



Specification

BTEC Nationals

Edexcel BTEC Level 3 Subsidiary Diploma and BTEC Level 3 Extended Diploma in Dental Technology (QCF)

For first teaching September 2010

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Qualification titles covered by this specification

Edexcel BTEC Level 3 Subsidiary Diploma in Dental Technology (QCF)

Edexcel BTEC Level 3 Extended Diploma in Dental Technology (QCF)

These qualifications have been accredited to the Qualifications and Credit Framework (QCF) and are eligible for public funding as determined by the Department for Children, Schools and Families (DCSF) under Sections 96 and 97 of the Learning and Skills Act 2000.

The qualification titles listed above feature in the funding lists published annually by the DCSF and the regularly updated website www.dcsf.gov.uk/. The QCF Qualifications Accreditation Number (QAN) should be used by centres when they wish to seek public funding for their learners. Each unit within a qualification will also have a QCF unit code.

The QCF qualification and unit codes will appear on the learners' final certification documentation.

The QANs for the qualifications in this publication are:

Edexcel BTEC Level 3 Subsidiary Diploma in Dental Technology (QCF)	500/7854/9
Edexcel BTEC Level 3 Extended Diploma in Dental Technology (QCF)	500/7795/8

These qualification titles will appear on learners' certificates. Learners need to be made aware of this when they are recruited by the centre and registered with Edexcel.

What are BTEC Nationals?

BTEC Nationals are QCF Level 3 qualifications designed to provide specialist work-related qualifications in a range of sectors. They give learners the knowledge, understanding and skills that they need to prepare for employment. The qualifications also provide career development opportunities for those already in work. Consequently they provide a course of study for full-time or part-time learners in schools, colleges and training centres.

The BTEC Nationals include Subsidiary Awards, Certificates and Diplomas which offer opportunities for nested provision and flexibility of delivery.

BTEC Nationals provide much of the underpinning knowledge and understanding for the National Occupational Standards for the sector, where these are appropriate. They are supported by the relevant Standards Setting Body (SSB) or Sector Skills Council (SSC). A number of BTEC Nationals are recognised as Technical Certificates and form part of the Apprenticeship Framework. They attract UCAS points that equate to similar-sized general qualifications.

On successful completion of a BTEC National qualification, learners can progress to or within employment or continue their study in the same or related vocational area.

BTEC National Subsidiary Award (30 credits)

The 30-credit BTEC National Subsidiary Award offers a specialist qualification that focuses on particular aspects of employment within the appropriate vocational sector. The BTEC National Subsidiary Award is a qualification which can extend a learner's programme of study and give vocational emphasis. It is broadly equivalent to one GCE Advanced Subsidiary Award.

The BTEC National Subsidiary Award is also suitable for more mature learners, who wish to follow a vocational programme of study as part of their continued professional development or who want to move to a different area of employment.

BTEC National Award/BTEC Subsidiary Diploma (60 credits)

The 60-credit BTEC National Award/BTEC Subsidiary Diploma extends the specialist work-related focus from the BTEC National Subsidiary Award. The BTEC National Award/BTEC Subsidiary Diploma offer flexibility and a choice of emphasis through the optional units. It is broadly equivalent to one GCE.

The BTEC National Award/BTEC Subsidiary Diploma is suitable for more mature learners, who wish to follow a vocational programme of study as part of their continued professional development or who want to move to a different area of employment.

BTEC National Certificate (120 credits)

The 120-credit BTEC National Certificate gives a specialist work-related programme of study that covers the key knowledge and practical skills required in the appropriate vocational sector. The BTEC National Certificate offers flexibility and a choice of emphasis through the optional units. It is broadly equivalent to two GCEs.

The BTEC National Certificate offers an engaging programme for those who are clear about the area of employment they wish to enter and for those who want to progress into higher education. These learners may wish to extend their programme through the study of a related Applied GCE, a GCE, a complementary NVQ or another qualification. These learning programmes can be developed to allow learners to study complementary qualifications without duplication of content.

For adult learners the BTEC National Certificate can extend their experience of work. It is a suitable qualification for those wanting a career change or who want to move into a particular area of employment following a career break.

BTEC National Diploma/BTEC Extended Diploma (180 credits)

The 180-credit BTEC National Diploma/BTEC Extended Diploma extends the specialist work-related focus available in the BTEC National Certificate. It is also suitable for those who have decided to enter a particular area of work. It is broadly equivalent to three GCEs.

Some learners may wish to gain the qualification in order to enter a specialist area of employment or to progress to higher education. Other learners may want to extend the specialism they studied on the BTEC National Subsidiary Award, BTEC National Award or Certificate programmes.

Key features of the Edexcel BTEC Subsidiary Diploma/BTEC Extended Diploma in Dental Technology (QCF)

The BTEC Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) have been developed to:

- give education and training for dental technology employees
- give opportunities for dental technology employees to achieve a nationally recognised Level 3 vocationally-specific qualification
- give full-time learners the opportunity to enter employment in the dental technology sector or to progress to vocational qualifications such as a Foundation Degree in Dental Technology
- give learners the opportunity to develop a range of skills and techniques, personal skills and attributes essential for successful performance in working life.

Rationale for the Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF)

These qualifications allow learners to develop the skills required to enable them to make an effective contribution to the dental technology sector.

Learners could come to these qualifications from a standard secondary school education, or from a vocationally-related background within the dental technology sector.

The qualifications are designed for learners who wish to enter careers as dental technicians.

The Edexcel BTEC Level 3 Subsidiary Diploma in Dental Technology (QCF) prepares learners for further vocational study, such as a Foundation Degree in Dental Technology. The Edexcel BTEC level 3 Extended Diploma in Dental Technology (QCF) prepares learners for employment in the dental technology sector.

The required skills, knowledge and understanding for both of these routes are such that the qualification consists only of core units, with no optional units.

The Edexcel BTEC Level 3 Subsidiary Diploma in Dental Technology (QCF) is a more general introduction to the dental technology sector. The Edexcel BTEC level 3 Extended Diploma in Dental Technology (QCF) is more specialised, as required by preparing learners for employment as a dental technician.

There is opportunity for innovative, imaginative and creative curriculum planning in all the units of this qualification, in both delivery of the content and the assessment of each unit.

● **Registration of Dental Technology**

Learners who are seeking employment in the dental technology sector, as a dental technician, are required to register with the General Dental Council.

The Edexcel BTEC Level 3 Extended Diploma in Dental Technology (QCF) is recognised as the accepted qualification for entry onto the Professionals Complimentary to Dentistry (PCD) register, by the General Dental Council (GDC).

For more information on the registration of the dental technicians please see the General Dental Council website www.gdc-uk.org.

● **National Occupational Standards**

BTEC Nationals are designed to provide much of the underpinning knowledge and understanding for the National Occupational Studies (NOS), as well as developing practical skills in preparation for work and possible achievement of NVQs in due course. NOS form the basis of National Vocational Qualifications (NVQs). BTEC Nationals do not purport to deliver occupational competence in the sector, which should be demonstrated in a work context.

Units in this specification relate to the 2009 General Dental Council (GDC) learning outcomes for Dental Technicians. These are set out in the GDC's 2009 document on requirements for the dental education and training for dentists and all groups of Dental Care Professionals. Each unit in the specification identifies links to elements of GDC Learning outcomes.

The relevant links between units in this qualification and the learning outcomes stipulated by the GDC are outlined in *Annexe F*.

Rules of combination for Edexcel BTEC Level 3 National qualifications

The rules of combination specify the:

- total credit value of the qualification
- the minimum credit to be achieved at the level or above the level of the qualification
- the mandatory unit credit
- the optional unit credit
- the maximum credit that can come from other QCF BTEC units (if applicable).

When combining units for a BTEC National qualification, it is the centre's responsibility to ensure that the following rules of combination are adhered to.

Edexcel BTEC Level 3 Subsidiary Diploma in Dental Technology (QCF)

- 1 Qualification credit value: a minimum of 60 credits
- 2 Minimum credit to be achieved at, or above, the level of the qualification: 45 credits
- 3 Mandatory unit credit: 60 credits
- 4 Optional unit credit: *there are no optional units in this qualification*

Edexcel BTEC Level 3 Extended Diploma in Dental Technology (QCF)

- 1 Qualification credit value: a minimum of 180 credits
- 2 Minimum credit to be achieved at, or above, the level of the qualification: 135 credits
- 3 Mandatory unit credit: 180 credits
- 4 Optional unit credit: *there are no optional units in this qualification*

Edexcel BTEC Level 3 Subsidiary Diploma in Dental Technology (QCF)

The Edexcel BTEC Level 3 Subsidiary Diploma in Dental Technology (QCF) is a 60-credit and 360 guided learning hour (GLH) qualification that consists of 6 mandatory units for the completed qualification. There are no optional units in this qualification.

Edexcel BTEC Level 3 National Award in Dental Technology			
Unit	Mandatory units	Credit	Level
1	Fundamentals of Dental Technology	10	3
2	Medical Emergencies, First Aid and Communication in the Dental Team	10	3
3	Dental Technology Techniques	10	3
4	Dental Anatomy, Oral Biology and Disease	10	3
5	Basic Dental Biomaterials Science	10	3
6	Legislation, Professionalism and Ethics in Dentistry	10	3

Edexcel BTEC Level 3 Extended Diploma in Dental Technology (QCF)

The Edexcel BTEC Level 3 Extended Diploma in Dental Technology (QCF) is a 180-credit and 1080 guided learning hour (GLH) qualification that consists of 18 mandatory units for the completed qualification. There are no optional units in this qualification.

Edexcel BTEC Level 3 National Diploma in Dental Technology			
Unit	Mandatory units	Credit	Level
1	Fundamentals of Dental Technology	10	3
2	Medical Emergencies, First Aid and Communication in the Dental Team	10	3
3	Dental Technology Techniques	10	3
4	Dental Anatomy, Oral Biology and Disease	10	3
5	Basic Dental Biomaterials Science	10	3
6	Legislation, Professionalism and Ethics in Dentistry	10	3
7	Dental Public Health and Preventative Dentistry	5	3
8	Removable Complete Prosthodontics	15	3
9	Removable Partial Prosthodontics	15	3
10	Dental Radiology and Imaging	5	3
11	Design of Fixed Prosthodontics	10	3
12	Complex Dental Materials Science	10	3
13	Techniques for Manufacturing Fixed Prosthodontics	15	3
14	Quality Assurance in Dental Technology	5	3
15	Principles of Orthodontic Therapy Regimes	5	3
16	Design, Manufacture and Modification of Orthodontic Appliances	15	3
17	Advanced Dental Technology Techniques and Procedures	10	3
18	Work-based Learning in Dental Technology	10	3

Assessment and grading

In BTEC Nationals all units are internally assessed.

All assessment for BTEC Nationals is criterion referenced, based on the achievement of specified learning outcomes. Each unit within the qualification has specified assessment and grading criteria which are to be used for grading purposes. A summative unit grade can be awarded at pass, merit or distinction:

- to achieve a 'pass' a learner must have satisfied **all** the pass assessment criteria
- to achieve a 'merit' a learner must additionally have satisfied **all** the merit grading criteria
- to achieve a 'distinction' a learner must additionally have satisfied **all** the distinction grading criteria.

Learners who complete the unit but who do not meet all the pass criteria are graded 'unclassified'.

Grading domains

The grading criteria are developed in relation to grading domains which are exemplified by a number of indicative characteristics at the level of the qualification.

There are four BTEC National grading domains:

- application of knowledge and understanding
- development of practical and technical skills
- personal development for occupational roles
- application of generic skills.

Please refer to *Annexe B* which shows the merit and distinction indicative characteristics.

Guidance

The purpose of assessment is to ensure that effective learning has taken place to give learners the opportunity to:

- meet the assessment and grading criteria and
- achieve the learning outcomes within the units.

All the assignments created by centres should be reliable and fit for purpose, and should build on the assessment and grading criteria. Assessment tasks and activities should enable learners to produce valid, sufficient and reliable evidence that relates directly to the specified criteria. Centres should enable learners to produce evidence in a variety of different forms and including, written reports, graphs and posters, along with projects, performance observation and time-constrained assessments.

Centres are encouraged to emphasise the practical application of the assessment and grading criteria, providing a realistic scenario for learners to adopt, and making maximum use of practical activities and work experience. The creation of assignments that are fit for purpose is vital to achievement and their importance cannot be over-emphasised.

The assessment and grading criteria must be clearly indicated in the fit-for-purpose assignments. This gives learners focus and helps with internal verification and standardisation processes. It will also help to ensure that learner feedback is specific to the assessment and grading criteria.

When looking at the assessment and grading grids and designing assignments, centres are encouraged to identify common topics and themes.

The units include guidance on appropriate assessment methodology. A central feature of vocational assessment is that it allows for assessment to be:

- current, ie to reflect the most recent developments and issues
- local, ie to reflect the employment context of the delivering centre
- flexible to reflect learner needs, ie at a time and in a way that matches the learner's requirements so that they can demonstrate achievement.

Calculation of the qualification grade

Pass qualification grade

Learners who achieve the minimum eligible credit value specified by the rule of combination will achieve the qualification at pass grade (see *Rules of combination for Edexcel BTEC Level 3 National qualifications*).

Qualification grades above pass grade

Learners will be awarded a merit or distinction or distinction* qualification grade (or combination of these grades appropriate to the qualification) by the aggregation of points gained through the successful achievement of individual units. The number of points available is dependent on the unit level and grade achieved, and the credit size of the unit (as shown in the 'points available for credits achieved at different QCF levels and unit grades' below).

Points available for credits achieved at different QCF levels and unit grades

The table below shows the **number of points scored per credit** at the unit level and grade.

Unit QCF level	Points per credit		
	Pass	Merit	Distinction
Level 2	5	6	7
Level 3	7	8	9
Level 4	9	10	11

Learners who achieve the correct number of points within the ranges shown in the 'qualification grade' table will achieve the qualification merit or distinction or distinction* grade (or combinations of these grades appropriate to the qualification).

Qualification grade

BTEC National Subsidiary Award

Points range above pass grade	Grade	
230-249	Merit	M
250-259	Distinction	D
260-270 and above	Distinction*	D*

BTEC National Award/BTEC Subsidiary Diploma

Points range above pass grade	Grade	
460-499	Merit	M
500-519	Distinction	D
520-540 and above	Distinction*	D*

BTEC National Certificate

Points range above pass grade	Grade
880-919	MP
920-959	MM
960-999	DM
1000-1029	DD
1030-1059	DD*
1060-1080 and above	D*D*

BTEC National Diploma/BTEC Extended Diploma

Points range above pass grade	Grade
1300-1339	MPP
1340-1379	MMP
1380-1419	MMM
1420-1459	DMM
1460-1499	DDM
1500-1529	DDD
1530-1559	DDD*
1560-1589	DD*D*
1590-1620 and above	D*D*D*

Please refer to *Annexe G* for examples of calculation of qualification grade above pass grade.

Quality assurance of centres

Edexcel's qualification specifications set out the standard to be achieved by each learner in order to be awarded the qualification. This is covered in the statement of learning outcomes, and assessment and grading criteria in each unit. Further guidance on delivery and assessment is given in the *Essential guidance for tutors* section in each unit. This section is designed to provide additional guidance and amplification related to the unit to support tutors, deliverers and assessors and to provide for a coherence of understanding and a consistency of delivery and assessment.

Approval

Centres that have not previously offered BTEC qualifications will first need to apply for, and be granted, centre approval before they can apply for approval to offer the programme.

When a centre applies for approval to offer a BTEC qualification they are required to enter into an approvals agreement.

The approvals agreement is a formal commitment by the head or principal of a centre to meet all the requirements of the specification and any linked codes or regulations. Sanctions and tariffs may be applied if centres do not comply with the agreement. Ultimately, this could result in the suspension of certification or withdrawal of approval.

Centres will be allowed 'accelerated approval' for a new programme where the centre already has approval for a programme that is being replaced by the new programme.

The key principles of quality assurance are that:

- a centre delivering BTEC programmes must be an approved centre and must have approval for programmes or groups of programmes that it is operating
- the centre agrees as part of gaining approval to abide by specific terms and conditions around the effective delivery and quality assurance of assessment; it must abide by these conditions throughout the period of delivery
- Edexcel makes available to approved centres a range of materials and opportunities intended to exemplify the processes required for effective assessment and examples of effective standards. Approved centres must use the materials and services to ensure that all staff delivering BTEC qualifications keep up to date with the guidance on assessment
- an approved centre must follow agreed protocols for standardisation of assessors and verifiers; planning, monitoring and recording of assessment processes; and for dealing with special circumstances, appeals and malpractice.

The approach of quality assured assessment is made through a partnership between an approved centre and Edexcel. Edexcel is committed to ensuring that it follows best practice and employs appropriate technology to support quality assurance processes where practicable. Therefore, the specific arrangements for working with centres will vary. Edexcel seeks to ensure that the quality assurance processes that it uses do not place undue bureaucratic processes on centres and works to support centres in providing robust quality assurance processes.

Edexcel monitors and supports centres in the effective operation of assessment and quality assurance. The methods which it uses to do this for BTEC First and National programmes accredited under the Qualifications and Credit Framework (QCF) include:

- ensuring that all centres have completed appropriate declarations at the time of approval undertaking approval visits to centres where necessary
- requiring all centres to appoint a Lead Internal Verifier for designated groups of programmes and to ensure that this person is trained and supported in carrying out that role
- requiring that the Lead Internal Verifier completes compulsory online standardisation related to assessment and verification decisions for the designated programme
- assessment sampling and verification, through requested samples of assessments, completed assessed learner work and associated documentation
- overarching review and assessment of a centre's strategy for assessing and quality assuring its BTEC programmes.

Edexcel Quality Assurance Handbook

Centres should refer to the *Handbook for Quality Assurance for BTEC QCF Qualifications*, issued annually, for detailed guidance.

An approved centre must make certification claims only when authorised by Edexcel and strictly in accordance with requirements for reporting.

Centres that do not fully address and maintain rigorous approaches to quality assurance will be prevented from seeking certification for individual programmes or for all BTEC First and National programmes. Centres that do not comply with remedial action plans may have their approval to deliver qualifications removed.

Programme design and delivery

BTEC National qualifications consist of mandatory units and optional units. Optional units are designed to provide a focus to the qualification and give more specialist opportunities.

In BTEC Nationals each unit has a credit value. The credit value includes an estimate of time that might be allocated to direct teaching, instruction and assessment, together with other structured learning time such as directed assignments or supported individual study. It also includes learner-initiated private study. Centres are advised to consider this definition when planning the programme of study associated with this specification.

Mode of delivery

Edexcel does not define the mode of study for BTEC Nationals. Centres are free to offer the qualifications using any mode of delivery (such as full-time, part-time, evening only, distance learning) that meets their learners' needs. Whichever mode of delivery is used, centres must ensure that learners have appropriate access to the resources identified in the specification and to the subject specialists delivering the units. This is particularly important for learners studying for the qualification through open or distance learning.

Learners studying for the qualification on a part-time basis bring with them a wealth of experience that should be utilised to maximum effect by tutors and assessors. The use of assessment evidence drawn from learners' work environments should be encouraged. Those planning the programme should aim to enhance the vocational nature of the qualification by:

- liaising with employers to ensure a course relevant to learners' specific needs

- accessing and using non-confidential data and documents from learners' workplaces
- including sponsoring employers in the delivery of the programme and, where appropriate, in the assessment
- linking with company-based/workplace training programmes
- making full use of the variety of experience of work and life that learners bring to the programme.

Resources

BTEC Nationals are designed to prepare learners for employment in specific occupational sectors. Physical resources need to support the delivery of the programme and the proper assessment of the learning outcomes and should, therefore, normally be of industry standard. Staff delivering programmes and conducting the assessments should be familiar with current practice and standards in the sector concerned. Centres will need to meet any specific resource requirements to gain approval from Edexcel.

Facilities required for the Edexcel Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) include a fully equipped dental laboratory. The laboratory should be fitted with appropriate benching, hand pieces, extractor units, mixing machines, model trimmers, light cure boxes, pressure pots, vacuum-forming machines, Bunsen burners, polishing lathes, first aid kits and fire extinguishers in position, all PPE, infection control and safety equipment, a wide range of dental materials, plaster work facilities, casting and curing equipment, a suitable boiling-out unit, a packaging bench with extraction and trimming and polishing facilities.

Learners should be equipped with a full dental toolkit, a selection of trimming burs for a variety of materials, protective overalls and personal protective equipment; goggles, masks and gloves, where appropriate.

Access to dental laboratories that host work placements is essential. Work placement visits and work placement record sheets will be required for learners prior to being sent on placements. Access to hospital and commercial dental laboratories that provide a range of dental technology services is very important.

Staff delivering this qualification should be competent, experienced and registered dental technicians. Ideally they should have recent laboratory experience within dental technology and show evidence of regular contact with the industry and/or technical updating.

More specialised resources are detailed within the *Delivery and Assessment Guidance* and *Essential Resources* sections of each unit.

Delivery approach

It is important that centres develop an approach to teaching and learning that supports the specialist vocational nature of BTEC National qualifications and the mode of delivery. Specifications give a balance of practical skill development and knowledge requirements, some of which can be theoretical in nature. Tutors and assessors need to ensure that appropriate links are made between theory and practical application and that the knowledge base is applied to the sector. This requires the development of relevant and up-to-date teaching materials that allow learners to apply their learning to actual events and activity within the sector. Maximum use should be made of the learner's experience.

An outline learning plan is included in each unit and demonstrates how the credit has been assigned to the unit.

The outline learning plan gives an indication of the volume of learning related to the achievement of the learning outcomes. Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

The use of photographic evidence and case studies are permitted in these qualifications.

Meeting local needs

Centres should note that the qualifications set out in this specification have been developed in consultation with centres and employers and the Sector Skills Councils or the Standards Setting Bodies for the relevant sector. Centres should make maximum use of the choice available to them within the optional units to meet the needs of their learners, and local skills and training needs.

In certain circumstances, units in this specification might not allow centres to meet a local need. In this situation, Edexcel will ensure that the rule of combination allows centres to make use of units from other standard QCF BTEC specifications. Centres are required to ensure that the coherence and purpose of the qualification is retained and to ensure that the vocational focus is not diluted.

Limitations on variations from standard specifications

The flexibility to import standard units from other BTEC Nationals is limited to a total of 25 per cent of the qualification credit value.

The use of these units cannot be at the expense of the mandatory units in any qualification.

Additional and specialist learning

Additional and specialist learning (ASL) consists of accredited qualifications at the same level as, or one level above, the Diploma course of study, which have been approved under Section 96 of the Learning and Skills Act 2000. The ASL may include BTEC qualifications which are also available to learners not following a Diploma course of study.

Qualifications for ASL must be selected from the ASL catalogue through the National Database of Accredited Qualifications (NDAQ). The catalogue includes qualifications which have the approval of the Diploma Development Partnership (DDP) and will expand over time as more qualifications are approved. To access the catalogue go to www.ndaq.org.uk and select 'Browse Diploma Qualifications'.

Functional Skills

BTEC Nationals give learners opportunities to develop and apply Functional Skills.

Functional Skills are offered as stand-alone qualifications at Level 2. See each individual unit for opportunities to cover ICT, Mathematics and English Functional Skills.

Personal, learning and thinking skills

Opportunities are available to develop personal, learning and thinking skills (PLTS) within sector-related context. PLTS are identified in brackets after the unit pass criteria to which they are associated and they are also mapped in *Annexe C*. Further opportunities for learners to demonstrate these skills may also be apparent as learners progress throughout their learning.

Access and recruitment

Edexcel's policy regarding access to its qualifications is that:

- they should be available to everyone who is capable of reaching the required standards
- they should be free from any barriers that restrict access and progression
- there should be equal opportunities for all wishing to access the qualifications.

Centres are required to recruit learners to BTEC qualifications with integrity. This will include ensuring that applicants have appropriate information and advice about the qualifications and that the qualification will meet their needs. Centres should take appropriate steps to assess each applicant's potential and make a professional judgement about their ability to successfully complete the programme of study and achieve the qualification. This assessment will need to take account of the support available to the learner within the centre during their programme of study and any specific support that might be necessary to allow the learner to access the assessment for the qualification. Centres should consult Edexcel's policy on learners with particular requirements.

Centres will need to review the entry profile of qualifications and/or experience held by applicants, considering whether this profile shows an ability to progress to a Level 4 qualification. For learners who have recently been in education, the profile is likely to include one of the following:

- a BTEC Level 2 qualification in dental technology or a related vocational area
- a standard of literacy and numeracy supported by a general education equivalent to four GCSEs at grade A*-C
- other related Level 2 qualifications
- related work experience.

More mature learners may present a more varied profile of achievement that is likely to include experience of paid and/or unpaid employment.

Restrictions on learner entry

Most BTEC National qualifications are accredited on the QCF for learners aged 16 years and over.

In particular sectors the restrictions on learner entry might also relate to any physical or legal barriers, for example people working in health, care or education are likely to be subject to police checks.

Edexcel BTEC Level 3 Nationals are listed on the DCSF funding lists under Section 96 and Section 97 of the Learning and Skills Act 2000.

Access arrangements and special considerations

Edexcel's policy on access arrangements and special considerations for BTEC and Edexcel NVQ qualifications aims to enhance access to the qualifications for learners with disabilities and other difficulties (as defined by the 1995 Disability Discrimination Act and the amendments to the Act) without compromising the assessment of skills, knowledge, understanding or competence.

Further details are given in the policy '*Access Arrangements and Special Considerations for BTEC and Edexcel NVQ Qualifications*', which can be found on the Edexcel website (www.edexcel.com). This policy replaces the previous Edexcel policy (Assessment of Vocationally Related Qualification: Regulations and Guidance Relating to learners with Special Requirements, 2002) concerning learners with particular requirements.

Recognition of Prior Learning

Recognition of Prior Learning (RPL) is a method of assessment (leading to the award of credit) that considers whether a learner can demonstrate that they can meet the assessment requirements for a unit through knowledge, understanding or skills they already possess and so do not need to develop through a course of learning.

Edexcel encourages centres to recognise learners' previous achievements and experiences whether at work, home and at leisure, as well as in the classroom. RPL provides a route for the recognition of the achievements resulting from continuous learning.

RPL enables recognition of achievement from a range of activities using any valid assessment methodology. Provided that the assessment requirements of a given unit or qualification have been met, the use of RPL is acceptable for accrediting a unit, units or a whole qualification. Evidence of learning must be valid and reliable.

Unit format

All units in Edexcel BTEC Level 3 National qualifications have a standard format. The unit format is designed to give guidance on the requirements of the qualification for learners, tutors, assessors and those responsible for monitoring national standards.

Each unit has the following sections.

Unit title

The unit title is accredited on the QCF and this form of words will appear on the learner's Notification of Performance (NOP).

QCF level

All units and qualifications within the QCF will have a level assigned to them, which represents the level of achievement. There are nine levels of achievement, from Entry Level to Level 8. The level of the unit has been informed by the QCF level descriptors and, where appropriate, the NOS and/or other sector/professional benchmarks.

Credit value

In BTEC National qualifications each unit consists of a credit value, learners will be awarded credits for the successful completion of whole units.

The credit value of a unit specifies the number of credits that will be awarded to a learner who has achieved the learning outcomes of the unit. The credit value of the unit will remain constant in all contexts, regardless of the assessment method used for the qualification(s) to which it contributes.

A credit value specifies the number of credits that will be awarded to a learner who has achieved all the learning outcomes of the unit.

Aim and purpose

The aim provides a clear summary of the purpose of the unit and is a succinct statement that summarises the learning outcomes of the unit.

Unit introduction

The unit introduction gives the reader an appreciation of the unit in the vocational setting of the qualification, as well as highlighting the focus of the unit. It gives the reader a snapshot of the unit and the key knowledge, skills and understanding gained while studying the unit. The unit introduction also highlights any links to the appropriate vocational sector by describing how the unit relates to that sector.

Learning outcomes

Learning outcomes state exactly what a learner should 'know, understand or be able to do' as a result of completing the unit.

Unit content

The unit content identifies the breadth of knowledge, skills and understanding needed to design and deliver a programme of learning to achieve each of the learning outcomes. This is informed by the underpinning knowledge and understanding requirements of the related National Occupational Standards (NOS).

The content provides the range of subject material for the programme of learning and specifies the skills, knowledge and understanding required for achievement of the pass, merit and distinction grading criteria.

Each learning outcome is stated in full and then the key phrases or concepts related to that learning outcome are listed in italics followed by the subsequent range of related topics.

Relationship between content and assessment criteria

The learner must have the opportunity within the delivery of the unit to cover all of the unit content.

It is not a requirement of the unit specification that all of the content is assessed. However, the indicative content will need to be covered in a programme of learning in order for learners to be able to meet the standard determined in the assessment and grading criteria. The merit and distinction grading criteria enable the learner to achieve higher levels of performance in acquisition of knowledge, understanding and skills.

Content structure and terminology

The information below shows how unit content is structured and gives the terminology used to explain the different components within the content.

- Learning outcome: this is given and in bold at the beginning of each section of content.
- Italicised sub-heading: it contains a key phrase or concept. This is content which must be covered in the delivery of the unit. Colons mark the end of an italicised sub-heading.
- Elements of content: the elements are in plain text and amplify the sub-heading. The elements must also be covered in the delivery of the unit. Semi-colons mark the end of an element.
- Brackets contain amplification of content which must be covered in the delivery of the unit.
- 'eg' is a list of examples used for indicative amplification of an element (that is, the content specified in this amplification that could be covered or that could be replaced by other, similar material).

Assessment and grading criteria

Each grading grid gives the assessment and grading criteria used to determine the evidence that each learner must produce in order to receive a pass, merit or distinction grade. It is important to note that the merit and distinction grading criteria require a qualitative improvement in the learner's evidence and not simply the production of more evidence at the same level.

Essential guidance for tutors

This section gives tutors additional guidance and amplification to aid understanding and a consistent level of delivery and assessment. It is divided into the following sections.

- *Delivery* – explains the content's relationship with the learning outcomes and offers guidance about possible approaches to delivery. This section is based on the more usual delivery modes but is not intended to rule out alternative approaches.
- *Outline learning plan* – the outline learning plan demonstrates how the credit for the unit has been assigned. The outline learning plan gives an indication of the volume of learning related to the achievement of the learning outcomes. Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place. Learning time is defined as the amount of time a learner, at the level of the unit, is expected to take on average, to complete the learning outcomes of the unit to the standard determined by the assessment criteria.
- *Assessment* – gives amplification about the nature and type of evidence that learners need to produce in order to pass the unit or achieve the higher grades. This section should be read in conjunction with the grading criteria.
- *Programme of suggested assignments* – the table shows how the suggested assignments match and cover the assessment grading criteria.
- *Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications* – sets out links with other units within the qualification. These links can be used to ensure that learners make connections between units, resulting in a coherent programme of learning. The links show opportunities for integration of learning, delivery and assessment.
- *Essential resources* – identifies any specialist resources needed to allow learners to generate the evidence required for each unit. The centre will be asked to ensure that any requirements are in place when it seeks approval from Edexcel to offer the qualification.
- *Employer engagement and vocational contexts* – provides a short list of agencies, networks and other useful contacts for employer engagement and for sources of vocational contexts.
- *Indicative reading for learners* – gives a short list of learner resource material that benchmarks the level of study.

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Unit 1: Fundamentals of Dental Technology

Unit code:	H/600/7262
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

The aim of this unit is to give learners an insight into techniques used in the construction of custom-made dental devices. Specific techniques are common to all specialties of dental technology and this unit enables learners to acquire the skills needed to carry out these procedures.

● Unit introduction

This unit enables learners to use dental laboratory equipment in a safe environment and to become accustomed to the various instruments and materials required to complete basic procedures.

Learners will look at commonly used methods for the construction of dental models, the various types of model, their design requirements and the materials used in their production.

This unit introduces learners to the design requirements for custom-made impression trays and how they are constructed to allow the production of a master model which will ensure the completed dental device fits the patient.

Learners will also learn about the design requirements and construction of record blocks and how they are used in the process of providing dental appliances.

The unit shows learners how to articulate dental models using a variety of articulators and demonstrates how articulation is a crucial aspect in the process of providing a custom-made dental device.

● Learning outcomes

On completion of this unit a learner should:

- 1 Be able to construct dental models
- 2 Be able to construct custom-made dental impression trays
- 3 Be able to construct record blocks
- 4 Be able to articulate dental models.

Unit content

1 Be able to construct dental models

Design requirements: purpose of a model; model design, eg preliminary, study, master, orthodontic, sectioned; construction techniques; material selection; anatomical requirements; base design; die design; presentation requirements

Initial preparation: receipt of impressions; prescription interpretation; impression identification; impression checks; impression treatment before casting

Casting impressions: selection of equipment; mixing techniques; casting methods

Removal of impression material: methods; model assessment; model identification

Trimming models: instruments and equipment; trimming methods; sectioning methods; die trimming; model finishing

2 Be able to construct custom-made dental impression trays

Design features: purpose of trays; tray design types, edentulous, partially dentate; relevance and importance of anatomical landmarks; peripheral outline; reasons for and design of spacers and stops; reasons for and design of handle and finger rests; retention aids

Construction techniques: prescription interpretation; instruments and equipment; materials; model preparation; reasons and techniques for spacers; material manipulation; trimming and finishing; quality assurance checks

3 Be able to construct record blocks

Cast analysis: peripheral outline; elimination of undercuts

Record blocks: uses; materials used; construction techniques for edentulous and partially dentate; design requirements; rim height, width and position

4 Be able to articulate dental models

Articulators: types; uses; how articulators simulate jaw movements; adjustments; interpretation and transfer of data from record blocks to articulator

Articulation of models: preparation of models; split cast technique; articulation techniques for removable prosthodontics, orthodontics and fixed prosthodontics

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 identify the different types of dental model	M1 describe the design requirements for each type of dental model	D1 explain how poorly constructed dental models can have an effect on the outcome of a dental device
P2 construct dental models to a clinically acceptable standard, with substantial guidance [CT2, RL4, SM3]	M2 construct dental models to a clinically acceptable standard, with limited guidance	D2 construct dental models to a clinically acceptable standard, working independently
P3 identify the different types of custom-made impression tray	M3 describe the design requirements for each type of custom-made impression tray	D3 explain how a poorly designed and constructed tray can have an effect on the outcome of the master dental model
P4 construct custom-made impression trays to a clinically acceptable standard, with substantial guidance [CT2, RL4, SM3]	M4 construct custom-made impression trays to a clinically acceptable standard, with limited guidance	D4 construct custom-made impression trays to a clinically acceptable standard, working independently
P5 describe the uses of record blocks	M5 describe the design requirements of record blocks for edentulous and partially dentate patients	D5 explain how data registered on a record block is used in the construction of a dental device
P6 construct record blocks to a clinically acceptable standard, with substantial guidance [CT2, RL4, SM3]	M6 construct record blocks to a clinically acceptable standard, with limited guidance	D6 construct record blocks to a clinically acceptable standard, working independently
P7 identify the different types of dental articulator	M7 describe the main features of the different types of dental articulator	D7 explain how models are articulated to the different types of dental articulator
P8 articulate models to a clinically acceptable standard, with substantial guidance [CT2, RL4, SM3]	M8 articulate models to a clinically acceptable standard, with limited guidance	D8 articulate models to a clinically acceptable standard, working independently

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

Learners should have access to a fully-equipped dental laboratory and also to the full range of impression materials and impression techniques from the various dental specialties to enable them to acquire the skills to process all types of dental model. The completion of a clinically acceptable dental model will ensure that learners can proceed to the next stages, namely impression trays, record blocks and articulation. Learners should be encouraged to work independently but to seek advice or guidance when necessary.

Delivery

Tutors delivering this unit have opportunities to use a wide variety of techniques, including lectures, practical demonstrations, discussions, seminar presentations, independent learner research using the internet and/or library resources, the use of personal laboratory experience, and work placements. Delivery should encourage learners to be enthusiastic about their new profession and motivate them to find out more information and improve their skills through questioning and practice.

Work placements should be monitored regularly in order to ensure the quality of the learning experience. Learners and supervisors should be made aware of the requirements of this unit before any work related activities, so that naturally occurring evidence can be collected at the time. Learners should be encouraged to keep a notebook to record all completed practical work. For example, as a new employee in a dental laboratory, a learner will have the opportunity to produce models, impression trays, record blocks and articulate. It is essential that tutors stress the importance of patient and learner welfare, accuracy and quality in dental technology techniques.

Health and safety issues relating to working in a dental laboratory environment must be regularly reinforced. Risk assessment must be carried out both in the training laboratory and work experience laboratory before the start of practical activities.

Tutors should consider integrating the delivery, private study and assessment relating to this unit with other units and assessment instruments that learners may be taking as part of their programme of study.

Learning outcomes 1, 2, 3 and 4 are directly linked. Visits to clinical environments to meet with patients and dental care professionals would be beneficial at this stage of the learning process.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments.

Learning outcome 1

Introduction to the materials and equipment used in the construction of dental models and discuss health and safety procedures.

Discuss pouring techniques and conservation die systems.

Demonstrate mixing materials and pouring impressions.

Learners carry out the pouring of a range of impressions.

Discuss removal of impression materials and anatomical landmarks.

Demonstrate trimming models and die preparation.

Learners carry out the trimming of models and die preparation.

Learning outcome 2

Introduction to materials and equipment used in the construction of custom-made impression trays and health and safety procedures.

Demonstrate the construction of a light-cured impression tray.

Learners construct light-cured impression trays.

Demonstrate the construction of a shellac impression tray.

Learners construct shellac impression trays.

Personal study time and research.

Assignment 1: Dental Models and Custom-made Impression Trays (P1, P2, P3, P4, M1, M2, M3, M4, D1, D2, D3, D4)

Learning outcome 3

Introduction to the materials and equipment used in the construction of record blocks.

Demonstrate construction of edentulous upper shellac and lower wax- based record blocks.

Learners construct edentulous record blocks.

Demonstrate construction of edentulous light-cure based record blocks.

Learners construct edentulous record blocks.

Demonstrate construction of partially dentate record blocks.

Learners construct partially dentate record blocks.

Learning outcome 4

Discuss different types of articulator and explain their movements.

Introduction to the procedures used in the articulation of dental models

Demonstrate articulation using a plane line articulator.

Learners articulate dental models using a plane line articulator.

Demonstrate articulation of dental models using average value articulators.

Learners articulate dental models using average value articulators.

Personal study time and research.

Assignment 2: Record Blocks and Articulation (P5, P6, P7, P8, M5, M6, M7, M8, D5, D6, D7, D8)

Review of unit and programme of assignments.

Assessment

Generic guidance on assessment

All learners are entitled to initial guidance in planning their work but the level of assistance required should be taken into account when their work is assessed. In the grading criteria grid, reference is made to learners working with 'substantial guidance', with 'limited guidance' and 'independently'. When assessing the work, assessors should apply the following guidelines.

'Substantial guidance': Learners have to be guided and advised throughout to ensure that progress is made. Learners rely on the support of the tutor, who has to assist in most aspects of the work. This level of support restricts learners to a pass grade, irrespective of the quality of the evidence.

'Limited guidance': The tutor supports learners initially in the choice of topic for investigation. Thereafter, the tutor reacts to questions from learners and suggests a range of ideas that they can act on. Learners frequently check matters of detail. The tutor needs to assist in some aspects of the work. This level of support restricts learners to a pass or merit grade, irrespective of the quality of the evidence.

'Independently': The tutor supports learners initially in the choice of topic for the investigation or task. Thereafter, the tutor occasionally assists learners and only when asked, but monitors progress throughout. This level of support gives access to all three grades: pass, merit and distinction.

Assessment

For P1, learners must identify the different types of dental model. This could be evidenced by showing the learner a selection of dental models, ie study models, preliminary models, master models, orthodontic study models and conservation models with trimmed dies. The learner could verbally identify each model, which could be documented by the assessor using a generic check sheet.

For P2, learners must construct dental models using recognised materials and techniques. The models would be the evidence from the centre and a witness statement would be the evidence from the workplace. If assessed during a placement the witness statement should be provided by the workplace mentor and verified by the tutor. Learners are permitted substantial guidance from the tutor or workplace mentor.

For P3, learners must identify different types of custom-made impression tray. This could be evidenced by showing the learner a selection of custom-made impression trays, which they have to verbally identify. The assessor could use a generic check sheet to document this.

For P4, learners must construct custom-made impression trays using recognised materials and techniques. The impression trays would be the evidence from the centre and a witness statement would be used as evidence from the workplace. If assessed during a placement, a witness statement should be provided by the workplace mentor and verified by the tutor. Learners are permitted substantial guidance from the tutor or workplace mentor.

For P5, learners must describe what record blocks are used for within dentistry.

For P6, learners must construct record blocks using recognised materials and techniques. The record blocks would be the evidence from the centre and a witness statement would be used as evidence from the workplace. If assessed during a placement, the witness statement should be provided by the workplace mentor and verified by the tutor. Learners are permitted substantial guidance from the tutor or workplace mentor.

For P7, learners must identify the different types of dental articulator.

Learners could be shown a selection of articulators which they verbally identify. This could then be documented by the assessor, using a generic check sheet.

For P8, learners must articulate models using recognised techniques. The articulated models would be the evidence from the centre and a witness statement used as evidence from the workplace. If assessed during a placement, the witness statement should be provided by the workplace mentor and verified by the tutor.

Learners are permitted substantial guidance from the tutor or workplace mentor.

For M1, learners must explain the design requirements for the different types of dental model. This could be evidenced by a written assignment containing images.

For M2, learners must construct dental models using recognised materials and techniques. The models would be the evidence from centre and a witness statement would be used as evidence from the workplace. If assessed during a placement, the witness statement should be provided by the workplace mentor and verified by the tutor. Learners are permitted limited guidance from the tutor or workplace mentor.

For M3, learners must describe the design requirements for each type of custom-made impression tray. This could be evidenced by a written assignment containing images.

For M4, learners must construct custom-made impression trays using recognised materials and techniques. The impression trays would be the evidence from the centre and a witness statement would be used as evidence from the workplace. If assessed during a placement, the witness statement should be provided by the workplace mentor and verified by the tutor. Learners are permitted limited guidance from the tutor or workplace mentor.

For M5, learners must describe the design requirements of record blocks. This could be evidenced as part of a written assignment containing images.

For M6, learners must construct record blocks using recognised materials and techniques. The record blocks would be the evidence from the centre and a witness statement would be used as evidence from the workplace. If assessed during a placement, a witness statement should be provided by the workplace mentor and verified by the tutor. Learners are permitted limited guidance from the tutor or workplace mentor.

For M7, learners must describe the main features of the different types of dental articulator. This could be evidenced by a written assignment containing images.

For M8 learners must articulate models using recognised techniques. The articulated models would be the evidence in the learning institution and a witness statement would be used as evidence from the workplace. If assessed during a placement, the witness statement should be provided by the workplace mentor and verified by the tutor.

Learners are permitted limited guidance from the tutor or workplace mentor.

For D1, learners are required to explain the effect of poorly designed and constructed models on the outcome of a custom-made dental device. This could be evidenced by a written assignment.

For D2, learners must construct dental models using recognised materials and techniques whilst working independently. The models would be the evidence from the centre and a witness statement would be used as evidence from the workplace. If assessed during a placement, the witness statement should be provided by the workplace mentor and verified by the tutor.

For D3, learners are required to explain the effect of poorly designed and constructed custom-made impression trays on the outcome of the master model. This could be evidenced by a written assignment.

For D4, learners must construct custom-made impression trays using recognised materials and techniques and working independently. The impression trays would be the evidence from the centre and a witness statement would be used as evidence from the workplace. If assessed during a placement, a witness statement should be provided by the workplace mentor and verified by the tutor.

For D5, learners are required to explain how data registered on a record block is used in the construction of a dental device. This could be evidenced by a written assignment containing images.

For D6, learners must construct record blocks using recognised materials and techniques and working independently. The record blocks would be the evidence from the centre and a witness statement would be used as evidence from the workplace. If assessed during a placement, a witness statement should be provided by the workplace mentor and verified by the tutor.

For D7, learners are required to explain how various dental models used by the different specialties are articulated. This could be evidenced by a written assignment containing images.

For D8, learners must articulate models using recognised techniques and working independently. The articulated models would be the evidence from the centre and a witness statement would be used as evidence from the workplace. If assessed during a placement, the witness statement should be provided by the workplace mentor and verified by the tutor.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, P4 M1, M2, M3, M4 D1, D2, D3, D4	Dental Models and Custom-made Impression Trays	You have started work in a dental laboratory. As a new employee you will start in the plaster room. Your mentor will demonstrate the use of the equipment and discuss health and safety precautions. The mentor will demonstrate mixing, pouring up and trimming models. You will be supervised until competent. You should keep notes of preparation techniques and mixing ratios. When you have mastered dental models you move to the main laboratory where your mentor will explain the materials and equipment used in the construction of special trays. You will construct special trays and be supervised until competent.	Written assignment Practical tasks

Criteria covered	Assignment title	Scenario	Assessment method
P5, P6, P7, P8 M5, M6, M7, M8 D5, D6, D7, D8	Record blocks and articulation	You are in the main laboratory to construct record blocks and will be supervised until competent. In the plaster room your mentor will demonstrate articulation techniques using a range of articulators. You will be supervised articulating models.	Written assignment Practical tasks

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the *BTEC Nationals in Dental Technology* sector suite. This unit has particular links with:

Level 3
Unit 3: Dental Technology Techniques
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 5: Basic Dental Biomaterials Science
Unit 8: Removable Complete Prosthodontics
Unit 9: Removable Partial Prosthodontics
Unit 11: Design of Fixed Prosthodontics
Unit 13: Techniques for Manufacturing Fixed Prosthodontics
Unit 14: Quality Assurance in Dental Technology
Unit 16: Design, Manufacture and Modification of Orthodontic Appliances

Essential resources

Facilities required for this unit include a fully equipped dental laboratory. It should meet all health and safety legislation and be registered with the MHRA. Learners within the laboratory should have access to benching fitted with a hand piece and extractor unit. The laboratory should have a vacuum-mixing machine, a model trimmer, a light cure box, Bunsen burner, polishing lathe and a selection of dental materials. Learners should be equipped with a dental toolkit and a selection of trimming burs.

Staff delivering this unit should be competent, experienced and registered with the General Dental Council. They should have recent laboratory experience within dental technology and show evidence of contact with the industry and evidence of continuing professional development.

Learners will need access to a library with a range of relevant books and journals.

Employer engagement and vocational contexts

Where possible learners should visit and gain work experience in both a private dental laboratory and a hospital dental laboratory as this will give them a balanced overview of the differences in service provision and work procedures carried out in these different working environments.

Indicative reading for learners

Textbooks

Basker R M and Davenport J C – *Prosthetic Treatment of the Edentulous Patient, 4th Edition* (Wiley Blackwell, 2002) ISBN 0632059982

McCabe J F and Walls A W G – *Applied Dental Materials, 9th Edition* (Wiley Blackwell, 2008) ISBN 140139617

McCord J F, Smith P and Grey N – *Treatment of Edentulous Patients* (Churchill Livingstone, 2004) ISBN 0443073074

Journals

Dental Lab Journal

The Dental Technician

Dental Technologies

Private Laboratory

Quintessence Journal of Dental Technology

Websites

www.derweb.co.uk

www.dla.org.uk

www.dta-uk.org

www.qjdt.co.uk

Dental Education Resources

Dental Laboratories Association

Dental Technicians Association

Quintessence Journal of Dental Technology

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit:

Skill	When learners are ...
Creative thinkers	[CT2] asking questions to clarify construction issues
Reflective learners	[RL4] inviting feedback and using it as a means of improving their practical work
Self-managers	[SM3] organising their time and resources when carrying out vocational tasks practicals

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Effective participators	[EP3] proposing practical ways forward with construction projects, breaking these into manageable steps

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using in-house ICT systems to find information for assignments
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	
Manage information storage to enable efficient retrieval	saving information and assignment work in a folder
Follow and understand the need for safety and security practices	aware of keeping their password safe and not disclosing it to others
Troubleshoot	able to identify a fault and know the procedure to report it
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	collecting information from books and journals
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	obtaining information from identified websites
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	making sure that the information they require is obtainable from a website, eg pictures of dental appliances and equipment
Bring together information to suit content and purpose	creating a single document that has all the information for their work
Present information in ways that are fit for purpose and audience	presenting the information from the document as requested in the brief
Evaluate the selection and use of ICT tools and facilities used to present information	discussing how the document can be improved
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	using email to send centre produced work to own address keeping own messages safely in a folder creating a contact list
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	discussing construction techniques for the practical tasks

Skill	When learners are ...
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading handouts given during discussions
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing their assignments

Unit 2: Medical Emergencies, First Aid and Communication in the Dental Team

Unit code:	F/600/7267
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

The aim of this unit is to enable learners to establish their responsibilities within the working environment, and provide them with effective communication and ICT skills in the provision of oral healthcare. It will also instil an understanding of dealing with medical emergencies and the health and safety regulations which govern dental personnel.

● Unit introduction

The study of behavioural science, communication skills and health informatics are essential for all dental studies. Learners need to recognise different cultural and social backgrounds so as to enhance equality, diversity and rights within their working environment.

In learning outcome 1, learners will develop a knowledge and understanding of communication methods, and their importance in the provision of oral healthcare and treatment regimes. Learners will develop an awareness of how communication can be misinterpreted, and how this can cause barriers which affect both the patient and the dental team.

Learning outcome 2 is designed to develop learners' skills in dealing with medical emergencies and the principles of basic first aid. It introduces learners to cardiac arrest, epileptic seizures, upper respiratory obstruction, inhalation or ingestion of foreign bodies, anaphylactic reaction, hypoglycaemia, cuts, burns, scalds and haemorrhaging, and what they need to do when dealing with these types of emergencies.

Learning outcome 3 is designed to develop learners' knowledge of regulations for dental personnel; this will cover topics such as first aid health and safety; incident and accident reporting; RIDDOR; and regulations for manual handling and lifting of heavy dental materials and equipment.

Learning outcome 4 will enable learners to gain an understanding of a range of information and communication technology resources that are used within a dental capacity. They will learn how ICT is used to enhance communication within the dental workplace.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know about communication methods in order to form effective working relationships
- 2 Be able to demonstrate first aid procedures needed for medical emergencies in the clinical setting or dental laboratory
- 3 Know the health and safety regulations required for dental personnel
- 4 Know how information technology is incorporated in a clinical and dental laboratory environment.

Unit content

1 Know about communication methods in order to form effective working relationships

Definition: good communication (the transfer and receiving of information between individuals, utilising appropriate methods to ensure professional working relationships)

Internal and external communication barriers: different cultural, social and ethnic minorities, impairments and disabilities such as hearing, sight, physical, age and learning difficulties; external barriers including background noise from equipment, disruptions and distractions encountered specific to dentistry

Recognition and management of patients: accommodating specific patient needs and employing suitable methods to promote equality; diversity and rights to show inclusion throughout treatment planning; application and standards of care

Methods of communicating: verbal and non-verbal; written format; telephone; ICT; body language; facial expressions; posture; pitch; tone and language

2 Be able to demonstrate first aid procedures needed for medical emergencies in the clinical setting or dental laboratory

Medical emergencies: unconsciousness, eg fainting, shock, head injury, stroke, heart attack, asphyxia, poisoning, epilepsy and diabetes; airway and breathing problems, eg choking, asthma, hyperventilation; circulatory problems, eg angina, heart attack, shock, cardiogenic shock, neurogenic shock, anaphylactic shock; wounds and bleeding, eg types of wound: abrasion, laceration, incision, puncture, amputation, contusion and types of bleeding, arterial, venous, capillary, effects of blood loss; burns and scalds, eg wet (heat) scalds, chemical burns, electrical burns, hot object burns; injuries to bones, muscles and joints, eg fracture, dislocation, sprain, strain

Signs and symptoms: unconsciousness; airway and breathing problems; circulatory problems; wounds; internal and external bleeding; burns; scalds; injuries to bones; muscles; joints; diabetes; epilepsy; poisons

Principles of treatment: lifting and handling casualties; treatment and first aid (unconsciousness, airway and breathing problems, wounds, bleeding, burns, scalds, diabetes, epilepsy, poisons, injuries to bones, fractures and breaks)

3 Know the health and safety regulations required for dental personnel

Current health and safety (first aid) regulations: employers' and employees' responsibilities; first aid kits; first aiders; reporting of incidents at work; RIDDOR; accident book; first aid patient report form

Risk assessment: regulations for manual handling and lifting of heavy dental materials and equipment

4 Know how information technology is incorporated in a clinical and dental laboratory environment

How information technology and resources are utilised in the clinical setting: storing; planning; updating medical records; digital images; arranging patient appointments; referrals and transfer of information via email

How information technology and resources are utilised in the dental laboratory: storing of clinician details for itemised billing for laboratory services; storing information based on material stock control; record and account details with dental manufacturing companies for purchasing equipment and materials; storing records for employees, eg personal details; salary; inland revenue; national insurance; appraisal; disciplinary

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 identify the methods of communicating when giving, receiving and retrieving information [IE1, IE3, IE5]	M1 explain how communication barriers can be recognised and managed to avoid complaints	D1 explain why effective working relationships will enhance and manage patient care
P2 describe the barriers to communications [IE1, IE3, IE5]		
P3 identify medical emergencies relevant to dentistry [CT1]	M2 describe the main symptoms associated with medical emergencies relevant to dentistry	D2 explain how the principles of first aid are related to medical emergencies relevant to dentistry
P4 demonstrate principles of first aid [TW1, TW3]		
P5 describe suitable aspects of health and safety applicable to dentistry [IE3, IE5]	M3 explain how health and safety legislation relates to employers' and employees' responsibilities	
P6 describe how ICT methods, resources and equipment are incorporated within the dental workplace [IE1, IE4]	M4 describe the ICT resource to be utilised in either the clinical setting or dental laboratory	D3 produce the specification for the ICT resource to be used in either the clinical setting or the dental laboratory

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers CT – creative thinkers	RL – reflective learners TW – team workers	SM – self-managers EP – effective participators
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Essential guidance for tutors

Delivery and assessment guidance

The delivery of this unit should be designed to stimulate learners using a wide variety of media to include formal lectures, discussion, Question and Answer sessions, role play, practical activities and the use of ICT facilities. Site visits from subject specialists, such as St John Ambulance and Dental Community Health, are recommended. Assessment may take the form of *viva voce*, practical simulation, summative examination, and independent research in the form of written assignments.

Delivery

This unit is designed to give learners a general knowledge and understanding of communication and maintaining effective working relationships between the patient, families, carers, dental clinicians and dental technicians.

The unit outlines possible medical emergencies that could be encountered by any member of the dental team. It is essential that learners develop practical ability in, knowledge and understanding of first aid procedures.

Tutors delivering this unit should therefore consider integrating the delivery, private study and assessment relating to this unit with other relevant units in the qualification.

Delivery should be structured to stimulate learners and enhance motivation. Lectures, question and answer sessions, discussion, video, role play, practical activity, and research using CD ROMs, the internet and library resources would all be applicable. It is important that resuscitation manikins are available for learners to perform CPR techniques, in order to acquire the basic first aid skills. Site visits to first aid approved training establishments, such as St John Ambulance, would be helpful. Some Primary Care Trusts have simulation centres designed specifically for first aid training.

Learning outcome 1 should be delivered as formal lectures, videos, case studies, role-play scenarios and group discussions applicable to addressing communication and barriers likely to be encountered in the clinical environment or dental laboratory. The recognition and management of patients and other healthcare professionals should be delivered as formal lectures by subject specialists from external agencies such as Dental Community Health or National Health Sectors. Methods of communication can be delivered as formal lectures or group discussions and include the use of ICT and presentation software. Also, for successful completion of learning outcome 1, learners need to carry out independent research and produce written documentation in the form of an assignment.

Learning outcomes 2 and 3 are directly linked. These should be delivered as formal lectures, discussion, oral questioning, practical simulation, role play, video, summative examination, and independent research in the form of written assignments. Learners must be able to identify possible medical emergencies and respond by engaging in simulated practical activities of administering first aid to demonstrate knowledge, understanding and competency.

Learning outcome 4 covers information technology and resources utilised in the dental profession. This should be delivered as formal lectures, discussion, oral questioning, work-based learning, and independent learner research in the form of a written assignment.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction to the unit and structure of the programme of assignments.
Learning outcome 1 Discussion, with role play, of methods of communication. Research and discuss barriers to communication. Recognise and discuss patient diversity and rights. Q&A, discussion and role play. Assignment 1: Communication Within the Dental Environment (P1, P2, M1, D1)
Learning outcome 2 Introduction to medical emergencies. Recognise signs and symptoms. Demonstration and participation of first aid procedures. Learners carry out oral questioning, practical simulation, role play, summative examination. Assignment 2: Medical Emergencies and First Aid Procedures within the Dental Environment (P3, P4, M2, D2)
Learning outcome 3 Research regulations – RIDDOR. Learners to discuss risk assessment for manual handling. Practical demonstration of and participation in manual handling techniques. Assignment 3: Health and Safety Regulations for Dental Personnel (P5, M3)
Learning outcome 4 Learners to carry out research into clinical ITC resources. Learners to use ICT research and discuss ITC within the dental laboratory. Assignment 4: The Utilisation of Information Technology Within Clinical and Laboratory Situations (P6, M4, D3)
Review of unit and programme of assignments.

Assessment

Most of the evidence for this unit will be generated from a series of assignments designed to encapsulate the grading criteria for each of the four learning outcomes. Further evidence will be generated and documented by written examination, *viva voce* and practical activities where appropriate. It is advisable that assignments are designed to cover learning outcomes 1 to 4. The material for these assignments will be gained by formal study and from information researched and collated during private study.

To achieve a pass grade for the unit, learners must achieve all the pass criteria as outlined in the grading grid. To achieve a merit grade, learners must achieve all the pass criteria plus all of the merit criteria as outlined in the grading grid. To achieve a distinction grade, learners must achieve the entire pass and merit criteria plus all the distinction criteria as outlined in the grading grid.

Evidence may be collected using assignments like those outlined below.

Learners will gain the knowledge to be able to communicate effectively as part of the dental team. An appreciation of the methods of communicating when giving, receiving and retrieving information between the patient, clinician and dental technician is essential for the enhancement of effective working relationships.

To achieve P1, learners must identify various forms of communication: verbal, non-verbal (body language), telephone, information technology, written communication and documentation. Learners must identify methods of giving, receiving and retrieving information. Consideration is given to the style of questioning, listening, summarising and reflecting back, appropriate silences, zones of interaction and body language.

To achieve P2, learners must be able to describe barriers to communication. Consideration must be given to internal barriers from the patient or the healthcare provider, prejudice, assumption, labelling, judging and external barriers or things outside the individual, such as background noise, distractions, language and interruptions. To achieve M1, learners must address communication with individuals where there are communication differences, hearing impairment, visual impairment, learning difficulties, language difficulties, gender differences, age, cultural and ethnic differences, which could possibly lead to complaints from patients, their carers or relatives. Learners must be able to recognise these barriers in order to avoid such complaints and explain the correct procedures for dealing with complaints within the dental environment.

To achieve D1, learners must identify and demonstrate how healthcare professionals can foster effective working relationships to enhance and manage patient care, the provision of dental devices and securing the longevity of oral healthcare.

To achieve P3, learners will develop the ability to identify medical emergencies related to the clinical setting or dental laboratory. M2 can be achieved by the learner describing the main symptoms of medical emergencies as identified in P3.

To achieve P4, learners should show the ability to simulate practical activities of administering first aid, and demonstrate knowledge and understanding of and competency in the procedures. D2 can be achieved by explaining how the principles of first aid are related to such medical emergencies as identified in P3.

To achieve P5, learners will demonstrate their knowledge and understanding of health and safety regulations applicable to dentistry, including risk assessment, COSHH and health and safety applicable to first aid.

To gain M3, learners must explain how health and safety regulations relate to employers' and employees' responsibilities, including reporting of incidents at work, accident reports and first aid reporting.

To achieve P6, learners will describe how information and communication technology and resources can aid communication within the dental environment.

To achieve M4, learners should describe a suitable ITC resource that could be utilised in a clinical environment or dental laboratory.

D3 can be evidenced and achieved by producing the specification for an ICT resource to be used in either the clinical environment or the dental laboratory.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, M1, D1	Communication within the Dental Environment	You are asked by the laboratory manager to prepare a client communication index for your establishment, they request that you include all various methods of communication that are available to each individual client.	Research Written account Role-play scenarios
P3, P4, M2, D2	Medical Emergencies and First Aid Procedures within the Dental Environment	Whilst in the laboratory, a member of staff collapses. As the identified first aider, you have to assess the situation and then follow correct procedures for a medical emergency. When satisfactory measures have been taken, you then have to write an accurate report.	Viva voce Oral questioning Written account Summative examination Simulated practicals
P5, M3	Health and Safety Regulations for Dental Personnel	As the identified health and safety officer in your establishment, one of your duties is to ensure that all relevant H&S documentation is displayed and updated. This includes all relevant COSHH and risk assessments for materials and processes used and undertaken.	Written account Risk assessments

Criteria covered	Assignment title	Scenario	Assessment method
P6, M4, D3	The Utilisation of Information Technology Within Clinical and Laboratory Situations	Knowing that you are interested in computer technology, you are asked by your manager to research the various ICT systems that are available to be used within the dental environment, and then to make recommendations as to which system would be suitable for your establishment.	Research Written account Diagrams of equipment ICT specification data Use of ICT systems

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology sector suite. This unit has particular links with:

Level 3
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 6: Legislation, Professionalism and Ethics in Dentistry
Unit 10: Dental Radiology and Imaging
Unit 18: Work-based Learning in Dental Technology

Essential resources

Facilities required for this unit include basic first aid equipment and adult and infant resuscitation manikin dolls. A range of specialist visual aids of the human head and body and simulated anatomical skeletons is also required. Adequate library resources should be available with access to ICT facilities, the internet and a range of appropriate textbooks and journals.

Consideration should be given to room size to allow learners enough space to practise activity resuscitation on manikins.

Staff delivering this unit should be competent, experienced and in possession of a General Dental Council (GDC) registered qualification and ideally possess a first aid certificate endorsed by St John Ambulance or an approved training establishment.

Employer engagement and vocational contexts

Dental anatomy forms the basis of all dental technology techniques with regards to function and clinical suitability in the design and manufacture of custom-made dental devices. Where possible, learners should visit clinical and hospital departments, or have visiting specialist lecturers from these establishments. Where this is not possible, learners should be given appropriate case study materials and simulation.

Indicative reading for learners

Textbooks

Ewles L and Simnet I – *Promoting Health: A Practical Guide* (Bailliere Tindall, 2003) ISBN 0702026638

Inglehart M and Bagramian R – *Oral Health-Related Quality of Life* (Quintessence, 2002) ISBN 0867154217

Lieb Gott B – *The Anatomical Basis of Dentistry, 2nd Edition* (Mosby Elsevier, 2001) ISBN 032301013X

St John Ambulance – *British Red Cross – First Aid Manual* (Dorling Kindersley, 2002) ISBN 0751337048

Journals

Dental Nursing (Pensord Press Ltd)

Dental Practice (AE Morgan Publications Ltd)

The Dental Technician (AE Morgan Publications Ltd)

Websites

www.bda.org

British Dental Association

www.dla.org.uk

Dental Laboratories Association

www.healthcare.org.uk

Dental Links

www.the-probe.co.uk

The Probe

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	<p>[IE1, IE5] identifying methods of communicating when giving, receiving and retrieving information</p> <p>[IE3, IE5] exploring the barriers to communications; describing suitable aspects of health and safety applicable to dentistry</p> <p>[IE4] analysing and evaluating how ICT methods, resources and equipment contribute to communication within the workplace</p> <p>[IE6] explaining how health and safety contributes to the continuing professional development of dental personnel</p>
Creative thinkers	[CT1] identifying medical emergencies relevant to dentistry; explaining how communication barriers can be recognised and managed to avoid complaints; describing the main symptoms of medical emergencies
Team workers	[TW1, TW3] demonstrating principles of first aid, lifting and handling casualties, dressing and bandaging wounds

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Creative thinkers	[CT6] adapting ideas for the specification of ICT resources to be used in either the clinical environment or the dental laboratory
Reflective learners	[RL1] assessing how the principles of first aid are related to medical emergencies
Effective participators	<p>[EP1] seeking resolutions for the process of handling complaints</p> <p>[EP4] producing the specification for the ICT resource to be used in either the clinical setting or the dental laboratory</p>

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using internet searches entering data word-processing documents to meet the requirements of assignments
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	producing a plan of tasks to be undertaken reflecting on how the assignment is progressing
Manage information storage to enable efficient retrieval	saving information in suitable files and folders
Follow and understand the need for safety and security practices	keeping food and drink away from computers ensuring they use their own login and password explaining how safety is addressed in the context of the tasks explaining why the IT usage policy forbids certain actions
Troubleshoot	carrying out checks to identify the source of a problem encountered, eg missing file of work
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using suitable data from the internet, books, and data supplied by the tutor
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	searching for data selecting appropriate data from existing ICT systems, evaluating whether it meets the requirements of the assignment task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	ensuring all necessary information for the unit is available electronically, eg tables of information regarding ICT specifications, tables of numerical data, pictures of equipment
Bring together information to suit content and purpose	collecting information in one file for editing into a suitable format
Present information in ways that are fit for purpose and audience	presenting information in the formats required in the assignment briefs
Evaluate the selection and use of ICT tools and facilities used to present information	evaluating whether the presentation of data is appropriate in terms of the grading criteria
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	sending emails to tutors with appropriate information attached demonstrating to tutors that email has been used appropriately responding to feedback on assignments

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in class discussion interacting with peers during role play interaction with unit tutor during <i>vive voce</i>
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	using suitable terminology whilst writing an article
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	producing technically correct written articles and reports

Unit 3: Dental Technology Techniques

Unit code:	M/600/7278
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

The aim of this unit is to enable learners to use a range of practical techniques and to develop the underlying knowledge required to construct simple acrylic dentures, modify existing complete dentures, construct simple single unit prosthodontic restorations and produce simple orthodontic base plates incorporating direct retaining components.

● Unit introduction

This unit builds on the skills and knowledge acquired in *Unit 1: Fundamentals of Dental Technology* and allows learners to develop the skills and knowledge required to confidently undertake simple dental technology techniques and to gain an understanding of their importance.

In learning outcome 1, learners will look at simple prescription instructions, basic dental terminology, health and safety issues relating to the construction methods of complete acrylic dentures and the use and function of dental articulators. Learners will develop their understanding of the construction process for acrylic dentures first introduced in *Unit 1: Fundamentals of Dental Technology*.

Learning outcome 2 introduces learners to the commonly used construction methods for simple single-unit fixed prosthodontic restorations, which they may be expected to construct within a dental laboratory. Learners will be given the opportunity to develop and improve their skills.

In learning outcome 3, learners will be introduced to the construction techniques required to produce simple orthodontic baseplates. They will work with a range of dental biomaterials, instruments and equipment.

Learning outcome 4 covers a variety of methods used in the modification of existing complete dentures and gives learners an insight into the reasons and indications for these modifications.

● Learning outcomes

On completion of this unit a learner should:

- 1 Be able to construct simple acrylic dentures, using common construction methods
- 2 Be able to construct simple single-unit fixed prosthodontic restorations
- 3 Be able to construct simple orthodontic baseplates incorporating direct retaining components
- 4 Be able to modify existing complete dentures.

Unit content

1 Be able to construct simple acrylic dentures, using common construction methods

Prescriptions and stages of construction: interpretation of basic prescription requirements and terminology; construction stages; faults occurring during construction

Articulators: types used in removable prosthodontics; articulating and mounting procedures

Tooth selection and setting: tooth selection by information from various sources; types available; shades and moulds of artificial teeth; cusp formations and measurements; tooth position and interdigitation

Waxing procedures: waxing-up techniques; aesthetics; baseplate design and contours; surface finish and accuracy

Processing dentures: flasking preparations; flasking and packing techniques and systems; curing methods; costs compared; deflasking techniques; trimming and polishing; health and safety

Remounting techniques and final checks: re-establishing occlusion; final checks for fit; decontamination of dentures; medical devices regulations; packing and dispatch of finished dentures

2 Be able to construct simple single-unit fixed prosthodontic restorations

Prescriptions and terminology: interpretation of basic prescription requirements and terminology

Articulators: types used in fixed prosthodontics; articulating and mounting procedures

Anterior and posterior single-unit metallic substructures: types, eg post and core, coping; die preparation; contouring and dimensions; lost wax techniques; finishing and metal preparation; health and safety; passing on for next process

Metallic crowns: die preparation; waxing-up methods; anatomical considerations; dimensions and contours; lost wax techniques; trimming, polishing and fitting; health and safety; medical devices regulations; packing and dispatching

Temporary crowns: design requirements; material selection; die preparation; construction techniques; trimming, polishing and finishing methods; health and safety; medical devices regulations; packing and dispatching

3 Be able to construct simple orthodontic baseplates incorporating direct retaining components

Prescriptions and terminology: interpretation of basic prescription requirements and terminology

Baseplate: simple baseplate design; construction techniques; trimming and polishing methods; correcting faults

Direct retaining components (clasps): purpose of clasps; types of clasp; wire bending techniques; positioning and fixing prior to spraying up

Finishing and final checks: baseplate and metallic component checks; baseplate and component fit to model; decontamination of appliance; medical devices regulations; packing and dispatch of finished appliance

4 Be able to modify existing complete dentures

Receiving cases: checking dentures and accepting contract; decontamination of dentures

Denture relining: reasons for relining; material selection; construction techniques; health and safety

Remounting and final checks: remounting techniques; final checks of dentures and fit to model; decontamination of dentures; medical devices regulations; packing and dispatch of modified dentures

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 outline the criteria for tooth selection	M1 describe the process of tooth setting	D1 discuss the effects of poor tooth selection and setting
P2 describe the stages of construction for complete dentures including prescription instructions, health and safety and Medical Devices Directive (MDD) requirements [IE2]	M2 explain the types of articulators which may be used for denture construction, including their ability to simulate jaw movement	
P3 construct a range of simple acrylic dentures, using a variety of articulators and materials, to a clinically acceptable standard, using all health and safety and quality assurance requirements, from given prescriptions, with substantial guidance [SM2, SM3]	M3 construct a range of simple acrylic dentures, using a variety of articulators and materials, to a clinically acceptable standard, using all health and safety and quality assurance requirements, from given prescriptions, with limited guidance	D2 construct a range of simple acrylic dentures, using a variety of articulators and materials, to a clinically acceptable standard, using all health and safety and quality assurance requirements, from given prescriptions, working independently
P4 describe the construction techniques used in the lost wax process for the manufacture of single-unit metallic crowns and substructures for fixed prosthodontics [IE6]	M4 discuss the types of metallic substructures that could be used in simple single-unit fixed prosthodontic restorations, including the advantages and limitations of each type	D3 discuss the reasons for the use of temporary restorations in fixed prosthodontics treatment, including common construction methods for simple, single-unit temporary restorations

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<p>P5 construct a range of simple single-unit fixed prosthodontic restorations, using various construction techniques and materials to a clinically acceptable standard, meeting all health and safety and quality assurance requirements, from given prescriptions and with substantial guidance. [SM5, RL3]</p>	<p>M5 construct a range of simple single-unit fixed prosthodontic restorations, using various construction techniques and materials to a clinically acceptable standard, meeting all health and safety and quality assurance requirements, from given prescriptions and with limited guidance.</p>	<p>D4 construct a range of simple single-unit fixed prosthodontic restorations, using various construction techniques and materials to a clinically acceptable standard, meeting all health and safety and quality assurance requirements, from given prescriptions and working independently.</p>
<p>P6 construct a simple orthodontic baseplate, incorporating metallic retaining components to a clinically acceptable standard, meeting all health and safety and quality assurance requirements, from given prescriptions and with substantial guidance. [SM6, RL3]</p>	<p>M6 construct a simple orthodontic baseplate, incorporating metallic retaining components to a clinically acceptable standard, meeting all health and safety and quality assurance requirements, from given prescriptions and with limited guidance.</p>	<p>D5 construct a simple orthodontic baseplate, incorporating metallic retaining components to a clinically acceptable standard, meeting all health and safety and quality assurance requirements, from given prescriptions and working independently.</p>
<p>P7 reline existing complete dentures using various construction techniques to a clinically acceptable standard, meeting all health and safety and quality assurance requirements from given prescriptions and with substantial guidance. [SM4]</p>	<p>M7 reline existing complete dentures using various construction techniques to a clinically acceptable standard, meeting all health and safety and quality assurance requirements from given prescriptions and with limited guidance.</p>	<p>D6 reline existing complete dentures, using various construction techniques to a clinically acceptable standard, meeting all health and safety and quality assurance requirements, from given prescriptions and working independently.</p>

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

The delivery of this unit is through formal lectures, practical demonstrations, group discussions, work placements, laboratory and formal visits coupled with research using internet and library resources. Assessment is through combined theory and practical assignments.

Delivery

The delivery of this unit should be in a variety of forms to enable learners to fully understand the techniques being taught. This could include formal lectures, practical demonstrations, group discussions, work placements, laboratory and clinic visits. Research using the internet, library resources and also the use of personal laboratory experience would all be appropriate.

Work placements should be monitored regularly with tutor/work placement supervisor communication, either through verbal contact or placement visits and the use of record sheets. This is to ensure the quality of the learning experience. Naturally occurring evidence should be collected at the work placement. For example, learners may have the opportunity to produce a range of dental appliances and they should be encouraged to collect record sheets of work undertaken with supervisor comments regarding quality and standard.

Whichever methods of delivery are used, tutors should inform learners of the importance of dental technology techniques, their accuracy and quality, patient welfare and working as part of the dental team. It is essential that health and safety issues relating to working in a dental laboratory environment are regularly reinforced and risk assessments undertaken before practical activities. Tutors should consider integrating the delivery, private study and assessment relating to this unit with any other relevant units and assessment learners may also be taking as part of the programme of study.

Learning outcome 1 could be delivered by formal lectures, practical demonstrations, group discussions, work placements, practical tasks and independent learner research. Learners will identify and follow simple prescription instructions and basic dental terminology. Health and safety issues must be addressed before learners use dental materials and equipment in a given task. Adequate personal protective equipment (PPE) must be provided and used when undertaking practical tasks. Visiting expert speakers could add to the relevance of the subject for learners. For example, a prosthetic dental technician from a private or hospital dental laboratory or a dental company representative could talk about their work, the situations they face, materials available and the methods they use or systems they sell to construct simple acrylic dentures.

Learning outcome 2 introduces learners to fixed prosthodontics and the commonly used construction methods for simple, single-unit restorations. Delivery techniques should be varied as in learning outcome 1. Learners should be given opportunities to develop and improve their practical skills. Adequate PPE must be provided and used when undertaking practical tasks. A visit to a local dental practice or dental hospital clinic to observe simple, single fixed prosthodontic work being carried out on a patient would be helpful for learners' understanding of the subject. Visiting expert speakers could add to the relevance of the subject for learners. For example, a fixed prosthodontic dental technician from a private or hospital laboratory or a local dental practitioner could talk about their work and the methods they use.

Learning outcome 3 introduces learners to the construction techniques required to produce simple orthodontic baseplates. Delivery techniques should be varied as in learning outcome 1. This will enable learners to fully understand the orthodontic techniques being taught. Work placements in an orthodontic laboratory would form part of and enhance the learning experience. Health and safety issues must be addressed and adequate PPE must be provided and used before learners undertake any practical tasks.

Visiting expert speakers could include an orthodontic dental technician from a private or hospital laboratory or an orthodontic clinician who could talk about their work and the methods they use. A visit to an orthodontic clinic or examining sets of study models from discharged patients would enhance the learning experience.

Learning outcome 4 enables learners to understand the methods used and the necessity for modifying existing complete dentures. Forms of delivery should include formal lectures, practical demonstrations, practical tasks, group discussions and independent learner research. Adequate PPE should be provided and used when undertaking practical tasks. A relevant work placement in a prosthodontic laboratory would allow learners to practise the techniques of modifying existing complete dentures and possibly experience a variety of techniques. A visiting expert speaker could add to the relevance of the subject, for example a prosthetic dental technician from a private dental laboratory could talk about their work, the different methods they use and the variety of materials available. They could explain the importance of this type of work in a private dental laboratory. A dental company representative could discuss materials and techniques and any new equipment and systems on the market for undertaking this type of work.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction to the unit and structure of the programme of assignments.
Learning outcome 1 Prescriptions. Tooth selection and settings. Waxing procedures. Denture processing. Remounting techniques. Assignment 1: Construction Methods for Simple Acrylic Dentures (P1, P2, P3, M1, M2, M3, D1, D2)
Learning outcome 2 Prescriptions and terminology. Types of articulators. Metallic substructures. Metallic crowns. Temporary crowns. Assignment 2: Construction Techniques for Single-unit Metallic Crowns and Substructures (P4, P5, M4, M5, D3, D4)

Topic and suggested assignments/activities and/assessment

Learning outcome 3

Prescriptions and terminology.

Orthodontic baseplates.

Retaining components.

Finishing and final checks.

Assignment 3: Construction of Simple Orthodontic Appliances with Metallic Retaining Components (P6, M6, D5)

Learning outcome 4

Receiving cases.

Denture relining.

Remounting and final checks.

Assignment 4: Relining of Existing Complete Dentures (P7, M7, D6)

Review of unit and programme of assignments.

Assessment

Generic guidance on assessment

All learners are entitled to initial guidance in planning their work, but the level of assistance required should be taken into account when their work is assessed. In the assessment criteria grids, reference is made to learners working with 'substantial guidance', with 'limited guidance' and 'independently'. When assessing the work, assessors should apply the following guidelines.

'Substantial guidance': Learners have to be guided and advised throughout to ensure that progress is made. Learners rely on the support of the tutor, who has to assist in most aspects of the work. This level of support restricts learners' to a pass grade, irrespective of the quality of the evidence.

'Limited guidance': The tutor supports learners initially in the choice of topic for investigation. Thereafter, the tutor reacts to questions from learners' and suggests a range of ideas that they can act upon. Learners frequently check matters of detail. The tutor needs to assist in some aspects of the work. This level of support restricts learners to a pass or a merit grade, irrespective of the quality of the evidence.

'Independently': The tutor supports learners initially in the choice of topic for the investigation or task. Thereafter, the tutor occasionally assists learners, and only when asked, but monitors progress throughout. This level of support gives access to all three grades; pass, merit and distinction.

Unit-specific guidance on assessment

To achieve a pass grade, learners must achieve the eight pass criteria listed on the grading grid provided. The pass assessment criteria can be linked together to form larger projects incorporating the written and practical elements of the unit that are directly linked, with the exception of P7 and P8.

P1, P2 and P3 could be linked to form a project that incorporates a written and practical element.

For P1, learners will be expected to outline the criteria for tooth selection to include all the factors which can affect the selection of anterior and posterior teeth. Evidence for this could take the form of a written report with pictorial explanation or an ICT presentation using appropriate software.

For P2, learners must describe the stages of construction for complete dentures for prosthetics. Learners will be expected to cover prescription requirements, health and safety, Medical Devices Directive, basic tooth selection and setting, waxing and processing procedures. Evidence may be in the same format as for P1.

P3 requires learners to construct a range of simple acrylic dentures, with substantial guidance, using a variety of articulators and materials from a given prescription. These must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 1. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. This criterion could be assessed through learners submitting a practical piece of work to be formally assessed or directly by the tutor during practical activities. If the direct format is used suitable evidence from guided activities would be observation records completed by learners and the tutor. If assessed during work placement, witness statements should be provided by a suitable representative and verified by the tutor. A record of learners' competence should be kept using a checklist in conjunction with question and answer sessions. Guidance on the use of observation records and witness statements is provided on the Edexcel website.

P4 and P5 could be linked to form a project that incorporates a written and practical element.

For P4, learners must describe the construction techniques used in the lost wax process for the manufacture of single-unit metallic crowns and substructures for fixed prosthodontics. Learners will be expected to cover prescription requirements, types of articulators and mounting techniques, health and safety and Medical Devices Directive. Evidence may be in the same format as for P1.

P5 requires learners to construct a range of simple single-unit fixed prosthodontic restorations, with substantial guidance, using various construction techniques and materials from a given prescription. These must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 2. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

P6 requires learners to construct a simple orthodontic baseplate, with substantial guidance, incorporating metallic retaining components from a given prescription. This must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 3. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

P7 requires learners to relines existing complete dentures with substantial guidance, from a given prescription. These must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 4. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

To achieve a merit grade, learners must achieve all of the pass grade criteria and the seven merit grade criteria. The merit assessment criteria can be linked together to form larger projects incorporating the written and practical elements of the unit that are directly linked, with the exception of M6 and M7.

M1, M2 and M3 can be linked together to form a project which includes the related written and practical elements of this unit.

M1 requires learners to describe the process of tooth setting to include anterior and posterior teeth. Evidence may be in the same format as for P1.

M2 requires learners to explain the faults that can occur during the construction of dentures to include possible causes of error at each stage. Evidence may be in the same format as for P1.

M3 requires learners to construct a range of simple acrylic dentures, with limited guidance, using a variety of articulators and materials from a given prescription. These must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 1. Where possible the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

M4 and M5 can be joined enabling learners to link the theory element with the practical tasks in this area of the unit.

M4 requires learners to discuss the types of metallic substructures that could be used in simple, single-unit fixed prosthodontic restorations and discuss the advantages and limitations of each type. Learners will be expected to cover anterior and posterior restorations. This can be linked directly to work being undertaken by learners to provide evidence for P4. Evidence may be in the same format as for P1.

M5 requires learners to construct a range of simple, single-unit fixed prosthodontic restorations, with limited guidance, using various construction techniques and materials from a given prescription. These must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 2. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

M6 requires learners to construct a simple orthodontic baseplate incorporating metallic retaining components with limited guidance from a given prescription. This must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 3. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

M7 requires learners to reline existing complete dentures, with limited guidance, using various construction techniques from a given prescription. These should be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 4. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

To achieve a distinction grade, learners must achieve all of the pass and merit criteria and the six distinction grade criteria. The distinction assessment criteria can be linked together to form larger projects incorporating the written and practical elements of the unit that are directly linked, with the exception of D6 and D7.

D1 and D2 can be joined together to create a project that incorporates both the related written and practical elements.

D1 requires the learner to discuss the effect of poor tooth selection and setting of anterior and posterior teeth to include the possible effects on the appearance and function of the prostheses. This can be linked directly to work being undertaken by learners to provide evidence for M1. Evidence may be in the same format as for P2.

D2 requires learners to construct a range of simple acrylic dentures, working independently, using a variety of articulators and materials from a given prescription. These must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 1. Where possible the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

D3 and D4 can be linked together to create a project that will follow a similar format to M4 and M5.

D3 requires learners to discuss the reasons for the use of temporary restorations in fixed prosthodontics treatment and describe common construction methods for simple, single-unit temporary restorations. Learners will be expected to cover anterior and posterior restorations and materials used. This can be linked directly to work being undertaken by learners to provide evidence for M4. Evidence may be in the same format as for P2.

D4 requires learners to construct a range of simple, single-unit fixed prosthodontic restorations, working independently, using various construction techniques and materials from a given prescription. These must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 2. Where possible the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

D5 requires learners to construct a simple orthodontic baseplate, working independently, incorporating metallic retaining components, from a given prescription. This must be to a clinically acceptable standard, using all health and safety and quality assurance requirements. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 3. Where possible the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

D6 requires learners to reline existing complete dentures, working independently, using all health and safety and quality assurance requirements from a given prescription. Tutors should identify the given objectives, which are likely to be driven by the requirements of the Medical Devices Directive. Tutors should identify the prescription requirements for this part of the assessment criterion. It is not expected that learners will use all the methods listed in the unit content for learning outcome 4. Where possible the type and complexity of these should be the same for all learners to ensure fairness of assessment. Evidence may be in the same format as for P3.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1 P2, M2 P3, M3, D2	Construction Methods for Simple Acrylic Dentures	The owner of ABC Dental Laboratory has asked you to produce a student guide on the construction of simple acrylic dentures. You have also been requested to produce Class I F/-, -/F and F/F as examples for students to copy.	Construction of Class I F/-, -/F, F/F checklists Q&A on processes Written report
P4, M4, D3 P5, M5, D4	Construction Techniques for Single-unit Metallic Crowns and Substructures	The owner of ABC Dental Laboratory has asked you to produce a guide on constructing single-unit metallic crowns and substructures for fixed prosthodontics. You have also been asked to produce an example of a crown and a substructure for students to copy.	Construction of single metallic crown and coping Checklists Q&A on processes Written report
P6, M6, D5	Construction of Simple Orthodontic Appliances with Metallic Retaining Components	You have received a prescription from a local dentist which requires you to construct an orthodontic retaining appliance for a patient.	Checklists Practical activity Q&A on processes
P7, M7, D6	Relining of Existing Complete Dentures	You have received some dentures from a local dentist on which you are requested to carry out a reline.	Checklists Practical activity Q&A on processes

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology sector suite. This unit has particular links with:

Level 3
Unit 1: Fundamentals of Dental Technology
Unit 2: Medical Emergencies, First Aid and Communication in the Dental Team
Unit 3: Dental Technology Techniques

Level 3

Unit 4: Dental Anatomy, Oral Biology and Disease

Unit 5: Basic Dental Biomaterials Science

Unit 6: Legislation, Professionalism and Ethics in Dentistry

Unit 7: Dental Public Health and Preventative Dentistry

Unit 8: Removable Complete Prosthodontics

Unit 9: Removable Partial Prosthodontics

Unit 10: Dental Radiology and Imaging

Unit 11: Design of Fixed Prosthodontics

Unit 12: Complex Dental Materials Science

Unit 13: Techniques for Manufacturing Fixed Prosthodontics

Unit 14: Quality Assurance in Dental Technology

Unit 15: Principles of Orthodontic Therapy Regimes

Unit 16: Design, Manufacture and Modification of Removable Orthodontic Appliances

Unit 17: Advanced Dental Procedures

Unit 18: Work-based Learning in Dental Technology

Essential resources

Facilities required for this unit include a fully-equipped dental laboratory including individual bench spaces for learners with suitable seating, Bunsen burners, hand piece, overhead lighting, bench extraction, plaster work facilities, casting and curing equipment, a suitable boiling out unit, packing bench with extraction and trimming and polishing facilities. There should be an appropriate first aid kit and fire extinguisher. Learners should be provided with protective overalls and personal protective equipment: safety glasses, mask and gloves where appropriate.

Access to dental laboratories that provide facilities for work placements is essential. Work placement visits and record sheets will be required before learners are sent on placements.

Staff delivering this unit should be registered, competent, experienced dental technicians. Ideally they should have recent laboratory experience within their chosen field and teaching remit and show evidence of regular contact with the industry and/or technical updating.

Employer engagement and vocational contexts

This unit covers a range of skills required to construct and modify a range of basic appliances which could be prescribed for patients in all specialities of dental technology. Where possible, learners should visit clinical and hospital departments, or have visiting specialist lecturers from these establishments. Where this is not possible, learners should be given appropriate case study materials and simulation.

Indicative reading for learners

Textbooks

Brand R W and Isselhard D E – *Anatomy of Orofacial Structures* (Mosby, 1994) ISBN 0801679672

Combe E – *Dental Biomaterials* (Kluwer Academic Publishers, 1999) ISBN 0792385314

Houston W J, Tulley W J and Stephens C D – *A Textbook of Orthodontics* (Wright, 1992) ISBN 0723609861

Jagger D and Harrison A – *Complete Dentures – Problem Solving* (Macmillan Journals, 1999)
ISBN 0904588572

Lamb D J – *Problems and Solutions in Complete Denture Prosthodontics* (Quintessence Publishing, 1992)
ISBN 1850970211

McCabe J F – *Applied Dental Materials* (Blackwell Science, 1994) ISBN 0632028262

McCord A and Grant A F – *A Clinical Guide to Complete Denture Prosthetics* (Macmillan Journals, 2000)
ISBN 0904588645

Mitchell L – *An Introduction to Orthodontics* (Oxford University Press, 1996) ISBN 0192624318

Murray H V, Sluder T B and Barton R E – *Fixed Restorative Techniques* (University of North Carolina Press, 1989) ISBN 0807842508

Rosenstiel S F, Land M F and Fujimoto J – *Contemporary Fixed Prosthodontics* (Mosby, 2001)
ISBN 081515559X

Sowter J B and Barton R E – *Removable Prosthodontic Techniques* (University of North Carolina Press, 1987)
ISBN 0807841668

Journals

Dental Dialogue (TW Media UK)

Dental Laboratory (The Dental Laboratories Association)

The Dental Technician (AE Morgan Publications Ltd)

Dental Technologies (CRG Publications)

Quintessence Journal of Dental Technology (Quintessence Publishing Co Ltd)

Websites

www.bracon.co.uk

Bracon Dental Suppliers

www.derweb.co.uk

Dental Education Resources

www.dla.org.uk

Dental Laboratories Association

www.dta-uk.org

Dental Technicians Association

www.metrodent.co.uk

Metrodent Dental Supplier

www.qjdt.co.uk

Quintessence Journal of Dental Technology

www.us.elsevierhealth.com

Journal of Prosthetic Dentistry

www.zahndental.com

Zahn Dental Suppliers

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE2] planning and carrying out research to describe the stages of denture construction for complete dentures [IE6] supporting conclusions when describing the construction techniques used in the lost wax process for the manufacture of single-unit metallic crowns and substructures for fixed prosthodontics
Self-managers	[SM2, SM3] working towards constructing a range of simple acrylic dentures, organising time and resources [SM5, RL3] responding to change, seeking advice and support, reviewing progress and acting on outcomes when constructing a range of simple single-unit fixed prosthodontic restorations [SM6, RL3] managing emotions, reviewing progress and acting on outcomes when constructing simple orthodontic baseplates, incorporating metallic retaining components [SM4] anticipating and managing risks when relining existing complete dentures

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Reflective learners	[RL6] communicating knowledge in a relevant way when describing the construction of complete dentures and explaining the possible faults which can occur

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	<p>carrying out internet searches</p> <p>entering data</p> <p>word processing documents to meet the requirements of assignments</p>
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	producing a plan of tasks to be undertaken, reflecting on how the assignment is progressing
Manage information storage to enable efficient retrieval	saving information in suitable files and folders
Follow and understand the need for safety and security practices	<p>keeping food and drink away from computers</p> <p>ensuring they use their own login and password</p> <p>explaining how safety is addressed in the context of the tasks</p> <p>explaining why the IT usage policy forbids certain actions</p>
Troubleshoot	carrying out checks to identify the source of a problem encountered, eg missing file of work
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using suitable data from the internet, books and data supplied by the tutor and associated specialist lecturers
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	<p>searching for data</p> <p>selecting appropriate data, evaluating whether it meets the requirements of the assigned task</p>
ICT – Develop, present and communicate information	
<p>Enter, develop and format information independently to suit its meaning and purpose including:</p> <ul style="list-style-type: none"> ● text and tables ● images ● numbers ● records 	<p>ensuring all necessary information for the unit is available electronically, ie:</p> <ul style="list-style-type: none"> ● digital images of appliances ● digital images of construction procedures
Bring together information to suit content and purpose	collecting information in one file for editing into a suitable format
Present information in ways that are fit for purpose and audience	presenting information in the formats required in the assignment briefs
Evaluate the selection and use of ICT tools and facilities used to present information	evaluating whether the presentation of data is appropriate in the terms of the grading criteria
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	<p>communicating electronically with tutors and peers</p> <p>storing materials relevant to the assignment</p> <p>responding to tutor feedback</p>

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	mixing ratios of acrylic resins; gypsum products; refractory investments
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	participating in class discussions and Q&A sessions asking relevant questions
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading, retrieving and selecting appropriate text understanding anatomical terminology relevant to the assignment
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing reports and assignments



Unit 4: Dental Anatomy, Oral Biology and Disease

Unit code:	T/600/7282
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

The aim of this unit is to enable learners to explore the anatomical structures of the human skull and develop a knowledge of dental anatomy, oral biology and associated diseases. It also links the importance of anatomical structures and features to the design and manufacture of custom-made dental devices.

● Unit introduction

The study of human dental anatomy and oral biology is recognised as an essential part of all dental studies. It is, therefore, widely accepted that learners undertaking the study of dental technology should possess a fundamental knowledge and understanding of dental anatomy, oral biology and associated diseases. Knowledge of the structures and functions of the oral cavity lower facial third, the temporo-mandibular joint and oro-facial musculature is essential to enable the dental technician to communicate effectively with other members of the dental team, and to facilitate the successful design and manufacture of custom-made dental devices.

This unit is designed to develop learners' knowledge and understanding of the human dentition, introducing learners to embryology, tooth eruption sequences, natural occlusion, tooth structure, tooth morphology and function. These areas provide learners with essential links to all of the applied dental technology units within the qualification.

The final part of this unit will provide learners with an essential understanding of the changes that occur through growth and development of the craniofacial skeleton, and introduce learners to the recognised theories of ageing and disease related to the oral cavity, associated tissues, structures and human dentition.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know the location and function of human oro-facial structures and anatomical landmarks
- 2 Know the location, relationship and function of the bones and musculature of the craniofacial skeleton and oral cavity
- 3 Know the growth patterns, development, form and characteristics of human dentition
- 4 Know the theories of growth, development, ageing and disease which relate to the oral cavity, dentition and craniofacial structures.

Unit content

1 Know the location and function of human oro-facial structures and anatomical landmarks

Anatomical landmarks: sagittal plane; median plane; transverse plane; coronal plane; medial; lateral; anterior; posterior; mesial; distal; buccal; labial; proximal; superior; inferior

Intra-oral landmarks: mucosa; sulcus; tongue; frenal attachments; hard palate; soft palate; uvula; palatine tonsils; palatine fovea; palatal torus; rugae; alveolar ridges

Extra-oral landmarks: chin; lips; cheeks; nose; orbital ridge; eye; external auditory meatus

Alveolar bone and tooth support: alveolar bone structure (simple bone morphology); function; periodontal ligament; gingivae; bone cells (osteoclasts, osteoblasts, osteocytes)

Nerve supply to the jaws: trigeminal nerve (fifth cranial); mandibular division; maxillary division; appropriate branches of the facial nerve (seventh cranial); general nerve innervation to the oral cavity

Blood supply to and from the oral cavity: arterial supply (external and internal carotid, lingual, maxillary, facial); venous drainage (jugular, facial, pterygoid plexus, maxillary, anterior retro-mandibular)

Lymphatic system: lymph nodes (submental, submandibular, parotid, cervical); interconnection of lymph nodes

Human saliva: functions; main components; salivary glands (parotid, submandibular, sublingual); production and flow

2 Know the location, relationship and function of the bones and musculature of the craniofacial skeleton and oral cavity

Bones of the cranium: frontal; temporal; occipital; parietal; ethmoid; sphenoid

Bones of the facial skeleton: maxillae; nasal; palatine; zygomatic; lacrimal; mandible (body, ramus, angle, coronoid process, sigmoid notch, condyle head, mylohyoid ridge, external oblique line); associated bone features (foramen, fossa, meatus, canal, condyle, process)

Temporo-mandibular joint: condyle head; glenoid fossa; articular eminence; styloid process; capsule; synovial cavity; ligaments (temporo-mandibular, stylo mandibular); main movements (hinge, lateral, protrusive, retrusive); centric position

Muscles of mastication: temporalis; masseter; medial pterygoid; lateral pterygoid; mylohyoid; geniohyoid; digastric

Muscles of expression: orbicularis oris; zygomaticus major; zygomaticus minor; levator labii superioris; levator anguli oris; depressor anguli oris; depressor labii inferioris; levator labii inferioris; risorius; buccinator

The tongue: muscles (stylohyoid, hyoglossus, genioglossus, styloglossus, palatoglossus); changes in shape (swallowing, speech); features (taste buds, papillae); functions

Muscles of the soft palate: levator veli palatini; tensor veli palatini; palatoglossus; palatopharyngeus; uvula

3 Know the growth patterns, development, form and characteristics of human dentition

Structure of natural teeth: development; eruption cycles and patterns (deciduous, permanent); number of teeth (deciduous, permanent); composition and form (enamel, dentine, pulp, cementum); function

Natural and simulated occlusion: relationship between the upper and lower occlusal surfaces (deciduous, permanent, mixed); interdigitation; articulation; masticatory efficiency; appreciation of tooth morphology in respect of conservation; prosthetic restorations by way of wax incremental techniques

Range of human teeth: characteristics (incisors, canines, premolars, molars); variations (shape, size, position, number of cusps); coronal features (pits, fossae, developmental grooves, dissectional grooves, marginal ridges, mamelons); average tooth measurements

External factors: heredity; diet; environment

4 Know the theories of growth, development, ageing and disease which relate to the oral cavity, dentition and craniofacial structures

Craniofacial growth: craniofacial form; facial embryology; cranial growth; neurocranium; cranial base; mid facial development; mandible; nasal; factors affecting development

Theories of ageing related to oral tissues: epithelium; connective tissue; bone (maxillary, mandibular, alveolar); wound healing in the oral cavity

Changes in the dentition: freeway space; over eruption; tooth loss; drifting; methods employed to reduce occlusal interference

Diseases and disorders: oral flora and fauna (candida albicans); the role of oral micro-organisms in the formation of plaque; caries; periodontal disease; potentially malignant conditions of the oral cavity

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 identify the intra-oral landmarks of the face and surrounding area, using appropriate anatomical terminology [IE1]	M1 describe the intra-oral landmarks of the face and surrounding area, using appropriate anatomical terminology	D1 relate an understanding of the intra-oral landmarks of the face and surrounding structures, with regards to design criteria for custom-made dental devices
P2 identify the periodontal structures and neurovascular supply of the maxilla and mandible [IE1]	M2 describe how the teeth are supported within the alveolar bone, emphasising the function of the neurovascular supply to the teeth	
P3 identify the salivary glands and major lymph nodes in the face and neck [IE1]	M3 explain the function of the salivary glands and major lymph nodes of the face and neck	D2 explain how the salivary and lymphatic systems maintain a healthy oral environment, emphasising the effects of reduced saliva flow
P4 identify the position and relationship of the bones of the cranium and facial skeleton [IE1]	M4 describe the function of the bones of the middle and lower facial thirds, including the role of the temporo-mandibular joint	D3 explain the movements of the temporo-mandibular joint during speech, mastication and swallowing, including how these movements are limited and controlled
P5 identify the muscles of the facial skeleton and oral cavity [IE1]	M5 describe the origin, insertion and actions of the muscles of mastication and facial expression, the tongue and soft palate	D4 explain the reasons for the changes in shape and position of the tongue, soft palate and lips during speech, mastication and swallowing
P6 describe the stages in the eruption cycles and development of deciduous and permanent teeth	M6 explain the major changes that take place in human dentition throughout life, indicating what are the likely effects and possible means of correction	

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P7 describe natural tooth forms, features and occlusal relationship [RL4]	M7 produce examples of posterior tooth form and occlusion using a recognised wax incremental technique	D5 evaluate the various forms of simulated natural dentitions used in dental technology
P8 identify in visual format the major changes in face shape related to growth, development and age [CT1]	M8 explain how the face changes during growth, development and ageing	D6 account for the facial changes associated with growth, development and age, generalising as to how external factors can influence the changes
P9 identify the common forms of oral flora, fauna and micro-organisms	M9 explain the causes and formation of dental caries, including the effect of caries on the dentition	D7 explain the common diseases of the oral mucosa, including potentially malignant conditions

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

This unit should be delivered using a wide range of delivery methods and media; including lectures, discussion and ICT research. Clinical observations, where possible, and the use of natural and artificial skulls and human teeth are invaluable. Assessment will predominantly be assignment based, and *vive voce* where appropriate.

Delivery

This unit is designed to give learners a general level of knowledge and understanding of the anatomical structures, tissues and functions of the human head, predominantly focusing on the oral cavity, dentition and associated structures and tissues.

Tutors will appreciate that a fundamental understanding of oral and facial anatomical structures and features should form an essential foundation for all applied dental technology units; therefore, this unit should be delivered before or with such units.

Tutors delivering this unit should consider integrating the delivery, private study and assessment relating to this unit with other relevant units that form part of the programme of study.

Delivery should be structured to stimulate, motivate and enthuse learners through use of a wide range of delivery methods and media. Lectures, question and answer sessions, discussion, video, and research using CD ROMs, the internet and library resources would all be suitable. It is recognised that some degree of clinical observation would be invaluable (although not always practicable), and that the use of phantom heads, natural and artificial skulls and human teeth would also be considered useful learning resources.

Learning outcomes 1 and 2 are closely linked. They are intended to give learners a general overview of the anatomical structures and associated tissues of the human head focusing to a great extent on the oral cavity, bones of the skull and musculature. Delivery techniques and media should be varied. It is suggested that learners observe their own oral structures as a natural resource, supplemented by clinical observation when practicable. They should have access to a range of human skulls (natural or artificial) to realise a three-dimensional experience of the oro-facial anatomy. Ideally a range of other anatomical models and high quality audio-visual materials should be available to describe and illustrate anatomical structures and tissues that cannot be visualised by other means.

Learning outcome 3 can be delivered through formal lectures, practical demonstrations, set formative exercises and self-supported learning, particularly for wax incremental techniques. Learners should have access to a range of natural and artificial skulls together with various examples of natural and simulated human teeth.

Learning outcome 4 is likely to be delivered through formal lectures, audio-visual materials and discussion. Learners should be encouraged to undertake individual and group research activities in order to demonstrate their ability to meet the grading criteria. Visiting expert speakers would add to the relevance of the subject for learners. For example, a dental hygienist could talk about the diseases and disorders of the oral cavity.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction to the unit and structure of the programme of assignments.
Learning outcome 1 Introduction to the intra-oral and extra-oral landmarks of the face and surrounding area. Learners to produce diagrams to identify the location and function of human oro-facial structures and associated anatomical landmarks. Introduction, discussion and illustration of the neurovascular, lymphatic and salivary systems. Assignment 1: Anatomical Structures and their Relation to Design of Custom-made Dental Devices (P1, M1, D1) Assignment 2: Location and Function of Human Orofacial Structures (P2, P3, M2, M3, D2)
Learning outcome 2 Learners produce labelled diagrams of the bones of the cranium and facial skeleton. Learners produce labelled diagrams identifying musculature of the head, face and oral cavity. Discuss the relationship, location and function of the bones and muscles. Assignment 3: Bones and Muscles of the Facial Skeleton and Oral Cavity (P4, P5, M4, M5, D3, D4)
Learning outcome 3 Introduction and discussion regarding growth patterns and development of human dentition. Production of illustrations, form and characteristics of human dentition. Learners to produce occlusal simulation using incremental wax additive tooth techniques. Assignment 4: The Human Dentition, its Growth, Development and Form (P6, P7, M6, M7, D5)
Learning outcome 4 Introduction to the theories of growth, development and ageing. Learners to research the flora and fauna of the oral cavity and oral diseases. Assignment 5: Theories of Craniofacial Growth, Development and Ageing (P8, M8, D6) Assignment 6: Flora, Fauna and Diseases of the Oral Cavity (P9, M9, D7)
Review of unit and programme of assignments.

Assessment

Most of the evidence for this unit will be generated from a series of assignments designed to encompass the grading criteria for each of the four learning outcomes. Further evidence will be generated and documented by *vive voce* where appropriate. It is suggested that one assignment is designed to cover one learning outcome: the material for these assignments will be gained through formal study, and from information researched and collated during private study. Assignments can be stand alone or integrated with the content of other units that form links within the general framework of study.

Care should be taken with integrated assignments to ensure that learners meet the assessment criteria for each unit and record this appropriately.

To achieve a pass grade, learners must achieve all of the pass criteria in the grading grid. To achieve a merit grade, learners must achieve all of the pass criteria plus all of the merit criteria in the grading grid. To achieve a distinction grade, learners must achieve all of the pass criteria and merit criteria plus all of the distinction criteria in the grading grid.

P1 requires learners to identify numerous intra-oral and facial landmarks as indicated by the unit tutor, using appropriate anatomical terminology. This could be assessed by learners producing accurate diagrams of the oral cavity and face.

P2 requires learners to identify the alveolar and periodontal tooth supporting structures of the maxilla and mandible together with their associated blood and nerve supply. This should be assessed by the labelling of anatomical cross-sectional diagrams of the head, *viva voce*, or a combination of the two, and formally recorded by the tutor.

P3 requires learners to identify the salivary glands and major lymph nodes, from studying cross-sectional diagrams of the human head and neck. This should then be assessed and recorded by the unit tutor.

P4 requires learners to identify the bones of the human skull, their position and relationship. This can be assessed by *viva voce* utilising natural or simulated human skulls, and recorded by the unit tutor or by illustration and labelling.

P5 requires learners to identify the muscles of mastication and facial expression, by producing correctly labelled diagrams. Learners will also be required to identify the relevant anatomical features of the tongue and soft palate.

For P6, learners must describe the stages of tooth eruption and continued development of both the deciduous and permanent dentitions.

For P7, learners must demonstrate an appreciation and understanding of natural tooth form, features and occlusal relationship. Learners could produce a reference booklet, which could be used by others, describing and illustrating the shape and features of the deciduous and permanent human dentitions.

P8 requires learners to identify the changes in face shape in relation to growth, development and ageing. The assessment can be by written account or by *viva voce*.

For P9, learners are required to identify the common forms of flora, fauna and micro-organisms that are found in the oral cavity.

M1 requires learners to describe the intra-oral landmarks of the face and surrounding areas, identified in P1, using appropriate anatomical terminology. This could take the form of a glossary of terms, with each term being followed by a description and definition. The glossary could be produced as a ready reference guide for other users.

For M2, learners must describe how the alveolar, periodontal and gingival tissues, identified in P2, support the teeth within the alveolar bone, and how the vitality of these structures is maintained by the functions of the associated neurovascular systems.

For M3, learners must explain the functions of the salivary glands and major lymph nodes of the face and neck identified in P3.

For M4, learners must explain the relationship and function of the bones of the middle and lower thirds of the facial skeleton. Learners should discuss the role of the temporo-mandibular joint (TMJ) with regards to function. Once assessed this could be used as a precursor to D3.

For M5, learners must describe the origin, insertion and action of the muscles of mastication, muscles of facial expression, the tongue and soft palate. This could take the form of a table or chart indicating the name of the muscle, its origin, insertion and action, in four columns.

For M6, learners will adapt and expand the evidence documented in P6 to explain the changes that take place to the human dentition throughout life, and what effect these changes could have on the individual.

M7 requires learners to produce examples of posterior tooth form and occlusion using a recognised wax incremental technique. This can be assessed and documented by a combination of *viva voce* and the production of a series of posterior occlusal forms to simulate natural tooth shape using a recognised wax incremental technique.

For M8, learners must explain the changes taking place in face shape. This could be by producing a series of visuals to accompany the explanation. The form of the visuals is non-specific, but it is important that they are correct in size ratio.

For M9, learners are required to fully explain the causes and formation of dental caries and the effect that caries have on the dentition.

For D1, learners must relate their understanding of how natural anatomical shape and features have a direct bearing on the design criteria for custom-made dental devices by incorporating, and relating, the evidence documented to achieve P1 and M1.

For D2, learners must explain how the salivary glands, production of saliva and the lymphatic system maintain a healthy oral environment. The explanation should also include what effect reduced production and flow of saliva would have on the oral environment.

For D3, learners are required to explain the movements of the temporo-mandibular joint during natural functions, ie speech mastication and swallowing. The explanation should include how these movements are controlled and limited, identifying the muscle and ligaments that come into play during these actions.

D4 requires learners to explain the actions of the tongue, soft palate and lips. Learners must reference the actions of the various muscle groups and how each group of muscles affects the function, shape and position of the tongue, soft palate and lip during speech, mastication and swallowing.

D5 requires learners to evaluate the various forms of simulated natural dentition available for use in dental technology. Learners must evaluate their findings taking into consideration such things as cost, time saving ability, similarity to natural form and functional ability.

For D6, learners are required to account for the changes in facial appearance associated with growth development and age. This should include how external factors could have a direct influence on these changes. Consideration should be given to heredity, diet/nutrition and environment.

For D7, learners are required to explain the common diseases of the oral mucosa, including potentially malignant conditions thereof. Learners could link together, and evidence, P9, M9 and M6 as one in the form of a booklet entitled Diseases and Disorders of the Oral Cavity.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	Anatomical Structures and their Relation to Design of Custom-made Dental Devices	You have been asked to help produce an illustrated reference booklet, that can be used by other learners, to identify anatomical structures which are relevant to the design of custom-made dental devices.	Anatomically correct labelled diagrams Glossary of descriptions and definitions Written report

Criteria covered	Assignment title	Scenario	Assessment method
P2, P3, M2, M3, D2	Location and Function of Human Orofacial Structures	A friend of the family, who teaches at the local secondary school, has asked if you could produce diagrams of the human skull, with a series of overlays depicting: the periodontal structures; the neurovascular system of the maxilla and mandible; the salivary glands; and the lymphatic system.	Vive voce Anatomically correct labelled diagrams Identification and recording charts Written report
P4, P5, M4, M5, D4	Bones and Muscles of the Facial Skeleton and Oral Cavity	A friend of the family, who teaches at the local secondary school, has asked if you could produce interactive diagrams of the human skull, with a series of overlaying muscle structures.	Vive voce Anatomically correct labelled diagrams Tables and charts Written account Identification and recording
P6, P7, M6, M7, D5	The Human Dentition, its Growth, Development and Form	The owner of ABC Dental Laboratory has asked you to produce a reference booklet explaining and illustrating the shape and features of the deciduous and permanent human dentitions. Together with a series of wax occlusal carvings to be used as a visual aid for his apprentice technicians.	Vive voce Written account Learner reference booklet Occlusal wax carvings Written evaluation
P8, M8, D6	Theories of Craniofacial Growth, Development and Ageing	You have been asked to produce an ICT presentation and accompanying notes, to illustrate and explain the theories of craniofacial growth, development and ageing.	Viva voce Written account Visual presentation Written report
P9, M9, D7	Flora, Fauna and Diseases of the Oral Cavity	You have been asked to produce a reference booklet of colour photographs of the flora, fauna and common diseases of the oral cavity to be used by a class of dental nurses.	Written account Written report

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology sector suite. This unit has particular links with:

Level 3
Unit 1: Fundamentals of Dental Technology
Unit 3: Dental Technology Techniques
Unit 7: Dental Public Health and Preventative Dentistry
Unit 8: Removable Complete Prosthodontic
Unit 9: Removable Partial Prosthodontics
Unit 10: Dental Radiology and Imaging
Unit 11: Design of Fixed Prosthodontics
Unit 15: Principles of Orthodontic Therapy Regimes

Essential resources

This unit requires specialist lecturers who can, where appropriate, link the theoretical aspects to the production of custom-made dental devices and associated practical techniques, such as wax incremental techniques. This will require access to a dental laboratory situation. A range of specialist visual aids of the head and oral cavity will be needed, including natural and simulated human skulls, natural and simulated human teeth and other appropriate anatomical models. Adequate library resources should be available with access to ICT facilities, the internet and a range of appropriate journals.

Employer engagement and vocational contexts

Dental anatomy forms the basis of all dental technology techniques with regards to function and clinical suitability in the design and manufacture of custom-made dental devices. Where possible, learners should visit clinical and hospital departments, or have visiting specialist lecturers from these establishments. Where this is not possible, learners should be given appropriate case study materials and simulation.

Indicative reading for learners

Textbooks

Bath-Bolgh M, Fehrenbach M J and Herring S W – *Illustrated Dental Embryology, Histology and Anatomy* (Saunders, 2002) ISBN 0721601138

Beek V G – *Dental Morphology* (Elsevier, 1983) ISBN 0723606668

Brand R, Isselhard D – *The Anatomy of Orofacial Structures* (Mosby/Elsevier, 2003) ISBN 0323019544

Fehrenbach M J, Herring S W – *Illustrated Anatomy of the Head and Neck* (Saunders, 2001) ISBN 0721693636

McNeill C – *Science and Practice of Occlusion* (Quintessence, 1997) ISBN 0867153040

Shillingburg H T, Wilson E L – *Guide to Occlusal Waxing* (Quintessence, 2000) ISBN 0867153857

Journals

BSI – British Standard Dental Vocabulary, General and Clinical Terms (British Standards Institute, 1992)

The Dental Technician (AE Morgan Publications Ltd)

Dental Technologies (CRG Publications)

Quintessence Journal of Dental Technology (Quintessence Publishing)

Websites

www.bda.org

British Dental Association

www.bsrd.org

British Society for Restorative Dentistry

www.cdta.org.uk

Clinical Dental Technicians Association

www.dentalguide.co.uk

UK and Ireland Dental Guide

www.dental-technology.info

The Dental Digest

www.dentstar.co.uk

International dental internet resources

www.derweb.co.uk

Dental education resources on the web

www.dta-uk.org

Dental Technicians Association

www.healthcare.org.uk

Dental Links

www.the-probe.co.uk

The Probe

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1] identifying the position and relationship of the bones of the cranium and facial skeleton; labeling diagrams identifying the periodontal structures and neurovascular supply of the maxilla and mandible; identifying the salivary glands and major lymph nodes in face and neck; identifying muscles of the facial skeleton and oral cavity
Creative thinkers	[CT1] identifying in visual format the major changes in face shape related to growth, development and age

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Creative thinkers	[CT4] questioning the assumptions as to how external factors can influence facial changes associated with growth, development and age
Reflective learners	[RL4] producing examples of posterior tooth form and occlusion using a recognised wax incremental technique [RL5] evaluating the various forms of simulated natural dentitions used in dental technology

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	<p>carrying out internet searches</p> <p>entering data</p> <p>word processing documents to meet the requirements of assignments</p>
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	producing a plan of tasks to be undertaken, reflecting on how the assignment is progressing
Manage information storage to enable efficient retrieval	saving information in suitable files and folders
Follow and understand the need for safety and security practices	<p>keeping food and drink away from computers</p> <p>ensuring they use their own login and password</p> <p>explaining how safety is addressed in the context of the tasks</p> <p>explaining why the IT usage policy forbids certain actions</p>
Troubleshoot	carrying out checks to identify the source of a problem encountered, eg missing file of work
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using suitable data from the internet, books, and data supplied by the tutor and associated specialist lecturers
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	<p>searching for data</p> <p>selecting appropriate data, evaluating whether it meets the requirements of the assignment task</p>
ICT – Develop, present and communicate information	
<p>Enter, develop and format information independently to suit its meaning and purpose including:</p> <ul style="list-style-type: none"> • text and tables • images • numbers • records 	<p>ensuring all necessary information for the unit is available electronically, ie:</p> <ul style="list-style-type: none"> • flow charts of neurovascular systems • digital images of natural and simulated anatomical structures
Bring together information to suit content and purpose	collecting information in one file for editing into a suitable format
Present information in ways that are fit for purpose and audience	presenting information in the formats required in the assignment briefs
Evaluate the selection and use of ICT tools and facilities used to present information	evaluating whether the presentation of data is appropriate in terms of the grading criteria
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	<p>communicating electronically with tutors and peers.</p> <p>storing materials relevant to the assignment</p> <p>responding to tutor feedback</p>

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	participating in class discussions and Q&A sessions asking pertinent questions
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading, retrieving and selecting appropriate text understanding anatomical terminology relevant to the assignment
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing reports and assignments



Unit 5: Basic Dental Biomaterials Science

Unit code:	F/600/7284
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

This unit will enable an individual entering the dental laboratory environment to develop an awareness and understanding of the uses and limitations of dental technology materials commonly used during the construction of dental devices to a set clinical prescription.

● Unit introduction

This unit is an introduction to the science of common dental materials and learners are encouraged to explore the uses and limitations of these materials. There is the opportunity within the unit to build on and further develop the underpinning knowledge and understanding of the safe handling of dental biomaterials in order to achieve optimum and consistent results for the construction of various dental devices. This will provide a link to enhance the areas covered in *Unit 1: Fundamentals of Dental Technology*.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know how to select and use gypsum and synthetic stone materials
- 2 Understand how to utilise a range of dental waxes
- 3 Understand the uses of different polymeric materials
- 4 Know the properties of dental impression materials.

Unit content

1 Know how to select and use gypsum and synthetic stone materials

Properties of gypsum materials: types; variations and manufacturing processes; selection; ideal properties; mechanical properties; selection; safe storage; handling and disposal

Uses: handling techniques; vacuum mixing; mixing ratios and effects on properties; defects; synthetic stone materials; relating the use of gypsum materials for the differing disciplines within dental technology

Separating media: types; handling techniques and effects on gypsum materials; safe handling; storage and disposal

2 Understand how to utilise a range of dental waxes

Properties of dental waxes: melting points; storage; colours; ideal properties; limitations

Structure: compositions; natural/synthetic; grading; stability; effects of residue on process

Range of dental waxes: modelling wax; sticky wax; inlay wax; tooth carving wax; carding wax

3 Understand the uses of different polymeric materials

Science of polymers: basic polymer science; polymerisation; structure of polymers

Properties of polymeric materials: requirements; ideal properties; limitations; selection and manipulation; safe storage; handling and disposal

Materials: thermoforming plastics; denture base and repair resins; denture teeth polymers; curing techniques and cycles

4 Know the properties of dental impression materials

Properties of impression materials: limitations; ideal properties; handling and disposal; decontamination and cross-infection control procedures

Materials: mucostatic; mucocompressive; impression pastes; putties; elastomers; silicones; disposal procedures; impression waxes

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 identify the general properties and uses of the main forms of gypsum and synthetic stone materials used in the dental laboratory [IE I]	M1 compare the main forms of gypsum and synthetic stone materials used in the dental laboratory with the ideal requirements	D1 evaluate gypsum and synthetic stone materials used in the dental laboratory
P2 state the different media for separating materials generally used in the dental laboratory [CT I]	M2 compare media for separating materials used in the dental laboratory with the ideal requirements based on use	D2 examine the effectiveness of media for separating materials used in the dental laboratory
P3 explain the use of dental waxes found within the dental laboratory [IE I]	M3 review the properties of dental waxes in relation to their structure	D3 evaluate waxes used in the dental laboratory
P4 explain the principles underlying the use of polymeric materials in the dental laboratory [IE I]	M4 compare the polymeric materials used within the dental laboratory with the ideal requirements related to these materials.	D4 assess different types of polymeric materials used within the dental laboratory environment
P5 state the considerations for the use of different types of dental impression materials [IE I]	M5 describe the classification of dental impression materials	D5 evaluate currently used dental impression materials

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

As there is a practical element to this unit, delivery should be carried out in a dental laboratory. There will also be formal lectures and group activities to enhance the teaching methods. The assessment evidence suggests the use of different formats including group work, presentations and case studies.

Delivery

Delivery should incorporate a range of relevant techniques that draw on a variety of resources to introduce learners to the range of dental materials available. Lectures, discussions, seminar presentations, practical evaluations, research using the internet and/or library resources would all be suitable. Site visits to dental companies, supervised practicals using dental technology techniques related to the materials covered in the learning outcomes, and the use of personal and/or relevant dental laboratory experience would enhance learners' understanding of basic dental biomaterials. Activities from other units in this programme can be linked to this unit.

Regular monitoring of work placements to ensure the quality of the learning experience should be encouraged and is an integral part of *Unit 18: Work-based Learning in Dental Technology*. Dental laboratory owners, managers and supervisors should be made aware of the requirements of this unit, before any work-related activities, to link dental laboratory techniques with the dental materials currently used. For example, learners may have the opportunity to record the different types of dental impression materials received from the dental surgery and, using suitable model materials, to construct accurate casts for cases following direct instruction from a prescription. Consideration should be given to the sharing of individual research through a group/class approach and using presentations, group seminars, practical demonstrations, handouts and discussions. This will encourage a broader dissemination of knowledge.

Whichever delivery methods are used, it is essential that tutors stress the importance of health and safety when handling dental materials and are aware of the current COSHH regulations.

Tutors should consider integrating the delivery, private study and assessment relating to this unit with any other relevant units and assessment instruments learners may also be taking as part of their programme of study.

Learning outcome 1 is likely to be delivered through formal lectures, discussions and independent learner research. The use of practicals related to model-making materials and separating media, linking to *Unit 1: Fundamentals of Dental Technology* would help learners appreciate the demands made on the dental materials in normal use and their correct selection for the range of dental technology disciplines.

Learning outcome 2 covers the basic understanding and properties of dental waxes currently used by the dental technician, which are developed further in the area of material selection for a specific role. Formal lectures, demonstrations and supervised practicals linking to other relevant units in the programme should form part of the delivery of this outcome.

Learning outcome 3 focuses on the underpinning scientific knowledge and properties of polymers used in dentistry. Selection and techniques used to process these materials following a prescription are integral parts of this learning outcome. It is expected that formal lectures, demonstrations and supervised practicals linking to other relevant units in the programme will form part of the delivery of this outcome. Data sheets and hazard cards from companies supplying the materials would be useful in addressing health and safety issues.

Learning outcome 4 considers the properties of currently available impression materials used in dentistry. Delivery techniques should be varied and could include field trips to clinical environments for demonstrations in using this material. It is expected that formal lectures, demonstrations and supervised practicals will form the majority of the delivery for this outcome.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments.

Learning outcome 1

Introduction to gypsum products and separating media utilised in the dental laboratory.

Discuss the sourcing and manufacturing processes used to form dental modelling materials.

Discuss processing techniques for gypsum materials and synthetic stone materials.

Discuss practical testing procedures.

Carry out testing procedures.

Finalise testing procedures and start to organise structure for technical report and presentation.

Introduce learners to the structure of an academic technical report.

Discuss the ideal properties of gypsum-based materials and synthetic stone.

Review the main uses of gypsum materials and synthetic stone and the ideal properties of model materials.

Discuss the composition of dental modelling materials.

Demonstrate manipulation techniques used to process dental modelling materials.

Group presentations.

Discuss the use of different separating media.

Demonstrate the handling techniques and effects on model materials.

Discuss safe handling, storage and disposal of model materials.

Assignment 1: Gypsum Products and Synthetic Stone Utilised in the Dental Laboratory (P1, P2, M1, M2, D1, D2)

Topic and suggested assignments/activities and/assessment

Learning outcome 2

Introduction to the properties and uses of dental waxes.

Introduce the variety of waxes that can be used in the production of dental appliances.

Discuss the basic properties, application, and history of dental waxes.

Demonstrate the uses of a range of waxes.

Discuss the composition of natural and synthetic waxes and how they affect the properties of the material.

Present the classification of dental waxes.

Discuss the ideal properties of dental waxes.

Personal study time and research.

Assignment 2: Properties and Uses of Dental Waxes (P3, M3, D3)

Learning outcome 3

Introduce the variety of polymeric dental materials.

Discuss simple polymer science and types of polymerisation.

Discuss the uses of polymeric materials in the production of dental appliances.

Examine the ideal requirements for a permanent polymeric material.

Discuss the requirements of ideal materials to function as a restorative material.

Introduce the ideal properties for polymeric materials.

Discuss the function and action of constituents present in polymeric materials.

Research the health and safety and environmental aspects necessary to use these materials in a safe manner.

Demonstrate different forming and curing systems.

Analyse a range of available polymeric systems to determine the most cost efficient system and the system that returns reliable appliances.

Demonstrate different finishing and polishing techniques for polymeric materials.

Demonstrate quality control processes for a range of polymeric materials and appliances.

Personal study time and research.

Assignment 3: Properties and Uses of a Range of Polymeric Dental Materials (P4, M4, D4)

Learning outcome 4

Discuss the main uses of impression materials.

Demonstrate differing impression material mixing and processing techniques.

Discuss impression taking techniques that are carried out by clinical members of the dental team.

Presentation on ideal properties of impression materials.

Discuss the different classification of impression materials and compare them against the ideal properties of impression materials.

Examine the consequences of poor impression taking techniques on the production of dental appliances.

Discuss cross infection and contamination regimes for impression materials and their safe handling.

Assignment 4: Investigating Dental Impression Materials (P5, M5 D5)

Review of unit and programme of assignments.

Assessment

To achieve a pass grade for the unit, learners must meet the five pass criteria listed in the grading grid provided.

P1 requires learners to identify the general properties of the main forms of gypsum and synthetic stone materials used in the dental laboratory. Learners will be expected to cover the range of uses and properties listed in the unit content. This criterion could be assessed directly by the tutor during practical activities or by learners' practical research projects providing evidence for a technical report. If this format is used suitable evidence from guided activities would be observation records completed by learners and the tutor.

P2 requires learners to state the forms of separating materials generally used in the dental laboratory. They will be expected to cover the handling techniques and effects on gypsum materials. Consideration should be given to the safe handling, storage and disposal of these materials. Evidence for this could take the form of activities linked to P1 in an observation record completed by learners and the tutor.

P3 requires learners to explain the use of dental waxes found within the dental laboratory. Learners will be expected to state the main types of dental waxes available to the dental technician. Evidence for this could be assessed by the tutor during practical activities. If this format is used, suitable evidence from guided learning activities would be the observation records completed by learners and the tutor. Alternatively, the learner could provide evidence in the form of a presentation using ICT.

For P4, learners will be expected to explain polymeric materials used for various purposes within the dental laboratory. Evidence for this could take the form of a presentation using a poster highlighting the outcomes of this.

For P5, learners must state the considerations for the use of different types of dental impression materials that are currently available. Learners will be expected to include the range of impression materials used in the dental surgery. Evidence for this could take the form of a case study investigating the most popular materials commonly used in dentistry.

To achieve a merit grade, learners must meet all of the pass grade criteria and the five merit grade criteria.

For M1, learners are required to compare the main forms of gypsum and synthetic stone materials used in the dental laboratory with the ideal requirements. They may contextualise how gypsum and synthetic stone materials are developed to meet the mechanical and physical property requirements. Evidence may be in the same format as for P1.

M2 requires learners to compare separating materials used in the dental laboratory with the ideal requirements. They will be expected to make comparisons with the generally accepted ideal requirements which will explain the types and function of separating materials. Evidence presented may be in the same format as for P2.

For M3, learners must review the properties of dental waxes and compare with ideal requirements. They will be expected to make comparisons with generally-accepted ideal requirements and in doing so will explain the properties and structure of a range of dental waxes. The evidence presented must be broad ranging, realistic and feasible.

For M4, learners are required to compare the polymeric materials used within the dental laboratory with the ideal requirements. They will be expected to make comparisons with generally-accepted ideal requirements and in doing so will explain the function of a range of polymeric materials. The evidence presented must be broad ranging, realistic and feasible.

M5 requires learners to describe the classification of dental impression materials. This can be directly linked to P1 and could be assessed during work placement. If assessed this way witness statements should be provided by a suitable representative and verified by the tutor. The evidence presented must be broad ranging, realistic and feasible.

To achieve a distinction grade, learners must achieve all of the pass and merit grade criteria and the five distinction grade criteria.

D1 requires learners to evaluate gypsum and synthetic stone materials used in the dental laboratory. Learners' evidence should be broad ranging giving examples of laboratory procedures and techniques that justify the exacting requirements of gypsum and synthetic stone materials.

D2 requires learners to examine the effectiveness of separating materials used in the dental laboratory. Learners may contextualise their evidence as described in M2. Evidence may be in the same format as for M2.

D3 requires learners to evaluate waxes used in the dental laboratory. Learners' evidence should be broad ranging giving examples of dental laboratory procedures and techniques that explain the importance of selected dental waxes to meet a range of uses.

For D4, learners are required to assess current polymeric materials used within the dental laboratory. Learners may contextualise their evidence as described in M4. Evidence may be in the same format as for M4.

For D5, learners are required to evaluate current impression materials. Learners' evidence should be broad ranging and include an explanation of current impression materials used within dentistry. A link can be made to M2 and evidence provided may be in the same format as for M5.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, M1, M2, D1, D2	Gypsum Products and Synthetic Stone Utilised in the Dental Laboratory	As part of a dental team working in a dental laboratory you have been asked to work as an action group to test the quality and manipulation of gypsum and synthetic stone materials used to produce dental casts.	The test results will form part of a technical report. Practical observations by the tutor.
P3, M3, D3	Properties and Uses of Dental Waxes	Your employer has asked you to carry out research into different waxes that are commonly used in dental laboratories in order to improve the range of waxes currently used in your work placement.	ICT presentation informing the audience of your research into dental waxes and your recommendations.

Criteria covered	Assignment title	Scenario	Assessment method
P4, M4, D4	Properties and Uses of a Range of Polymeric Dental Materials	Your employer has been experiencing polymeric material processing difficulties and a high number of returned appliances. They have asked you to write a report on the properties and uses of materials to help them understand these materials.	Formal essay evidencing the uses and properties polymeric materials.
P5, M5, D5	Investigating Dental Impression Materials	As part of a quality assurance process your employer has asked you to carry out a case study into the different types of impression materials and impression-taking techniques that the laboratory clients use. This will allow your employer to assess and eliminate production faults caused by poor impression materials and impression-taking techniques.	Case study recording the use of different impression materials and the techniques used to form an impression.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology sector suite. This unit has particular links with:

Level 3
Unit 1: Fundamentals of Dental Technology
Unit 3: Dental Technology Techniques
Unit 8: Removable Complete Prosthodontics
Unit 9: Removable Partial Dentures
Unit 11: Design of Fixed Prosthodontics
Unit 13: Techniques for Manufacturing Fixed Prosthodontics
Unit 15: Principles of Orthodontic Therapy Regimes
Unit 16: Design, Manufacture and Modification of Removable Orthodontic Appliances
Unit 18: Work-based Learning in Dental Technology

Essential resources

Facilities required for this unit include a fully equipped dental laboratory. The laboratory should be fitted with appropriate benching, hand pieces, extractor units, mixing machines, model trimmers, light cure boxes, pressure pots, vacuum forming machines, Bunsen burners and polishing lathes. First aid kits, fire extinguishers, all PPE, infection control and safety equipment should be present, as well as a wide range of dental materials.

Learners should be equipped with a full dental toolkit and a selection of trimming burs for a variety of materials. Personal protective equipment is mandatory.

Access to hospital and commercial dental laboratories that provide a range of dental technology services is very important.

Staff delivering this unit should be competent and experienced, and be registered dental technicians. Ideally, they should have recent laboratory experience within dental technology and show evidence of regular contact with the industry and/or technical updating.

Learners will need access to library and IT facilities with a range of relevant books, journals and software applications.

Employer engagement and vocational contexts

To further enhance the delivery of this unit it is suggested that learners are able to access commercial and hospital laboratories as part of a work placement or field trip. Visits to material manufacturers will help learners gain an understanding of the properties of the materials covered in this unit.

Textbooks

Anusavice K J – *Phillip's Science of Dental Materials, 11th Edition* (W B Saunders, 2003) ISBN 0721693873

Craig R G and Powers J M – *Restorative Dental Materials, 11th Edition* (Mosby, 2001) ISBN 0323014429

Gladwin M A and Bagby M – *Clinical Aspects of Dental Materials* (Lippincott Williams and Wilkins) ISBN 0781743443

Anderson J N – *Applied Dental Materials, 8th Edition* (Blackwell Science, 1998) ISBN 0632042087

Van Noort R – *Introduction to Dental Materials, 2nd Edition* (CV Mosby, 2002) ISBN 0723432155

Journals

The British Dental Journal (Nature Publishing Group)

The Dental Technician (AE Morgan Publications Ltd)

Dental Technologies (CRG Publications)

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1] planning and developing their gypsum tests, explaining the use of dental waxes, explaining the use of polymeric materials, considering the use of different types of dental impression materials
Creative thinkers	[CT1] experimenting with gypsum separating media

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE2] researching polymeric materials and their uses
Creative thinkers	[CT5] experimenting with different separating media
Reflective learners	[RL5] using materials in other units in this programme to help in their development of material knowledge to satisfy the learning outcomes in this unit [RL6] delivering ICT presentations on the different types of dental waxes used in dental laboratories
Team workers	[TM6] responding to other learners' dental wax presentations. showing the ability to constructively feedback to the presenter
Self-managers	[SM1] carrying out gypsum experiments exhibiting the ability to be flexible in relation to developments and challenges [SM2, SM3] recording the types of impression materials that are sent into a dental laboratory
Effective participators	[EP3] carrying out gypsum material tests demonstrating an ability to plan the project over a series of sessions

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using computers to develop and deliver their presentations
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	recording information to present in a case study
Manage information storage to enable efficient retrieval	saving material and assignment files in organised folders
Follow and understand the need for safety and security practices	following associated health and safety procedures related to the use of computers and VDUs
Troubleshoot	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using multimedia software to formulate assignments
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	searching websites for information and demonstrating the ability to extract details that are relevant to the purpose of the task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	storing and recalling information electronically that satisfies the requirements of the grading criteria in this unit, eg ICT presentation on dental waxes
Bring together information to suit content and purpose	generating reports or essays which include essential data to inform the reader of the uses of a specific dental material, eg polymeric dental materials
Present information in ways that are fit for purpose and audience	submitting evidence in a variety of formats to meet the requirements of the brief
Evaluate the selection and use of ICT tools and facilities used to present information	assessing their use of IT to produce documents and reflecting on their skill development needs in this area
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	communicating using email and chat rooms (Moodle) with peers and tutors, eg support for assignment development
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	using mixing ratios and quantity to test and use materials effectively

Skill	When learners are ...
Identify the situation or problem and the mathematical methods needed to tackle it	setting up the parameters of their material tests and altering factors to meet their assignment plans
Select and apply a range of skills to find solutions	using timed experiments
Use appropriate checking procedures and evaluate their effectiveness at each stage	recording information in a controlled manner to ensure the validity of their experiments and results as part of a quality control process
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	finalising their projects and preparing them for submission or presentation
Draw conclusions and provide mathematical justifications	reflecting on their experiments to formulate conclusions to show their understanding of the procedures and results
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in group discussions, assignment seminars and tutorials
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	researching material using books, journals and the internet
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing technical reports, case studies and essays following the requirements of the assignment brief



Unit 6: Legislation, Professionalism and Ethics in Dentistry

Unit code:	R/600/7287
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

This unit develops learners' understanding of the requirements of entering into a professional career and the legislative and ethical demands that will be placed on them as a professional to ensure the safety of the patient.

● Unit introduction

An integrated team approach to the dental treatment of patients ensures that the patient receives the best possible dental care in a safe and controlled environment. It is a statutory requirement for all dental care professionals to register with the General Dental Council to allow them to practise in their chosen field.

Learning outcome 1 introduces learners to the concept of the delivery of dental care by a team of healthcare professionals. It delivers an insight into the roles of dental care professionals and explains how the team works together in the best interest of the patient. Various communication techniques that team members use will be considered. Patient management and treatment plans and costs will be covered.

The treatment of patients and the construction of dental appliances is governed by legislation and regulated by the General Dental Council. Adherence to this legislation is important to ensure the health and safety of the patient and the dental technician. Learning outcome 2 examines the legislative requirements to practice as a dental technician and provides an understanding of the need for these laws. Learners also discover the consequences to themselves and their patients of not upholding these legal requirements. As litigation is becoming more frequent in the UK, learners are given information on methods to protect themselves against prosecution.

Learning outcome 3 encourages learners to become aware of the ethical considerations involved in the treatment of patients.

Learning outcome 4 gives learners an understanding of the need to develop a professional manner towards those with whom they interrelate throughout their working lives.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know the roles of the dental team integral to dental patient care and treatment
- 2 Know the requirements of current legislation that applies to the practice of dental technology
- 3 Know the ethical requirements necessary to fulfil the duties of a dental technician
- 4 Be able to demonstrate professional conduct towards colleagues and patients.

Unit content

1 Know the roles of the dental team integral to dental patient care and treatment

Team roles: roles and responsibilities, eg dentist, dental nurse, dental hygienist/therapist, dental technician, clinical dental technician, orthodontic therapist; reasons for a team approach; the advantages and disadvantages of working in a team; other people involved in the treatment of patients

Integration: methods of communicating information; interaction between team members; treatment plans; receipt, management and return of laboratory work; methods of payment; lifelong learning

2 Know the requirements of current legislation that applies to the practice of dental technology

Registration: reasons for statutory registration; requirements for registration purposes, qualifications, codes of practice, continuing professional development; regulatory function of the General Dental Council; The Dentists' Act 2005 (as amended); principles and practices of audits carried out in a dental laboratory; ways of dealing with colleagues failing their professional responsibilities; medico-legal consequences

Patient treatment: laws that affect patient treatment, Human Rights Act, Disability Discrimination Act, Data Protection Act; methods of insuring against litigation; reasons for the Medical Devices Directive; consequences of not upholding legislative requirements; patient consent

Workplace: employee induction; employment protection; policies and procedures; job descriptions and personal specifications; equality and diversity; indemnity insurance

3 Know the ethical requirements necessary to fulfil the duties of a dental technician

Ethical obligations: General Dental Council requirements; personal and public morality; standards of conduct in professional and personal life; consent, duty of care and confidentiality, eg data storage and record keeping; patient best interests; codes of practice; equality and diversity; consequences of not upholding ethical obligations

Ethical and legal considerations: ethics related to the role of a dental technician, eg scope of practice; ethical dilemmas; patient complaints; maintain confidentiality; dealing with gender and racial issues; providing sufficient information about conditions and possible treatment; employment law; use of correct materials

4 Be able to demonstrate professional conduct towards colleagues and patients

Behaviour patterns: body language; speech patterns; interpersonal skills; verbal communication

Appearance: personal grooming and hygiene

Contacts: patients; patient management; dentists; treatment plans, prescriptions and contracts; dental nurses and receptionists; telephone techniques; electronic communication; methods of dealing with complaints

General Dental Council; Standards for Dental Professionals; Standards for Student Dental Technicians; scope of practice

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 outline the roles of each member of the dental team employed in treatments involving dental appliances [IE3, CT2]	M1 describe the reasons for a team approach to dental healthcare, including its advantages and disadvantages	D1 define how an integrated dental team approach can be managed to improve patient care
P2 outline the criteria specified by the General Dental Council to register as a dental technician	M2 explain the need for statutory registration for dental technicians	D2 discuss the medico-legal consequences of not adhering to registration requirements
P3 outline legislation that applies to patient treatment involving the practice of dental technology	M3 explain how legislation can be implemented in the dental laboratory environment	
P4 outline workplace legislation that applies to the running of a dental laboratory [SM3]		
P5 identify the ethical obligations involved in the treatment of patients	M4 explain how ethical obligations affect both the patient and the dental technician	D3 discuss the consequences of not adhering to the ethical requirements of the General Dental Council
P6 describe how a professional might be expected to conduct themselves	M5 explain how a person's speech and body language might influence other people's perception of them	D4 discuss why it is necessary to behave professionally when involved in the healthcare of others
P7 contribute in a professional manner to treatment of patients as part of a dental team [TM4, EP3]	M6 record the dental technician's role in the professional activities of treating a patient	D5 carry out an investigation into extended roles for dental technicians that are recognised by the General Dental Council

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

Tutors need to use a variety of teaching resources to deliver the unit content. Interaction with other dental care professionals is an essential element of development that will embed the skills required to meet the legal and ethical demands of the profession. Assessment of the unit requires learners to provide evidence using a range of assessment methods.

Delivery

Tutors delivering this unit have opportunities to use a wide variety of techniques, including lectures, discussions, group seminar presentations, workshops, films and research using the internet and/or library resources. External speakers from the various governing bodies could be invited to give presentations to learners to enhance the delivery of this subject. Delivery should encourage learners to communicate with other members of the dental team and to build good working relationships with them. It should make learners aware of the importance of patients and the commitment and responsibility they have to their patients and to the other dental team members.

Whichever delivery methods are used, it is essential that tutors stress the importance of patient and learner welfare, teamwork in the provision of dental healthcare and ethical and professional guidelines and behaviour.

Tutors should consider integrating the delivery, private study and assessment relating to this unit with any other relevant units and assessment instruments that learners may be taking as part of the programme of study.

Learning outcome 1 can be delivered using a variety of methods but should be taught in association with other learners from the dental team. Group work and interactive workshops would be a good delivery method for this outcome to ensure learners get to know learners from other dental team groups. Visits from dental team speakers and visits to clinical environments to meet with patients and other dental team members would be beneficial to the learning experience at this early stage of the learning process. Shadowing other team members would give an insight into their roles and duties.

Learning outcome 2 could be delivered through formal lectures and discussions. Legislation needs to be taught to give learners the opportunity to apply legislative facts to a dental laboratory environment. It is essential that learners are taught the current legislation relating to the areas specified in the unit content.

Learning outcome 3 covers the ethical obligations necessary to carry out the role of a dental technician. Delivery techniques should be varied and it is expected that the ethical regulations and standards will be taught as formal lectures but that morality and behavioural codes might be taught through discussion groups and debating forums. Learners should be encouraged to give examples of ethical and moral dilemmas encountered in their lives. Films and documentaries could be discussed and debated.

Learning outcome 4 investigates professional behaviour amongst dental healthcare professionals. This could be delivered through role-play situations, discussion groups, shadowing colleagues and recording scenarios. Fictional medical television programmes could be used to highlight good and bad behaviour towards colleagues and patients. Visiting speakers, for example other qualified dental team members, could be used to discuss real-life situations.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction to the unit and structure of the programme of assignments.
Learning outcome 1 Introduction to the dental team members and their roles during the treatment of patients. Examine the roles and responsibilities of each team member. Discuss the reasons for a team approach. Debate the advantages and disadvantages of team working. Introduce other health care professionals that may be employed in the dental treatment of patients. Discuss professional relationships within the dental team. Personal research and study time.
Assignment 1: The Roles of the Dental Team Integral to Dental Patient Care and Treatment (PI, MI, DI)
Learning outcome 2 Introduce the current legislation relevant to dental technology and the practice of dentistry. Discuss the requirements of professional registration on the General Dental Councils (GDC) register. Examine the effects of non-compliance with regulatory legislation. Discuss the legislation related to patient treatment, eg Human Rights Act, Disability Discrimination Act, Data Protection Act. Investigate the reasons for the Medical Devices Directive and the role of the Medical and Healthcare Products Regulatory Agency (MHRA). Discuss the commitments of the employer to employment laws. Investigate the sources of professional advice. Discuss the principles and practices involved in dental laboratory audits. Examine additional legal requirements, ECDL and other CPD (continuing professional development). Personal research and study time.

Topic and suggested assignments/activities and/assessment

Assignment 2: The Requirements of Current Legislation that Apply to the Practice of Dental Technology (P2, P3, P4, M2, M3, D2)

Learning outcome 3

Introduce the ethical requirements necessary to fulfil the duties of a dental technician.

Discuss the ethical requirements for a registrant of the General Dental Council.

Debate personal and public morality.

Discuss the standards of conduct in professional and personal life.

Ethical scenarios for discussion:

- ethical dilemmas
- patient complaints
- maintaining confidentiality
- dealing with gender and racial issues
- providing sufficient information about conditions and possible treatment
- employment law
- fraud – use of correct materials.

Discuss issues focusing on patient confidentiality.

Debate the subject of patient consent.

Consider additional ethical responsibilities for dentistry in the areas of product development for involved clinical and laboratory applications and research.

Personal research and study time.

Assignment 3: The Ethical Requirements Necessary to Fulfil the Duties of a Dental Technician (P5, M4, D3)

Learning outcome 4

Introduce the requirements of a professional health vocation.

Discuss behavioural patterns: body language; speech patterns; interpersonal skills; verbal communication.

Examine the influence of appearance, personal grooming and hygiene.

Discuss the communication with potential contacts involved with the treatment of patients.

Demonstrate methods of dealing with complaints.

Discuss the legal requirements of communication and data protection.

Introduce the Standards for Dental Professionals and Standards for Student Dental Technicians published by the General Dental Council.

Personal research and study time.

Assignment 4: Be Able to Demonstrate Professional Conduct Towards Colleagues and Patients (P6, P7, M5, M6, D4, D5)

Review of unit and programme of assignments.

Assessment

To achieve a pass grade for the unit learners must achieve the seven pass criteria listed in the grading grid.

For P1, learners will be expected to outline the roles involved in the dental team and give a brief description of each member's roles and responsibilities. Evidence for this could take the form of a pictorial presentation with notes (possibly using appropriate software), an annotated poster or leaflet. Alternatively, this could be evidenced as a project.

For P2, learners must outline the criteria required by the General Dental Council to register as a dental technician. Evidence for this could be presented as an information leaflet for new recruits to dental technology. Alternatively, this could be evidenced as a project with P3 and P4.

For P3, learners must outline the legislation that applies to the treatment of patients who will need appliances fabricated by a dental technician. Evidence for this could be presented as an information poster for new recruits to dental technology. Alternatively, this could be evidenced as a project with P2 and P4.

For P4, learners must review legislation that is essential to the running of a dental laboratory. This could be evidenced through an oral presentation or alternatively evidenced as a project with P2 and P3.

P5 requires learners to identify the ethical obligations that are relevant to the treatment of patients. Evidence for this criterion could be a written report.

P6 requires learners to describe the ideal professional conduct and behaviour that an individual will have to exhibit to meet professional obligations.

Evidence for this criterion should be written as a report and linked to P7.

For P7, learners must work in a professional manner (the key issue being professional conduct) as part of a dental team carrying out treatment on patients. This could be evidenced by a witness statement which describes clearly the evidence of meeting this criterion. This should be provided by the workplace supervisor and verified by the tutor. Guidance on the use of witness statements is provided on the Edexcel website. Alternatively, this may be evidenced as part of a project with P1 and P4.

To achieve a merit grade for the unit, learners must achieve all of the pass grade criteria and the five merit grade criteria.

For M1, learners will be expected to describe the reasons for a team approach to dental healthcare, including its advantages and disadvantages. This can be directly linked to work undertaken in P1. Evidence for this could take the form of a pictorial presentation with notes (possibly using appropriate software), an annotated poster or leaflet. Alternatively, this could be evidenced as a project.

For M2, learners must explain the need for statutory registration for dental technicians. This can be directly linked to work undertaken in P2. Evidence for this could be presented as an information leaflet for new recruits to dental technology. Alternatively, this could be evidenced as a project with M3.

For M3, learners must explain how legislation can be implemented in the dental laboratory to ensure their practices meet the requirements of the specific legislation and the governing bodies.

M4 requires learners to explain how ethical obligations affect the patient and the dental technician. This can be directly linked to work undertaken in P3. Evidence for this could be presented as an information leaflet for new recruits to dental technology. Alternatively, this could be evidenced as a project with P5.

For M5, learners must explain how a person's speech and body language might influence other people's perception of them. This can be directly linked to work undertaken in P4. Evidence for this could be presented as an information leaflet for new recruits to dental technology. Alternatively, this could be evidenced as a project with M6.

M6 requires learners to record the role of a dental technician during the treatment of patients to ensure that the process of treating a patient takes place in a professional manner. Evidence for this could be presented in the form of a reflective journal recording the activities undertaken by a dental technician to fulfil the requirements of a dental prescription form.

To achieve a distinction grade for the unit, learners must achieve all of the pass and merit criteria and the five distinction grade criteria.

For D1, learners are required to define how an integrated team approach can be managed to improve patient care. This can be directly linked to work undertaken in P1 and M1. Evidence may be in the same format as for M1.

D2 requires learners to discuss the medico-legal consequences of not adhering to registration requirements. This can be directly linked to work undertaken in P2 and M2. Evidence may be in the same format as for M2.

For D3, learners must discuss the consequences of not adhering to the ethical requirements of the General Dental Council. This can be directly linked to work undertaken in P5 and M4. Evidence may be in the same format as for M4.

For D4, learners must discuss why it is necessary to behave professionally in the healthcare of others. This could be evidenced in the form of notes from a group discussion. Alternatively, it may form part of a project with M5 and D5.

D5 requires learners to investigate the extended roles of the dental technician that have been recognised by the General Dental Council. Evidence may be in the format of a written report.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	The Roles of the Dental Team Integral to Dental Patient Care and Treatment	You are working for a dental technology department within a Primary Care Trust and have been asked by your line manager to produce a presentation as part of a marketing strategy that can be used to promote the dental team and help educate patients. Posters and leaflets can also be designed to further enhance the presentation.	Design and produce an ICT presentation. Additionally, posters and leaflets can be designed to enhance the information provided in the presentation.

Criteria covered	Assignment title	Scenario	Assessment method
P2, P3, P4, M2, M3, D2	The Requirements of Current Legislation that Applies to the Practice of Dental Technology	<p>You are considering setting up a dental laboratory in this country and as part of this process you will need to comply with a range of compulsory legislation associated with the production of dental custom-made devices. To ensure compliance you need to write a report on all aspects of legislation that meets the requirements of the GDC, MHRA and other employment and European factors.</p> <p>The report should also include a review of legislation that applies to patient treatment and to the running of a dental laboratory.</p>	Write a report on the compulsory legislative requirements, registration with the GDC, the reasons for its implementation and the consequences of not adhering to the registration requirements.
P5, M4, D3	The Ethical Requirements Necessary to Fulfil the Duties of a Dental Technician	Your work-based mentor is employing new staff and wants them to be aware of the ethical demands of the role of a dental technician. They have asked you to write a report on the ethical aspects of being a dental technician.	Write a report on the ethical obligations of a healthcare professional and how to comply with the GDC's standards of conduct.

Criteria covered	Assignment title	Scenario	Assessment method
P6, P7, M5, M6, D4, D5	Be Able to Demonstrate Professional Conduct Towards Colleagues and Patients	<p>Becoming a dental technology professional involves professional and personal skills development. This assignment has been designed to allow you to consider the professional behaviour of a registrant. You will be in contact with other team members and patients in the working environment and you will need to exhibit a level of professionalism conducive to this relationship.</p> <p>Personal conduct can also affect registration so you need to consider your conduct in your own personal life.</p>	<p>Evidence to be sourced from tutor notes of a group discussion on the requirements of professionalism.</p> <p>Work-based witness statement to quantify adherence to professionalism in the work placement.</p> <p>Written report.</p>

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology sector suite. This unit has particular links with:

Level 3
Unit 2: Medical Emergencies, First Aid and Communication in the Dental Team
Unit 1: Fundamentals of Dental Technology
Unit 3: Dental Technology Techniques
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 5: Basic Dental Biomaterials Science
Unit 6: Legislation, Professionalism and Ethics in Dentistry
Unit 7: Dental Public Health and Preventative Dentistry
Unit 8: Removable Complete Prosthodontics
Unit 9: Removable Partial Prosthodontics
Unit 10: Dental Radiology and Imaging
Unit 11: Design of Fixed Prosthodontics
Unit 12: Complex Dental Biomaterials Science
Unit 13: Techniques for Manufacturing Fixed Prosthodontics
Unit 14: Quality Assurance in Dental Technology
Unit 15: Principles of Orthodontic Therapy Regimes
Unit 16: Design, Manufacture and Modification of Removable Orthodontic Appliances
Unit 18: Work-based Learning in Dental Technology

Essential resources

Access to hospital and commercial dental laboratories that provide a range of dental technology services is very important, as is access to clinical areas and other dental team members.

Learners will benefit from work experience in a dental laboratory and guidance from a designated work-based mentor. Access to compulsory documentation will help learners to understand the legal and professional standard requirements associated with dental technology.

Staff delivering this unit should be competent, experienced and registered dental technicians. Ideally they should have recent laboratory experience within dental technology and show evidence of regular contact with the industry and/or technical updating.

Learners will need access to library and IT facilities with a range of relevant books, journals and software applications.

Employer engagement and vocational contexts

Learners will benefit from work experience in a dental laboratory and guidance from a designated work-based mentor. Access to compulsory documentation will help learners to understand the legal and professional standard requirements associated with dental technology.

Indicative reading for learners

Textbooks

Balmer C, Barlett D, Beighton D, Brand H and Brunton P – *Clinical Handbook of Dental Hygiene and Therapy* (Blackwell Publishing, 2006) ISBN 1405135409

Ewles and Simnet – *Promoting Health: a Practical Guide* (Bailliere Tindall, 2003) ISBN 0702026638

Groten M, Janda R – *Clinical Investigation of Medical Devices in Dentistry* (Quintessence 2003) ISBN 1850970696

Inglehart M, Bagramian R – *Oral Health-Related Quality of Life* (Quintessence, 2002) ISBN 0867154217

Levison H – *Textbook for Dental Nurse, 9th Edition* (Blackwell Science, 2004) ISBN 0632040319

Miles L – *Dynamic Dentistry* (Link Publishing, 2003)

Mitchell L and Mitchell D – *Oxford Handbook of Clinical Dentist, 3rd Edition* (Oxford University Press, 1999) ISBN 0192629638

Pine C, Harris R – *Community Oral Health* (Quintessence, 2004) ISBN 1850970920

Rule J, Veatch R Ethical – *Questions in Dentistry, 2nd Edition* (Quintessence, 1993) ISBN 0867152036

Journals

The British Dental Journal (Nature Publishing Group)

The Dental Technician (AE Morgan Publications Ltd)

Dental Technologies (CRG Publications)

Other reading

Cross-infection control information updates from the Department of Health and related professional bodies, for example BDA.

General Dental Council publications on ethical guidance, for example maintaining standards (www.gdc-uk.org) and Ethical Guidance.

Websites

www.derweb.co.uk

www.dla.org.uk

www.dta-uk.org

www.gdc-uk.org

www.mhra.org

Dental Education Resources

Dental Laboratories Association

Dental Technicians Association

General Dental Council

Medical and Health Care Products Regulatory Agency

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE3] outlining the different roles within the dental team
Creative thinkers	[CT2] asking questions about the roles of the dental team
Team workers	[TM4] contributing in a professional manner to the work of a dental team
Self-managers	[SM3] investigating the implementation of legislation in their working environment
Effective participators	[EP3] developing their skills and roles within the dental team

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE3] exploring the reasons, advantages and disadvantages of registration with the GDC. They should consider the perspective of the patient, clinician, laboratory and dental technician
Creative thinkers	[CT6] developing their ideas of the consequences of non-conformance with the registration of dental technicians
Reflective learners	[RL4] discussing their assignment grades and how the project can be improved to increase the overall grade
Team workers	[TM6] debating points of interest during group discussions; providing peers with positive and constructive feedback
Effective participators	[EP5] debating issues during group discussions

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	working towards their dental team leaflet. Finding information to add to project
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	setting up a process to manage their studies. Evaluating the effectiveness of the process in group discussions
Manage information storage to enable efficient retrieval	saving information and assignments in suitable files to facilitate easy recall
Follow and understand the need for safety and security practices	using computers to store patient information in the laboratory environment
Troubleshoot	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	researching for information on the internet for their assignment and class work
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	using suitable websites deciphering information to add into assignments
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	storing information for their assignments electronically so it can be easily found and assessed
Bring together information to suit content and purpose	creating assignment work in the form of written reports and patient information leaflets
Present information in ways that are fit for purpose and audience	presenting assignment work in the agreed format
Evaluate the selection and use of ICT tools and facilities used to present information	evaluating the format of their assignments with the tutor and peers and presenting ideas on how it could be improved
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	communicating information via the email system including the attaching of files. Taking part in chat rooms set up to help with their unit
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	

Skill	When learners are ...
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	discussing the roles of the dental team and taking an active part in a professional conduct debate
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading recommended text on a given subject to help formulate an understanding of the material
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing assignments and patient leaflets following assignment briefs

Unit 7: Dental Public Health and Preventative Dentistry

Unit code:	R/600/7290
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

The aim of this unit is for learners to develop insight into, and knowledge of, how dental public health is administered and how dental care professionals can contribute towards preventative dentistry which helps reduce the amount of necessary dental treatment.

● Unit introduction

Dental public health is the science and practice of measures to prevent the onset of oral diseases of the teeth and neighbouring soft tissues, promoting oral health and improving the quality of life through the organised efforts of society.

The unit will give learners an insight into how the dental team provides a service to an individual and a community.

This unit will provide learners with the knowledge of how dental public health concerns itself with the environmental, social and economic influences on the oral health of the population and the availability of effective and efficient services to restore the dentally diseased to health.

Learners will know how preventative dentistry is the modern way of reducing the amount of dental treatment necessary to maintain a healthy mouth.

This unit will enable learners to understand the modern approach of dental public health and its aims to improve oral healthcare through appropriate preventative dentistry, oral healthcare education and treatment services by ensuring that all individuals and agencies are equipped with the information for appropriate decision making.

Learners will know how to design and advise on the construction of custom-made dental devices to help reduce any potential for further damage to the oral mucosa and remaining teeth.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know how the dental team operates within the community
- 2 Know the sociological, environmental and economic factors which contribute to oral health or illness
- 3 Know the procedures, successes and limitations of preventative dentistry
- 4 Know how to design dental appliances to minimise their potential to cause further oral disease.

Unit content

1 Know how the dental team operates within the community

Hospital dental services: organisation; scope; special needs dentistry; special care dentistry

Community dental services: organisation; scope; paediatrics, school screening; orthodontics; health clinics, health centres; domiciliary

General dental practice: organisation; scope

Studies and surveys: epidemiological studies (experience, incidence, prevalence); national dental surveys (standardised)

Communication and education: oral health educators; oral health promotion; supporting and encouraging individuals; medical practitioners; parents; welfare workers; nurses (medical, nursery, school); school teachers; classroom assistants; carers; health visitors

2 Know the sociological, environmental and economic factors which contribute to oral health or illness

Sociological factors: attitudes; beliefs; values; changing behaviour; gender; age; social group; individuals' rights

Environmental factors: living conditions; disease; drinking water; diet; habits (smoking, alcohol consumption, sugar consumption)

Economic factors: employment; lifestyle; affordability; marketing of products

3 Know the procedures, successes and limitations of preventative dentistry

Procedures to prevent dental disease: regular check-ups; diet; fluoride; tooth brushing; flossing; mouthwash; pit and fissure sealants; use of straws; sugar free gum; primary prevention; secondary prevention; tertiary prevention

Care of appliances and restorations: full dentures; partial dentures; immediate dentures; removable orthodontic appliances; fixed orthodontic appliances; crowns; bridges; implants

4 Know how to design dental appliances to minimise their potential to cause further oral disease

Prosthetics: ill fitting; baseplate extension in full dentures and partial dentures, placement of retentive devices (clasps) placement of reciprocation, partial denture support (occlusal rests, cingulum rests, onlays); connectors in partial dentures

Conservation: shape of labial, buccal, lingual and occlusal surfaces of conservation restorations (porcelain crowns, bonded porcelain crowns, light-cure composite crowns, multi-unit bridges, minimal preparation bridges, metal restorations, veneers)

Orthodontics: removable appliances; fixed appliances; extension of baseplate; wire work; retentive devices

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 identify the dental services that are available to an individual and a community [IE3, CT2]	M1 describe how dental services provide a service to an individual and a community	D1 evaluate how oral health education for an individual and a community can improve oral health
P2 list the factors that can affect the oral health of an individual [IE5]	M2 describe how the various factors influence the oral health of an individual	D2 explain how the factors that impact on an individual's oral health can be reduced
P3 identify preventative dentistry measures currently employed to reduce and control dental disease	M3 describe the successes and limitations of currently employed preventative dentistry measures	D3 evaluate currently employed preventative dentistry measures
P4 identify the correct design criteria for dental appliances that will eliminate the potential for damage to the remaining dentition and oral tissues [IE1]	M4 describe how the correct design of dental appliances can prevent further damage to the remaining dentition and oral tissues	D4 analyse the design criteria for dental appliances that will prevent further damage to the remaining dentition and oral tissues and suggest improvements

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

Learners need access to the range of dental services available to the general public to enable them to form an understanding of how these services operate. Learners also require access to dental laboratories that offer all dental specialities to enable them to acquire the necessary information from technical staff regarding the design of the full range of dental appliances.

Delivery

Tutors delivering this unit have the opportunity to utilise a wide range of teaching and learning techniques. A learner-centred approach is suggested for this unit, and a formal input from lectures and the use of library and internet resources is recommended. Group discussions will help learners develop an all round appreciation of this area of study.

It is recognised that periods of clinical observation and patient contact are invaluable as a learning resource but this is not always practicable, in which case access to a range of high-quality, audio-visual materials is suggested.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments.

Learning outcomes 1, 2 and 3

Introduction on dental services available to individuals and communities.

Visit hospital dental services to observe the roles of the dental team and discuss the range of treatments and services offered.

Visit community dental services to observe their role in the community.

Visit a general dental practitioner to discuss treatments.

Meet with an oral health educator to discuss information that is available to patients and their role in dental health education. Obtain patient information leaflets.

Discussion with a hygienist about their role and the advice given to patients. If possible, observe a treatment.

Personal study time and research.

Assignment 1: Preventative Dentistry Through the Dental Team (P1, P2, P3, M1, M2, M3, D1, D2, D3)

Topic and suggested assignments/activities and/assessment

Learning outcome 4

Introduction and discussion on relevant material and research issues.

Research texts and internet regarding topic.

Meet senior clinical staff to obtain information regarding how they select a certain treatment plan for patients.

Meet senior technical staff to discuss and observe the construction of dental appliances for the different specialties.

Collect images of completed appliances relevant to research.

Personal study time.

Assignment 2: Design of Dental Appliances (P4, M4, D4)

Review of unit and programme of assignments.

Assessment

To achieve a pass grade for the unit learners must achieve the four pass criteria listed in the grading grid.

Learning outcomes 1, 2 and 3 are linked and could be presented as a written assignment drawing on various sources of information about dental public health.

For P1, learners will be expected to identify the dental services that are available to an individual and a community.

For P2, learners must list the various social, environmental and economic factors that can impact on the oral health of individuals.

For P3, learners must identify current preventative dentistry measures that are employed to reduce and control dental disease.

For P4, learners must identify the correct design criteria for dental appliances covering the three specialties (prosthetics, conservation and orthodontics).

For M1, learners are required to describe the dental services that are available to an individual or a community.

For M2, learners must describe how social, environmental and economic factors influence an individual's or a community's oral health.

For M3, learners are required to describe the successes and limitations of currently used preventative dentistry measures.

For M4, learners must describe the correct design for custom-made dental devices to limit further deterioration of the remaining dentition and oral tissues. The evidence could be supported by diagrams.

For D1, learners must evaluate how oral health education for an individual and a community can improve oral health. The evidence could include a dental health message (such as a leaflet, picture or badge) that could be used to support the importance of preventative dentistry. The use of past public dental health campaigns could be considered.

For D2, learners must explain how the factors that impact on the oral health of individuals can be reduced or eliminated.

For D3, learners need to evaluate currently used preventative dentistry measures and comment on their effectiveness and suggest potential improvements.

For D4, learners must analyse recognised design criteria for custom-made dental devices, comment on their effectiveness and suggest improvements. Diagrams could be included to support the analysis.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1 M1 D1 P2 M2 D2 P3 M3 D3	Preventative Dentistry through the Dental Team	As a member of the dental team you must be aware of other team members' duties and responsibilities and this will be done by visiting various dental services. You will visit dental premises that are available and keep notes of discussions and observations obtained during these visits.	Written assignment containing different methods of communication (eg leaflets, pamphlets or other information sources) available to the public regarding dental health advice
P4 M4 D4	Design of Dental Appliances	You are working in a laboratory and will rotate within the different specialties. You will observe experienced technicians designing appliances. You should keep notes and draw diagrams for future reference.	Written assignment containing diagrams

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology sector suite. This unit has particular links with:

Level 3
Unit 2: Medical Emergencies, First Aid and Communication in the Dental Team
Unit 3: Dental Technology Techniques
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 8: Removable Complete Prosthodontics
Unit 9: Removable Partial Prosthodontics
Unit 11: Design of Fixed Prosthodontics
Unit 16: Design, Manufacture and Modification of Orthodontic Appliances

Essential resources

Specialist lecturers are essential for the successful delivery of this unit. Library resources should be accessible along with access to ICT facilities and a range of appropriate textbooks and journals to develop learners' understanding.

Employer engagement and vocational contexts

It is important that links are established between all members of the dental team and that learners have access to the various dental services to enable them to obtain an in-depth understanding of how these services operate and have the opportunity to observe the role of each dental care professional.

Indicative reading for learners

Textbooks

Basker R M and Davenport C J – *Prosthetic Treatment of the Edentulous patient* (Blackwell, 2002)
ISBN 0632059980

Carr A, McGivney G P and Brown D – *Mc Crackens Removable Partial Prosthodontics* (Mosby 2004)
ISBN 323026281

Ewles L and Simnett I – *Promoting Health, A Practical Guide* (Bailliere Tindall, 2003) ISBN 0702026638

Harris N and Garcia-Godoy F – *Primary Preventative Dentistry* (Prentice Hall, 2003) ISBN 0130918911

Humphris G and Ling M – *Behavioural Sciences for Dentistry* (Churchill Livingstone, 2000) ISBN 0443051909

Isaacson K G, Muir J D and Reed R T – *Removable Orthodontic Appliances* (Butterworth-Heinemann 2000)
ISBN 0723610533

Murray J J, Nunn J H and Steele JG (Editors) – *Prevention of Oral Diseases* (Oxford University Press, 2003)
ISBN 01926632795

Pine C and Harris R – *Community Oral Health* (Quintessence, 2005) ISBN 1850970920

Rosentiel S F, Land M F and Fujimoto J – *Contemporary Fixed Prosthodontics, 3rd Edition* (Mosby, 2001)
ISBN 081515559X

Levine R and Stillman-Lowe C – *The Scientific Basis of Oral Health Education* (B Dental J, 2004)

Journals

The Journal of the British Dental Association

The Journal of the British Dental Hygienists Association

Websites

www.dentalguide.co.uk

UK and Ireland Dental Guide

www.dental-technologyfo

The Dental Digest

www.dentstar.co.uk

International Dental Internet Resources

www.derweb.co.uk

Dental education resources on the web

www.healthcare.org.uk

Dental links

www.the-probe.co.uk

The Probe

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1] identifying correct design criteria for dental appliances in order to eliminate potential damage [IE3] finding out about the dental services available to an individual and a community [IE5] finding out about the factors that can affect the oral health of an individual
Creative thinkers	[CT2] finding out about the dental services available to an individual and a community

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE4] analysing and evaluating information obtained during discussions with senior staff and deciding on its relevance to their research
Reflective learners	[RL5] evaluating the experiences they obtained during clinical and technical visits to aid them in future construction of appliances
Team workers	[TW1] collaborating with dental team members to ensure a successful outcome to a patient's treatment plan
Self-managers	[SM3] organising their time and resources when visiting various clinical areas
Effective participators	[EP4] identifying improvements to design criteria that would enhance a patient's oral health

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using the in-house ICT system to find information
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	compiling information, images and transferring into allocated files reflecting on their finished work and the way it was compiled
Manage information storage to enable efficient retrieval	saving information and assignment work in a folder
Follow and understand the need for safety and security practices	aware of keeping their password safe and not disclosing it to others
Troubleshoot	able to identify a fault and know how to report it
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	collecting information from books, journals, the internet and handouts supplied by the tutor
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	obtaining information from identified websites and assessing whether it suits the purpose of the task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	making sure that the information they require is obtainable from a website, eg images of dental appliances and equipment
Bring together information to suit content and purpose	creating a single document that has all the information for their report
Present information in ways that are fit for purpose and audience	presenting the information in the way it has been requested in the brief, eg written assignments
Evaluate the selection and use of ICT tools and facilities used to present information	discussing how the documents could be improved
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	using email to send centre produced work to own address keeping their messages and replies safe creating a list of suppliers regarding materials
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	

Skill	When learners are ...
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	discussing with other dental care professionals their roles, responsibilities and treatments available from the dental services. Explaining their role to other DCPs
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading handouts given during lectures and information obtained from the internet, books and journals
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing up their assignments

Unit 8: Removable Complete Prosthodontics

Unit code:	D/600/7292
QCF Level 3:	BTEC National
Credit value:	15
Guided learning hours:	60

● Aim and purpose

This unit enables learners to develop their knowledge and practical skills in the design and construction of complex removable complete prosthodontics. It gives learners an insight into the frequently requested modifications for this type of appliance.

● Unit introduction

The dental technician is part of a multi-disciplinary team that meets the specific needs of patients. They have to be aware of the factors that create problems for the more complex edentulous patient and that they have an important role in providing a successful outcome to a patient's treatment which will have a positive effect on their health and wellbeing.

Learners will know how incoming work is received and processed through a dental laboratory from receipt of impressions to the finished prosthesis and how the interpretation of prescriptive data aids the process.

The unit will allow learners to gain the ability to meet a client's requirements and be able to provide technical advice for requested complex removable complete prosthesis.

Learners will develop the knowledge and practical skills to be able to plan, design and construct complex, removable complete prosthodontics for edentulous patients using average value and fully adjustable articulators.

Learners will be aware of the most common modifications that may be required for removable complete prosthesis for try-in or after finish.

Learners will gain the knowledge needed to incorporate components, which strengthen the appliance and reduce the masticatory load on the underlying structures. Learners will also be aware of the devices that are available to improve the retention and stability of the appliance for the benefit of the patient.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know how to receive and progress work through a dental laboratory
- 2 Be able to construct complex removable complete prosthodontics
- 3 Know the modifications requested for removable complete prosthodontics
- 4 Know the types of implant and precision attachment systems for removable complete prosthodontics.

Unit content

1 Know how to receive and progress work through a dental laboratory

Receiving work: contract review; type of information and data to establish requirements; prescription analysis; meeting a client's requirements; laboratory's capabilities

Progression of work within the dental laboratory: progressing work according to treatment plan; procedure for referring work to a more experienced technician, department or laboratory

Communication with team members: terminology related to complete removable prosthodontics; design requests; treatment plan; needs of the patient; procedure for clarification of design options

2 Be able to construct complex removable complete prosthodontics

Selection of materials and teeth: trial base requirements; types of trial base materials; tooth selection by information from various sources; forms of anterior and posterior teeth

Design requirements: retaining and displacing forces; peripheral extension; denture contours; denture stability and retention; neutral zone; fraenum attachments; tongue space; inclusion of co/ch bases and strengtheners; need to reduce masticatory loading

Aesthetics: position of teeth to meet registration information; centre line; lip support; overbite/overjet; irregular setting; trimming and staining teeth; interchanging moulds; colour of flange

Tooth setting requirements: general tooth setting for Class II and III skeletal patterns; balanced occlusion; compensating curves; protrusive and working contacts

Waxing: forms of contouring; stippling; rugae simulation; peripheral outline and thickness; palatal thickness; surface finish and presentation

Flasking and packing techniques: mould production; inclusion of co/ch base; strengthener; soft lining

Finishing: techniques and materials used for finishing, abrasion and polishing

Re-mounting techniques: re-establishing occlusal vertical dimension; balanced occlusion

3 Know the modifications requested for removable complete prosthodontics

Modifications: alter vertical dimension, centre line, tooth position; replace anterior or posterior teeth,; base extension/reduction; inclusion of strengthener; soft lining; co/ch base; grind-in; adjust/reshape base; reposition post dam

4 Know the types of implant and precision attachment systems for removable complete prosthodontics

Clinical and laboratory communication: terminology relating to implant and precision attachment systems; diagnostic and treatment planning through interdisciplinary cooperation; information required for transferring clinical data; ordering materials and components; costings

Implants utilised to retain complete prosthodontics: osseo integrated; metal frameworks; substructure manufacture; diagnostic trial set-up to establish the position of teeth in terms of aesthetics (centre line, tooth position, length of tooth); anterior/posterior function; radio-opaque markers; CT-scanning or X-rays to identify implant position; surgical guides/transfer systems; silicone matrixes; final prosthesis fabrication and insertion

Precision attachments utilised to retain complete prosthodontics: treatment planning; tooth preparation for tooth supported complete dentures; abutments (non-coping, coping, attachments); implant retained attachments; magnets; studs (ceka, dalbo, rothermann); bars (dolder); soldering attachments

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 describe the procedures used when receiving and progressing patient work through a dental laboratory [CT2]	M1 define terminology regarding removable complete prosthesis to enable effective communication between members of the dental team	D1 explain how a complete denture progresses through the dental laboratory from acceptance to despatch
P2 describe how occlusal registration data determine the setting of teeth for Class I, II and III patients	M2 explain the variations in anterior and posterior tooth settings for Class I, II and III patients	D2 analyse prescription and patient requests to determine how they affect the appearance and setting of teeth for Class I, II, III patients
P3 carry out the construction of complex removable complete prosthodontics to a clinically acceptable standard, with substantial guidance [RL3, SM3]	M3 carry out the construction of complex removable complete prosthodontics to a clinically acceptable standard, with limited guidance	D3 carry out the construction of complex removable complete prosthodontics to a clinically acceptable standard, working independently
P4 describe the modifications that may be requested for removable complete prosthodontics	M4 explain how modifications are carried out to removable complete prosthodontics	D4 evaluate modifications to removable complete prosthodontics to ensure they have been carried out to a clinically acceptable standard
P5 list the types of implant and precision attachment systems used to retain removable complete prosthodontics	M5 explain the clinical and laboratory procedures used to incorporate an implant or a precision attachment into removable complete prosthodontics	D5 Discuss how a team approach is essential to achieve a successful outcome for an implant or precision attachment treatment plan

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers CT – creative thinkers	RL – reflective learners TW – team workers	SM – self-managers EP – effective participators
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Essential guidance for tutors

Delivery and assessment guidance

Learners need access to a fully equipped dental laboratory with suitably experienced personnel with the knowledge and experience to provide support to learners when they are completing their complex removable complete prostheses. The technical personnel should have a working knowledge of complex retention systems to be able to advise learners regarding these intricate and expensive systems.

Delivery

A learner-centred approach is suggested for this unit and any formal input from lectures and background reading should be consolidated in a simulated work environment. The simulated work environment should be the main vehicle for developing understanding through application. Simulation exercises should be supported by demonstrations, case studies, formal lectures and independent study. Group discussions and evaluation of simulated work to set and agree checklists will help learners develop an all round appreciation of the quality control aspect of this area of work.

Theory and practice need to be integrated to enable learners to apply knowledge to realistic, complex complete prosthodontic design and construction. The importance of detailed analysis, construction and action planning should be emphasised.

Evidence for learning outcomes could be generated through time-constrained assignments monitored in the classroom and laboratory. Quality checks are regarded as good working practice and are therefore essential to the unit.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction to the unit and structure of the programme of assignments.
Learning outcomes 1 and 3
Discuss and observe work acceptance and progression during a visit to a hospital service laboratory.
Discuss and observe work acceptance and progression during a visit to a private laboratory.
Assignment 1: Dental Laboratory Procedures (PI, MI, DI)

Topic and suggested assignments/activities and/assessment

Learning outcomes 2 and 3

Plan and prepare for practical tasks.

Articulate dental models for set-up and try-in.

Select teeth and materials for set-ups.

Set-up teeth and wax-up ready for try-in.

Incorporate a modification to one of the try-ins.

Complete self-assessment sheets at each stage.

Complete quality checks.

Flask, pack and finish.

Complete self-assessment sheet at each stage.

Complete quality checks.

Carry out a modification to a complete prosthesis.

Complete a self-assessment sheet at each stage.

Complete a quality check on the finished appliance.

Personal study time and research.

Assignment 2: Complex Removable Complete Prosthodontic Construction and Modification (P2, P3, P4, M2, M3, M4, D2, D3, D4)

Learning outcome 4

Research information: diagrams, pamphlets, technical journals, laboratory and clinical procedure manuals, suppliers, catalogues, costs.

Discuss implant and attachment systems with senior technical staff.

Discuss implant and attachment systems with senior clinical staff.

Personal study time.

Assignment 3: Implant and Precision Attachment Systems for Removable Complete Prosthodontics (P5, M5, D5)

Review of unit and programme of assignments.

Assessment

Generic guidance on assessment

All learners are entitled to initial guidance in planning their work, but the level of assistance required should be taken into account when their work is assessed. In the grading grids, reference is made to learners working with 'substantial guidance', with 'limited guidance' and 'independently'. When assessing the work, assessors should apply the following guidelines.

'Substantial guidance': Learners have to be guided and advised throughout to ensure that progress is made. Learners rely on the support of the tutor, who has to assist in most aspects of the work. This level of support restricts learners to a pass grade, irrespective of the quality of the evidence.

'Limited guidance': The tutor supports learners initially in the choice of topic for investigation. Thereafter, the tutor reacts to questions from learners and suggests a range of ideas that learners act upon. Learners frequently check matters of detail. The tutor needs to assist in some aspects of the work. This level of support restricts learners to a pass or a merit grade, irrespective of the quality of the evidence.

'Independently': The tutor supports learners initially in the choice of topic for the investigation or task. Thereafter, the tutor occasionally assists learners, and only when asked, but monitors progress throughout. This level of support gives access to all three grades; pass, merit and distinction.

Unit-specific guidance on assessment

Assessment is an important factor in the way in which learners utilise and manage their time. Evidence could be collected using assignments that allow for effective and meaningful feedback. In the development of knowledge, skills and attitudes appropriate to the practice of dental technology, the importance of learner progression through the unit must be acknowledged. Competence should be achieved at the level of the qualification, so learners must see the value of stages along the way.

Assessment

To achieve a pass grade, learners must achieve the five pass criteria on the grading grid provided.

For P1, learners must describe commonly used procedures to receive and progress work through a dental laboratory. This includes learners showing that they understand how work is referred on to more experienced colleagues and an understanding of procedures relating to a dental laboratory's capabilities eg what to do if the dental laboratory can not offer a particular service. Learners could be given laboratory prescriptions and they could use this information to interpret how decisions are made regarding the acceptance and progression through the laboratory of a complete denture. Alternatively, learners could observe and document the process by shadowing a member of staff in a private or hospital laboratory.

For P2, learners must describe how occlusal registration data determines the setting of anterior and posterior teeth for Class I, II and III patients. They could provide diagrams of the occlusal relationship of each class.

For P3, learners must carry out the construction of complex removable complete prosthodontics, with substantial guidance. This could be Class II, III and then proceed with one to finish. The assessor could give feedback to learners during the construction and learners could self-assess their work at each stage.

For P4, learners must describe the modifications that may be requested to a removable complete prosthodontics at different stages in its construction. This evidence could be produced in a grid form with the modification, the construction technique and reasons why it may be requested.

For P5, learners must list the common types of implant and precision attachment systems available for a removable complete prosthodontics.

For M1, learners must define the specialist terminology used in the construction of removable complete prosthesis and how it relates to the device to be constructed. They could produce a list of terminologies and describe what information is required to enable effective communication between the dental team suggest either 'within the dental team' or 'between members of the dental team'.

For M2, learners must explain how variations in the basic setting of anterior teeth may be changed. This evidence could be in written form and learners could provide diagrams of non- basic anterior tooth settings.

For M3, learners must carry out the construction of complex removable complete prosthesis, with limited guidance. This could be both Class II and III and then proceed with one to finish. The assessor could give feedback to learners during the construction and learners should assess their own progress at various stages.

For M4, learners must explain how modifications could be completed on a removable complete prosthesis. This evidence could be produced in the format of a Standard Operating Procedure (SOP).

For M5, learners must explain the techniques used to incorporate an implant or precision attachment device into a removable complete prosthesis. Evidence could be produced by selecting one of the systems from the list produced in P5 and could contain diagrams of the various stages of the process.

For D1, learners must explain how a removable complete prosthesis progresses through a dental laboratory. Their evidence should explain each stage of the progression route.

For D2, learners must analyse prescription and patient requests to determine how anterior teeth are set or altered. This evidence could come in written form describing the information that may be received regarding how anterior teeth are positioned to improve a patient's appearance or to achieve a patient's requests.

For D3, learners must carry out the construction of removable complete prosthesis, working independently. This could be both Class II and III and then proceed with one to finish. A learner could self-assess their progress at various stages by using generic check sheets.

For D4, learners must evaluate a modification to a removable complete prosthesis. This evidence can be achieved by selecting a modification from the evidence produce for P4 and the exercise assessed using an observation record with feedback.

For D5, learners must discuss how a multi-disciplinary team approach can achieve a successful outcome using an implant or precision attachment system. Evidence could be in the form of learners selecting a system and describing each team member's part in the process.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1 M1 D1	Dental Laboratory Procedures	You have just started work in a dental laboratory and as part of your induction you have to know the laboratories procedures for incoming work. You will shadow a member of staff and then be observed carrying out these procedures.	Work acceptance and progress flow chart Identified ICT laboratory system
P2 M2 D2 P3 M3 D3 P4 M4 D4	Complex Removable Complete Prosthodontic Construction and Modification	You are working in the prosthetics laboratory and have been given some set-ups to complete to the wax try-in stage, when one of the try-ins returns from the clinic you will take it through to finish.	Written/practical assignment
P5 M5 D5	Implant and Precision Attachment Systems for Removable Complete Prosthodontics	As a new member of staff you need to be aware of the retention systems that are utilised within the laboratory for removable complete prosthodontics.	Written assignment with images and manufacturers' leaflets

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology sector suite. This unit has particular links with:

Level 3
Unit 1: Fundamentals of Dental Technology
Unit 2: Medical Emergencies, First Aid, Communication in the Dental Team
Unit 3: Dental Technology Techniques
Unit 4: Dental Anatomy, Oral Biology and Dental Disease
Unit 5: Basic Dental Biomaterials Science
Unit 10: Dental Radiology and Imaging
Unit 12: Complex Dental Biomaterials Science
Unit 14: Quality Assurance in Dental Technology
Unit 18: Work-based learning in Dental Technology

Essential resources

A dental laboratory with vocationally specific lecturers, a range of dental prosthetics and polymeric materials and specialist fabrication equipment are essential for this unit. Sufficient library resources should be accessible along with ICT facilities, the internet and a range of appropriate journals for developing learner understanding. The specialist technological support groups related to this area may be able to provide additional support and guidance regarding developments in techniques and designs. Benchmark samples are also useful to assist in learning and to confirm the specific requirements of the custom-made dental devices.

Employer engagement and vocational contexts

Where possible, learners should visit private and hospital dental laboratories, this will enable them to obtain a balanced overview of the difference in work acceptance and progression procedures carried out by these differently managed service providers.

Indicative reading for learners

Textbooks

Basker R M and Davenport J – *Prosthetic Treatment of the Edentulous Patient* (Blackwell Science, 2002) ISBN 0632059982

Feine J S and Carlsson G E – *Implant Overdentures* (Quintessence Publishing, 2003) ISBN 0867154306

Hobkirk J, Watson R and Searson L – *Introducing Dental Implants* (Churchill Livingstone, 2003) ISBN 0443071853

Jenkins G – *Precision Attachments* (Quintessence Publishing, 1999) ISBN 1850970386

Misch C E – *Dental Implant Prosthetics* (Mosby, 2004) ISBN 0323019552

Journals

The Dental Technician

Dental Technologies

Quintessence Journal of Dental Technology

Websites

www.dentalguide.co.uk

www.dental-technology.info

www.dentstar.co.uk International

www.derweb.co.uk

www.healthcare.org.uk

www.the-probe.co.uk

UK and Ireland Dental Guide

The Dental Digest

Dental Internet Resources

Dental education resources on the web

Dental links

The Probe

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Creative thinkers	[CT2] asking questions to extend their understanding of how the more complex systems are completed
Reflective learners	[RL3] acting on the guidance received during the completion of practical tasks
Self-managers	[SM3] organising their time and resources to complete their practical tasks

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE4] analysing and evaluating information obtained during laboratory visits
Reflective learners	[RL1] self-assessing when completing check sheets after completion of each construction stage
Team workers	[TM5] taking responsibility for the contribution they are making to the completion of a patient's treatment plan
Effective participators	[EP1] discussing concerns regarding complex retention systems with senior personnel to resolve issues

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using the in-house ICT system to find information
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	compiling information, images and transferring into allocated files reflecting on the finished work and the way it was compiled
Manage information storage to enable efficient retrieval	saving information and assignment work in a folder
Follow and understand the need for safety and security practices	aware of keeping their password safe and not disclosing it to others
Troubleshoot	able to identify a fault and know how to report it
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	collecting information from books, journals, the internet and handouts supplied by the tutor
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	obtaining information from identified websites and assessing whether it suits the purpose of the task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	making sure that the information they require is obtainable from a website, eg images of dental appliances and equipment
Bring together information to suit content and purpose	creating a single document that has all the information for their report
Present information in ways that are fit for purpose and audience	presenting the information in the way it has been requested in the brief, eg written assignments
Evaluate the selection and use of ICT tools and facilities used to present information	discussing how the documents could be improved
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	using email to send centre produced work to own address keeping their messages and replies safe creating a list of private dental laboratories and hospital contacts creating a list of suppliers regarding materials

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	discussing construction techniques for the practical tasks
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading handouts given during lectures and demonstrations
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing up their assignments



Unit 9: Removable Partial Prosthodontics

Unit code:	T/600/7296
QCF Level 3:	BTEC National
Credit value:	15
Guided learning hours:	60

● Aim and purpose

The purpose of this unit is to enable learners to develop their knowledge and practical skills in the complex field of removable partial prosthodontics. This will be achieved by tuition on the planning, design and fabrication of removable partial dentures.

● Unit introduction

The unit covers both polymeric dentures including the use of acrylic components and polymeric-metallic removable partial dentures. The long-term suitability of simple tissue borne dentures is considered in relation to tissue damage. Learners should be able to comment on the provision of tissue borne dentures and design, construct and evaluate simple removable partial dentures.

Learners should be informed of wrought components that can be included in polymeric partial dentures. Learners will be able to convert wax patterns into metal and polymeric material and use correct finishing techniques on polymeric-metallic materials.

Emphasis is placed on the interpretation of information, the development of knowledge, its application and development of skills related to partial dentures and the suitability of the appliance for the patient. A substantial period of time may need to be devoted to formal demonstration in this unit as learners progress to preparing and constructing polymeric-metallic removable partial dentures.

On completion of this unit, learners should be able to make appliances to an acceptable standard within a given period of time, as will be necessary in commercial laboratories.

Learners should be encouraged to develop their own operating procedures and COSHH data files relating to all the stages of making removable partial dentures (RPDs) covered in this unit.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know the reasons for the provision of removable partial dentures (RPD)
- 2 Know the design requirements and components of partial denture cases
- 3 Be able to construct simple removable partial dentures in a polymeric material
- 4 Be able to construct polymeric-metallic removable partial dentures.

Unit content

1 Know the reasons for the provision of removable partial dentures (RPD)

Choices when considering partial denture cases: cost; suitability; oral condition; appearance

Types of cases: classification of partial dentures (Kennedy, Becketts); technical terms used in partial denture construction; reasons for and against polymeric partial dentures

Treatment planning: reasons for and against the use of partial dentures; prescription requirements

2 Know the design requirements and components of partial denture cases

Surveying and cast analysis: reasons for surveying and methods used; paths of insertion; undercut depths; component designs relative to survey lines; information about periodontal and hard tissue conditions

Design of partial dentures: mucosa borne; tooth borne; tooth mucosa borne designs; safe restoration; self-cleansing concept; analysis of function and form

Loads applied by dentures in use: effects of applied forces to tissues and remaining teeth

Design components: major connectors; minor connectors; components that provide retention; bracing and support; indirect retention; cast clasps; wrought clasps; supports; palatal, lingual, buccal bars and plates; retention for polymeric components and backings

Overall designs: design and components, selection and setting of teeth

3 Be able to construct simple removable partial dentures in a polymeric material

Prepare: select appropriate materials; design and plan construction in correct order; consider health and safety issues of construction; collect and arrange documents related to construction of RPDs (operation procedures, COSHH, materials data and component forms); review prescriptions

Construction: articulation; surveying; duplication of master cast; select components; set teeth to obtain correct fit and function; process and finish partial dentures to a prepared design using a polymeric base material

Quality assurance: check completed partial dentures against prescription requirements

4 Be able to construct polymeric-metallic removable partial dentures (RPD)

Action plan: plan and design polymeric/metallic partial denture; organise materials and equipment

Cast preparation: articulate models, survey models; duplicate surveyed casts; use refractory investments; prepare refractory investment cast for use

Lost wax process: produce wax patterns (connectors, bracing, retention, support); other parts for use in the lost wax process; investing and wax removal methods; selection and use of partial denture alloys

Finishing: metal casting; devesting; trimming; surface finishing; polishing metals; articulation and occlusal relationships; setting artificial teeth; trial denture assessment; process and finish using a polymeric base material

Quality assurance: quality checks; check complete denture against prescription requirements

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 describe the reasons for the provision of removable partial dentures	M1 explain specific reasons, for and against, replacing missing teeth with removable partial dentures	D1 discuss the potential limitations and advantages of removable partial dentures
P2 describe partial denture cases according to load-bearing areas and edentulous spaces [IE1]	M2 classify a selection of partial denture cases, using known methods	D2 compare current classifications of partial dentition cases
P3 list the components of polymeric and polymeric-metallic partial dentures	M3 describe the components of polymeric and polymeric-metallic partial dentures	D3 justify the use of the components in polymeric and polymeric-metallic partial dentures
P4 list the stages in planning and designing partial dentures	M4 illustrate examples of partial denture design using the practical cases used in this unit	D4 evaluate different partial denture designs for given cases
P5 describe the selection and setting of artificial teeth onto partially dentate appliance		
P6 survey and duplicate a selection of casts following details on a prescription, with substantial guidance [SM2]	M5 survey and duplicate a selection of casts following details on a prescription, with limited guidance	D5 survey and duplicate a selection of casts following details on a prescription, working independently
P7 carry out processes currently used to convert wax trial areas of partial dentures into polymeric forms [IE1]	M6 report on currently used systems for converting the wax trial areas of partial dentures into polymeric forms	D6 create a report evaluating systems for converting wax trial areas into polymeric forms
P8 manufacture a simple removable partial denture, with substantial guidance [RL2]	M7 manufacture a simple removable partial denture, with limited guidance	D7 manufacture a simple removable partial denture, working independently

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P9 manufacture a metallic partial denture including polymeric components, with substantial guidance [RL2]	M8 manufacture a metallic partial denture including polymeric components, with limited guidance	D8 manufacture a metallic partial denture including polymeric components, working independently

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

The use of a dental laboratory is an essential element to the delivery of this unit as there is a considerable amount of learning time devoted to the practical development of learners. They will be instructed on the principles of designing and constructing partial dentures using different techniques and materials. The assessment guidance asks the learner to demonstrate the knowledge gained in the form of vocationally centred written reports and practical submissions.

Delivery

The knowledge and understanding related to this unit is applied to the construction processes of polymeric and polymeric-metallic removable partial dentures (RPDs) in order to follow design requirements. This unit allows learners to choose and make appropriate components and improve their understanding of removable partial denture design and construction.

Delivery in a dental laboratory will enable an integration of theory and practice enabling learners to apply their knowledge to practical removable partial denture design and construction. The importance of detailed analysis and planning should be emphasised. Learners should be able to relate design requirements for components to individual case examples.

Practical demonstrations/videos will help learners to apply knowledge to actual cases. The theory and application of surveying will need thorough explanation with demonstration as well as practical work.

Group discussion or presentation of actual cases can be used to help learners understanding of varied and individual case design requirements.

Health and safety issues relating to the use of materials and equipment must be stressed.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments.

Learning outcome 1

Introduce the reasons for the provision of removable partial dentures (RPD).

Discuss treatment planning specific to the provision of RPDs.

Examine the selection criteria for partial denture cases.

Explain and define technical terms used in partial denture construction.

Introduce the classifications related to partial dentures.

Demonstrate the classification of partial denture using partially dentate models.

Personal research and study time.

Assignment 1: Reasons for Removable Partial Prosthodontics (P1, M1, D1)

Learning outcome 2

Describe surveying and cast analysis and its influence on appliance design.

Demonstration of surveying.

Discuss paths of insertion and displacement.

Discuss the health of the oral cavity, the health of the supporting teeth and their underlying structures.

Examine the different commonly used partial denture designs.

Discuss the effects of applied forces to soft and hard tissues.

Discuss component design and application and their influence on the overall prognosis of the appliance.

Explain the retention of polymeric components onto metallic base plates.

Personal research and study time.

Assignment 2: Design and Construction Principles of Partial Dentures (P2, P3, P4, P5, M2, M3, M4, D2, D3, D4)

Topic and suggested assignments/activities and/assessment

Learning outcome 3

Learners select materials and prepare the working area for the construction stages of partial dentures.

Discuss the health and safety requirements when constructing partial dentures.

Demonstrate the design, surveying and duplication stages of construction.

Learners survey and duplicate master models.

Learners design partial dentures based on tuition.

Learners carry out articulation of master models.

Demonstrate component selection and application.

Learners apply designs to duplicated models using dental waxes etc.

Demonstrate the setting of teeth in edentulous areas.

Learners set teeth to design and occlusion.

Demonstrate flasking techniques.

Learners complete flasking stages.

Demonstration of devesting, trimming and polishing stages of construction.

Learners complete the trimming and polishing of their partial dentures.

Learners seat dentures to master models and assess occlusal relationship.

Discuss quality assurance.

Assignment 3: Manufacturing Polymeric Partial Dentures (P6,P7, P8, M5, M6, M7, D5, D6, D7)

Learning outcome 4

Learners select materials and prepare the working area for the construction stages of partial dentures.

Revisit design, surveying, duplication and articulation stages of construction.

Learners plan and design polymeric/metallic partial denture.

Demonstrate the use refractory investments for the forming of a refractory model and mould.

Learners carry out the construction of a refractory model.

Learners apply their designs to the models, producing a wax pattern.

Discuss sprue techniques and the lost wax process.

Demonstrate investing and wax removal methods.

Learners complete patterns and investment stages.

Demonstrate casting of alloys into partial denture mould.

Demonstrate devesting, trimming and polishing stages.

Learners carry out devesting, trimming and polishing stages to the metal base plate.

Learners set teeth to the edentulous areas present on the model and process tooth bearing areas with a permanent polymeric material.

Learners complete partial denture as in learning outcome 3.

Assignment 4: Manufacturing Polymeric/Metallic Partial Dentures (P9, M8, D8)

Review of unit and programme of assignments.

Assessment

Generic guidance on assessment

All learners are entitled to initial guidance in planning their work, but the level of assistance required should be taken into account when their work is assessed. In the assessment criteria grids, reference is made to learners working with 'guidance', with 'minimal guidance' and 'independently'. When assessing the work, assessors should apply the following guidelines.

'Substantial guidance': Learners have to be guided and advised throughout to ensure that progress is made. Learners rely on the support of the tutor, who has to assist in most aspects of the work. This level of support restricts learners to a pass grade, irrespective of the quality of the evidence.

'Limited guidance': The tutor supports learners initially in the choice of topic for investigation. Thereafter, the tutor reacts to questions from learners and suggests a range of ideas that learners act upon. Learners frequently check matters of detail. The tutor needs to assist in some aspects of the work. This level of support restricts learners to a pass or a merit grade, irrespective of the quality of the evidence.

'Independently': The tutor supports learners initially in the choice of topic for the investigation or task. Thereafter, the tutor occasionally assists learners, and only when asked, but monitors progress throughout. This level of support gives access to all three grades; pass, merit and distinction.

Unit-specific guidance on assessment

Evidence is collected using assignments and practical work with written or oral tests. To achieve a pass, learners must achieve the nine pass criteria listed in the grading grid.

For P1, learners are expected to describe the reasons for providing simple removable partial dentures. Evidence could be provided in assignments.

P2 requires learners to describe partial denture cases according to load bearing areas or edentulous spaces using correct terminology. As in P1 this could be covered by assignments or by a written test using sample casts.

For P3, learners will need to list the components that are commonly employed in the design of polymeric and polymeric-metallic partial dentures. Evidence could be provided in assignments.

For P4, learners must list the planning stages and basic design features of a removable partial denture. Evidence may be provided by assignment.

For P5, learners must describe how to select and set artificial teeth in saddle areas included in a partial denture. This could be covered by an observed practical with a written or oral test or by assignments.

For P6, learners are required to survey and duplicate a selection of casts for the provision of partial dentures, with substantial guidance. The cases must have opposing dentition or occlude with each other and at least two are required. This section can be evidenced in the form of a practical observation.

P7 requires learners to carry out processing procedures to convert wax trial areas into polymeric materials. This could be assessed by the tutor during practical activities or by assignment and presented practical work.

P8 requires learners to manufacture a simple removable partial denture, with substantial guidance. This section can be evidenced in the form of a practical observation.

P9 requires learners to manufacture a metallic-polymeric partial denture, with substantial guidance. This can be assessed using the same method mentioned in P8.

To achieve a merit grade, learners must achieve all the pass grade criteria and the eight merit grade criteria.

For M1, learners must explain specific reasons for and against replacing missing teeth with removable partial dentures, as for P1 this could be covered in assignments.

M2 requires learners to classify a selection of partial denture cases. This could be covered by assignments or by a written test using sample casts.

For M3, learners must describe partial denture components for polymeric and polymeric-metallic appliances. This could be included in a written report stated for P3

For M4, learners are required to illustrate examples of partial denture design partially dentate cases issued in the practical element of this unit. Evidence could be provided in a report format linked to M3

For M5, learners are required to survey and duplicate a selection of casts following details on a prescription, with limited guidance. This could be assessed using the same methods as P5 and P7.

M6 requires learners to prepare a report on the current systems used to convert wax trial dentures to polymeric forms including heat cure, cold cure, auto polymerising, injection moulding and light cured systems. This can be assessed in the form of an assignment.

For M7, learners must manufacture a simple removable partial denture, with limited guidance. They should include suitable designs and describe prescription procedures, suggest alternative designs, select suitable retainers and major connectors, and prepare the cast for duplication. Assessment could be done by the tutor during practical activities or by assignment and presented practical work.

For M8, learners must manufacture a metallic partial denture, including polymeric components, with limited guidance. They should include suitable designs, suggest alternative designs, select suitable retainers and major connectors, and prepare the cast for duplication. Assessment could be done by the tutor during practical activities or by assignment and presented practical work.

To achieve a distinction grade, learners must achieve all of the pass and merit criteria and the eight distinction grade criteria.

For D1, learners are required to discuss the potential limitations and advantages of removable partial dentures using appropriate terminology. This could be assessed by assignments or observed presentations to other learners.

For D2, learners must compare current classifications of partial dentitions. Assessment could be by the same methods used in D1.

For D3, learners must justify the use of components in their designs of removable partial dentures. This is best done by assignment or by presentation to other learners.

D4 requires learners to evaluate a selection of partial denture designs. This can be assessed by assignment or presentation to other learners.

D5 requires learners to survey and duplicate a selection of casts following details of a prescription, working independently. This can be assessed by observed practical work and assignment.

D6 requires learners to evaluate systems for converting wax trial areas into polymeric forms. Learners should evaluate at least two processes and may record their results in the form of an assignment

D7 requires learners to manufacture a simple removable partial denture, working independently. This should be assessed from observed practical work.

D8 requires learners to manufacture a metallic partial denture, including polymeric components, working independently. This should be assessed from observed practical work.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	Reasons for Removable Partial Prosthodontics	Your employer is considering opening a prosthetic department in the laboratory. As part of their justification they have asked you to write a report on the reasons why partial dentures are selected as part of a treatment plan.	Written report demonstrating knowledge of the subject
P2, P3, P4, P5 M2, M3, M4 D2, D3, D4	Design and Construction Principles of Partial Dentures	You have been asked by your employer to write a report on the design and construction stages of partial dentures to demonstrate your knowledge before you are employed in the prosthetic department of the laboratory.	Written report consisting of: <ul style="list-style-type: none"> • surveying • duplication • designing appliances • components • processing methods
P6, P7, M5, M6, D5, D6 P8, M7, D7	Manufacturing Polymeric Partial Dentures	Your work-based mentor has asked you to construct a polymeric partial denture as part of a staff appraisal process. You will carry out all of the practical elements of this task and be assessed on the amount of guidance you require to produce an appliance of an acceptable standard.	Practical submission to include: <ul style="list-style-type: none"> • articulation • surveying • duplication • design concepts • processing
P9, M8, D8	Manufacturing Polymeric/Metallic Partial Dentures	Your work-based mentor has asked you to construct a metallic/polymeric partial denture as part of a staff appraisal process. You will carry out all of the practical elements of this task and be assessed on the amount of guidance you require to produce an appliance of an acceptable standard.	Practical submission to include: <ul style="list-style-type: none"> • as above • metal casting • metal processing • acrylic stages

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology sector suite. This unit has particular links with:

Level 3
Unit 1: Fundamentals of Dental Technology
Unit 3: Dental Technology Technique
Unit 5: Dental Anatomy, Oral Biology and Disease
Unit 5: Basic Dental Biomaterials Science
Unit 8: Removable Complete Prosthodontics
Unit 10: Dental Radiology and Imaging
Unit 12: Complex Dental Materials Science
Unit 14: Quality Assurance in Dental Technology.

Essential resources

Specialist lecturers and a training dental laboratory with a range of dental specialist metallic and polymeric material, with specialist fabrication equipment are essential for this unit.

Sufficient library resources should be available. Access to the internet and a range of appropriate journals for developing learners' understanding is important.

Specialist support groups related to dental technology may be able to provide additional support and guidance regarding developments in techniques and designs. Benchmark samples, particularly those showing stages of construction, are useful to assist learning and to show the specific requirements of removable partial dentures that learners will make.

Employer engagement and vocational contexts

Work placements in a dental laboratory will help learners to understand the detail in this unit. It will also enable them to develop their practical skills and gain knowledge from an alternative perspective.

External supply companies should be encouraged to deliver sessions in this unit, for example material selection or design of partial dentures.

Indicative reading for learners

Textbooks

Carr A, McGivney G P and Brown D – *McCracken's Removable Partial Prosthodontics, 11th Edition* (Mosby, 2004) ISBN 0323026281

Davenport J C and Basker R M – *A Clinical Guide to Removable Partial Denture Design* (British Dental Association Shop, 2000) ISBN 0904588637

McCord J F, Grant A and Youngson C – *Missing Teeth: A Guide to Treatment Options* (Churchill Livingstone December 16, 2002) ISBN 0443071535

Sowter J – *Dental Laboratory Technology: Removable Prosthodontic Techniques* (Chapel Hill, NC University of North Carolina, 1987) ISBN 0807841668

Stratton R J and Wiebelt F J – *An Atlas of Removable Partial Denture Designs* (Quintessence, 1988)
ISBN 0867151900

Wheater P R, Ash M, Nelson S – *Wheeler's Dental Anatomy, Physiology and Occlusion, 8th Edition* (Saunders, 2003) ISBN 0721693822

Journals

Aesthetics of Removable Dentures (La Cour R)

Dental Dialogue (TW Media UK)

Dental Laboratory (The Dental Laboratories Association)

Dental Technologies (CRG Publications)

Journal of Prosthetic Dentistry (Elsevierhealth)

Quintessence Journal of Dental Technology (Quintessence Publishing)

The Dental Technician (AE Morgan Publication)

Websites

www.dentanet.org.uk

Dental hygiene

www.dentstar.co.uk

International dental internet resources

www.derweb.so.uk/index.html

Dental education resources on the web

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1] describing different types of partial dentures based on load bearing areas using the correct terminology; converting wax trial areas of partial dentures into polymeric forms
Reflective learners	[RL2] setting goals and managing time during practical partial denture projects
Self-managers	[SM2] working towards personal goals during the surveying of cast models

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE2] investigating partial design concepts in relation to prescription requirements and the oral health of the patient
Creative thinkers	[CT5] exploring different design concepts for partial denture cases. Selecting best designs based on knowledge gained in this unit and constructing appliance
Reflective learners	[RL4] demonstrating design ideas to peers and allowing them to analyse the appliance and give feedback [RL5] evaluating partial denture design concepts to forward their understanding and progression
Team workers	[TW1] actively taking part in small-group activities
Self-managers	[SM3] carrying out assignment work and personal study
Effective participators	[EP4] evaluating their finished practical projects

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using the internet for research recording data word processing documents to meet the requirements of assignments
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	
Manage information storage to enable efficient retrieval	storing information gathered during assignment research
Follow and understand the need for safety and security practices	correctly using computers, keeping the computer area free from food and drink using only their own log ins using patient-sensitive material in a way that conforms to professional standards and data protection
Troubleshoot	spellchecking assignments
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using the internet or other media to help design their partial dentures
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	searching for different components that can be used in partial dentures appliances
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	taking photos of their practical projects to present in their assignments keeping records of techniques used
Bring together information to suit content and purpose	collating information to use for an assignment
Present information in ways that are fit for purpose and audience	meeting presentation requirements of assignment briefs
Evaluate the selection and use of ICT tools and facilities used to present information	
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	taking part in internet chat rooms designed to assist in their studies

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	using materials that require measurements and the use of ratios
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	calculating multiple mixing measurements and ratios for larger practical tasks using burn out furnaces that have temperature settings
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in group discussions relating to the reasons for partial denture appliances interacting with external speakers, dental team members and patients
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	comparing different denture design concepts on the internet, in books and handouts
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	completing their assignments



Unit 10: Dental Radiology and Imaging

Unit code:	A/600/7302
QCF Level 3:	BTEC National
Credit value:	5
Guided learning hours:	30

● Aim and purpose

The aim of this unit is to enable learners to gain a general level of knowledge and understanding of dental radiology and imaging, including the concepts of radiograph analysis, which will allow them to identify relevant anatomical landmarks and features to support the assessment and treatment planning process for patients.

● Unit introduction

Dental radiology and imaging is a fundamental activity for those employed in dentistry. This specialist unit will provide an introduction to dental radiography covering scientific theory, imaging techniques, analysis of anatomical landmarks and related legislation.

This unit covers the principles and application of dental radiographs and imaging to support an assessment of prognosis and the planning of treatment. Learners will study dental radiographs to identify oral anatomical landmarks and features to support the treatment planning process. This will link to consideration for planning; design and fabrication of dental prostheses, for example orthodontics, maxillofacial, fixed prosthodontics and prosthetic appliances.

As the legislation affecting the management of dental radiography is becoming more important learners will study the potential hazards associated with X-rays on oral tissues and consider legal requirements for the control and use of dental X-ray equipment.

Learners entering the dental profession need a general level of understanding and knowledge of dental radiology and imaging in order to gain successful employment, and this unit provides them with the opportunity to gain this. The unit also enables learners to enter higher education and progress to advanced studies within a dental capacity.

Dental radiology and imaging links to most of the units in this qualification and is therefore best delivered at the beginning of the programme of study.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know the basic principles of radiographic theory
- 2 Understand the concepts of radiographic and imaging techniques employed in dentistry
- 3 Know the concepts of radiation protection and hazards associated with dental radiology
- 4 Know the anatomical landmarks and features produced on a dental radiograph.

Unit content

1 Know the basic principles of radiographic theory

Definition: basic theory of X-rays; how they are produced and the image formation on a radiograph

Radiographic equipment: panoramic unit; intra-oral unit; processing equipment

Advances in radiographic technology: how radiographic technology has progressed since it was first introduced in the provision of dental health care

2 Understand the concepts of radiographic and imaging techniques employed in dentistry

Film: types of dental film available, eg intra-oral; size 0, 2, 4, extra-oral; panoramic

Intra-oral techniques: bitewing; periapical; occlusal

Extra-oral techniques: panoramic; lateral, cephalometrics

Digital imaging: portable camera; panoramic

Radiographic processing: processing of radiographic images utilising manual and automatic techniques/equipment

3 Know the concepts of radiation protection and hazards associated with dental X-rays

Medical exposure: ionising radiation (medical exposure); regulations; IRMER 2000

Radiation safety: principles of radiation safety to the referrer; practitioner; operator; patient

Film critique: National Radiographic Protection Board (NRPB); diagnostic, ratings of radiographs

Quality assurance: standards to ensure reduced exposure; justification; radiographs that are clinically acceptable to facilitate periodic audits

Cross-infection control: methods of maintaining infection control during the taking and processing of dental radiographs

4 Know the anatomical landmarks and features produced on a dental radiograph

Radiographic analysis: differences between hard and soft tissues on dental radiograph; teeth and their correct location in the dental arches; abnormalities within the hard and soft tissues (cysts, malocclusions, carcinoma, cavities, pulpal necrosis, infection, periodontal disease)

Radiographic mounting: correct orientation of the dental radiograph to facilitate correct prognosis and analysis

Assessment and treatment planning: significance of a dental radiograph in treatment planning to facilitate the design and fabrication of any dental appliance

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 describe dental X-rays and the types of radiographic equipment available [IE1]	M1 explain how the image is produced on a dental radiograph	D1 explain how dental digital radiographic equipment and imaging has advanced for both the clinician and the patient.
P2 outline the types of dental film that are available	M2 describe the specific techniques for which the various types of dental film are most suited	D2 discuss the advantages and disadvantages of radiographic techniques for intra-oral and extra-oral imaging
P3 describe suitable dental film processing techniques	M3 explain the measures employed to control cross-infection in the processing of X-rays	D3 explain how film critique of diagnostic radiographs contributes to the overall effectiveness of reducing medical exposure and improving practice for the clinician
P4 outline the methods of medical exposure and radiation safety, and infection control, for the patient and clinician [IE3]	M4 explain how quality assurance can help to reduce medical exposure to both the patient and clinician in providing better care	D4 determine the relevant information from a radiograph, to influence a treatment plan
P5 identify the hard and soft tissues on a radiograph	M5 describe possible abnormalities within the hard and soft tissues	

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

This unit should be delivered using a wide range of delivery methods and media; these include lectures, discussions, oral questioning, *vive voce*, practical participation, assignments, case study scenarios and research using both the internet and library resources. Assessment will predominantly be assignment based, and *viva voce* where appropriate.

Delivery

Tutors delivering this unit have the opportunity to utilise a wide range of teaching and learning techniques. These include lectures, discussions, oral questioning, *vive voce*, practicals, assignments, case study scenarios and research using both the internet and library resources.

Delivery of this unit should stimulate, motivate, educate and enthuse learners, by using a variety of teaching methods to appeal to learners' differing learning styles.

Tutors should consider integrating delivery with private study and assessment linked to other relevant units.

Learning outcomes 1, 2 and 3 are directly linked. Ideally they would be delivered through formal lectures, discussion, oral questioning, site visits, video and independent learner research. Learners will be able to demonstrate an understanding and knowledge of the basic physics surrounding X-rays and how technologies have advanced. To accompany this, learners will gain knowledge and understanding of the different dental radiographic techniques, equipment, type of film, legalisation surrounding health and safety and the purpose of quality assurance.

Learning outcome 4 covers dental radiographic analysis, correct orientation and treatment planning. Learners should be able to demonstrate knowledge and understanding of relevant anatomical landmarks and features on radiographs. Learners must demonstrate awareness of the design of different types of custom-made dental devices that could be fabricated and relate to the significance of radiographs in treatment planning. Learners must be able to demonstrate the ability to identify abnormalities on a dental radiograph that may influence treatment planning and design of an appliance.

Evidence for each learning outcome can be generated through written assignments and oral questioning and recording in the form of a *viva voce* between the tutor and learner. The delivery of radiographic mounting should consist of a practical activity where learners must demonstrate an understanding and practical ability to select and orientate a variety of intra-oral and extra-oral dental radiographs to facilitate analysis and treatment planning.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction to the unit and structure of the programme of assignments.
<p>Learning outcome 1</p> <p>Introduction to radiographic principles.</p> <p>Learners to research available radiographic equipment.</p> <p>Investigate the advances in radiographic technology.</p> <p>Assignment 1: The Basic Principles of Radiographic Theory (P1,M1,D1)</p>
<p>Learning outcome 2</p> <p>Learners to discuss types of dental film.</p> <p>Learners simulate radiographic imaging techniques.</p> <p>Learners to demonstrate radiographic processing.</p> <p>Assignment 2: Concepts of Radiographic Imaging (P2,P3,M2,D2)</p>
<p>Learning outcome 3</p> <p>Discussions regarding hazards and protection.</p> <p>Research and document film critique.</p> <p>Learners will reflect on quality assurance.</p> <p>Identify and discuss cross-infection control.</p> <p>Assignment 3: Concepts of Radiation Protection and Hazards (P4,M3,M4,D3)</p>
<p>Learning outcome 4</p> <p>Introduction to dental radiographic analysis.</p> <p>Learners to demonstrate radiographic orientation.</p> <p>Learners to identify anatomical landmarks from dental radiographs.</p> <p>Treatment planning for custom-made dental device.</p> <p>Assignment 4: Radiographic Analysis and Treatment Planning (P5,M5,D4)</p>
Review of unit and programme of assignments.

Assessment

Most of the evidence for this unit can be generated by assignments designed to follow the documented grading criteria for learning outcomes. Further evidence will be generated and documented by a viva voce, practical activity and case study scenarios.

The material for the assignments may be gained by formal study, and from information researched and collated during private study.

To achieve a pass grade, learners must achieve all of the pass criteria as documented in the grading grid. To achieve a merit grade, learners must achieve all of the pass criteria plus all of the merit criteria as documented in the grading grid. A distinction grade can only be awarded to a learner demonstrating the ability to conform to the pass and merit criteria, plus all of the distinction criteria documented in the grading grid.

Evidence may be collected utilising two assignments for learning outcomes 1 and 2 incorporated as one integral assignment. The second assignment for this unit may be related to learning outcome 3.

To achieve P1, learners will gain knowledge of the basic theory surrounding dental X-rays and the types of radiographic equipment available

To achieve M1, learners will need to demonstrate knowledge of the production of dental X-rays, and explain how the image is formed on a dental radiograph.

To achieve D1, learners must develop and demonstrate a level of knowledge and understanding regarding the advances in technology regarding radiographic imaging and equipment

To achieve P2, learners will be able to outline the various types of dental film available.

To achieve M2, learners will produce written documentation of each of the dental films outlined in P2, and describe the specific technique to which each type is best suited. They will be able to identify the differences between radiographic techniques through supervised visits to a radiology department which will be encapsulated in their assignment.

To progress to D2, learners must show an understanding of the relevant advantages and disadvantages of different processing techniques for intra-oral and extra-oral imaging, taking into account cross-infection control, health and safety legislation; COSHH, handling, storage and disposal of processing chemicals such as lead foil, fixer and developing solutions.

To achieve P3, learners will describe suitable processing techniques for the types of dental film outlined in P2.

To achieve M3, learners will explain the measures employed to control cross-infection during the processing of X-rays.

To progress to D3, learners will produce written documentation explaining the effects of how film critique of diagnostic radiographs contributes to the overall effectiveness of reducing medical exposure and improving practice for the clinician.

To achieve P4, learners will show an understanding of medical exposure, radiation safety, film critique and infection control. They will also show an understanding of how quality assurance helps the dental community provide better patient care by reducing exposure to patients and clinician.

To achieve M4, learners will explain how quality assurance can help to reduce medical exposure to both the patient and clinician in providing better patient care.

To progress to D4 learners will select a radiograph and distinguish the correct orientation to facilitate prognosis and analysis. Learners will evaluate their radiograph selection by explaining the proposed treatment plan. This can be assessed utilising a variety of intra-oral and extra-oral radiographs as simulated case studies in the form of a *viva voce*.

To achieve P5 learners must be able to identify the different anatomical landmarks and features encapsulated on a variety of radiographs: features to be identified to include; maxilla, mandible, alveolar bone, teeth, gingivae, pulp chamber, tuberosity retro molar pad and individual teeth in permanent/deciduous dentitions

To progress to M5, learners will need to describe possible abnormalities within the hard and soft tissues including cysts, malocclusions, cavities, carcinoma, alveolar bone resorption and periodontal disease. This can be assessed and documented by *viva voce*.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	The Basic Principles of Radiographic Theory	A local dental surgeon has requested that you produce a report regarding current radiographic equipment needed for their new dental surgery.	<ul style="list-style-type: none"> • <i>Vive voce</i> • Discussion • Oral questioning and recording • Written report
P2, M2, D2, P3, M3	Concepts of Radiographic Imaging	You have been asked to prepare an ICT presentation and practical demonstration for a group of trainee dental nurses: the topics to be covered are, types of dental film, their specific usage, developing techniques, the radiographic and processing equipment used, cross-infection control and health and safety legislation.	<ul style="list-style-type: none"> • Discussion • Practical demonstration • Oral questioning and recording • Written account • ICT presentation
P4, M4, D3	Concepts of Radiation Protection and Hazards	You have been asked to produce an information booklet, to be used by trainee dental nurses, which identifies the concepts of radiation protection and hazards associated with dental X-rays.	<ul style="list-style-type: none"> • <i>Vive voce</i> • Discussion • Oral questioning and recording • Written account
P5, M5, D4	Radiographic Analysis and Treatment Planning	Working with your maxillofacial consultant, you are asked to mount, orientate and undertake preliminary analysis of a patient's cephalometric radiographs in preparation for osteotomy planning.	<ul style="list-style-type: none"> • Discussion • Practical demonstration • Oral questioning and recording • Written account

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology. This unit has particular links with:

Level 3
Unit 1: Fundamentals of Dental Technology
Unit 3: Dental Technology Techniques
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 8: Removable Complete Prosthodontics
Unit 9: Removable Partial Prosthodontics
Unit 11: Design of Fixed Prosthodontics
Unit 15: Principles of Orthodontic Therapy Regimes
Unit 16: Design, Manufacture and modification of Removable Orthodontic Appliances

Essential resources

Facilities required for this unit include radiographic and processing equipment utilised in a clinical setting or simulated dental surgery environment. Access to dental radiology departments that provide facilities in the provision of oral healthcare is essential for this unit.

The clinical environment should be fitted with a selection of dental films, intra-oral bitewing, periapical, occlusal and extra-oral pantomographic film. Additional resources include film holders, processing film hangers, lead protective aprons, darkroom accessory and safe light.

To analyse radiographic images to support treatment planning and identification of anatomical features dental imaging equipment is essential in the form of digital equipment and X-ray viewers.

To facilitate the correct prognosis and analysis of radiographs their orientation will require mounting resources in the form of acetate sheets, plastic film pockets and trollemount systems.

Suitable library resources should be available with the access to ICT facilities, the internet and a range of appropriate textbooks and journals.

Staff delivering this unit should be competent, experienced and in possession of a dental radiology certificate endorsed by the college of radiographers, DSASTAB or the NEBDN with recent clinical experience in dental radiology.

Employer engagement and vocational contexts

Dependent on organisational resources, potential site visits to a dental radiology department within a hospital or commercial sector would be helpful for learners. It would be beneficial to learners to develop an understanding and gain knowledge of the different radiographic techniques and equipment used in dentistry, accompanied by the health and safety legislation. The site visits would consist of supervised observation for independent research incorporating no practical elements.

Indicative reading for learners

Textbooks

Fehrenbach M J and Herring S W – *Illustrated Anatomy of the Head and Neck* (Saunders, 1995)
ISBN 0721640826

Logan B, Hutchings R and Reynolds P – *McMinn's Color Atlas of Head and Neck Anatomy* (Mosby, 2003)
ISBN 0723431965

Miles D A, Van Dis M L, Jensen C W and Ferretti A B – *Radiographic Imaging for Dental Auxiliaries, 3rd Edition*
(Saunders, 1999) ISBN 072168016X

Whaites E – *Essentials in Dental Radiography and Radiology* (Churchill Livingstone, 2002) ISBN 044307027X

White S C and Pharoah M J – *Oral Radiology: Principles and Interpretation* (Mosby, 2003) ISBN 0323020011

Woelfel J B and Schied R C – *Dental Anatomy: its Relevance to Dentistry* (Lippincott, 2001) ISBN 0781727979

Journals

Dental Nursing (Pensord Press Ltd)

Dental Practice (AE Morgan Publications Ltd)

The Dental Technician (AE Morgan Publications Ltd)

Websites

www.bda.org

British Dental Association

www.hpa.org.uk/dental

National Radiographic Protection Board

www.kodak.com/dental

Kodak

www.rcr.ac.uk

The Royal College of Radiologists

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1, IE3] describing dental X-rays and the types of radiographic equipment available; outlining medical exposure, radiation safety and infection control for patient and clinician

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE4] describing tissue abnormalities; determining the relevant information from a radiograph, to influence a treatment plan
Creative thinkers	[CT1] describing the specific techniques for which the various types of dental film are most suited [CT2] identifying possible abnormalities within the hard and soft tissues
Self-managers	[SM2] determining the relevant information from a radiograph, to influence a treatment plan
Effective participators	[EP3] discussing the advantages and disadvantages of radiographic techniques for intra-oral and extra-oral imaging, making reference to suitable methods of cross-infection control, and health and safety legislation during the handling of dental films/radiographs during exposure, processing and mounting

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using internet searches entering data word processing documents to meet the requirements of assignments
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	producing a plan of tasks to be undertaken reflecting on how the assignment is progressing
Manage information storage to enable efficient retrieval	saving information in suitable files and folders
Follow and understand the need for safety and security practices	keeping food and drink away from computers ensuring they use their own login and password explaining how safety is addressed in the context of the tasks explaining why the IT usage policy forbids certain actions
Troubleshoot	carrying out checks to identify the source of a problem encountered, eg missing file of work
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using suitable data from the internet, books, data supplied by the tutor
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	searching for data selecting appropriate data from existing ICT systems evaluating whether it meets the requirements of the assignment task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	ensuring all necessary information for the unit is available electronically, eg tables of information regarding ICT specifications, tables of numerical data, pictures of equipment
Bring together information to suit content and purpose	collecting information in one file for editing into a suitable format
Present information in ways that are fit for purpose and audience	presenting information in the formats required in the assignment briefs
Evaluate the selection and use of ICT tools and facilities used to present information	evaluating whether the presentation of data is appropriate in terms of the grading criteria
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	sending emails to tutors with appropriate information attached demonstrating to tutors that email has been used appropriately responding to feedback on assignments

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	analysing cephalometric radiographs for osteotomy planning
Identify the situation or problem and the mathematical methods needed to tackle it	measuring the ratios of chemicals such as lead foil, fixer and developing solutions
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	calculating radiographic exposure times appropriate to the type of film being used
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	participating in class discussions and Q&A sessions asking pertinent questions
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading, retrieving and selecting appropriate text. understanding anatomical terminology relevant to the assignment
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing reports and assignments

Unit 11: Design of Fixed Prosthodontics

Unit code:	Y/600/7310
QCF Level 3:	BTEC National
Credit value:	10

● Aim and purpose

The aim of this unit is to enable learners to understand the principles and requirements of treatment planning along with the design principles for single unit and multi-unit restorations. It also explores the systems available for producing all-ceramic restorations and reasons for the provision of temporary restorations and diagnostic wax-ups.

● Unit introduction

This unit focuses on the design of fixed prosthodontics. This area of dental technology is becoming increasingly popular and changes are continually occurring.

Learning outcome 1 introduces learners to the necessity of treatment planning for fixed prosthodontics, to ensure the best treatment for the patient, and gives them an insight into the types of tooth preparation done clinically by the dentist. Learners will begin to understand design requirements for single-unit restorations and become aware of the varying sub- and super-structure combinations. They will learn about the advantages and limitations of these types of restoration.

Learning outcome 2 covers dental bridge design showing progression from single-unit to multiple-unit restorations. Learners will discover the types of dental bridge design and component parts currently used. They will learn how each component part is vital to ensuring a viable bridge design.

The emergence of all-ceramic restorations that provide strength and excellent aesthetics has led to an increased popularity of this type of treatment with patients and dentists. In learning outcome 3, learners will gain knowledge of the types of all-ceramic restoration systems and the advantages and disadvantages of each.

Finally, in learning outcome 4 learners will understand the design requirements for temporary restorations and diagnostic wax-ups.

● Learning outcomes

On completion of this unit a learner should:

- 1 Understand the design requirements for single-unit restorations
- 2 Know the principles of design for multi-unit restorations
- 3 Know the types of all-ceramic restoration commonly used
- 4 Understand the reasons for the provision of temporary restorations and diagnostic wax-ups.

Unit content

1 Understand the design requirements for single-unit restorations

Treatment planning: patient examination; radiographs to check bone loss, periodontal tissue and tooth state; team discussions; prescription requirements; advantages and limitations of fixed prosthodontic treatment

Substructure designs: types of substructure; substructure design faults; clinical tooth preparations; bonding methods; choice of alloy; indications and limitations of metallic substructures

Aesthetic bonded superstructure design: material selection, eg ceramic and composite; anatomical shaping; space requirement; aesthetic consideration; function and limitations

Metallic restorations: wax pattern design, eg coronal shape, contact areas, emergence profile, occlusal harmony; choice of alloy

2 Know the principles of design for multi-unit restorations

Treatment planning: patient examination; radiographs to check bone loss, periodontal tissue and tooth state; team discussions; prescription requirements

Design principles: major dental bridge forms; components; indications and limitations of each bridge type and how other restorations could be used, eg dentures and implants

Retainers: types; functions; aesthetically acceptable; luting cements

Connectors: types of connector; function; positioning; precision attachments

Pontics: types of pontic; design requirements; functions; material selection

3 Know the types of all-ceramic restoration commonly used

All-ceramic crown systems: currently available systems; constituents; advantages and disadvantages of each system; types of restorations, eg full crowns, bridges, inlays: current CAD/CAM systems; techniques for the manufacture of all-ceramic restorations

4 Understand the reasons for the provision of temporary restorations and diagnostic wax-ups

Temporary restorations: types; reasons for their use; design features, eg easily cleaned to maintain a healthy oral environment, good contact points; function, eg prevent tooth movement, aesthetics; material selection, eg self-curing acrylic, stock tooth

Diagnostic wax-ups: reasons for their use during treatment planning; design

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 list the stages of treatment planning, prior to treatment commencing, in fixed prosthodontic treatment [IE1]	M1 describe the duties of the dental team in relation to the provision of fixed prosthodontics	D1 explain the advantages and limitations of fixed prosthodontic treatment
P2 describe the types of single-unit restorations available	M2 explain the indications and limitations of each restoration and substructure	D2 explain faults that can occur if the design of the substructure is incorrect
P3 list the materials that can be used for single-unit super-structures	M3 explain the importance of the ceramic metal junction and clinical tooth preparation design	D3 discuss how the overall design of the restoration affects the aesthetics and function of the restoration
P4 explain the anatomical design features that need to be included in single-unit restorations [IE2]	M4 explain the importance and limitations of component designs, including their functions	D4 discuss how the overall design of the restoration affects the aesthetics and function of the restoration
P5 describe the major features of dental bridge design and components	M5 explain the advantages and disadvantages of each system	D5 explain ways in which bridges can be retained
P6 describe the current systems for all-ceramic restorations	M6 describe the present CAD/CAM systems available for all-ceramic restorations	D6 explain the advantages and disadvantages of each system
P7 explain the use of temporary restorations, giving reasons for their design features [CT3]	M7 describe the materials and techniques that could be used to construct temporary restorations	D7 explain the importance of temporary restorations and diagnostic wax-ups to the overall treatment plan of the patient
P8 explain the use of diagnostic wax-ups [IE1]	M8 explain the importance of aesthetics	D8 explain the importance of diagnostic wax-ups to the overall treatment plan of the patient

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

The delivery of this unit should be designed to stimulate learners, using a wide range of media including: formal lectures, discussions, Q&A sessions, practical activities and the use of ICT facilities. Site visits from subject specialists are recommended. Assessment may take the form of practical simulation, *viva voce*, summative examination and independent research in the form of written assignments.

Delivery

The learning outcomes for this unit provide learners with knowledge of the design requirements for fixed prosthodontic appliances. They also provide the underpinning knowledge necessary for the production of fixed prosthodontics. Delivery could be in the form of lectures, demonstrations, discussions, seminar presentations, research using the internet and/or library resources and the use of personal and laboratory experience. It is important to keep learners motivated by providing variety in the delivery methods.

Whichever delivery methods are used, it is essential that tutors stress the importance of patient welfare, dental teamwork and the importance of accuracy and quality when designing fixed prosthodontics.

This unit could be delivered alongside:

Unit 4: Dental Anatomy, Oral Biology and Disease

Unit 7: Dental Public Health and Preventative Dentistry

Unit 10: Dental Radiology and Imaging

Unit 12: Complex Dental Biomaterials Science

Unit 13: Techniques for Manufacturing Fixed Prosthodontics

Unit 14: Quality Assurance in Dental Technology.

Learning outcomes 1 and 2 are directly linked. These are likely to be delivered through formal lectures, demonstrations, discussions and independent learner research. Learners will become aware of the design requirements and treatment planning for the provision of single-unit restorations and metal substructures. They will understand the reasons for using each restoration and metallic substructure. Visiting expert speakers could add to the relevance of the subject for learners, for example, through lectures and seminars where speakers could talk about their work, materials, design methods and give demonstrations.

Learning outcome 3 covers the all-ceramic systems and explains the differences between them. Delivery techniques should be varied and can be linked to the delivery of learning outcomes 1 and 2. It is expected that formal lectures, discussions and demonstrations would form part of the delivery of this outcome. Health and safety issues and patient welfare must be addressed whilst designing the restorations. Visiting expert speakers could add to the relevance of the subject. For example, an expert ceramist could demonstrate and discuss the new developments in all-ceramic restoration, or dental supplies companies could demonstrate their particular systems. Learners could visit external laboratories that construct these restorations.

Learning outcome 4 looks at the types of temporary restorations and diagnostic wax-ups and explains why they are used. Different materials and design features are covered and include advantages and disadvantages of each method. Delivery techniques should be varied. It is expected that formal lectures, demonstrations and independent learner research will form part of the delivery of the outcome. Health and safety issues and patient welfare must be addressed whilst designing the restorations. Visiting expert speakers could add to the relevance of the subject for learners, for example sales representatives could demonstrate new advanced materials, techniques and equipment.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction to the unit and structure of the programme of assignments.
Learning outcome 1 Describe treatment planning. Discuss prescription requirements, learners create their own. Discuss advantages and limitations of fixed prosthodontic treatment. Describe types of substructure. Describe substructure design faults. Discuss clinical tooth preparations. Describe bonding methods. Describe choice of alloy. Discuss aesthetics, ICT case studies. Discuss anatomical shaping; space requirement. Describe design principles. Assignment 1: Treatment Planning (P1, P2, P3, P4, M1, M2, M3, M4, D1, D2, D3, D4) List the stages of treatment planning, prior to treatment commencing, in fixed prosthodontic treatment.
Learning outcome 2 Describe the types of single-unit restorations available, including all-metallic. List the materials that can be used for single-unit substructures. Describe the major dental bridge design and components. Assignment 2: Bridge Design (P5, M5, D5) List bridge designs.
Learning outcome 3 Discuss currently available systems. Describe constituents. Discuss advantages and disadvantages of each system. Discuss types of restorations. Explore the current CAD/CAM systems and techniques available for the manufacture of all-ceramic restorations. Assignment 3: All-ceramic Systems and CAD/CAM (P6, M6, D6) Describe the current systems for all-ceramic restorations.

Topic and suggested assignments/activities and/assessment

Learning outcome 4

Temporary restorations.

Discuss reasons for their use.

Describe design features.

Discuss materials.

Discuss advantages and disadvantages.

Diagnostic wax-ups.

Describe reasons for their use during treatment planning design.

Discuss design features.

Describe anatomical shaping – space requirement.

Discuss aesthetics.

Assignment 4: Principles of Temporary Restorations and Aesthetics (P7, P8, M7, M8, D7, D8)

Explain the use of temporary restorations, giving reasons for their design features.

Explain the use of diagnostic wax-ups.

Review of unit and programme of assignments.

Assessment

To achieve a pass grade, learners must achieve the eight pass criteria listed in the grading grid.

For P1, learners will be expected to list the stages of treatment planning before starting treatment for fixed prosthodontic restorations and explain the importance to the final outcome. Learners will be expected to cover treatment planning and explain why the designs for metallic substructures, aesthetic substructures and metallic restorations are important. Evidence for this could take the form of a pictorial presentation with an explanation (possibly using ICT), a report with diagrams, an annotated poster or leaflet.

For P2, learners must describe the types of single-unit restorations available, identifying the different substructure designs. Evidence may be in the same format as P1. It could also be linked to assessment for P3.

For P3, learners must list the available materials for producing single unit restorations. Evidence may be in the same format as for P1. It could also be linked to assessment for P2.

For P4, learners must explain the anatomical design features that need to be included into the single unit substructure. Evidence may be in the same format as for P1. It could also be linked to assessment for P4.

For P5, learners must list the component parts of a dental bridge describing the different pontic and connector designs. Learners will be expected to include the materials that can be used. Evidence may be in the same format as for P1. It could also be linked to assessment for P4.

For P6, learners must describe the current systems for all-ceramic restorations including CAD/CAM, listing the types of restorations that can be constructed by this method. Evidence may be in the same format as for P1. It could also be linked to assessment for P2.

For P7, learners must explain the use of temporary restoration and the reasons for their design. Learners will be expected to cover a range of reasons for their use, design features and functions. Evidence may be in the same format as for P1.

For P8, learners must explain the uses of diagnostic wax-ups and explain the reasons for their design. Learners will be expected to cover a range of reasons for their use, design features and functions. Evidence may be in the same format as for P1.

To achieve a merit grade for the unit, learners must achieve all of the pass grade criteria and the seven merit grade criteria.

For M1, learners are required to describe the duties of each member of the dental team in relation to the provision of fixed prosthodontics and list the prescription requirements expected for the provision of a single-unit restoration. This can be directly linked to work undertaken in P1. Evidence may be in the same format as for P1.

For M2, learners must explain the indications and limitations of each restoration and substructure. Learners will be expected to cover substructure designs and aesthetic superstructure design listed in the unit content. This can be directly linked with work undertaken in P2. Evidence may be in the same format as for P1.

M3 requires learners to explain the importance of the metal ceramic junction and clinical tooth preparation. Learners must give examples of where the metal ceramic junction should be positioned for a number of different cases and what restorations could be used on the different tooth preparations. This can be directly linked to work undertaken in P3. Evidence may be in the same format for P1.

M4 requires learners to give indications and limitations of each dental bridge design. Learners must give examples of where each bridge design would be most suitable and explain the situations where the bridge can be used. This can be directly linked to work undertaken in P4. Evidence may be in the same format for P1.

For M5, learners must explain the importance of pontic and connector design and describe their function. Learners must give examples of where each pontic and connector design are most suited and explain what they do. This can be directly linked to work undertaken in P5. Evidence may be in the same format as for P1.

M6 requires learners to explain the advantages and disadvantages of each all-ceramic system. Learners must give examples of where the metal ceramic junction should be positioned for a number of different cases and what restorations can be used on the different tooth preparations. This can be directly linked to work undertaken in P6. Evidence may be in the same format as for P1.

M7 requires learners to describe materials and techniques that could be used to construct temporary restorations, giving advantages and disadvantages of each material and technique. This can be directly linked to work undertaken in P7. Evidence may be in the same format as for P1.

M8 requires learners to describe the importance of aesthetics in the production of diagnostic wax-ups, giving advantages with assisting communication. This can be directly linked to work undertaken in P8. Evidence may be in the same format as for P1.

To achieve a distinction grade, learners must achieve all of the pass and merit criteria and the seven distinction grade criteria.

For D1, learners are required to discuss the necessity for fixed prosthodontic restorations and explain the advantages and limitations of the treatment. This can be directly linked to work undertaken in P1 and M1. Evidence may be in the same format as for P1.

D2 requires learners to describe faults than can occur if the design of the substructure is incorrect and explain the design requirements of all metallic single-unit restoration. This can be directly linked to work undertaken in P2 and M2. Evidence may be in the same format as for P1.

D3 requires learners to discuss how the overall design of the restoration affects the aesthetics and function of the restoration. Learners must give examples of substructures, superstructures, materials, space requirement, preparation position and type. This can be directly linked to work undertaken in P3 and M3. Evidence may be in the same format as for P1.

D4 requires learners to discuss how the overall design of the restoration affects the aesthetics and function of the restoration. This can be directly linked to work undertaken in P5 and M5. Evidence may be in the same format as for P1.

D5 requires learners to describe ways in which bridges can be retained including the use of precision attachments and implants. This can be directly linked to work undertaken in P5 and M5. Evidence may be in the same format as for P1.

D6 requires learners to discuss computer-aided design systems currently available. Learners must show that they have researched the different systems and explain how they work giving advantages and disadvantages. This can be directly linked to work undertaken in P6 and M6. Evidence may be in the same format as for P1.

D7 requires learners to discuss the importance of temporary restorations to the overall treatment plan of the patient. Learners must give evidence that they understand temporary restorations are used to aid treatment planning and patient care. This can be directly linked to work undertaken in P7 and M7. Evidence may be in the same format as for P1.

D8 requires learners to discuss the importance of temporary diagnostic wax-ups to the overall treatment plan of the patient. Learners must give evidence that they understand diagnostic wax-ups are used to aid treatment planning and patient care. This can be directly linked to work undertaken in P7 and M7. Evidence may be in the same format as for P1.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	Treatment Planning	You are involved in a discussion with the dental team and are asked to record a treatment plan.	Written account Identification and recording information
P2, M2, D2	Bridge Design	A dentist asks as part of their treatment planning for a record of bridge designs.	Written account Identification Labelled diagrams
P3, M3, D3	All-ceramic Systems CAD/CAM Systems	A dentist wishes to produce an all-ceramic restoration for a patient and would like a detailed reference as to what is available for their patient.	Written account Diagrams Charts Data
P4, M4, D4	Principles of Temporary Restorations and Aesthetics	ABC Dental Laboratory would like a reference guide for their students to gain an understanding of aesthetics.	Aesthetics Anatomical design Function

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology. This unit has particular links with:

Level 3
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 7: Dental Public Health and Preventative Dentistry
Unit 10: Dental Radiology and Imaging
Unit 12: Complex Dental Biomaterials Science
Unit 13: Techniques for Manufacturing Fixed Prosthodontics
Unit 14: Quality Assurance in Dental Technology

Essential resources

It is essential that a classroom is available for lectures, discussion and presentations. There must be library and ICT facilities available and access to journals, websites and professional bodies to aid the development of learners. There should be specialist technical support available for learners. Staff delivering this unit should be registered, competent and experienced dental technicians with an in-depth knowledge of the subject. Ideally they should have recent industrial experience within a fixed prosthodontic department or laboratory, or show evidence of regular contact with the industry.

Employer engagement and vocational contexts

The manufacturing of fixed prosthodontics is an important part of dentistry. Custom-made dental appliances are essential for aesthetics and function and patient welfare. Where possible, learners should visit clinical and hospital departments or have visiting specialist lecturers from such establishments. Where this is not possible, learners should be provided with suitable resources, materials and simulation.

Indicative reading for learners

Textbooks

Ash M and Nelson S – *Wheeler's Dental Anatomy, Physiology and Occlusion, 8th Edition* (Saunders, 2003)
ISBN 0721693822

Craig R G and Powers J M – *Restorative Dental Materials, 11th Edition* (Mosby, 2001) ISBN 0323014429

Gladwin M, *Clinical Aspects of Dental Materials* (Lippincott Williams & Wilkins, 2004) ISBN 0781743443

Hobkirk J, Watson R and Searson L – *Introducing Dental Implants* (Churchill Livingstone, 2003)
ISBN 0443071853

McNeil C – *Science and Practice of Occlusion* (Quintessence, 1997) ISBN 0867153040

Naylor P – *Introduction to Metal Ceramic Technology* (Quintessence, 1992) ISBN 0867152370

Rosenstiel S F, Land M F and Fujimoto J – *Contemporary Fixed Prosthodontics, 3rd Edition* (Mosby, 2001)
ISBN 081515559X

Shillingburg H T, Hobo S, Whitsett L D, Jacobi R and Brachetts S – *Fundamentals of Fixed Prosthodontics, 3rd Edition* (Quintessence, 1997) ISBN 086715201X

Shillingburg H T, Wilson E L and Morrison J T – *Guide to Occlusal Waxing, 3rd Edition* (Quintessence, 2000) ISBN 0867153857

Smith B G – *Planning and Making Crowns and Bridges* (Taylor & Francis, 1998) ISBN 1853173142

Touati B, Nathanson D and Miara P – *Esthetic Dentistry and Ceramic Restorations* (Taylor & Francis, 1998) ISBN 185317159X

Van Noort R – *Introduction to Dental Material, 2nd Edition* (Mosby Wolfe, 2002) ISBN 0723432155

Journals

Dental Dialogue (TW Media UK)

Dental Laboratory (The Dental Laboratories Association)

The Dental Technician (AE Morgan Publication Co)

Dental Technologies (CRG Publications)

Quintessence Journal of Dental Technology (Quintessence Publishing Co Ltd)

Websites

www.bda.org	British Dental Association
www.brsd.org	British Society for Restorative Dentistry
www.dentalexcellencetech.com	Fundamentals of Esthetics (Dents TW Media)
www.dentalexcellencetech.com	Shades, a World of Colour (Dents TW Media)
www.dentalguide.co.uk/index.html	UK and Ireland Dental Guide
www.dental-technology.info	The Dental Digest
www.derweb.co.uk/index.html	Dental Education resources on the web
www.dla.org.uk	Dental Laboratories association
www.dta-uk.org	Dental Technicians Association
www.gdc-uk.org	General Dental Council
www.medical-devices.gov.uk/mda	Medical Devices Directive

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1] listing stages of treatment planning [IE2] explaining anatomical design features
Creative thinkers	[CT3] explaining the use of temporary restorations

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Reflective learners	[RL4] explaining the use of temporary restorations and diagnostic wax-ups
Team workers	[TW1] actively taking part in small-group activities
Self-managers	[SM3] carrying out assignment work and personal study
Effective participators	[EP4] evaluating their finished practical projects

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	searching the internet entering data word processing documents to meet the requirements of assignments
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	reflecting on the way that an assignment has been approached
Manage information storage to enable efficient retrieval	saving information in suitable files in suitable folders
Follow and understand the need for safety and security practices	keeping food and drink away from computers ensuring they use their own login and password explaining how safety is addressed in the context of the tasks explaining why the IT usage policy forbids certain actions
Troubleshoot	carrying out checks to identify the source of a problem encountered, eg missing file of work
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using data from the internet, books, and data supplied by the tutor and the results of experiments, to describe and explain trends in properties
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	searching for data on trends in properties; selecting appropriate data in trends in properties and evaluating whether it meets the requirements of the assignment task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	collating data in tables and writing about trends in data saving images of industrial production of substances and uses of substances keeping records of properties studied
Bring together information to suit content and purpose	collecting information in one file for editing into a suitable format
Present information in ways that are fit for purpose and audience	presenting information in the formats required in the assignment briefs
Evaluate the selection and use of ICT tools and facilities used to present information	evaluating whether the presentation of data is appropriate in terms of the grading criteria
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	sending emails to tutors with appropriate information attached demonstrating to tutors that email has been used appropriately responding to feedback on assignments

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	analysing data on flexural strengths and hardness
Identify the situation or problem and the mathematical methods needed to tackle it	using appropriate methods to tackle presentation problems, eg use of graphs
Select and apply a range of skills to find solutions	analysing data on material strengths and suitability
Use appropriate checking procedures and evaluate their effectiveness at each stage	estimating results; calculating using Excel or a calculator
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	writing reports about material strengths using suitable mathematical language
Draw conclusions and provide mathematical justifications	correctly identifying trends in data, using examples
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in class discussions about how trends may be described. interacting with external, industrial speakers presenting data on materials
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading and comparing information from text and tables. using persuasive language in writing an article on aesthetics restoration
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing reports, articles and notes as required by assignment briefs

Unit 12: Complex Dental Materials Science

Unit code:	F/600/7317
QCF Level 3:	BTEC National
Credit value:	10

● Aim and purpose

This unit is designed to give learners an understanding of the dental materials used to construct complex dental devices and will assist them in the selection and manipulation of materials.

● Unit introduction

This unit allows learners to understand how the properties of dental materials can be altered or enhanced for maximum benefit and they will consider the effects of the composition of dental materials by their function and properties.

Learning outcome 1 will introduce learners to the metals and alloys used to construct a range of devices and components, both cast and wrought, in all fields of dental technology.

In learning outcome 2, fixed prosthodontic technology uses a variety of glass, ceramic and composite materials to replicate natural teeth. Learning outcome 3 allows learners to investigate this range of materials and will enhance their ability to ensure correct selection and use of the most suitable materials.

In learning outcome 3, learners will acquire knowledge of the characteristics and uses of refractory materials used in the lost wax process used to form metallic cast restorations and aesthetic ceramic castings. This outcome is directly linked to the practical work undertaken in *Unit 13: Techniques for Manufacturing Fixed Prosthodontics*.

In the final learning outcome, learners become aware of the need to repair or join metallic components and are introduced to the materials required for soldering in dental technology.

The unit ensures that learners are knowledgeable in the safe handling and disposal of dental materials to ensure their own safety and the safety of the patient and that they understand the cost implications and quality requirements when choosing suitable materials.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know the properties and uses of metals and alloys in dental technology
- 2 Understand the properties and manipulation of ceramic and composite type materials used in the construction of fixed prosthodontic devices
- 3 Know the properties and uses of dental refractory materials
- 4 Be able to use duplicating materials.

Unit content

1 Know the properties and uses of metals and alloys in dental technology

Basic metallurgy: structure of metals and alloys, eg solid solutions, space lattice, grain boundaries; properties of pure metals; property changing by alloying metals; phase diagrams related to understanding alloy properties

Alloys: commonly used alloys; gold alloys; ceramic-bonding alloys, stainless steel alloys and cobalt chromium alloys

Applied dental metallurgy: ideal properties of alloys for dental devices; compositions and properties of gold alloys; carat ratings and the effect on properties; composition and properties of ceramic-bonding alloys, stainless steel alloys and cobalt chromium alloys; composition and properties of solders; biocompatibility, including allergies and hypersensitivity; corrosion and galvanic cells; joining metals by soldering and welding processes; safe handling and disposal; health and safety; quality assurance

Changing structure: work hardening, fatigue and failure, eg bending stainless steel wire, over stressing wire, over flexing of cast alloys; heat treatments eg relieving work hardening by the application of heat; melting and casting, eg gas/air torch, induction, centrifugal casting, vacuum casting

Processing techniques: trimming, polishing and finishing methods; surface treatments, eg blasting, electrolytic polishing; layer structure and function, eg anodic, passive, Beilby; manipulation methods for wrought alloys

Material selection: properties in relation to the function of the dental device; cost analysis; availability and disposal; health and safety considerations

2 Understand the properties and manipulation of ceramic and composite type materials used in the construction of fixed prosthodontic devices

Simulation of natural teeth: material selection; constituents and properties of materials; effects of constituents on properties; optical features required of materials used to simulate natural teeth; pigments and colouring

Chemistry: chemical process during firing and curing; chemical bonding; fusion

Application: reasons for use; manipulation techniques eg compaction, firing, trimming and glazing/staining; characterising materials; glazing processes and polishing systems; curing and firing cycles; health and safety considerations; cost analysis; quality assurance

3 Know the properties and uses of dental refractory materials

Terms and characteristics: refractory and binder; compensation expansion; heating cycles and breakdown

Types and uses: gypsum bonded, and phosphate bonded; constituents and properties of each type; effects of constituents on properties; refractory's for fixed and removable prosthodontics, investments for ceramic work and soldering; surface mould finish and mould porosity; controlling expansion

Application: reasons for use; manipulation techniques; hardening refractory materials; setting and heating; removal from cast devices; safe storage, handling and disposal; environmental considerations; cost analysis; health and safety considerations; quality assurance

4 Be able to use duplicating materials

Types and uses: silicones; agars; constituents and properties of each type; model duplication; indices; moulds

Application: reasons for use; manipulation methods; pre-duplication surface treatments for models; safe storage, handling and disposal; health and safety considerations; cost analysis; quality assurance

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 list the constituents, properties and uses of commonly used dental alloys [IE1]	M1 describe the ideal properties for alloys used in the construction of dental appliances	D1 explain how changing the ratio of constituents in alloys can affect the properties of alloys
P2 identify the methods used to heat and melt dental alloys	M2 describe the various methods of changing the structure of dental alloys	D2 discuss the methods for abrading and polishing commonly used dental alloys
P3 list the temperatures required to melt the commonly used dental alloys		
P4 describe the purpose of each constituent present in dental ceramics and composites	M3 compare the properties of dental ceramics and composites to the commonly accepted ideal requirements of aesthetic dental materials	D3 discuss the processing methods of dental ceramics and composites
P5 describe the types of metal-free ceramic core systems currently available	M4 explain how each type of ceramic aesthetic system is used to produce natural looking restorations	D4 evaluate ceramic aesthetic systems considering cost, strength, ease of use, staff training and prognosis of appliances
P6 review the manipulation techniques for ceramics and composites [IE2, CT2]		
P7 list the constituents, properties and uses of commonly used dental refractory materials	M5 outline how the expansion of refractory materials can be controlled by chemical and physical methods	D5 discuss the faults which can occur through incorrect use of refractory materials and describe the cost implications of this
P8 duplicate a range of models and appliances using various techniques and materials from given prescriptions, with substantial guidance [SM2, SM3]	M6 duplicate a range of models and appliances using various techniques and materials from given prescriptions, with limited guidance	D6 duplicate a range of models and appliances for different purposes, using a variety of materials and techniques, from given prescriptions, working independently

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

The delivery of this unit encourages a variety of teaching methods and resources. External speakers and the use of practical demonstrations and learner activities will enrich the unit delivery. Ideally, the unit is presented in a laboratory environment. Assessment engages with a range of evidence sources including written reports, practical tasks and presentations.

Delivery

This unit may be delivered mainly through formal lectures, seminars and research using the internet and/or library resources. The tutor may refer to these lectures, seminars and research during practical demonstrations when using the relevant materials, but for the bulk of the unit, assessment may be evidenced through written means. Learners should be encouraged to research materials they use through dental supplies companies and the internet.

Whichever delivery methods are used, it is essential that tutors stress the importance of patient and learner welfare in relation to Control of Substances Hazardous to Health (COSHH) regulations and the necessity for using the materials according to manufacturers' instructions to ensure quality standards and safety at all times.

The importance of health and safety issues relating to working in a dental laboratory environment must be stressed and regularly reinforced and risk assessments must be carried out both in the training laboratory and work experience laboratory before starting practical activities.

Tutors should consider integrating the delivery, private study and assessment relating to this unit with any other relevant units learners may be taking as part of the programme of study.

Learning outcome 1 is likely to be delivered through formal lectures but visits to local material suppliers and manufacturers should be considered. It is important that learners understand the origin of alloys and the properties and uses of metals and alloys in dental technology. They will be introduced to basic metallurgy and applied dental metallurgy.

Learners should become familiar with the various metal structures and gain insight into changing that structure. They will be directed in how to choose an appropriate material for the required purpose and learn to handle these materials in a suitable and safe manner. Learners will become aware of the health and safety requirements and quality assurance procedures necessary to ensure patient safety and satisfaction.

Visits from dental material suppliers and manufacturers could help to enhance learners' understanding of the wide variety of dental materials available in the marketplace.

Learning outcome 2 investigates the use of ceramic and composite materials for the construction of fixed prosthodontic devices. Manipulation techniques such as compaction, firing, trimming and glazing/staining are investigated. Delivery should be by formal lectures, tutor demonstrations and independent learner research. However it is usual for dental manufacturing and supplies companies to provide speakers, CD ROMs, videos, etc to advertise their products and these are all acceptable delivery methods. Visits to laboratories who construct full ceramic restorations using CAD/CAM would give valuable insight into the methods used to produce these restorations. Visits from clinicians to speak about the materials used for fixed prosthodontic restorations would also be a valuable experience for learners.

There are direct links with *Unit 16: Advanced Dental Technology Techniques and Procedures*.

Learning outcome 3 covers the refractory materials used in the lost wax process and explains their characteristics and uses. Delivery will be mainly through formal lectures and independent learner research. It would be helpful for learners to research a wide range of materials from various manufacturers so that they become aware of the various handling techniques, manufacturing outcomes and cost implications. Sample packs of refractory materials are often available from dental material suppliers and a wide range of information is available in this area.

Local qualified technicians could be asked to give talks on their experiences of the different types of refractory materials used and dental supply company reps will arrange speakers and demonstrations from the manufacturers.

Learning outcomes 1 and 3 could be linked as most manufacturers and suppliers offer a casting system that includes alloys and refractory materials.

Learning outcome 4 looks at the variety of dental duplicating materials used in dental technology and discusses their application. Delivery techniques should be varied. It is expected that formal lectures seminars, practical demonstrations and independent research by learners will form part of the delivery of the outcome.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments.

Learning outcome 1

Introduction to the whole unit and the material that will be investigated and used during this unit.

Presentation on alloys: commonly used alloys; gold alloys; ceramic-bonding alloys, stainless steel alloys and cobalt chromium alloys.

Learner-led discussion on the ideal properties of alloys for dental devices; compositions and properties of gold alloys; carat ratings and the effect on properties.

Presentation and discussion on basic metallurgy: structure of metals and alloys, eg solid solutions, space lattice, grain boundaries; properties of pure metals; property changing by alloying metals; phase diagrams related to understanding alloy properties.

Research into common compositions and properties of ceramic-bonding alloys, stainless steel alloys and cobalt chromium alloys.

Discuss biocompatibility of alloys, including allergies and hypersensitivity; corrosion and galvanic cells.

Demonstration of a metal casting technique, eg gas/air torch, induction, centrifugal casting, vacuum casting.

Demonstration of soldering techniques.

Presentation on the composition and properties of solders; joining metals by soldering and welding processes.

Demonstrations covering trimming, polishing and finishing a range of metallic restorations.

Discuss surface treatments, eg blasting, electrolytic polishing; layer structure and function, eg anodic, passive, Beilby; manipulation methods for wrought alloys.

Topic and suggested assignments/activities and/assessment

Discuss and demonstrate methods of changing alloy structures: work hardening, fatigue and failure, eg bending stainless steel wire, over stressing wire, over flexing of cast alloys; heat treatments, eg relieving work hardening by the application of heat.

Present information on the properties of alloys in relation to the function of the dental device; cost analysis; availability and disposal; health and safety considerations safe handling and disposal; quality assurance.

Assignment 1: The Properties and Uses of Metals and Alloys in Dental Technology (P1, P2, P3, M1, M2, D1, D2)

Learning outcome 2

Introduce learning outcome – properties and manipulation of ceramic and composite type materials used in the construction of fixed prosthodontic devices.

Discuss how materials simulate the characteristics of natural teeth.

Demonstrate material selection criteria.

Research the constituents and properties of these materials.

Discuss the optical properties required of materials used to simulate natural teeth; pigments and colouring.

Discuss how artificial materials replicate natural dentition.

Demonstration of ceramic and composite application techniques.

Learner activity experiencing the manipulation of these materials.

Discuss the chemical process that occur during firing and curing; chemical bonding; fusion.

Demonstration of ceramic firing and composite curing.

Presentation reinforcing the demonstration of characterising materials; glazing processes and polishing systems; curing and firing cycles.

Assignment seminar evidencing learning outcome 2.

Discuss the health and safety considerations; cost analysis; quality assurance.

Learner activity to highlight possible health and safety hazards.

Assignment 2: The Properties and Manipulation of Ceramic and Composite Materials (P4, P5, P6, M3, M4, D3, D4)

Learning outcome 3

Present the commonly used terms and characteristics: refractory and binder; compensation expansion; heating cycles and breakdown.

Types and uses: gypsum bonded, phosphate bonded.

Using a range of products discuss the origins of these materials.

Discuss the constituents and properties of each type of refractory material and their application.

Demonstrate mixing techniques.

Discuss the reasons for use; manipulation techniques; hardening refractory materials; setting and heating.

Learners to discuss the indication and the selection of the correct refractory material based alloy type and restorative technique.

Demonstrate the removal of refractory material from cast devices; consider safe storage, handling and disposal; environmental considerations; cost analysis; health and safety considerations; quality assurance; risk assessment.

Learner activity – risk assess process.

Assignment 3: The Characteristics and Uses of Refractory Materials (P7, M5, D5)

Topic and suggested assignments/activities and/assessment

Learning outcome 4

Discuss different types and uses of a range of duplicating materials silicones; agars; constituents and properties of each type; model duplication; indices; moulds.

Practical examination – duplicating a range of dental cast models.

Review of unit and programme of assignments.

Assessment

To achieve a pass grade for the unit, learners must achieve the eight pass criteria listed in the grading grid provided.

For P1, learners are expected to list the constituents, properties and uses of commonly used dental alloys. Evidence for this could take the form of a pictorial presentation with notes (possibly using appropriate software), an annotated poster or leaflet. Alternatively, it could be linked as a project with P2 and P3.

For P2, learners are expected to identify the methods available to heat and melt dental alloys. Evidence for this could take the form of a pictorial presentation with notes (possibly using appropriate software), an annotated poster or leaflet. Alternatively, it could be linked as a project with P1 and P3.

For P3, learners must provide a detailed list of melting ranges for commonly used dental alloys. This can be evidenced as part of a project with P1.

For P4, learners must describe the purpose of each constituent present in dental aesthetic materials (ceramic and composite). This can be evidenced as part of a report with P5 and P6.

For P5, learners are required to describe metal-free restorative techniques that are currently available. Evidence for this could be presented in the same format as P4 or as an annotated poster or leaflet.

For P6, learners are expected to review the manipulation techniques for ceramics and composites. Evidence for this criterion could be supported by practical assessment and a presentation demonstrating the learner's practical techniques. The evidence could be presented in the same format as P4 and P5.

For P7, learners must list the constituents, properties and uses of commonly used dental refractory materials. Evidence for this could be provided in a written report format.

For P8, learners must duplicate a range of models and appliances, for different purposes, using a variety of materials and techniques from given prescriptions. These models and appliances might be duplicated both in the learning institution and the workplace and must be to a clinically accepted standard. The actual duplicated items would be the evidence in the learning institution and a witness statement might be used as evidence from the workplace. If assessed during a placement, the witness statement should be provided by the workplace supervisor and verified by the tutor. Guidance on the use of witness statements is given on the Edexcel website. Learners are permitted substantial guidance from tutors and workplace supervisors.

To achieve a merit grade, learners must achieve all of the pass grade criteria and the six merit grade criteria.

For M1, learners are required to describe the ideal properties of dental alloys used in the construction of dental appliances. Evidence should be broad ranging and include a variety of dental devices. This can be directly linked to work undertaken in P1 and M1. Evidence may be in the same format as for P1.

For M2, learners are expected to describe the various methods for changing the structure of dental alloys. This can be directly linked to work undertaken in P2. Evidence may be in the same format as for P2.

For M3, learners are expected to compare the properties of dental ceramics and composites to the commonly accepted ideal requirements of aesthetic dental.

This can be linked directly with work undertaken in P4. Evidence may be in the same format as for P4.

For M4, learners must explain how aesthetic systems are used to produce natural looking restorations. This can be linked directly with work undertaken in P5. Evidence may be in the same format as for P5.

For M5, learners must outline how the expansion of refractory material can be controlled by chemical and physical methods. This can be linked directly with work undertaken in P7. Evidence may be in the same format as for P7.

For M6, learners must duplicate a range of models and appliances, for different purposes using a variety of materials and techniques from given prescriptions. These models and appliances might be duplicated both in the learning institution and the workplace and must be to a clinically accepted standard. The actual duplicated items would be the evidence in the learning institution and a witness statement might be used as evidence from the workplace. If assessed during a placement the witness statement should be provided by the workplace supervisor and verified by the tutor. Guidance on the use of witness statements is provided on the Edexcel website. Learners are permitted limited guidance from tutors and workplace supervisors.

To achieve a distinction grade, learners must achieve all of the pass and merit criteria and the six distinction grade criteria.

For D1, learners are expected to explain how changing the percentage inclusion of constituents can affect the properties of alloys. This can be directly linked to work undertaken in P1. Evidence may be in the same format as for P1.

For D2, learners are required to discuss the methods for abrading and polishing the commonly used dental alloys. They must include a broad range of techniques and materials with information from various manufacturers and suppliers. This can be directly linked to work undertaken in P2 and M2. Evidence may be in the same format as for P2.

For D3, learners are expected to discuss the processing methods of dental ceramics and composites. The evidence produced must be broad ranging and feasible. This can be directly linked to work undertaken in P4 and M4. Evidence may be in the same format as for P4.

D4 requires learners to evaluate aesthetic systems considering cost, strength, ease of use, staff training and prognosis of appliances. This can be directly linked to work undertaken in P5 and M4. Evidence may be in the same format as for P5.

For D5, learners are required to discuss the faults which can occur through incorrect use of refractory materials and describe the cost implications of this. Evidence should include a detailed breakdown of what cost issues are involved in relation to working times for clinician and technician and material costs involved. This can be directly linked to work undertaken in P6 and M5. Evidence may be in the same format as for P6.

For D6, learners must duplicate a range of models and appliances, for different purposes using a variety of materials and techniques from given prescriptions. These models and appliances might be duplicated both in the learning institution and the workplace and must be to a clinically accepted standard. The actual duplicated items would be the evidence in the learning institution and a witness statement might be used as evidence from the workplace. If assessed during a placement the witness statement should be provided by the workplace supervisor and verified by the tutor. Guidance on the use of witness statements is given on our website (www.edexcel.com). Learners are permitted minimal guidance from tutors and workplace supervisors.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, M1, M2, D1, D2	The Properties and Uses of Metals and Alloys in Dental Technology	You have been appointed to a metal production department within a dental laboratory. You are informed by your mentor of the importance of alloy selection and use in the construction of dental appliances. The mentor requires you to design and deliver a presentation on the properties, manipulation techniques and uses of common types of alloys so that you can demonstrate your knowledge of the subject before you start to construct metal restorations.	Presentations using ICT techniques
P4, P5, P6, M3, M4, D3, D4	The Properties and Manipulation of Ceramic and Composite Materials	<p>Cosmetic dentistry has seen an increase in patient demand for natural looking restorations. The current material trend requires you to be skilled in the use of aesthetic materials.</p> <p>The laboratory that you work for has no knowledge of aesthetic materials. Your employer requires you to investigate a range of current materials that can be used to return good aesthetic properties. You will need to present your findings to the employer in the form of a written report, making recommendations so that your employer can buy a new system.</p>	Written report

Criteria covered	Assignment title	Scenario	Assessment method
P7, M5, D5	The Characteristics and Uses of Refractory Materials	You are now competent at waxing-up restorations and want to carry out the next stage in the construction process of fixed prosthodontic restorations. To demonstrate your knowledge of refractory materials your mentor has asked you to write a report on the uses of refractory materials.	Written report
P8, M6, D6	Duplicating a Range of Dental Cast Models	You have been asked by your mentor to duplicate a range of dental casts. You will have to demonstrate your knowledge of material selection and your practical ability.	Assessment form and practical test

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology. This unit has particular links with:

Level 3
Unit 17: Advanced Dental Technology Techniques and Procedures
Unit 9: Removable Partial Prosthodontics
Unit 13: Techniques for Manufacturing Fixed Prosthodontics
Unit 16: Design, Manufacture and Modification of Removable Orthodontic Appliances
Unit 18: Work-based Learning in Dental Technology

Essential resources

A fully-equipped dental laboratory is required for this unit. The laboratory should be fitted with appropriate benching, hand pieces, extractor units, mixing machines, model trimmers, gel machines, Bunsen burners, first aid kits, fire extinguishers, PPE, infection control and safety equipment, and a wide range of dental materials. Learners should be equipped with full dental toolkits and a selection of trimming burs for a variety of materials.

Access to those hospital and commercial dental laboratories that provide a range of dental technology services is very important.

Staff delivering this unit should be competent, experienced, and registered dental technicians. Ideally, they should have recent laboratory experience within dental technology and show evidence of regular contact with the industry and/or technical updating.

Learners will need access to library and ICT facilities with a range of relevant books, journals and software applications.

Employer engagement and vocational contexts

This unit will benefit from support from external companies, field trips and work experience in a dental laboratory.

Indicative reading for learners

Textbooks

Anderson J N – *Applied Dental Materials, 8th Edition* (Blackwell Science, 1998) ISBN 0632042087

Anusavice K J – *Phillip's Science of Dental Materials, 11th Edition* (WB Saunders, 2003) ISBN 0721693873

Craig R G and Powers J M – *Restorative Dental Materials, 11th Edition* (Mosby, 2001) ISBN 0323014429

Gladwin M A and Bagby M – *Clinical Aspects of Dental Materials* (Lippincott Williams and Wilkins) ISBN 0781743443

Van Noort R – *Introduction to Dental Materials, 2nd Edition* (C V Mosby, 2002) ISBN 0723432155

Journals

The British Dental Journal (Nature Publishing Group)

The Dental Technician (AE Morgan Publications Ltd)

Dental Technologies (CRG Publications)

Websites

www.bracon.co.uk

www.dentalexcellencetech.com

www.dentalexcellencetech.com

www.derweb.co.uk

www.dla.org.uk

www.dta-uk.org

www.metrodent.co.uk

www.qjdt.co.uk

www.us.elsevierhealth.com

www.zahndental.com

Bracon Dental Suppliers

Fundamentals of Esthetics (Dents TW Media)

Shades, a World of Colour (Dents TW Media)

Dental Education Resources

Dental Laboratories Association

Dental Technicians Association

Metrodent Dental Supplier

Quintessence Journal of Dental Technology

Journal of Prosthetic Dentistry

Zahn Dental Suppliers

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1] listing the constituents, properties and uses of dental alloys [IE2] reviewing the manipulation techniques for ceramics and composites
Creative thinkers	[CT2] reviewing the manipulation techniques for ceramics and composites
Self-managers	[SM2, SM3] duplicating models and appliances using various techniques and materials
Effective participators	[EP1] carrying out their risk assessment into the use of refractory materials

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE6] explaining their evidence during presentations and providing reasoned conclusions to their evidence
Creative thinkers	[CT4] questioning other learners about their conclusions to their dental alloy presentations
Reflective learners	[RL4] reacting to the feedback they receive following the completion of their practical task of duplicating models and appliances [RL6] delivering dental alloy presentations to their peers.
Team workers	[TM4] listening to peer presentations in a fair and considerate manner [TM7] acting in a responsible manner during a field trip to alloy supply companies
Self-managers	[SM3] managing their assignments setting goals and achievable targets
Effective participators	[EP1] carrying out a risk assessment into the use of refractory materials

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using computers to develop and deliver their presentations
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	recording information to present in a case study
Manage information storage to enable efficient retrieval	saving material and assignment files in organised folders
Follow and understand the need for safety and security practices	following associated health and safety procedures related to the use of computers and VDUs
Troubleshoot	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using multimedia software to formulate assignments
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	searching websites for information and demonstrating the ability to extract details that are relevant to the purpose of the task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	able to store and recall information electronically that satisfies the requirements of the grading criteria in this unit, eg ICT presentation on dental alloys
Bring together information to suit content and purpose	generating reports or essays which include essential data to inform the reader of the uses of a specific dental material, eg refractory dental materials
Present information in ways that are fit for purpose and audience	submitting evidence in a variety of formats to meet the requirements of the brief
Evaluate the selection and use of ICT tools and facilities used to present information	assessing their use of IT to produce documents and reflecting on their skill development needs in this area
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	communicating using email and chat rooms (Moodle) with peers and tutors, eg support for assignment development
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	using mixing ratios and quantity whilst using materials in an effective manner

Skill	When learners are ...
Identify the situation or problem and the mathematical methods needed to tackle it	investing multiple rings with refractory investment materials
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	finalising their projects and preparing them for submission or presentation
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in group discussions, assignment seminars and tutorials
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	researching material using books, journals and the internet
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing technical reports, case studies and essays following the requirements of the assignment brief

Unit 13: Techniques for Manufacturing Fixed Prosthodontics

Unit code:	L/600/7319
QCF Level 3:	BTEC National
Credit value:	15

● Aim and purpose

The aim of this unit is to enable learners to gain knowledge of the principles and techniques involved in the design and manufacture of fixed prosthodontics. It also links the importance of aesthetics, patient welfare and function in the manufacturing of custom-made appliances.

● Unit introduction

This unit gives learners an introduction to the manufacturing techniques used in fixed prosthodontic restorations. It will give them an insight into current methods of construction and the materials used. Learners will also have the opportunity to design and construct a range of fixed prosthodontic restorations and gain basic skills using a wide range of dental biomaterials.

Learning outcomes 1 and 2 and 5 provide learners with the knowledge and skills to produce metallic and non-metallic substructures.

In learning outcomes 3 and 4, learners will gain an understanding of the techniques required to build up ceramic and composite materials and will become skilled in the manipulation of these materials. Learners will appreciate the necessity of providing excellent aesthetic results restorations to the patient.

Finally, learners will discover methods of manufacturing temporary restoration and diagnostic wax-up techniques and be able to construct them using a variety of materials.

Learners will be made aware of necessary prescription requirements, health and safety precautions and quality measures required to produce these dental appliances.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know the manufacturing processes used to produce substructures
- 2 Be able to manufacture substructures
- 3 Know the principles of applying the aesthetic superstructure
- 4 Be able to build up the aesthetic superstructure
- 5 Be able to manufacture substructures for dental bridges
- 6 Be able to produce temporary restorations and diagnostic wax-ups.

Unit content

1 Know the manufacturing processes used to produce substructures

Manufacturing process: stages of manufacturing; methods for producing metal copings; methods for producing ceramic coping; methods for producing post and cores; spruing principles and techniques; application of investment materials; furnace burnout requirements; casting and melting methods; fitting and finishing processes; reasons for casting failures; soldering techniques; health and safety; relevant codes of practice

2 Be able to manufacture substructures

Construction methods: construction of commonly used metallic substructures, eg copings, post and cores, foils; wax pattern construction; spruing and investing; furnace burnout; melting metal and casting; fitting and finishing restorations; preventing casting failures; health and safety; relevant codes of practice

3 Know the principles of applying the aesthetic superstructure

Ceramic aesthetics: reasons for opaque application; methods of producing ceramic cores; ceramic build up techniques; methods and techniques for ceramic application; firing temperatures; staining and glazing techniques; characterising methods

Composite/polymeric aesthetics: opaque application; build up techniques; reasons for various curing cycles; finishing and characterising methods; health and safety; relevant codes of practice

4 Be able to build up the aesthetic superstructure

Ceramic aesthetics: metal preparation; opaque application; ceramic build ups; applying ceramics; condensing ceramics; firing ceramics; characterising ceramics; shade matching

Composite/polymeric aesthetics; building up composites/polymers; curing cycles for composites/polymers; finishing and characterising composites/polymers; shade matching; health and safety; relevant current codes of practice

5 Be able to manufacture substructures for dental bridges

Construction methods: construction of commonly used substructures, wax pattern construction; spruing and investing; furnace burnout; melting metal and casting; pressing ceramics; fitting and finishing of bridge restorations

6 Be able to produce temporary restorations and diagnostic wax-ups

Temporary restorations: construction techniques commonly used; material selection; shade matching

Diagnostic wax-ups: building up and shaping teeth; aesthetic implications; techniques to space fill

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 describe the methods of constructing substructures [IE2]	M1 describe current casting and melting methods, including common casting faults and their reasons	D1 explain the techniques for soldering, pre- and post-ceramic
P2 construct single-unit substructures for anterior and posterior restorations from given prescriptions, with substantial guidance [SM3]	M2 construct single-unit substructures for anterior and posterior restorations from given prescriptions, with limited guidance	D2 construct single-unit substructures for anterior and posterior restorations from given prescriptions, working independently
P3 identify the reasons for opaque application [IE1]	M3 describe methods of condensing ceramic and of staining and characterising ceramic and composite superstructure	D3 discuss firing and curing cycles, including why glazing and finishing methods are required
P4 describe the build-up techniques for ceramic and composite superstructures [IE4]		
P5 apply ceramic and composite materials to metal substructures for anterior and posterior restorations from given prescriptions, with substantial guidance [SM2]	M4 apply ceramic and composite to substructures for anterior and posterior restorations from given prescriptions, with limited guidance	D4 apply ceramic and composite to substructures for anterior and posterior restorations from given prescriptions, working independently
P6 construct substructures for anterior and posterior dental bridges from given prescriptions, with substantial guidance [SM3]	M5 construct substructures for anterior and posterior dental bridges from given prescriptions, with limited guidance	D5 construct substructures for anterior and posterior dental bridges from given prescriptions, working independently

P7 construct temporary restorations from given prescriptions, with substantial guidance [SM3]	M6 construct temporary restorations from given prescriptions, with limited guidance	D6 construct temporary restorations from given prescriptions, working independently
P8 construct diagnostic wax-ups from given prescriptions, with substantial guidance [SM3]	M7 construct diagnostic wax-ups from given prescriptions, with limited guidance	D7 construct diagnostic wax-ups from given prescriptions, working independently

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

The delivery of this unit should be designed to stimulate the learner using a wide range of media to include; formal lectures, discussions, Q&A sessions, practical activities and the use of ICT facilities. Site visits from subject specialists are recommended. Assessment may take the form of practical simulation, *vive voce*, summative examination and independent research in the form of written assignments.

Delivery

This unit should be delivered using a variety of teaching techniques to keep learners motivated. The unit gives learners practical and theoretical knowledge on the manufacturing of fixed prosthodontic restorations. Therefore the use of lectures, practical demonstrations, discussion, seminar presentations, supervised practicals, research using the internet and/or library resources and the use of personal and laboratory experience are all suitable methods of delivery.

Learners should complete work placements which should be monitored regularly in order to ensure the quality of the learning experience. During placements it would be beneficial if learners and supervisors were made aware of the requirements of this unit prior to any work-related activities, so that naturally occurring evidence could be collected at the time. For example, learners may have the opportunity to produce a range of simple fixed prosthodontic dental appliances such as waxing-up metal substructures or gold shell crowns and they should be encouraged to collect record sheets of work undertaken with supervisor comments regarding quality and standard.

Whichever delivery methods are used, it is essential that tutors stress the importance of patient welfare so learners understand why an appliance is made in such a way, dental technology techniques used for making the fixed prosthodontics and the importance of accuracy and quality.

Learners must be informed about health and safety issues relating to working in a dental laboratory when using hazardous materials and equipment. This should be regularly reiterated. Risk assessments must also be undertaken before practical activities.

Tutors should consider integrating the delivery, private study and assessment relating to this unit with other relevant units, for example *Unit 12: Complex Dental Materials Science*, *Unit 13: Techniques for Manufacturing Fixed Prosthodontics* and *Unit 5: Basic Dental Biomaterials Science*. These units will help learners understand tooth anatomy and morphology, which is extremely important when building up crowns. This will help make them aware of the different materials that could be used, and the advantages and disadvantages of each.

Learning outcomes 1, 2 and 5 are directly linked. Learners will become aware of the manufacturing methods for substructures and have the ability to produce a range of these substructures. These learning outcomes are likely to be delivered through formal lectures, demonstrations, discussions, work placements and independent learner research.

During delivery, health and safety issues must be addressed prior to learners using dental materials and equipment to undertake a given task. Adequate Personal Protective Equipment (PPE) must be provided and used following the production of suitable risk assessments.

Visiting expert speakers could add to the relevance of the subject, for example lectures and seminars where speakers could talk about their work, materials and methods of manufacture and give demonstrations. These could be dental supplies representatives or qualified dental technicians.

Learning outcomes 3 and 4 are directly linked and cover the principles of applying aesthetic bonded superstructures to the substructure. This gives learners the opportunity to build up the superstructures. Delivery techniques should be varied and can be linked to the delivery of learning outcomes 1 and 2.

It is expected that formal lectures, discussions, demonstrations, supervised practicals and work placements would form part of the delivery of this outcome.

Health and safety issues and patient welfare must be addressed before learners undertake any practical work. Adequate PPE must be provided and used following the production of suitable risk assessments.

Visiting expert speakers could add to the relevance of the subject for learners, for example an expert ceramist could demonstrate and discuss the importance of the aesthetic superstructure. Learners would gain experience and knowledge from work placements on different ceramic and composite materials.

Learning outcome 5 looks at the methods commonly used to produce temporary restorations. It is expected that formal lectures, demonstrations, supervised practicals and work placements will form part of the delivery of the outcome.

Health and safety issue and patient welfare must be addressed before learners undertake any practical work. Adequate PPE must be provided and used following the production of suitable risk assessments.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments.

Learning outcome 1

Introduce safety in laboratory – hazards appropriate to unit.

Describe the methods of constructing substructures.

Introduce stages of manufacturing.

Discuss methods for producing copings.

Discuss methods for producing post and cores.

Discuss spruing principles and techniques.

Identify furnace burnout requirements; casting and melting methods; fitting and finishing processes.

Describe current casting and melting methods, including common casting faults and their reasons.

Explain the techniques for soldering, pre- and post-ceramic.

Discuss Medical Devices Directive regulations; relevant current legislation and codes of practice.

Assignment 1: Sub-structure Production Techniques (PI, MI, DI)

Describe production techniques.

Topic and suggested assignments/activities and/assessment

Learning outcome 2

Health and safety; Medical Devices Directive regulations; relevant current legislation and codes of practice.

Demonstrate construction methods.

Demonstrate techniques for manufacturing copings.

Learners carry out manufacturing copings.

Demonstrate post and core manufacture.

Learners carry out post and core manufacture.

Learners practise wax pattern construction.

Learners practise spruing and investing techniques.

Demonstrate melting metal and casting; fitting and finishing restorations.

Demonstrate techniques for preventing casting failures.

Assignment 2: Produce a Single-unit Anterior and Posterior Coping and Prepare for Ceramic/Composite Application (P2, M2, D2)

Produce a single-unit anterior and posterior coping and prepare for ceramic/composite application.

Learning outcome 3

Ceramic bonding

Discuss aesthetics.

Discuss and demonstrate shade taking techniques.

Discuss reasons for opaque application.

Discuss ceramic application and build up techniques.

Discuss firing temperatures.

Discuss staining and glazing techniques.

Discuss characterising methods.

Composite/polymeric

Discuss opaque application.

Discuss building up composites/polymers.

Discuss curing cycles for composites/polymers.

Discuss finishing and characterising composites/polymers.

Assignment 3: Create a Stage-by-stage Build-up Chart for Ceramic (P3, M3, D3)

Create a stage-by-stage build-up chart for composite.

Create a stage-by-stage build-up chart for ceramic and create a stage-by-stage build-up chart for composite.

Topic and suggested assignments/activities and/assessment

Learning outcome 4

Ceramic bonded to metal/full ceramic.

Demonstrate metal preparation of copings for opaque application.

Learners carry out metal preparation of copings for opaque application.

Demonstrate opaque application.

Learners carry out opaque application.

Demonstrate ceramic build-ups, applying ceramics-condensing ceramics.

Learners carry out ceramic build-ups, applying ceramics-condensing ceramics.

Demonstrate firing ceramics.

Demonstrate characterising ceramics.

Demonstrate shade matching.

Composite/polymeric

Demonstrate opaque application.

Learners carry out opaque application.

Demonstrate building up techniques.

Learners carry out building up techniques.

Demonstrate curing cycles for composites/polymers.

Demonstrate finishing and characterising composites/polymers.

Demonstrate shade matching.

Assignment 4: Produce a Ceramic Restoration (P4, M4, D4)

Produce a composite restoration.

Produce a ceramic restoration and produce a composite restoration.

Learning outcome 5

Demonstrate wax pattern construction for bridges.

Learners carry out wax pattern construction for bridges.

Demonstrate spruing and investing techniques.

Learners carry out spruing and investment techniques.

Demonstrate melting metal and casting.

Learners carry out fitting and finishing restorations.

Assignment 5: Produce Multi-unit Anterior Substructure (P5, M5, D5)

Produce Maryland bridge substructure

Produce multi-unit anterior substructure and produce Maryland bridge substructure.

Topic and suggested assignments/activities and/assessment

Learning outcome 6

Temporary restorations

Demonstrate construction techniques commonly used.

Learners carry out construction of temporary restoration.

Demonstrate shade matching and characterisation.

Learners carry out shade matching and characterisation.

Diagnostic wax-ups.

Demonstrate diagnostic wax-up techniques.

Learners carry out diagnostic wax-up.

Demonstrate building up and shaping teeth.

Learners carry out building up and shaping teeth.

Demonstrate aesthetic implications.

Demonstrate techniques to space fill.

Assignment 6: Produce an Anterior Temporary Restoration (P6, M6, D6, P7, M7, D7)

Produce a diagnostic restoration.

Produce an anterior temporary restoration and produce a diagnostic restoration.

Review of unit and programme of assignments.

Assessment

Generic guidance on assessment

All learners are entitled to initial guidance in planning their work, but the level of assistance required should be taken into account when their work is assessed. In the assessment and grading grid, reference is made to learners working with 'substantial guidance', with 'limited guidance' and 'independently'. When assessing the work, assessors should apply the following guidelines.

'Substantial guidance': Learners have to be guided and advised throughout to ensure that progress is made. Learners rely on the support of the tutor, who has to assist in most aspects of the work. This level of support restricts Learners to a pass grade, irrespective of the quality of the evidence.

'Limited guidance': The tutor supports learners initially in the choice of topic for investigation. Thereafter, the tutor reacts to questions from learners and suggests a range of ideas that learners act upon. Learners frequently check matters of detail. The tutor needs to assist in some aspects of the work. This level of support restricts learners to a pass or a merit grade, irrespective of the quality of the evidence.

'Independently': The tutor supports learners initially in the choice of topic for the investigation or task. Thereafter, the tutor occasionally assists learners, and only when asked, but monitors progress throughout. This level of support gives access to all three grades; pass, merit and distinction.

All work produced needs to be manufactured to a clinically acceptable standard, using all health and safety and quality assurance requirement

Unit-specific guidance on assessment

To achieve a pass grade for the unit, learners must achieve the eight pass criteria listed in the grading grid.

For P1, learners will be expected to describe the methods commonly used to construct substructures. Learners will be expected to cover the range of methods listed in the unit content. Evidence for this could take the form of a pictorial presentation with an explanation a report with diagrams, an annotated poster or leaflet. It could also be linked to assessment for P2.

P2 requires learners to construct single-unit substructures for anterior and posterior restorations, with substantial guidance ready for the application of ceramic and composite materials from a given prescription. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Learners must be given the same type and complexity of appliance to ensure fairness of assessment. This criterion could be assessed through learners submitting a practical piece of work to be formally assessed or assessed directly by the tutor during practical activities. If the direct format is used suitable evidence from guided activities would be observed records completed by learners and tutor.

For P3, learners must identify the reasons for opaquing substructures and build up techniques for ceramic and composite materials. Learners will be expected to cover the range of methods listed in the Unit 3 content. Evidence may be in the same format as for P1.

P4 requires learners to describe commonly used build-up techniques for ceramic and composite superstructures. Evidence for this could take the form of a pictorial presentation with an explanation a report with diagrams, an annotated poster or leaflet. The evidence may be in the same format as P1.

P5 requires learners to apply ceramic and composite material to substructures, with substantial guidance from a given prescription. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. All learners must be given the same type and complexity of appliance to ensure fairness of assessment. The evidence may be in the same format as P2.

P6 requires learners to construct substructures for dental bridges, with substantial guidance, from a given prescription. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. The evidence may be in the same format as for P2.

P7 requires learners to design and construct temporary restorations, with substantial guidance, from a given prescription. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. The evidence may be in the same format as for P2.

P8 requires learners to design and construct a diagnostic wax-up, with substantial guidance, from a given prescription. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Where possible, the type and complexity of these should be the same for all learners to ensure fairness of assessment. The evidence may be in the same format as for P2.

M1 requires learners to describe current casting and melting methods, including common casting faults and their reasons. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Where possible the type and complexity of these should be the same for all learners to ensure fairness of assessment. It is not expected that learners will be required to use all of the methods listed in the unit content in learning outcome 6. The evidence may be in the same format as for P1.

M2 requires learners to design and construct substructures for anterior and posterior restorations, with limited supervision, ready for the application of ceramic and composite materials from a given prescription. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

M3 requires learners to describe the methods of condensing ceramic and include the methods used to stain and characterise restorations. This can be directly linked to work undertaken in P3. Evidence may be in the same format as for P1.

For M4, learners must design and apply ceramic and composite for anterior and posterior restorations from a given prescription with limited guidance. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

M5 requires learners to design and construct substructures for anterior and posterior restorations, with limited supervision, ready for the application of ceramic and composite materials from a given prescription. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

For M6, learners must construct temporary restoration from a given prescription with limited guidance. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

For M7, learners must construct diagnostic wax-up for anterior restorations from a given prescription with limited guidance. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

To achieve a distinction grade, learners must achieve all of the pass and merit criteria and the seven distinction grade criteria.

For D1, learners are required to explain the techniques used for pre- and post- ceramic soldering. This can be associated with M1. Evidence may be in the same format as for P1 or short-answer questions.

D2 requires learners to design and construct substructures for anterior and posterior restoration, working independently, ready for the application of ceramic and composite materials. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

D3 requires learners to identify firing and curing cycles and explain why glazing and finishing methods are required. This can be directly linked to P1 and M1. Evidence may be in the same format as for P1.

D4 requires learners to design and apply ceramic and composite to substructures for anterior and posterior restorations working independently. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

D5 requires learners to design and construct substructures for anterior and posterior restoration, working independently, ready for the application of ceramic and composite materials. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

For D6, learners must design and construct temporary restoration with ceramic and composite for anterior and posterior restorations from a given prescription with limited guidance. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

For D7, learners must design and construct diagnostic wax-up for anterior restorations from a given prescription working independently. Tutors should identify the given objectives which are likely to be driven by the requirements of the Medical Devices Directive. Tutors must ensure the fairness of assessment for all learners in making the complexity of the task the same. Evidence may be in the same format as for P2.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	Sub-structure Production Techniques	Your laboratory has asked for a detailed guide on manufacturing and casting procedures for their trainees to produce substructures.	Written account Identification and recording Diagrams
P2, M2, D2	Produce a Single-unit Anterior and Posterior Coping and Prepare for Ceramic/composite Application	A dentist has requested you make a single anterior and single posterior coping for a try-in prior to ceramic build up.	Coping manufacture Material preparation
P3, M3, D3	Create a Stage-by-stage Build-up Chart for Ceramic Create a Stage-by-stage Build up Chart for Composite	Your laboratory has requested a step-by-step-guide for producing ceramic and composite restorations for their trainees.	Written account Diagrams Charts
P4, M4, D4	Produce a Ceramic Restoration Produce a Composite Restoration	A dentist has sent in a prescription for a metal ceramic posterior crown and composite anterior crown.	Aesthetics Anatomical design Metal preparation Function
P5, M5, D5	Produce Multi-unit Anterior Substructure Produce Maryland Bridge Substructure	A dentist has requested a multi-unit anterior bridge and single anterior Maryland Bridge for a try-in prior to ceramic build up.	Coping manufacture Material preparation
P6, M6, D6 P7, M7, D7	Produce an Anterior Temporary Restoration Produce a Diagnostic Restoration	A dentist has sent in a prescription for a single-unit temporary restoration and requested a diagnostic wax-up for 4 anterior teeth.	Aesthetics Anatomical design Function

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology. This unit has particular links with:

Level 3
Unit 1: Fundamentals of Dental Technology
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 7: Dental Public Health and Preventative Dentistry
Unit 11: Design of Fixed Prosthodontics
Unit 12: Complex Dental Materials Science
Unit 18: Work-based Learning in Dental Technology.

Essential resources

A training dental laboratory equipped with appropriate benching, lighting, hand pieces, materials and machinery to manufacture the various appliances in this unit. The important materials for this unit are a ceramic system, composite, tooth-coloured acrylic, die stone, dental waxes, alloys, solder and investment materials. Machinery such as casting machines, furnaces, and light curing facilities are required. It is essential that a classroom is available for lectures, discussion and presentations. There must be library and ICT facilities available, access to journals, websites and professional bodies. Staff delivering this unit should be registered, competent and experienced dental technicians with an in-depth knowledge of the subject. Ideally, they should have recent industrial experience within a fixed prosthodontic department or laboratory, or show evidence of regular contact with the industry.

Employer engagement and vocational contexts

The manufacturing of fixed prosthodontics is an important part of dentistry. Custom-made dental appliances are essential for aesthetics and function and patient welfare. Where possible, learners should visit clinical and hospital departments or have visiting specialist lecturers from such establishments. Where this is not possible, learners should be provided with suitable resources, materials and simulation.

Indicative reading for learners

Textbooks

Ash M and Nelson S – *Wheeler's Dental Anatomy, Physiology and Occlusion, 8th Edition* (Saunders, 2003) ISBN 0721693822

Craig RG and Powers JM – *Restorative Dental Materials, 11th Edition* (Mosby, 2001) ISBN 0323014429

Gladwin B – *Clinical Aspects of Dental Materials* (Lippincott Williams & Wilkins, 2004) ISBN 0781743443

Hobkirk J, Watson R and Searson L – *Introducing Dental Implants* (Churchill Livingstone, 2003) ISBN 0443071853

McNeill C – *Science and Practice of Occlusion* (Quintessence, 1997) ISBN 0867153040

Naylor P – *Introduction to Metal Ceramic Technology* (Quintessence, 1992) ISBN 0867152370

Rosenstiel S F, Land MF and Fujimoto J – *Contemporary Fixed Prosthodontics, 3rd Edition* (Mosby, 2001) ISBN 081515559X

Shillingburg H T, Whitsett L D, Jacobi R and Brachett S – *Fundamentals of Fixed Prosthodontics, 3rd Edition* (Quintessence, 1997) ISBN 086715201X

Shillingburg H T, Wilson E L and Morrison J T – *Guide to Occlusal Waxing, 3rd Edition* (Quintessence, 2000) ISBN 0867153857

Smith B G – *Planning and Making Crowns and Bridges* (Taylor & Francis, 1998) ISBN 1853173142

Touati B, Nathanson D and Miara P – *Esthetic Dentistry and Ceramic Restorations* (Taylor & Francis, 1998) ISBN 185317159X

Van Noort R – *Introduction to Dental Materials, 2nd Edition* (Mosby Wolfe, 2002) ISBN 0723432155

Journals

Dental Dialogue (TW Media UK)

Dental Laboratory (The Dental Laboratories Association)

The Dental Technician (AE Morgan Publication Co Ltd)

Dental Technologies (CRG Publications)

Quintessence Journal of Dental Technology (Quintessence Publishing Co Ltd)

Websites

www.brsd.org

British Society for Restorative Dentistry

www.bda.org

British Dental Association

www.dentalexcellencetech.com

Shades, a World of Colour (Dents TW Media)

www.dentalexcellencetech.com

Fundamentals of esthetics (Dents TW Media)

www.dentalguide.co.uk/index.html

UK and Ireland Dental Guide

www.dental-technology.info

The Dental Digest

www.derweb.co.uk/index.html

Dental education resources on the web

www.dla.org.uk

Dental Laboratories Association

www.dta-uk.org

Dental Technicians Association

www.gdc-uk.org

General Dental Council

www.medical-devices.gov.uk/mda

Medical Devices Directive

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE2] describing the methods of constructing substructures [IE1] identifying the reasons for opaquing
Self-managers	[SM3] constructing substructures for anterior and posterior dental bridges from given prescriptions [SM2] applying ceramic and composite materials to substructures for anterior and posterior restorations

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Creative thinkers	[CT1] discussing firing and curing cycles, including why glazing and finishing methods are required

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	searching the internet entering data word processing documents to meet the requirements of assignments
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	reflecting on the way that an assignment has been tackled
Manage information storage to enable efficient retrieval	saving information in suitable files and folders
Follow and understand the need for safety and security practices	keeping food and drink away from computers ensuring they use their own login and password explaining how safety is addressed in the context of the tasks explaining why the IT usage policy forbids certain actions
Troubleshoot	carrying out checks to identify the source of a problem encountered, eg missing file of work
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using data from the internet, books, and data supplied by the tutor and the results of experiments, to describe and explain trends in properties
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	searching for data on trends in properties selecting appropriate data in trends in properties and evaluating whether it meets the requirements of the assignment task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	collating data in tables and writing about trends in data saving images of industrial production of substances and uses of substances keeping records of properties studied
Bring together information to suit content and purpose	collecting information in one file for editing into a suitable format
Present information in ways that are fit for purpose and audience	presenting information in the formats required in the assignment briefs
Evaluate the selection and use of ICT tools and facilities used to present information	evaluating whether the presentation of data is appropriate in terms of the grading criteria
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	sending emails to tutors with appropriate information attached demonstrating to tutors that email has been used appropriately responding to feedback on assignments

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	analysing possible casting faults, eg temperature
Identify the situation or problem and the mathematical methods needed to tackle it	analysing data on flexural strengths and hardness
Select and apply a range of skills to find solutions	using appropriate methods to tackle presentation problems, eg use of graphs
Use appropriate checking procedures and evaluate their effectiveness at each stage	analysing data firing parameters
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	estimating results; calculating using Excel or a calculator
Draw conclusions and provide mathematical justifications	writing reports about material strengths using suitable mathematical language
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in class discussions about how trends may be described. interacting with external, industrial speakers presenting data on materials
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading and comparing information from text and tables using persuasive language in writing an article on aesthetic
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing reports, articles and notes as required by assignment briefs



Unit 14: Quality Assurance in Dental Technology

Unit code:	J/600/7321
QCF Level 3:	BTEC National
Credit value:	5

● Aim and purpose

The aim of the unit is to enable learners to understand the laws and standards that apply to all dental laboratories in the running of their business. Learners will be able to use the information gained from this unit and be able to apply quality assurance procedures within a dental laboratory.

● Unit introduction

As dental technology has advanced, patients' expectations and knowledge of available treatment has also increased. The need for implementing and maintaining quality assurance has become an essential requirement within the dental laboratory to satisfy compliance with the current legislation and standards laid down by the Medical Devices Directive and customer-driven needs.

Those employed in dental technology must have knowledge and understanding of the laws and standards that determine quality assurance and ensure they comply and operate within them. This unit will provide learners with a general knowledge and understanding of the current legislation and standards that cover quality assurance in dental technology.

Learning outcome 1 looks at the concept of quality assurance. It will give learners an understanding of the development and application within dental technology so that laboratories are able to provide customers with quality products that are consistent, and provide safeguards which ensure the products supplied are constructed in a safe and appropriate manner.

Learning outcome 2 will outline current legislation and standards that govern and affect dental laboratories and their staff.

Learning outcome 3 ensures that learners fully understand how current quality assurance legislation can be used to create a quality system for a dental laboratory.

Learning outcome 4 ensures that learners will be able to gather information for quality control improvements and utilise it appropriately.

● Learning outcomes

On completion of this unit a learner should:

- 1 Understand the reasons for applying quality assurance in the dental laboratory
- 2 Know the current quality assurance legislation and standards that influence dental laboratories
- 3 Understand how current quality assurance legislation can be used to create a quality system for a dental laboratory
- 4 Be able to gather information that is needed when implementing procedures to improve future quality.

Unit content

1 Understand the reasons for applying quality assurance in the dental laboratory

Development: quality assurance in the dental laboratory setting

Definition: quality assurance; quality management; quality control

Importance of quality assurance: customer satisfaction and safety; consistency of products; personal safety and liability

Implications: of applying a quality assurance policy

2 Know the current quality assurance legislation and standards that influence dental laboratories

Current legislation: Medical Devices Directive (MDD); Data Protection Act and Personal Protective Equipment (PPE) legislation

Current standards: International Organisation for Standardisation 9000 (ISO 9000); Dental and Manufacturing Audit Scheme (DAMAS)

3 Understand how current quality assurance legislation can be used to create a quality system for a dental laboratory

Quality manual: work in accordance with a quality manual

Scope: standardised procedures; material selection and supply; quality planning; contract review; document and data control; product identification and traceability

Legislation: Medical Devices Directive (MDD); Data protection act and Personal Protective Equipment (PPE) legislation

4 Be able to gather information that is needed when implementing procedures to improve future quality

Documentation: record keeping; data storage; prescription requirements; product tracking; staff training; complaints

Effects: patient dissatisfaction; health implications to patients and technicians; payment disputes; legal action

Internal auditing: the need for internal auditing; basic internal auditing within the dental laboratory; review of updates regarding legislation

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 explain how quality assurance has evolved in the dental laboratory, including quality assurance, quality management and quality control [IE2] [RL5]	M1 describe how companies that have effective quality assurance procedures are more successful in business than those that do not	D1 evaluate how quality management, quality control and quality assurance have proved beneficial to a dental laboratory
P2 list the current quality assurance legislation and standards that are required to operate a dental laboratory within the law [CT2]	M2 identify processes in a dental laboratory where quality assurance can be applied	
P3 explain the importance of following procedures and maintaining records in the dental laboratory [IE4]	M3 explain how products can be tracked throughout their manufacturing process in a dental laboratory	D2 evaluate a basic internal audit for a dental laboratory, including how quality can be improved and implemented
P4 demonstrate how to keep records and audit trails for the benefit of the dental laboratory [CT5] [EP1]		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers CT – creative thinkers	RL – reflective learners TW – team workers	SM – self-managers EP – effective participators
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Essential guidance for tutors

Delivery and assessment guidance

It is essential that learners have access to a range of information resources, including access to the internet. Learners are required to engage with a specified dental laboratory as part of the unit assessment.

Delivery

The purpose of this unit is to develop an understanding of quality assurance and the impact it has when applied to business. A study into the evolution of quality assurance shows the learner how improvements in quality have evolved over the years and how consistency can be achieved.

Learners will need to use several sources to research the current legislation which affect dental technology and how they are adapted to comply with the Medical Devices Directive. Copies of relevant legal documents such as The Medical Devices Directive (MDD) Data Protection Act and Personal Protective Equipment (PPE) should be provided by the centre. These are relatively complex resources, so learners should be directed to the relevant parts they need to consider. Quality systems are individual to every laboratory and must comply with the legal requirements laid down by law. Learners gradually see how the documentation process is applied in the laboratory and records and files that have been developed can be used in audit trails. The audits carried out lead to improvements in several areas of the business which enable consistent quality to be achieved.

Learning outcomes 1, 2, 3 and 4 are directly linked. These are likely to be delivered through formal lectures, demonstrations, discussions, work placements and independent learner research. Learners will understand how to interpret the laws and standards which must be applied to all dental laboratories.

Learners will be able to see for themselves how compliance will safeguard the patient in safety and satisfaction.

Visits to a working dental laboratory environment give the learner an opportunity to see how quality systems are applied and would be beneficial at this stage of the learning process.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction to the unit and structure of the programme of assignments.
Learning outcome 1
A brief look into the evolution of quality assurance, when it began and how it has developed over the years.
Explain quality assurance.
Explain quality management.
Explain quality control.
Consider the requirements for customer satisfaction, safety and consistency of product.

Topic and suggested assignments/activities and/assessment
An introduction to personal safety and liability issues that may arise.
Understanding the reasons for applying quality assurance in the dental laboratory.
A group discussion based on the advantages and disadvantages of applying quality assurance.
Assignment 1: Evolution of Quality Assurance and the Introduction of Quality Systems into the Dental Laboratory (P1, M1, D1)
Learning outcome 2
Consider current legislation leading into the Data Protection Act and its application to a dental environment.
A look into the current standards and the international standards organisation (ISO9000).
Explain the voluntary scheme known as the Dental and Manufacturing Audit Scheme (DAMAS) and how it can be beneficial in a dental laboratory.
Assignment 2: Understanding the Current Legislation that Affects Dental Laboratories within the UK (P2, M2, D2)
Learning outcome 3
Discuss standard procedures, material selection and supply, quality planning, contract review, document and data control, product identification and traceability.
Investigate requirements concerning complaints procedures, disputes and legal action.
Discuss how to work in accordance with a quality manual.
Assignment 3: Applying the Quality Assurance System Within the Dental Laboratory and Dealing with a Complaint (P3, M3, D3)
Learning outcome 4
Know how to work in accordance with the quality manual.
Follow correct procedures for record keeping, data storage, prescription requirements.
Know how to carry out internal audits and audit trails.
Assignment 4: Traceability, Audit, Audit Trails and Why we Need to Use Them (P4, M4, D4)
Review of unit and programme of assignments.

Assessment

Generic guidance on assessment

Learning outcome 1 could be evidenced by a written report from the learner on the history of quality assurance. Findings could be recorded by using internet searches, information from lectures and information in the library resource centre.

Learning outcome 2 could be evidenced be evidenced through reading through the legislation on Medical Devices Directive (MDD), Data Protection Act and Personal Protective Equipment legislation (PPE). The research carried out can be written in the form of an assignment.

Learning outcome 3 could be evidenced by setting up a basic quality manual based on the Dental and Manufacturing Audit Scheme (DAMAS). This will include a prescription design to include contract review, standardised procedures, material handling, staff training records and data control.

Learning outcome 4 could be evidenced by writing an assignment on how the quality system has worked over a period of time and the stored data is retrieved, audited and reviewed. Recommendations from the findings are then determined and written into the system.

When applying the grading criteria, tutors should follow the advice below. Please note that the examples of evidence given here are indicative only. This advice is not inclusive.

To achieve a pass grade for the unit, a learner may require substantial assistance and guidance from the tutor to achieve all of the outcomes in this unit. Pass grade learners will be able to follow an assignment brief which guides them through the investigations. They are unlikely to be able to deviate from this guidance, for instance by developing their own ideas. They will be able to follow an investigative process and record information with some accuracy. They will use some correct terminology and be able to identify problems and errors. Much of the pass grade learner's work, whilst reasonably accurate, will be descriptive in nature.

For P1, learners must be able to explain how quality assurance has evolved in the dental laboratory. Their explanation should include quality assurance, quality management and quality control. Learners should be able to demonstrate an understanding of the importance and development of quality assurance as listed in the unit content. This could be evidenced in the form of a written report or a presentation using relevant ICT. Alternatively, P1 could be linked to P2 and P3 and submitted as a project.

P2 requires learners to list the current legislation available for the Medical Devices Directive, Data Protection Act and Legislation for Personal Protective Equipment. Evidence could be in the form of a written report or an oral presentation.

For P3, learners must show they understand why following procedures and maintaining records are important aspects of quality assurance in the dental laboratory. This could be evidenced in the form of a written report or a presentation using relevant ICT.

For P4, learners should use a real quality management system to collect and store information that will be used in improving the service provided by the laboratory.

Merit grade learners will generally work with more independence. They will be able to investigate and research with less initial, structured guidance and will be able to plan in more depth. They will identify some problems without prompting and be able to offer some solutions independently. Merit grade learners' work will be accurate and detailed from a description standpoint, but in addition it will offer some discussion, explanation and reasoning.

For M1, learners should look into the success of companies who have applied quality assurance procedures and make a comparison with those who have not.

For M2, learners must be able to identify areas within the dental laboratory where quality assurance could be applied. They will also have the opportunity to see whether the areas can be improved.

For M3, learners will need to explain traceability, how work is tracked throughout production and how data can be retrieved for audit purposes.

Distinction grade learners will work with significant autonomy and will not require detailed guidance from the tutor. They are likely to view the tutor as one resource among many. They will access and use a wide range of resources and be able to research material. Their planning and written work will be accurate and detailed. Their practical work will recognise the difficulties of recording information and look for alternative methods. There will be a tendency towards summative work and conclusions, plus an ability to see several sides to a discussion, problem or debate. Distinction level work will be accurate and detailed, as well as offering in-depth explanations and where appropriate, evaluation or assessment.

For D1, learners will look at the history of quality assurance and evaluate the effect on business success, and why it is relevant to dental technology.

For D2, learners will carry out a basic internal audit of a quality system for a dental laboratory. The findings will lead them to evaluate how the product can be improved.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	Evolution of Quality Assurance and the Introduction of Quality Systems into the Dental Laboratory	You are thinking of setting up your own dental laboratory. Before you can get started, you need to understand why quality assurance is applied to dental laboratories, how it started and why it is important for success in the business. Write a set of reference notes that you can use to help you understand the development of quality assurance and why it is important for dental laboratories.	Report using research obtained from lectures, handouts and notes internet searches and library resources.
P2, M2, D2	Understanding the Current Legislation that Affects Dental Laboratories Within the UK	Your employer, the owner of a dental laboratory, has asked you to write a report about the legal responsibility dental laboratories undertake in order to comply with quality assurance standards. Your reports should include all relevant current quality assurance legislation and standards that are required to operate a dental laboratory.	Assignment using handouts, information technology, and copies of the current legislation.
P3, M3, D3	Applying the Quality Assurance System within the Dental Laboratory and Dealing with a Complaint	You have been asked by your employer to write a report on how a quality assurance system is put into practice in a dental laboratory and work is tracked through the system. Write this report, including an example of how to deal with a complaint.	Assignment using handouts, information technology, and copies of the current legislation.

Criteria covered	Assignment title	Scenario	Assessment method
P4, M4, D4	Traceability, Audit, Audit Trails and Why we Need to Use Them	You have been asked to write a reference guide on audit trails for employees in a dental laboratory. The reference guide should give an explanation of the whole manufacturing process is carried out and used to improve quality.	Assignment using handouts, information technology, and copies of the current legislation.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology. This unit has particular links with:

Level 3
Unit 1: Fundamentals of Dental Technology
Unit 2: Medical Emergencies, First Aid and Communication in the Dental Team
Unit 3: Dental Technology Techniques
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 5: Basic Dental Biomaterials Science
Unit 6: Legislation, Professionalism and Ethics in Dentistry

Essential resources

Access to a PC for internet-based research and relevant audio/visual presentations as required, laboratory quality manuals, access to a dental laboratory, and library access for journals and research facilities will be required.

Staff delivering this unit should be competent and experienced in the delivery of quality assurance. It is highly desirable that they should have knowledge of the current laws and standards that impact on dental technology.

Employer engagement and vocational contexts

It is essential for the success of the unit, that employers actively involve learners fully with the quality system within the laboratory. Learners need to be shown a working model to fully understand how a quality system is integrated into everyday life in a modern dental laboratory.

Indicative reading for learners

Textbooks

Dale B G – *Managing Quality* (Blackwell, 2003) ISBN 0631236147

Hoyle D – *ISO 9000:2000 the A to Z Guide* (Butterworth-Heinemann, 2002) ISBN 0750658444

Hoyle D – *ISO 9000: Quality Systems Handbook* (Butterworth-Heinemann, 2000) ISBN 0750644516

Peach Robert W, Peach B and Ritter DS – *The Memory Jogger 9000/2000: A Pocket Guide to Implementing the ISO 9001 Quality Systems Standard* (Goal Q P C Inc, 2000) ISBN 1576810321

Seddon J – *The Case Against ISO 9000: How to Create Real Quality in Your Organisation* (Oak Tree Press, 2000) ISBN 1860761739

Journals

GDC Gazette (Published by the General Dental Council)

The Dental Laboratory Magazine (Dental Laboratory Association Ltd)

The Dental Technician (AE Morgan Publications Ltd)

Websites

www.dla.gov.uk

Dental Laboratories Association for details on Dental and Manufacturing Audit Scheme

www.hse.gov.uk

Health and Safety Executive

www.iso.org

International Standards Organisation

www.isoqar.com

ISOQAR – Quality Assurance Auditors

www.mrha.gov.uk

MRHA – Medicines and Healthcare Products Regulatory Agency

www.qmuk.co.uk

Quality Management UK

www.wikipedia.org

History of Quality Assurance

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE2] explaining how quality assurance has evolved in the dental laboratory [IE4] explaining the importance of following procedures and maintaining records in the dental laboratory
Creative thinkers	[CT2] listing current quality assurance legislation and standards [CT5] demonstrating how to keep records and audit trails for the benefit of the dental laboratory
Reflective learners	[RL5] explaining how quality assurance has evolved in the dental laboratory
Effective participators	[EP1] demonstrating how to keep records and audit trails for the benefit of the dental laboratory

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Reflective learners	[RL2] keeping records and audit trails, setting goals with success criteria for their work
Team workers	[TW6] looking at records and audit trails in the laboratory, providing constructive support and feedback to others
Self-managers	[SM6] keeping records and audit trails for the benefit of the laboratory, responding positively to change, seeking advice and support from others where needed

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	searching the internet word processing documents to meet the requirements of the assignment
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	
Manage information storage to enable efficient retrieval	saving information in suitable files and folders (eg memory stick)
Follow and understand the need for safety and security practices	keeping food and drink away from computers ensuring they use their own login and password explaining how safety is addressed in the context of the tasks explaining why the IT usage policy forbids certain actions
Troubleshoot	carrying out checks to identify the source of a problem encountered, eg missing a particular file of work
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	using data from the internet, books, and data supplied by the tutor
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	evaluating whether the data collected meets the requirements of the assignment task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	collating data from legislation and writing about the relevance to dental laboratories taking digital photographs and uploading these into suitable files saving images for use in assignments keeping records for audit use
Bring together information to suit content and purpose	collecting information in one file for editing into a suitable format
Present information in ways that are fit for purpose and audience	presenting information in the formats required for the assignment briefs
Evaluate the selection and use of ICT tools and facilities used to present information	evaluating whether the presented data is appropriate in accordance with the grading criteria
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	sending emails to tutors with appropriate information attached; demonstrating to tutors that email has been used appropriately; responding to feedback on assignments

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	carrying out audit trails involving mathematical data which needs to be understood and applied to a quality assurance context
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in class discussions about how trends may be described interacting with external, industrial speakers
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading and comparing information from text and tables using persuasive language in writing an article about quality assurance in dental laboratories
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing reports, articles and notes that are required to complete the assignments briefs

Unit 15: Principles of Orthodontic Therapy Regimes

Unit code:	H/600/7326
QCF Level 5:	BTEC National
Credit value:	5

● Aim and purpose

The aim of this unit is to enable learners to gain knowledge and understanding of the rationale of orthodontics, normal and abnormal tooth eruption, occlusion and malocclusion. Learners will become familiar with the techniques and therapy regimes that are used to modify tooth eruption and occlusion.

● Unit introduction

The dental technician's primary role in the workplace is to manufacture dental devices. To do this it is very important that the technician understands the need for orthodontics in society, the changes in oral tissues that the devices produce and how these changes occur.

It is important that learners undertaking this area of study should gain understanding of the principles and theories of orthodontic therapy, and an awareness and appreciation of the full range of orthodontic treatment regimes: simple removable orthodontic therapy, fixed orthodontic therapy and functional appliance therapy.

This unit deals with the area of dental technology concerned with knowledge and understanding of normal and abnormal tooth eruption, both in deciduous and permanent teeth and how this may affect occlusion or may be one of the determining factors of malocclusion.

As the correction of malocclusion is the main purpose of orthodontic treatment, the classification of malocclusion is covered to ensure that affective communication occurs between clinician and technician when discussing the details of patients' malocclusion.

To correct malocclusions tooth movement is often needed. These tooth movements occur through the application of forces. These forces and their application need to be understood to be able to design and manufacture appliances that will create the oral changes detailed in the treatment plans.

In addition, learners should develop an understanding of anchorage, retention and extra-oral traction to control tooth movement and to aid in the design of effective appliances.

This unit provides the theoretical background knowledge that is necessary to produce orthodontic appliances to a clinically acceptable standard.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know the rationale for orthodontic therapy
- 2 Know the theory and features of occlusion
- 3 Understand the theory of physiological tooth movement in the human dentition
- 4 Understand the principles and concepts of active orthodontic therapy regimes.

Unit content

1 Know the rationale for orthodontic therapy

Aims and objectives: the scope and limitations of orthodontic therapy; need for treatment; principles of treatment planning, importance of diagnostic aids eg radiographs

Indications and contra-indications: factors related to the success of orthodontic treatment; common causes of treatment failure; dental health

Benefits, disadvantages and potential risks: benefits (function, aesthetics, speech, psychological wellbeing, dental health); disadvantages and potential risks (root resorption, loss of periodontal support, decalcification, soft tissue damage)

2 Know the theory and features of occlusion

Occlusion: principles of ideal occlusion; ideal occlusion compared to malocclusion; mal-position of individual teeth; limitations of removable orthodontic therapy to achieve ideal occlusion

Malocclusion: aetiology and classification; Angle's classification; incisor classification; skeletal classification; mal-relationship of the dental arches; disorders related to the development of malocclusion

3 Understand the theory of physiological tooth movement in the human dentition

Tooth movement: physiological changes; influence; application of forces

Recording tooth movement: methods used to record tooth movement and position, as evidence of successful orthodontic planning and treatment

Adult orthodontics: possible difficulties encountered; orthodontics in conjunction with restorative dentistry

4 Understand the principles and concepts of active orthodontic therapy regimes

Simple removable appliance therapy: principles; modes of action; indications and contra-indications; advantages and disadvantages; progress monitoring

Fixed appliance therapy: principles; indications for usage; advantages and disadvantages; treatment planning; fixed appliance systems, orthodontic implants.

Functional appliance therapy: principles of application; mode of action; scope; indications and contra-indications

Retention: definition; reasons for provision; consideration of provision; retention regimes

Anchorage: definition; concept (applied force, reaction force); types of anchorage (simple, compound, stationary, reciprocal); anchorage loss; factors affecting anchorage

Extra-oral anchorage and traction: purpose; distinction between extra-oral anchorage (EOA) and extra-oral traction (EOT)

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 outline the rationale for orthodontic treatment [IE1, IE2] [CT 2]	M1 describe factors that can relate to the success or failure of orthodontic treatment	D1 discuss the benefits, disadvantages and potential risks associated with undertaking orthodontic treatment
P2 describe the formation of an ideal occlusion [CT 1]	M2 explain the formation of an ideal occlusion emphasising factors related to tooth eruption	D2 analyse the differences between ideal occlusion and malocclusion
P3 outline Angle's classification of malocclusion		
P4 explain orthodontic tooth movement and how these movements are recorded	M3 explain how variations in the use of applied forces can influence and affect orthodontic tooth movement	D3 discuss the possible difficulties encountered when undertaking adult orthodontic treatment, with the emphasis on tooth movement
P5 outline the basic modes of action of the three principal forms of orthodontic therapy, namely simple removable, fixed and functional [IE3, IE4]	M4 describe how the modes of action of the three principle forms of orthodontic therapy can influence the treatment regime undertaken	D4 evaluate the modes of action of the three principle forms of orthodontic therapy
P6 explain the physiological process of orthodontic tooth retention	M5 explain the need for orthodontic tooth retention	D5 evaluate the different categories of orthodontic tooth retention
P7 explain various types of orthodontic anchorage	M6 explain factors that affect orthodontic anchorage	D6 explain the principle differences between extra-oral anchorage (EOA) and extra-oral traction (EOT)

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

Learners will need access to examples of aids to treatment planning, orthodontic appliances and components, both laboratory-produced and clinical. Access to a clinical environment or resources such as video, typodonts and other types of instructional models would be advantageous when studying the theory of orthodontics.

Delivery

This unit is designed to give learners a general level of knowledge and understanding of normal and abnormal tooth eruption, occlusion and malocclusion and the different techniques and regimes that can be employed to correct and modify these by controlled tooth movement.

Tutors delivering this unit should consider integrating the delivery, private study and assessment relating to this unit with other relevant units that form part of the programme of study. The learning outcomes of this unit are closely linked to *Unit 16: Design, Manufacture and Modification of Removable Orthodontic Appliances* and also to the knowledge acquired from the study of *Unit 4: Dental Anatomy, Oral Biology and Disease*.

It is envisaged that formal teaching will be utilised at the outset of each topic area, involving the use of associated theory and understanding to form links with *Unit 17: Advanced Dental Technology Techniques and Procedures*.

Assignments structured around each learning outcome will enable learners to expand and develop their understanding of each specific topic area.

Delivery should be structured to stimulate, motivate and enthuse learners through the use of a wide range of delivery methods and media, including lectures, question and answer discussion and video. Research using CD ROMs, the internet and library resources would all be suitable methods of information retrieval. The use of literature and product descriptors from orthodontic supply and manufacturing companies would be an excellent source of invaluable information. Visiting specialist speakers could add to the relevance of the subject for learners. It is recognised that some degree of clinical observation would also prove to be invaluable although not always practicable.

Learning outcome 1 is likely to be delivered through lecture discussion, independent research, the use of factual or fictional case studies to promote discussion and recognised methods/systems for recording of treatment progress, ie radiographs, study models and photographs. Learning outcome 1 will introduce learners to the rationale and principles of orthodontic therapy, from which they should begin to develop a sound understanding of orthodontic theory. Learners will gain an understanding of the scope and limitations of orthodontic treatment regimes, together with the advantages and disadvantages, potential risks and benefits associated with such treatment.

In learning outcome 2 learners will gain knowledge of the concepts and features of ideal occlusion and classification of malocclusion. The aetiology of malocclusion will be explored, including skeletal, soft tissue and local factors, revisiting the theory of tooth eruption (*Unit 4: Dental Anatomy, Oral Biology and Disease*).

The unit is likely to be delivered through formal lecture, set formative exercises and self-supported learning. Ideally, the learning experience would be greatly enhanced by periods of clinical observation. Where this does not prove to be practicable learners should have access to a range of anatomical models to realise a three-dimensional experience. High quality audio-visual materials should also be used to describe and illustrate occlusion and malocclusions that cannot be visualised by other means.

In learning outcome 3, learners will gain and develop their knowledge and appreciation of the principles of physiological tooth movement under the influence of applied forces, the application of forces and the recording of these movements. This section of the unit will conclude by giving learners a basic awareness in the growing call for adult orthodontics. Learners will gain an insight into the difficulties posed by adult orthodontics, and how orthodontics and restorative dentistry can complement each other.

Learning outcome 4 is designed to form an essential link with *Unit 1 6: Design, Manufacture and Modification of Removable Orthodontic Appliances*. This outcome covers how removable appliances work, modes of action, the indications and contraindications for the use of removable appliance therapy, and the advantages and disadvantages of removable appliance therapy. The outcome will continue by introducing learners to the principles of fixed orthodontic therapy and the greater range and more complex forms of tooth movement that cannot be achieved with removable appliances. As with the section covering removable appliances, learners will gain knowledge of the indications and contraindications for the use of fixed appliance therapy, their place in treatment planning and the numerous clinical systems and laboratory produced appliances that are available. This section of the unit will conclude by introducing learners to functional appliance therapy, a unique area of orthodontics. Learners will gain knowledge of the modes of action, and indications for the use of functional appliances.

Concepts of retention will be discussed, including what retention is in orthodontics, changes to the tissues, reasons for using retention, use of short- medium- and long-term retention regimes and the design of retentive appliances. Anchorage – including simple, compound, stationary and reciprocal will need to be explained. Extra oral anchorage and extra oral traction will be discussed, comparing the action of the two regimes. Delivery methods are likely to be formal lectures, tutorials, internet, the use of factual or fictional case studies to promote discussion and independent learner research.

Learning outcome 4 will provide learners with knowledge of the principles and concepts of the three primary orthodontic therapy regimes, the reasons and considerations for the provision of retention, and an introduction to the concepts and provision of anchorage (also encompassing extra-oral anchorage and extra-oral traction). Sections of this learning outcome provide strong links with *Unit 1 6: Design Manufacture and Modification of Removable Orthodontic Appliances*.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments.

Learning outcome 1

Discussion of the theory introducing orthodontics, including the need for treatment, the scope and limitations of orthodontic therapy.

Discussion of the theory outlining principles of treatment planning, including a practical related to treatment planning, cephalometrics, IOTN.

Consider factors related to the success of orthodontic treatment; common causes of treatment failure; dental health.

Discuss benefits and risks of orthodontic treatment.

Assignment 1: Why do you Need Orthodontic Treatment? (P1, M1, D1)

Learning outcome 2

Investigate eruption patterns of deciduous and permanent teeth.

Investigate eruption related to occlusion (linked to *Unit 5*).

Know how to outline occlusion/malocclusion.

Understand the theory and undertake practical exercises related to classification of malocclusion.

Describe malposition of individual teeth and mal-relationship of the dental arches.

Examining disorders related to malocclusion.

Assignment 2: Occlusion and Malocclusion, the Foundation of Orthodontics (P2, M2, D2, P3)

Learning outcome 3

Discuss physiological changes of tooth supporting and related tissues during tooth movement.

Examine the factors that influence tooth movement, and the application of force to achieve tooth movement.

Understand principles and undertake practical exercises related to recording tooth movement: methods used to record tooth movement and position, as evidence of successful orthodontic planning and treatment (linked to learning outcome 1).

Group discussion regarding possible difficulties encountered when treating adults

Understand principle of examining orthodontics in conjunction with restorative dentistry.

Assignment 3: Orthodontic Therapy Regimes (Removable and Fixed) and Functional Orthodontic Appliance Therapy (P5, M4, D4)

Topic and suggested assignments/activities and/assessment

Learning outcome 4

Investigate theory covering simple removable appliance therapy: principles; modes of action; indications and contraindications; advantages and disadvantages; progress monitoring.

Investigate theory examining fixed appliance therapy: principles; indications for usage; advantages and disadvantages; treatment planning; fixed appliance systems.

Investigate theory related to functional appliance therapy: principles of application; mode of action; scope; indications and contra-indications.

Investigate theory covering retention: definition; reasons for provision; consideration of provision; retention regimes.

Investigate theory of anchorage: definition; concept (applied force, reaction force); types of anchorage (simple, compound, stationary, reciprocal); anchorage loss; factors affecting anchorage.

Investigate theory relating to extra-oral anchorage and traction: purpose; distinction between extra-oral anchorage (EOA) and extra-oral traction (EOT).

Assignment 4: A study of the Principles of Orthodontic Tooth Movement, Anchorage and Retention (P4, M3, D3, M4, D4, P5, M6, D6, P7)

Review of unit and programme of assignments.

Assessment

Most of the evidence for this unit will be generated from a series of assignments designed to encompass the documented grading criteria for each of the four learning outcomes: further evidence will be generated and documented by *vive voce* where appropriate. It is suggested that one assignment is designed to cover one learning outcome: the material for these assignments will be gained through formal study, and from information researched and collated during private study. The assignments can be stand alone or integrated with the content of other units that form links within the general framework of study.

However, with integrated assignments, care should be taken to ensure that learners meet the assessment criteria for each unit and that they record this appropriately.

To achieve a pass grade for the unit, learners must achieve all of the pass criteria as documented in the grading grid. To achieve a merit grade, learners must achieve all of the pass criteria plus all of the merit criteria as documented in the grading grid. To achieve a distinction grade, learners must achieve all of the pass criteria and merit criteria plus all of the distinction criteria as documented in the grading grid.

For P1, learners are expected to outline the rationale of orthodontic therapy. This will include information about the prevalence of malocclusion, the need and demand for treatment, treatment need (IOTN), dental health and psychological wellbeing. The evidence could be presented as an individually written document, a formal presentation or form part of a structured assignment that also encompasses M1 and D1.

P2 requires learners to outline the process of the formation of an ideal occlusion and consider tooth eruption, bone growth, and external factors such as diet and habits. Evidence may be in the same format as for P1 or form part of a structured assignment to satisfy learning outcome 2.

For P3, learners are required to show an understanding of Angle's classification of malocclusion. Evidence may be in the same format as for P1 or form part of a structured assignment that encompasses M2 and D2 to satisfy learning outcome 3.

P4 requires learners to explain the biological process of orthodontic tooth movement and methods employed to record these movements, physiological changes in the supporting tissues and application of forces. The evidence could be linked to the evidence for P1 or form part of a structured assignment that encompasses M3 and D3 to satisfy learning outcome 4.

P5 covers the three main forms of orthodontic therapy, those being simple removable therapy, fixed therapy and functional therapy. Learners must include information regarding modes of action and the advantages and disadvantages of each type of therapy.

P6 requires learners to produce evidence which defines and demonstrates an understanding of the physiological changes that occur in the oral tissues during orthodontic tooth retention. The evidence could be linked to the evidence for P1 or form part of a structured assignment that encompasses M6 and D6.

For P7, learners are required to demonstrate a basic understanding of anchorage; simple, reciprocal, complex, inter and intra maxillary. This could take the form of a written document which defines anchorage and outlines the various types of anchorage. (This information can be used as a foundation for M6 and D6.)

M1 requires learners to describe factors that influence the success or failure of orthodontic treatment. The evidence produced for P1 can be expanded on and discussed in greater detail; other factors to take into account include treatment planning, patient cooperation and patient suitability. The evidence could be presented as part of P1 or form part of a structured assignment that encompasses D1 to satisfy learning outcome 1.

M2 requires learners to explain fully the process of tooth eruption and the factors that can affect the formation of an ideal occlusion. Evidence produced for P2 must be explained and expanded upon to include the influence of local and general factors, eg tooth size to arch size ratios, soft tissue factors, habits. The evidence could be presented as part of P2 or form part of a structured assignment that encompasses D2 to satisfy learning outcome 2.

For M3, learners must show an understanding of how variations in the use of applied forces can influence and affect orthodontic tooth movement. Evidence could be in the form of a written document or a presentation. The evidence must make reference to the type of therapy used, the direction of applied force and strength of applied force. The evidence could be presented as an individually written document or form part of a structured assignment that encompasses D3 to satisfy learning outcome 3.

M4 requires learners to describe the modes of action of the three principle forms of orthodontic therapy and how this influences the treatment regime undertaken. Factors such as tooth movement required, single arch or both, and skeletal classification must be covered. The evidence could be presented as an individually written document or form part of a structured assignment that encompasses D4 to satisfy part of learning outcome 4.

For M5, learners could adapt and expand the evidence documented in P6 to describe the biological process and need for orthodontic tooth retention. (The information can be used as a precursor to D5.)

M6 requires learners to explain the various types of anchorage and the factors that can affect their application; the evidence documented in P7 could be adapted and expanded to form part of this criteria. (The information can be used as a precursor to D6.) The evidence could be presented as an individually written document or form part of a structured assignment that encompasses D6 to satisfy learning outcome 4.

For D1, learners are required to explain fully the benefits, disadvantages and potential risks associated with the various forms of orthodontic treatment. The information must encompass root resorption, loss of periodontal support, decalcification, soft tissue damage and TMJ dysfunction. The documented evidence generated for P1 and M1 can be utilised and expanded. The evidence could be presented as an individually written document or a formal presentation.

D2 requires learners to compare and contrast the differences between ideal occlusion and malocclusion as described by Angle in terms of formation and affect on the patients' oral health. The evidence could be presented as an individually written document or combined with evidence from P2, P3 and M2 to form part of a structured assignment to fulfil the requirements of learning outcome 2.

For D3, learners are required to discuss independently the difficulties that could possibly be encountered when adults undertake orthodontic treatment. Emphasis must be placed on tooth movement, cell regeneration and reduced vascularity. The evidence could be presented as an individually written document or combined with evidence from P4 and M3 to form part of a structured assignment to fulfil the requirements of learning outcome 3.

D4 requires learners to fully explain the modes of action of the three principal forms of orthodontic therapy, ie the systems/methods employed to physically move the teeth. The evidence could be presented as an individually written document or combined with evidence from P5 and M4 to form part of a structured assignment to fulfil the requirements of learning outcome 4.

D5 requires learners to explain in detail the different categories of orthodontic retention (short term, medium term, long term) and the reasons for the utilisation of these different regimes. The evidence could be presented as an individually written document or combined with evidence from P6 and M5 to form part of a structured assignment.

For D6, learners are required to explain in detail the purpose, principles and distinct differences between extra-oral anchorage (EOA) and extra-oral traction (EOT). The evidence could be presented as an individually written document or combined with evidence from P7 and M6 to form part of a structured assignment.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
PI, M1, D1	Why do you need Orthodontic Treatment?	The orthodontic practice that most of your work comes from has asked you to give a presentation to a group of their new dental nurses. This is to help them explain to patients the need for orthodontic treatments, what the patient and dental team can do to ensure its success, and the benefits and problems that may arise during or after treatment.	Formal multimedia presentation to peers and/or report

Criteria covered	Assignment title	Scenario	Assessment method
P2, M2, D2, P3	Occlusion and Malocclusion, the Foundation of Orthodontics	The correction of malocclusion is the reason for orthodontic treatment. You are required to write a report, to be published in an oral health booklet, for your local health centre. It will explain to the public what malocclusion is, how it may be identified and the factors that can cause it.	Written report in the form of a booklet
P5, M4, D4	Orthodontic Therapy Regimes (Removable and Fixed) and Functional Orthodontic Appliance Therapy	The GDC has asked for a submission from you in their magazine describing the treatment regimes and the appliances available from the orthodontic team. The article should be broad ranging in content and technical detail, so as to interest all members of the dental team.	Report or magazine article
P4, M3, D3, P6, M5, D5, P7, M6, D6	A study of the principles of Orthodontic Tooth movement, Anchorage and Retention	The science behind tooth movement and retention is always being updated as new discoveries are made. A presentation is required from you by a dental study group that you contribute to. You have been asked to examine the physiological aspect of tooth movement in orthodontics, the use of extra-oral anchorage and traction, and the retention required post treatment, highlighting the potential difficulties in treatment for the increasing number adult patients.	ICT presentation and or supporting written report

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology suite. This unit has particular links with:

Level 3
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 7: Dental Public Health and Preventative Dentistry
Unit 10: Dental Radiology and Imaging
Unit 12: Complex Dental Materials Science
Unit 16: Design, Manufacture and Modification of Removable Orthodontic Appliances

Essential resources

This unit should be delivered by vocationally-specific lecturers who can, where appropriate, link the theoretical aspects of this unit to the production of custom-made dental devices in associated practical units. Learners will need access to a range of specialist visual aids, natural and simulated human teeth, other appropriate anatomical models. Adequate library resources should be available with access to ICT facilities, the internet and a range of appropriate journals.

Employer engagement and vocational contexts

Employers should be approached to provide subject specific expertise and laboratory cases for discussion. Clinicians may be approached to deliver parts of the unit or to provide opportunities for the viewing of live cases by learners.

All the content of this unit should be presented from a vocational context where possible.

Indicative reading for learners

Textbooks

Bath-Balogh M and Fehrenbach M – *Illustrated Dental Embryology, Histology and Anatomy* (Saunders, 2002) ISBN 0721601138

Bishara S E – *Textbook of Orthodontics* (Saunders, 2001) ISBN 0721682898

Clark W J – *Twin Block Functional Therapy: Applications in Dentofacial Orthopaedics* (Mosby, 2002) ISBN 0723431701

Downer C G – *Dental Morphology* (Butterworth-Heinemann, 1983) ISBN 0723606668

Gill D S – *Orthodontics at a Glance* (Blackwell, 2008) ISBN 9781405127882

Ireland A J and McDonald F – *The Orthodontic Patient: Treatment and Biomechanics* (Oxford, 2003) ISBN 978-0-19-851048-2

Jones ML and Oliver RG (Editors) – *Walther & Houston's Orthodontic Notes* (Wright, 2000) ISBN 0723610657

Krishnan V and Davidovitch Z (Editors) – *Biological Mechanisms of Tooth Movement* (WileyBlackwell, 2009) ISBN 978-1-4051-7690-3

Lee J S – *Application of Orthodontic Mini-Implants* (Quintessence, 2007) ISBN 978-0-86715-465-8

McNeill C – *Science and Practice of Occlusion* (Quintessence, 1997) ISBN 0867153040

Mitchell L – *An Introduction to Orthodontics, 3rd Edition* (Oxford, 2007) ISBN 978-0-19-856812

Proffit WR and Fields HW – *Contemporary Orthodontics, 4th Edition* (Mosby, 2007) ISBN 13: 978-0-323-04046-4

Vanarsdall R L, Vig K W L and Graber T M – *Orthodontics: Current Principles and Techniques, 4th Edition* (Mosby, 2005) ISBN 0323026214

Journals

BSI – *British Standard Dental Vocabulary* (British Standards Institute)

The Dental Technician (AE Morgan Publications Ltd)

Dental Technologies (CRG Publications)

General and Clinical Terms (BS EN 21942)

Quintessence Journal of Dental Technology (Quintessence Publishing)

Websites

www.bda.org

British Dental Association

www.bsrd.org

British Society for Restorative Dentistry

www.cdta.org.uk

Clinical Dental Technicians Association

www.dentalguide.co.uk

UK and Ireland Dental Guide

www.dentstar.co.uk

International Dental internet Resources

www.dental-technology.info

The Dental Digest

www.derweb.co.uk

Dental Education Resources on the web

www.dta-uk.org

Dental Technicians Association

www.healthcare.org.uk

Dental Links

www.the-probe.co.uk

The Probe

www.orthota.co.uk

Orthodontic Technicians Association

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1, IE2] outlining the rationale for orthodontic treatment [IE3, IE4] outlining the three principal forms of orthodontic therapy
Creative thinkers	[CT1] describing the formation of an ideal occlusion [CT2] outlining the rationale for orthodontic treatment

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE6] using reasoned arguments to support answers during group discussions as part of learning activities
Creative thinkers	[CT3, CT4] presenting assignment work related to the criteria being assessed [CT2, CT6] presenting personal or group work using various media, and when completing class-based learning exercises
Reflective learners	[RL1, RL3] examining feedback from assessment work, or group discussions
Team workers	[TW1, TW2, TW3, TW4, TW5] working with groups, or having to work with limited resources
Self-managers	[SM2, SM3, SM5, SM6] managing their time efficiently to produce non-assessed work
Effective participators	[EP1, EP2, EP4, EP5] investigating new concepts, questioning theory or other learners' ideas in an effective and balanced way, during class discussions

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	researching all parts of assessed work, using the internet, and word processing
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	researching all parts of assessed work, using the correct multimedia tools to present work
Manage information storage to enable efficient retrieval	planning assessed work and presenting it
Follow and understand the need for safety and security practices	
Troubleshoot	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	researching all aspects of the unit either for personal study or assessed pieces of work
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	researching all aspects of the unit either for personal study or assessed pieces of work
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	preparing research to be presented either as class activities or assessed pieces of work
Bring together information to suit content and purpose	compiling research information and preparing it for class presentation or in the form of assessed written work
Present information in ways that are fit for purpose and audience	participating in class presentations of research or ideas, or producing other forms of assessed work
Evaluate the selection and use of ICT tools and facilities used to present information	
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	using any internet-based discussion group or centre virtual learning environment to store, retrieve or communicate information to other learners or tutors
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	

Skill	When learners are ...
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	working in groups or as individuals and participating in the discussion of ideas and concepts
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	compiling research information and preparing it for class presentation or in the form of assessed written work
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	presenting written assessment tasks linked to grading criteria



Unit 16: Design, Manufacture and Modification of Orthodontic Appliances

Unit code:	K/600/7330
QCF Level 3:	BTEC National
Credit value:	15

● Aim and purpose

The aim of this unit is to enable learners to gain an understanding of the design principles of removable and fixed orthodontic appliances, and using these principles to acquire the skills to manufacture and modify these appliances.

● Unit introduction

Over the years, orthodontic trends have changed both in materials and types of appliances that are used. This unit focuses on a range of orthodontic appliances and investigates their manufacture, design and modification.

A range of removable appliances can be commonly prescribed for patients and in learning outcomes 1 and 2, learners will be introduced to this range of appliances. They will learn the design principles and construction techniques for active, functional and retaining appliances.

As fixed appliance treatment becomes more popular with orthodontists, learning outcomes 3 and 4 look at different forms of fixed appliance treatment. Learners will be introduced to both clinically applied and laboratory constructed fixed appliances. They will look at the functions of fixed appliances and their construction techniques.

The need to repair existing orthodontic appliances is fundamental to ensuring that treatment is not compromised, and learning outcome 5 focuses on this. Learners will understand the need to repair and modify existing orthodontic appliances and investigate the reasons for component and material failure.

Because an understanding of the principles and rationale of orthodontic treatment is necessary to be able to understand the design of appliances fully, this unit should be taught after or along side *Unit 15: Principles of Orthodontic Therapy Regimes*.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know the design principles of removable orthodontic appliances
- 2 Be able to manufacture removable orthodontic appliances
- 3 Know the design principles of fixed orthodontic appliances
- 4 Be able to manufacture laboratory constructed fixed orthodontic appliances
- 5 Be able to repair and modify orthodontic appliances.

Unit content

1 Know the design principles of removable orthodontic appliances

Active appliance design: principles of general active removable appliance design; base-plate and bite plane design; designs of the currently used active components, eg Z Spring, Palatal Finger Spring, Buccal Canine Retractor; design of passive components, eg Adams Cribs, Southend clasp; actions and function of each active component

Functional appliance design: principles of functional appliance design; designs of functional appliances, eg Twin Block; the uses and function of functional appliances; limitations of functional appliances; how forces and tooth movement may be directed in the design of a functional appliance; modifications and adjustments to the Twin Block; retention of functional appliances

Retainer appliance design: design of orthodontic retainers, eg Hawley Retainer, Essix Retainer; retention of retainer appliances; minor tooth movement using orthodontic retainers

2 Be able to manufacture removable orthodontic appliances

Active orthodontic appliances: prescriptions and study models; construction of commonly used active components; positioning components; selection of materials for components, methods of activation of components; base-plate construction methods; health and safety; relevant codes of practice; cleaning and care for removable appliances; equipment and tools used; polishing and finishing techniques; delivery of work to patient

Functional orthodontic appliances: construction techniques for functional appliances, eg Twin Block; relevant codes of practice; cleaning and care for removable appliances; equipment and tools used; polishing and finishing techniques; delivery of work to patient

Orthodontic retaining appliances: pressure formed retainer splints and techniques for construction, construction techniques for commonly used retainers, eg Hawley Retainer; relevant codes of practice; cleaning and care for removable appliances; equipment and tools used; polishing and finishing techniques; delivery of work to patient

3 Know the design principles of fixed orthodontic appliances

Fixed appliance design: forms of commonly used fixed appliances; functions of clinically constructed fixed appliances eg Begg, Edgewise; functions of laboratory constructed fixed appliances eg Trans-palatal Arch, Quad Helix; advantages and limitations of fixed appliances.

4 Be able to manufacture laboratory constructed fixed orthodontic appliances

Fixed orthodontic appliances: construction techniques for fixed appliances, eg Trans-palatal Arch, Nance Button; soldering techniques; care and maintenance of fixed appliances; equipment and tools used; polishing and finishing techniques; delivery of work to patient; health and safety; relevant codes of practice

5 Be able to repair and modify orthodontic appliances

Repair: reasons for component failure; forms of permanent repair both to acrylic and wire component; techniques for repairing base-plates; effects of repairs to base-plates and components; health and safety; relevant codes of practice

Modification: reason to modify an existing orthodontic appliance; types of modifications; attachment of artificial teeth

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 identify different removable orthodontic appliances and their components [CT2, IE2]	M1 describe the construction principles of removable orthodontic appliance components	D1 explain the different functions of removable orthodontic appliance designs
P2 describe the design principles of removable orthodontic appliances		
P3 manufacture removable orthodontic appliances from a given prescription, with substantial guidance [CT5,6, SM3]	M2 manufacture removable orthodontic appliances from a given prescription, with limited guidance	D2 manufacture removable orthodontic appliances from a given prescription, working independently
P4 identify clinically and laboratory constructed fixed appliances [CT2, IE2]	M3 describe the functions of clinically and laboratory constructed fixed appliances	
P5 describe the design principles of fixed orthodontic appliances		
P6 manufacture laboratory constructed fixed orthodontic appliances from a given prescription, with substantial guidance [CT5,6, SM3]	M4 manufacture laboratory constructed fixed orthodontic appliances from a given prescription, with limited guidance	D3 manufacture laboratory constructed fixed orthodontic appliances from a given prescription, working independently
P7 list the types of repairs and modifications that might be required for an existing orthodontic appliance [CT2, IE2]	M5 describe the techniques used to repair and modify an orthodontic appliance	D4 explain what the technician and patient can do to ensure the longevity of an orthodontic appliance

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P8 repair fractured removable orthodontic appliances from given prescriptions, with substantial guidance [CT5,6, SM3]	M6 repair fractured removable orthodontic appliances from given prescriptions, with limited guidance	D5 repair fractured removable orthodontic appliances from given prescriptions, working independently
P9 modify existing orthodontic appliances from given prescriptions, with substantial guidance [CT5,6, SM3]	M7 modify existing orthodontic appliances from given prescriptions, with limited guidance	D6 modify existing orthodontic appliances from given prescriptions, working independently

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

The learner should have access to a range of appliances and appliance designs. The delivery should be carried out in a laboratory environment, having access to live cases where possible. Clinical visits and demonstrations will enhance the understanding of the term 'clinically acceptable'. Live demonstrations, videos, and the internet are essential tools when delivering this unit. All practical work should be produced to a clinically acceptable standard, meeting all health and safety and quality assurance requirements.

Delivery

Tutors delivering this unit have opportunities to use as wide a range of techniques as possible. Lectures, discussions, seminar presentations, demonstrations, supervised practicals, research using the internet and/or library resources and the use of personal and/or laboratory experience would all be suitable. Delivery should provide a sound understanding of orthodontic treatment and the appliances used to achieve such treatment. It should motivate learners to investigate orthodontics and its different appliances and theories.

Work placements should be monitored regularly in order to ensure the quality of the learning experience. It would be beneficial if learners and supervisors were to be made aware of the requirements of this unit before any work-related activities take place, so that naturally occurring evidence could be collected at the time. For example, learners may have the opportunity to produce a range of simple orthodontic appliances following on to more complex and more challenging orthodontic appliances. They should be encouraged to collect record sheets undertaken with supervisor comments regarding quality and standard.

Whichever delivery method is chosen it is vital that tutors stress the importance of patient welfare, accuracy, quality and importance of dental techniques.

Health and safety issues relating to working in a dental laboratory environment must be stressed and regularly reinforced, and risk assessments must be undertaken prior to practical activities.

Tutors should consider integrating the delivery, private study and assessment relating to this unit with any other relevant units and assessment instruments learners may also be taking as part of the programme of study.

Learning outcomes 1 and 2 are directly linked. These are likely to be delivered through formal lectures, discussions, demonstrations, supervised practicals and independent learner research. Learners will need to be aware of the aims of orthodontic treatment (Unit 16), design and construction methods of a range of removable orthodontic appliance, and the function of these appliances. Health and safety issues must be addressed before learners use dental materials and equipment prior to undertaking a given task. Adequate PPE must be provided and used when undertaking practical work.

Clinicians and technicians specialising in treatment planning, appliance design and construction can all add another perspective for learners. Dental supply companies can introduce new products which are relevant to removable orthodontic appliances and any new developments in the techniques and materials used in orthodontics.

Learning outcomes 3 and 4 are directly linked. They should cover the design principles of fixed orthodontic appliances. Learners should also be introduced to the principles of extra oral traction.

Health and safety issues must be addressed before learners use dental materials and equipment prior to undertaking a given task and adequate PPE must be provided and used when undertaking practical work. Delivery techniques should include formal lectures, practical demonstrations, supervised practicals and informal discussions. Speakers relevant to fixed orthodontic treatment can be invited to show, discuss and demonstrate fixed appliance treatment. Visits to orthodontic laboratories or clinics can show the practical application of orthodontic treatment.

Learning outcome 5 introduces learners to the correct construction methods for repairing and modifying orthodontic appliances. Delivery techniques should include formal lectures, practical demonstrations and supervised construction practicals. Visits to orthodontic laboratories or clinics can show the practical application of orthodontic treatment and would form part of the delivery of the outcome. Health and safety issues must be addressed before learners use dental materials and equipment and adequate PPE must be provided and used when undertaking practical work.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments.

Learning outcome 1

Investigate the theory covering principles of design, action and function of each active component:

- ◇ general active removable appliance design.
- ◇ baseplate and bite plane design.
- ◇ designs of the currently used active components, eg Z Spring, Palatal Finger Spring, and Buccal Canine Retractor.

Consider the theory of design of passive components, eg Adams Cribs, Southend Clasp.

Consider the theory of the actions and function of each passive component.

Investigate the theory related to:

- ◇ the principles of functional appliance design; designs of functional appliances, eg Twin Block; retention of functional appliances
- ◇ the uses and function of functional appliances
- ◇ limitations of functional appliances
- ◇ how forces and tooth movement may be directed in the design of a functional appliance
- ◇ modifications and adjustments to the Twin Block.

Investigate the theory covering retainer appliance design: design of orthodontic retainers, eg Hawley Retainer, Essix Retainer; retention of retainer appliances; minor tooth movement using orthodontic retainers.

Topic and suggested assignments/activities and/assessment

Learning outcome 2

Theory and practical demonstrations encompassing construction of commonly used components, eg Adams Cribs, Southend Clasps, Z Spring, Palatal Finger Spring, Buccal Canine Retractor, Roberts Retractor, labial bows.

Understand base-plate construction methods, polishing and finishing techniques, equipment and tools used.

Know how to clean and care for removable appliances.

Discussions about relevant aspects of health and safety; Medical Devices Directive (MDD) regulations; relevant current legislation and codes of practice.

Investigate functional orthodontic appliances.

Theory and practical presentations and exercise related to construction techniques for functional appliances, eg Twin Block.

Orthodontic retaining appliances.

Theory and practical demonstrations covering the techniques for construction of:

- ◇ pressure formed retainer splints
- ◇ commonly used retainers, eg Hawley Retainer, Begg etc.

Assignment 1: Removable Appliance Design, Function and Construction (P1, M1, D1, P2, M2, D2, P3)

Learning outcome 3

Theory and demonstrations related to fixed appliance design:

- ◇ forms of commonly used fixed appliances
- ◇ functions of laboratory constructed fixed appliances, eg Trans-palatal Arch, Quad Helix
- ◇ functions of clinically constructed fixed appliances, eg Begg, Edgewise
- ◇ advantages and limitations of fixed appliances
- ◇ extra-oral traction in fixed appliance treatment.

Learning outcome 4

Practical exercise and demonstrations related to fixed orthodontic appliances:

- ◇ construction techniques for fixed appliances; Trans-palatal Arch, Lingual Arch, Nance Button, Quad Helix
- ◇ soldering and laser welding techniques
- ◇ polishing and finishing techniques
- ◇ equipment and tools used health and safety.

Theory supporting the care and maintenance of fixed appliances and delivery of work to patient.

Assignment 2: Fixed Appliance Design, Function and Construction (P4, M3, D3, P6, M4, D4, P5)

Topic and suggested assignments/activities and/assessment

Learning outcome 5

Theory and practical activities regarding repair and modification of orthodontic appliances.

Theory presentation of forms of permanent repair to acrylic and wire components.

Discuss theory outlining the reasons for component failure.

Discuss theory covering handling of repairs in terms of health and safety; MDD regulations; relevant current legislation and codes of practice.

Practical demonstration and exercises practising repairs to baseplates and wire components.

Modification.

Discuss theory related to the reasons to modify an existing orthodontic appliance:

- ◇ types of modifications; attachment of artificial teeth.

Practical demonstrations of assessed practical tasks linked to theory.

Assignment 3: Repairing and Modifying Orthodontic Appliances (P7, M5, D4, P8, M6, D5, P9, M7, D6)

Review of unit and programme of assignments

Assessment

Generic guidance on assessment

All learners are entitled to initial guidance in planning their work, but the level of assistance required should be taken into account when their work is assessed. In the assessment and grading criteria grids, reference is made to learners working with 'substantial guidance', with 'limited guidance' and 'independently'. When assessing the work, assessors should apply the following guidelines.

'Substantial guidance': Learners have to be guided and advised throughout to ensure that progress is made. Learners rely on the support of the tutor, who has to assist in most aspects of the work. This level of support restricts Learners to a pass grade, irrespective of the quality of the evidence.

'Limited guidance': The tutor supports learners initially in the choice of topic for investigation. Thereafter, the tutor reacts to questions from learners and suggests a range of ideas that learners act upon. Learners frequently check matters of detail. The tutor needs to assist in some aspects of the work. This level of support restricts learners to a pass or a merit grade, irrespective of the quality of the evidence.

'Independently': The tutor supports learners initially in the choice of topic for the investigation or task. Thereafter, the tutor occasionally assists learners, and only when asked, but monitors progress throughout. This level of support gives access to all three grades; pass, merit and distinction.

Unit-specific guidance on assessment

All practical work should be produced to a clinically acceptable standard, using all health and safety and quality assurance requirements.

P1 requires learners to identify different removable appliances and their components. Learners must identify the different components of removable appliances and which appliance they are appropriate to as listed in unit content, learning outcome 1. Evidence for this could take the form of a written report, an oral presentation (possibly using appropriate software or OHPs); short-answer questions, or a leaflet/booklet.

For P2, learners must describe the design principles of removable orthodontic appliances.

For P3, learners must be able to manufacture a range of removable orthodontic appliances to a clinically acceptable standard, from a given prescription and with substantial guidance, using all health and safety and quality assurance requirements listed in unit content learning outcome 2. There should be at least three appliances produced with examples of the most common components and baseplate designs incorporated in them. The criterion could be assessed by submitting practical pieces of work to be formally assessed or directly by the tutor during practical activities. If a direct format is used, suitable evidence from guided activities would be observation records completed by learners and tutor. If assessed during a placement, witness statements should be provided by a suitable representative and verified by the tutor. Guidance on the use of observation records and witness statements is given on our website (www.edexcel.com).

For P4, learners are expected to identify a selection of clinically and laboratory constructed fixed appliances. For P5, learners are expected to describe the different designs and components that make up the various types of fixed appliances. Evidence may be in the same format as for P3.

P6 requires learners to manufacture laboratory constructed fixed appliances to a clinically acceptable standard and from a given prescription, with substantial guidance, using all health and safety and quality assurance requirements listed in unit content learning outcome 4. Evidence may be in the same format as for P3.

For P7, learners are expected to list a variety of repairs and modifications that might be required for an existing orthodontic appliance and explain the reason for component failure. Evidence may be in the same format as for P1.

P8 requires learners to repair a fractured removable orthodontic appliance from a given prescription and with substantial guidance, to a clinically acceptable standard, using all health and safety and quality assurance requirements. Evidence may be in the same format as for P3.

P9 requires learners to modify an existing orthodontic appliance to a clinically acceptable standard, from a given prescription and with substantial guidance, using all health and safety and quality assurance requirements. Evidence may be in the same format as for P3.

To achieve a merit grade for the unit, learners must achieve all of the pass grade criteria and the merit grade criteria.

For M1, learners must describe the construction principles of removable appliances. Learners need to show an understanding of the design principles of a range of different component parts from a range of orthodontic appliances which are listed in unit content learning outcome 1. The situation may be the same as that used to provide evidence for other criteria. Evidence for this could take the form of a written report, oral presentation (possibly using appropriate software or OHPs).

M2 requires learners to manufacture a range of removable orthodontic appliances to a clinically acceptable standard, from given prescriptions and with limited guidance, using all health and safety and quality assurance requirements listed in unit content learning outcome 2. Evidence may be in the same format as for P3.

For M3, learners must describe the functions of fixed appliances. Learners need to illustrate that they understand the functions and purpose of fixed appliance treatment. The situation may be the same as that used to provide evidence for other criteria. It may be directly linked to P4. Evidence may be in the same format as for M1.

M4 requires learners to manufacture different types of laboratory constructed fixed orthodontic appliances, to a clinically acceptable standard, from given prescriptions and with limited guidance, using all health and safety and quality assurance requirements. Evidence may be in the same format as for P3.

For M5, learners must describe the techniques to repair and modify an orthodontic appliance and explain the reason for modifying an orthodontic appliance. Learners are required to explain the methods of repairing fractured and failed wire components, along with how modifications can be done to an existing orthodontic appliance. They also need to give reasons why an orthodontic appliance would be modified. Evidence may be in the same format as for M1.

For M6, learners need to repair a fractured removable orthodontic appliance to a clinically acceptable standard, from given prescriptions and with limited guidance, using all health and safety and quality assurance requirements. Evidence may be the same format as for P3.

For M7, learners are required to modify a range of existing orthodontic appliances to a clinically acceptable standard, from given prescriptions and with limited guidance, using all health and safety and quality assurance requirements. Evidence may be in the same format as for P3.

To achieve a distinction grade for the unit, learners must achieve all of the pass and merit criteria and the six distinction grade criteria.

D1 requires learners to explain the function of removable appliances. Learners are expected to identify the different functions of different removable appliances as listed in the unit content for learning outcome 1. The situation may be the same as that used to provide evidence for other criteria. Evidence may be in the same format as for M1.

For D2, learners must manufacture a range of removable orthodontic appliances to a clinically acceptable standard, from given prescriptions and working independently, using all health and safety and quality assurance requirements listed in unit content learning outcome 2. Evidence may be in the same format as for P3.

For D3, learners must manufacture a range of laboratory constructed fixed orthodontic appliances, from given prescriptions and working independently to a clinically acceptable standard, using all health and safety and quality assurance requirements. Evidence may be in the same format as for P3.

For D4, learners need to explain what the technician and patient can do to ensure the longevity of an orthodontic appliance, and explain any cross-infection controls or health and safety considerations that are relevant when receiving an orthodontic appliance. The situation may be the same as that used to provide evidence for other criteria. Evidence may be in the same format as for M1.

For D5, learners must repair fractured removable orthodontic appliances to a clinically acceptable standard, from given prescriptions and working independently, using all health and safety and quality assurance requirements. Evidence may be in the same format as for P3.

For D6, learners must modify existing orthodontic appliances to a clinically acceptable standard, from given prescriptions and working independently, using all health and safety and quality assurance requirements. Evidence may be in the same format as for P3.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1, P2, M2, D2, P3	Removable Appliance Design, Function and Construction	A national orthodontic laboratory chain requires a manual to explain the design theory and function of the orthodontic appliances which they supply. The laboratory chain has asked you to produce it. Write the manual, ensuring you include examples of the appliances constructed.	Report and practical tasks

Criteria covered	Assignment title	Scenario	Assessment method
P4, M3, D3, P5 P6, M4	Fixed Appliance Design, Function and Construction	The local Primary Care Trust has asked you to produce a guide for all dental team members discussing both clinical and laboratory produced fixed orthodontic appliances. Write the guide, and include laboratory constructed examples which have been requested to accompany the guide.	Report and practical tasks
P7, M5 D4, P8, M6, D5, P9, M7, D6	Repairing and Modifying Orthodontic Appliances	The laboratory you work for is experiencing a higher than normal amount of returns from dentists due to appliance breakage. You have been asked to compile a report investigating how breakages occur, and if they do occur, how repairs and modifications are carried out in the laboratory. Write the report.	Report and practical tasks

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology. This unit has particular links with:

Level 3
Unit 3: Dental Technology Techniques
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 6: Legislation, Professionalism and Ethics in Dentistry
Unit 10: Dental Radiology and Imaging
Unit 12: Complex Dental Materials Science
Unit 14: Quality Assurance in Dental Technology
Unit 15: Principles of Orthodontic Therapy Regimes
Unit 18: Work-based Learning in Dental Technology.

Essential resources

Facilities required for this unit include a suitable dental laboratory with appropriate seating and benching. The laboratory benching should be fitted with dust extraction for trimming acrylic and appropriate trimming hand pieces or a designated area should be provided. At least one fume extractor and hydro-flask is required for any acrylic work to be carried out. All correct pliers, wax tools and trimming burs will be needed to complete the practical aspect of this unit. Essential materials are dental plasters, orthodontic acrylic resin, dental waxes, orthodontic sprung stainless steel wire of various thickness, stainless steel tubing, molar bands, expansion screws, vacuum-formed suck down material and silver solder to fulfil practical aspects of the learning outcomes.

Staff delivering this unit should be registered, competent and experienced dental technicians with an in-depth knowledge of the subject. Ideally they should have recent industrial experience within an orthodontic department or laboratory, or show evidence of regular contact with the industry.

Employer engagement and vocational contexts

Close links with employers are essential. They can provide input by supplying cases for the students for the production of appropriate practical work. They can give presentations related to new techniques, health and safety and laboratory experiences. Assessment could be carried out in the workplace by employers. All the unit content should be presented from a vocational point of view.

Indicative reading for learners

Textbooks

Gill D S – *Orthodontics at a Glance* (Blackwell, 2008) ISBN 9781405127882

Huge S – *The Orthodontic Appliance Reference Manual* (Ortho-Care UK) Ref: 8222-050

Isaacson K G, Muir J D and Reed R T – *Removable Orthodontic Appliances* (Butterworth-Heinemann, 2000) ISBN 0723610533

McDonald F and Ireland A J – *Diagnosis of the Orthodontic Patient* (Oxford Medical Publications, 1998) ISBN 0192628895

Mitchell L – *An Introduction to Orthodontics, 3rd Edition* (Oxford, 2007) ISBN 978-0-19-856812

Richardson A – *Interceptive Orthodontics* (Macmillan Journals, 2000) ISBN 0904588564

Orton H S – *Functional Appliances in Orthodontic Treatment Construction* (Quintessence, 1993) ISBN 1850970122

Jones M L and Oliver R G (Editors) *Walther and Houston's Orthodontic Notes* (Wright, 2000) ISBN 0723610657

Journals

BSI – *British Standard Dental Vocabulary* (British Standards Institute)

The Dental Technician (AE Morgan Publications Ltd)

Dental Technologies (CRG Publications)

General and Clinical Terms (BS EN 21942)

Quintessence Journal of Dental Technology (Quintessence Publishing)

Websites

www.braceface.com

www.dentalhealth.org.uk

www.dla.org.uk

www.dta-uk.org

www.orthota.co.uk

Orthodontics and fun

British Dental Health Foundation

Dental Laboratory Association

Dental Technicians Association

The Orthodontic Technicians Association – UK

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE2] carrying out research in connection with written assignment tasks investigating alternative manufacturing procedures of appliances
Creative thinkers	[CT2, 4] discussing appliance design and planning, either in groups during question and answer sessions or via written work [CT5, 6] carrying out manufacturing procedures
Reflective learners	[RL1, 5] evaluating and improving their own technical work [RL6] presenting conclusions relating to written and practical assessment
Team workers	[TW1, 4] working in the lab using shared resources to produce practical work within the required timescale
Self-managers	[SM3, 6] managing their time to produce written and practical work and being able to work efficiently when under pressure as in a commercial laboratory
Effective participators	[EP2] presenting conclusions relating to written work and explaining alternative techniques for practical tasks

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE3] exploring appliance design and treatment plans using radiographs, models and patient history
Creative thinkers	[CT5] developing new or modified techniques to deal with manufacturing problems.
Reflective learners	[RL1, 3] evaluating their own and others' practical work and giving positive feedback
Team workers	[TW1, 4] working with other learners to produce group presentations or practical work that requires the sharing of equipment.
Self-managers	[SM3, 5, 6] managing their time to produce written and practical work from this unit and others under pressure and being expected to work efficiently as in a commercial laboratory
Effective participators	[EP1, 2, 4, 5] participating in group discussions about many of the concepts that are covered in this unit

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	planning and preparing written assessment work researching all parts of assessed work, using the internet, and word processing
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	researching all parts of assessed work
Manage information storage to enable efficient retrieval	
Follow and understand the need for safety and security practices	
Troubleshoot	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	planning and preparing written assessment work. researching work for a class discussion
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	when using IOTN, cephalometrics and other diagnostic aids to collate information in the development of treatment plans and appliance designs
Bring together information to suit content and purpose	collation of information before the production written assessed work
Present information in ways that are fit for purpose and audience	preparing for group presentations and the production of written assessed work
Evaluate the selection and use of ICT tools and facilities used to present information	preparing for group presentations and the production of written assessed work
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	

Skill	When learners are ...
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	discussing appliance design and production
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading background information to prepare for the various topic areas covered in the unit
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	preparing to produce assessed written work in the form of essays or reports



Unit 17:

Advanced Dental Technology Techniques and Procedures

Unit code:	F/600/7334
QCF Level 3:	BTEC National
Credit value:	10

● Aim and purpose

This unit enables learners to investigate advanced procedures that are commonplace in dental technology. The focal points of this unit are precision attachments, dental implants and the use of digital technology to aid the construction of custom-made appliances.

● Unit introduction

Dental technology is a rapidly developing profession with many new and advanced techniques and procedures used to form dental appliances. It is essential that learners have a realistic knowledge of modern processes that are carried out in a modern dental laboratory environment.

This unit is a broad introduction to dental implantology, precision attachments and digital systems, including computer-aided design and computer-aided manufacture (CAD/CAM).

It introduces the learner to the clinical and technical aspects of advanced techniques used in the field of restorative dentistry.

As technical advances are introduced to dentistry it is essential that individuals employed in dental technology have an opportunity to explore more advanced procedures to help them in their future employment. There are links with other units delivered in this qualification, including *Unit 12: Complex Dental Material Science*, *Unit 11: Design of Fixed Prosthodontics*, *Unit 13: Techniques for Manufacturing Fixed Prosthodontics*, *Unit 8: Removable Complete Prosthodontics* and *Unit 16: Design, Manufacture and Modification of Removable Orthodontic Appliance*.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know about the selection and use of dental implants
- 2 Know how to select and use semi precision and precision attachments
- 3 Understand the principles and applications of modern digital dental systems.

Unit content

1 Know about the selection and use of dental implants

Clinical aspects of dental implantology: patient history; diagnostic stages; planning; imaging; quality of existing bone; site preparation; placement of implant; impression techniques; transfer of information; cross-infection control; healing process; temporisation; the role of the dental team

Materials selection: biocompatible implant materials; abutment materials; superstructure materials; the use of metal-free materials; sintered and pre-sintered materials

Design, planning, and selection of implants: different considerations for the range of dental technology disciplines; diagnostic procedures; communication with the clinical staff

Technical procedures: fixed prosthodontics; removable prosthodontics; orthodontics; diagnostic stages; stents; model requirements and articulation; special trays; abutment selection; superstructure fabrication; temporary fabrication

Common systems: range of applications; design of retentive systems; transverse screw retained; vertical screw retained; cementable super structures: advantages and disadvantages of each system; technical skills required; staff training; additional equipment

2 Know how to select and use select semi-precision and precision attachments

Clinical considerations for the use of precision attachments: preparation designs; health of the oral environment; quality of abutment teeth and underlying supportive structures; patient education and dexterity; communication techniques with other dental team members

Material selection: mechanical; biological and physical requirements of alloys used in a range of situations; metal-free restorations

Design, planning and selection of attachments: intracoronal; extracoronal; screw retained; recoverable attachments; bar type attachments; ball retained attachments; the use of magnets; differing frictional attachments; combination appliances; telescopic abutments; metal milling; preformed; plastic templates

Technical procedures: model fabrication to include articulation; the use of a parallometer; metal milling; investment and casting techniques; matrix stages; patrix stages; finishing procedures

Common systems: their application in relation to dental technology appliances and prescription requirements

3 Understand the principles and applications of modern digital dental systems

Principles of digital systems: computer-aided design and computer-aided manufacture; rapid prototyping and its uses; oral digital scanning; material requirements

Applications: virtual model environment; maxillo facial techniques; manufacture of dental appliances to include copings; bridges; partial denture base plates; shade taking systems

Common systems: laser scanning; contact scanners; intra oral scanners; software packages; milling lathes and milling centres; imaging systems

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 describe the clinical procedures that are carried out during the treatment of patients requiring dental implants [IE]	M1 review the material requirements associated with dental implants	D1 evaluate the different roles of dental care professionals associated with implant restorative techniques
P2 describe dental implants and their applications	M2 compare different dental implants systems against the ideal requirements	D2 analyse a dental implant system used for appliances in dental technology
P3 illustrate the technical procedures used to fabricate implant-supported appliances [CT]	M3 explain the technical procedures for implant-supported restorations	D3 evaluate common techniques used in dental technology to produce implant-supported restorations
P4 identify the clinical procedures that are carried out during the treatment of patients requiring semi-precision and precision attachments	M4 compare the suitability of materials used for dental attachments	D4 explain the common techniques used in dental technology to produce complex restorations incorporating dental attachments
P5 list the different attachment systems used in dental technology [IE]	M5 describe the technical procedures for simple restorative techniques that incorporate dental attachments	
P6 explain the principles of digital systems and their application in clinical and technical dentistry	M6 justify the use of a CAD/CAM system used to form dental restorations	D5 evaluate the use of digital technology in the dental laboratory

Essential guidance for tutors

Delivery and assessment guidance

The learning outcomes in this unit are to be delivered using a variety of teaching methods and styles. Additional external teaching support will be essential to the delivery of this unit to introduce learners to variety of advanced techniques. The assessment of the unit uses a range of different formats including article writing, ICT presentations and leaflet production.

Delivery

Delivery by tutors should incorporate a range of relevant techniques that draw on a variety of resources to introduce learners to the range of advanced dental technology techniques and procedures currently available. Lectures, discussions, seminar presentations, practical evaluations, multi-media delivery, field trips, external speakers, engagement with supply companies, research using the internet and/or library resources would all be suitable. Assessment from other units in this programme can be linked to this unit.

Dental laboratory owners, managers and supervisors should be made aware of the requirements of this unit to enable them to support the learners in this complex area. For example, learners may require an opportunity to observe and discuss with their work-based mentor cases involving advanced procedures. Engagement with these techniques will need considerable support and guidance. The learner will also be required to interpret direct instructions from a prescription. Consideration should be given to the sharing of individual research through a group/class approach and using presentations, group seminars, handouts and discussions. This will encourage a broader dissemination of knowledge.

Whichever delivery methods are used, it is essential that tutors stress professional standards required for this type of dental discipline.

Tutors should consider integrating the delivery, private study and assessment relating to this unit with any other relevant units and assessment instruments. Learners may also be taking as part of the programme of study.

Learning outcome 1 is likely to be delivered through formal lectures, discussions and independent learner research. The use of multimedia delivery, external speakers and field trips related to advanced techniques will enhance delivery of this unit.

Learning outcome 2 introduces the learner to a range of systems associated with dental attachments that may be used by the dental technician. It will be delivered using formal lectures, internet research and practical demonstrations.

Learning outcome 3 focuses on the underpinning knowledge required for the digital dental environment. It is expected that formal lectures, demonstrations, external speakers and field trips to dental shows will form part of the delivery of this outcome.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments.

Learning outcome 1

Introduction to clinical aspects of dental implantology.

Discuss diagnostic and clinical stages of implant treatment.

Demonstrate the construction of a ball bearing stent.

Present an introduction to impression-taking techniques, transfer of information, cross-infection control.

Learner practical activity – design and construct an open impression tray. Discuss the healing process and the role of the dental team.

Examine the ideal requirements for materials used to construct implants.

Learners to take part in a discussion relating to biocompatible implant alloys.

Present information on abutment materials and superstructure materials, focusing on properties and compatibility of metals.

Consider modern metal-free restorations and the use of metal-free materials.

Discuss the selection of implants for the different dental technology disciplines.

Present information to develop a knowledge of the application of implants to support fixed prosthodontics.

Presentation into the implant techniques used for removable prosthetics.

Discuss orthodontic implant techniques and maxillo facial cases.

Examine commonly used dental implant systems.

Discuss the design of retentive systems used to support implant superstructures.

Discuss the technical skills required, staff training, additional equipment to construct dental implant restorations.

Learner assignment development and study.

Assignment 1: Clinical and Technical Procedures Related to Dental Implants and Dental Attachments (P1, P2, P3, M1, M2, M3, D1, D2, D3)

Learning outcome 2

Introduction to clinical stages of attachment restorative procedures.

Presentation on common preparation designs commonly used in conjunction with attachments.

Present an introduction to the mechanical, biological and physical requirements of alloys used in a range of attachment situations.

Investigate metal-free materials that can be used as part of an attachment treatment plan.

Examine the design principles of a comprehensive range of attachments and their applications.

Presentation focusing on the design principles of telescopic abutments and their application.

Discuss the design principles and application of combination appliances.

Demonstrate the principles of wax designs for metal milling and their application.

Discuss the principles of articulation.

Practical demonstration of a common articulation technique.

Using a parallometer demonstrate the equipment and analyse casts.

Examine the requirements of investments and casting techniques.

Topic and suggested assignments/activities and/assessment

Practical demonstration of metal milling processes.

Presentation illustrating the matrix stages; matrix stages followed by practical demonstration.

Examine finishing procedures.

Learner assignment development and study.

Assignment 2: The Selection and Use of Semi-precision and Precision Attachments (P4, P5, M4, M5, D4)

Learning outcome 3

Introduction to the principles of digital systems CAD/CAM.

Internet research looking into the advantages of rapid prototyping and its uses.

Presentation discussing oral digital scanning with demonstrations of current systems (external delivery).

Examine the material requirements required for these techniques.

Demonstrate current digital software package that includes a Virtual Model Environment.

Present the manufacture techniques used to form dental appliances to include copings, bridge.

Introduction to the design and manufacturing processes undertaken to form a partial denture base plate using scanning technology.

Present the benefits for treatment of maxillo facial patients using CAD/CAM and digital imaging.

Practical demonstration of shade-taking systems.

Research a range of laser-scanning-systems.

Demonstration of common CAD/CAM software packages.

Discuss contact scanning systems.

Discuss white light scanning.

Present an introduction to milling lathes and milling centres.

Examine the use of a range of intra-oral scanning systems.

Learner assignment development and study.

Assignment 3: The Digital Dental Environment (P6, M6, D5)

Review of unit and programme of assignments.

Assessment

To achieve a pass grade for the unit, learners must achieve the six pass criteria listed in the assessment and grading grid.

P1 requires learners to describe the clinical procedures undertaken during the clinical stages of implantology. Learners will be expected to cover the clinical appointments and areas of patient care associated with this treatment. They should include all diagnostic phases of treatment, implant selection, site preparation and impression-taking techniques. This criterion could be assessed through formal report style evidence or by a patient information booklet on clinical stages of treatment.

P2 requires learners to provide evidence of a description of the forms of available dental implants and their applications. They will be expected to cover at least three different implants types used for restorative techniques in all dental technology disciplines. Evidence for this could take the form of activities linked to P1.

P3 requires learners to illustrate the procedures and techniques used in dental laboratories to fabricate implant based restorations. Learners will be expected to produce a logical account of the related procedures for one type of implant restoration. Evidence for this could be assessed by the production of Standard Operating Procedures (SOPs) supported by images and diagrams relevant to the process. Alternatively, the learner could provide evidence in the form of a presentation using IT.

P4 requires learners to identify the clinical procedures undertaken after dental attachment treatment has been selected. Learners will be expected to include the clinical appointments and areas of patient care associated with this treatment. They should include planning phases of treatment, tooth preparation, attachment selection and impression-taking techniques. This criterion could be assessed through writing an article for a magazine or by a patient information booklet on clinical stages of treatment.

For P5, learners must list the major types of attachment systems that can be used in restorative dentistry. They will also need to provide a discussion on the use of attachments based upon specific case studies. Evidence for this could be returned in the same format as P4 or take the form of a presentation.

For P6, learners need to discuss a range of digital systems that can enhance the production of restorative appliances. It should include clinical and technical systems. The assessment format for this criterion could take the form of a written report, essay or IT presentation with handouts.

To achieve a merit grade for the unit, learners must achieve all of the pass grade criteria and the four merit grade criteria.

For M1, learners are expected to discuss different materials that can be used in the fabrication of an implant supported appliance. It should consider clinical and technical materials. Evidence could be sourced from the same methods mentioned for P1.

M2 requires learners to compare at least three of implant system against the ideal requirements. They will be expected to carry out research into differing implant systems in order to generate a comparison with the generally accepted ideal requirements of implants. Learners should consider clinical and technical factors including complexity of system, staff training and additional equipment. Evidence presented may be in the same format as for P2.

For M3, learners must show evidence of an explanation of technical procedures that are carried out for implant-supported restorations. Learners can provide evidence in the form of SOPs as mentioned for P3.

For M4, learners are expected to compare different materials that can be used in the fabrication of an appliance incorporating an attachment. It should consider clinical and technical materials. Evidence can be provided in the same form as mentioned for P1.

For M5, learners are required to describe the technical procedures that are carried out to fabricate simple appliances that include dental attachments. Learners can provide evidence in the form of SOPs as mentioned for P3.

For M6, learners should consider a range of CAD/CAM systems and provide evidence to justify the selection of a specific system. This could be assessed by asking the learner to provide a written report.

To achieve a distinction grade, learners must achieve all of the pass and merit grade criteria and the five distinction grade criteria.

D1 requires learners to provide a detailed evaluation of the roles of the dental team involved in implant treatments. The significance of each role should be discussed and analysed. Evidence could be provided in the same format as P1 and M1.

D2 requires learners to analyse a range of implant systems and be able to select an implant system based on their findings. Evidence may be in the same format as for M2.

D3 requires learners to evaluate a range of implant systems focusing on the technical procedures to select an implant system based on their findings. Evidence can be used from P3, M3

For D4, learners are required to provide a detailed description of a range of current dental attachments that are used to produce complex dental appliances. Learners may contextualise their evidence as described in M4. Evidence may be in the same format as for M4.

For D5, learners must consider a range of digital systems and provide an evaluation of each system, including the advantages of using this type of technology. Evidence for this could take the form of a written report.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3 M1, M2, M3 D1, D2, D3	Clinical and Technical Procedures Related to Dental Implants and Dental Attachments	You have been asked by your mentor to develop a patient information leaflet on the topic of dental implants to allow patients to understand the clinical and technical procedures that are required to complete this type of restoration. It is part of a laboratory marketing strategy. It should include visual images of implantology.	Leaflet production using a variety of sources demonstrating knowledge of implant techniques.
P4, P5, M4, M5 D4	The Selection and Use of Semi-precision and Precision Attachments	You have been asked to produce a report on dental attachments by a dental technology publishing company who are sourcing articles for a new private dental technology magazine. You will need to include clinical and technical procedures to help readers of the article to select attachments.	Written report

Criteria covered	Assignment title	Scenario	Assessment method
P6, M6, D5	The Digital Dental Environment	Your employer is starting to develop a website for the laboratory that you are employed in. They have asked you to develop a presentation that can be used on the website to inform potential customers of the advances in the dental digital environment. You will need to consider both technical and clinical systems and review the benefits to the dental team and the patient.	ICT presentation and handout production

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology. This unit has particular links with:

Level 3
Unit 8: Removable Complete Prosthodontics
Unit 9: Removable Partial Dentures
Unit 11: Design of Fixed Prosthodontics
Unit 13: Techniques for Manufacturing Fixed Prosthodontics
Unit 15: Principles of Orthodontic Therapy Regimes
Unit 16: Design, Manufacture and Modification of Removable Orthodontic Appliances
Unit 18: Work-based Learning in Dental Technology

Essential resources

Facilities required for this unit include a fully-equipped dental laboratory. The laboratory should be fitted with appropriate benching, hand pieces, extractor units, mixing machines, model trimmers, light cure boxes, pressure pots, vacuum forming machines, Bunsen burners and polishing lathes. First aid kits, fire extinguishers, all PPE, infection control and safety equipment should be present, as well as a wide range of dental materials.

Learners should be equipped with a full dental toolkit and a selection of trimming burs for a variety of materials. Personal Protective Equipment is mandatory.

Access to hospital and commercial dental laboratories that provide a range of dental technology services is very important.

Staff delivering this unit should be competent and experienced, and be registered dental technicians. Ideally, they should have recent laboratory experience within dental technology and show evidence of regular contact with the industry and/or technical updating.

Learners will need access to library and IT facilities with a range of relevant books, journals and software applications.

Employer engagement and vocational contexts

To further enhance the delivery of this unit it is suggested that learners are able to access commercial and hospital laboratories as part of a work placement or field trip. Visits to material manufacturers will help learners gain an understanding of the properties of the materials covered in this unit.

Indicative reading for learners

Textbooks

Drago C – *Implant Restorations: A Step-by-Step Guide; 2nd Edition* (WileyBlackwell, 2007)
ISBN -13: 978-0813828831

Lee S J et al – *Applications of Orthodontic Mini Implants* (Quintessence, 2007) ISBN 978-0-86715-465-8

Mormann W H – *State of the Art of CAD/CAM Restorations: 20 Years of CEREC* (Quintessence 2006)
ISBN -13: 978-1850971641

Sherring – Lucas et al – *Attachments for Prosthetic Dentistry: Introduction and Application* (Quintessence Publishing Co Ltd, 1994) ISBN -13: 978-1850970361

Thomas S et al – *Contemporary Dental and Maxillofacial Imaging, An Issue of Dental Clinics* (The Clinics: Dentistry) (Saunders 2008) ISBN -13: 978-1416062868

Van Noort R – *Introduction to Dental Materials, 2nd Edition* (C V Mosby, 2002) ISBN 0723432155

Journals

The British Dental Journal (Nature Publishing Group)

The Dental Technician (AE Morgan Publications Ltd)

Dental Technologies (CRG Publications)

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[IE1] describing the clinical procedures that are carried out during the treatment of patients during dental implants
Creative thinkers	[CT1] discussing the use of different attachments in specific case studies
Self-managers	[SM2] carrying out assignment tasks in a timely and constructive manner

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	[IE2, IE6] researching the different digital systems that can be used in the fabrication of appliances, scanning and imaging [IE 4] analysing the different implant systems
Creative thinkers	[CT2] actively taking part in a group discussion or exploring ways to perform a practical task.
Team workers	[TW1, TW6] constructing practical projects and assisting fellow learners in this regard
Effective participators	[EP3, EP4] taking part in group discussions, demonstrations and ICT presentations; analysing their assignment tasks and taking part in assignment seminars

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	researching the different digital systems that can be used to enhance the production of restorations for the dental team and the patient
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	carrying out the planning and construction of their assignments in a variety of formats, presentations, articles
Manage information storage to enable efficient retrieval	recording their evidence to satisfy assignment briefs and storing the files in a logical, retrievable manner
Follow and understand the need for safety and security practices	ensuring that they use their own logins and passwords and storing data in a secure environment
Troubleshoot	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	researching data for assignments using advanced search engine techniques and collating the information
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	using the internet to source information and evaluating the quality of the information provided by recognised websites
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	using digital systems during external presentations and visits to dental shows provide a variety of information formats in ICT presentations and word processed projects
Bring together information to suit content and purpose	designing their projects and collating the relevant information to meet assignment brief
Present information in ways that are fit for purpose and audience	delivering presentation on the dental digital environment using entertaining and specific material relevant to the dental technology-based audience
Evaluate the selection and use of ICT tools and facilities used to present information	carrying out an evaluation on their ICT presentation highlighting their strengths and weaknesses and reflecting on how they performed and any improvements they can make
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	discussing assignment development using email or centre recognised chat rooms
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	calculating distortion factors of X-rays used in the diagnostic stages of implantology

Skill	When learners are ...
Identify the situation or problem and the mathematical methods needed to tackle it	using implant diagnostic techniques to determine the quantity of available bone around an implant site
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	taking part in group discussions and communicating whilst they are delivering their ICT presentation
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	sourcing information for assignments, determining actual information that will be relevant to their projects
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	producing an article for a dental technology magazine



Unit 18: Work-based Learning in Dental Technology

Unit code:	D/600/7339
QCF Level 3:	BTEC National
Credit value:	10

● Aim and purpose

The aim of this unit is to enable learners to develop their skills in a real-life situation and gain credit for their work-based activities. It develops a link between the knowledge and skills developed in the programme to enable them to undertake vocational tasks in the workplace.

● Unit introduction

This unit is intended for both part-time and full-time learners. It is designed to allow flexibility of study, to enable employed learners to contribute to the development of transferable skills and to be used by full-time learners during work experience placements in dental laboratories.

Learners should carry out the project in a dental laboratory setting.

The learner will select a specialist area of their profession and use this as a basis for a work-based practical project. They will learn how to maintain a log of their sessions during each stage of construction. When the custom-made dental appliance is finished, they will produce a report based on their project.

It is important learners have a suitably qualified and registered workplace mentor to coordinate with the academic coordinator in the planning, monitoring and collection of evidence for the unit.

● Learning outcomes

On completion of this unit a learner should:

- 1 Be able to plan a work-based dental technology practical project
- 2 Be able to maintain a logbook for the duration of a work-based dental technology practical project
- 3 Be able to undertake a work-based dental technology practical project
- 4 Be able to report on a dental technology practical project.

Unit content

1 Be able to plan a work-based dental technology practical project

Topic: negotiate a suitable topic and gain approval from tutor and work-based mentor

Project planning: aims and objectives of the project; time management; resources required; materials and equipment required for practical aspect

Information: introductory research, eg select a suitable project, decide on laboratory techniques and materials to complete the practical components, material manufacturers and suppliers, costings; literature research, eg journals, texts, internet, catalogues

2 Be able to maintain a logbook for the duration of a work-based dental technology practical project

Logbook entries: dates; letters; laboratory prescriptions, photographs, signatures; mentor feedback at each stage; self-reflection; patient responses to questions, activities; timescales; equipment used; processes; personal goals; health and safety; costings

3 Be able to undertake a work-based dental technology practical project

Resources: suitability of workplace; equipment and material requirements; suitability of supervision; suitability of project for work-based setting; costings

Timing: laboratory use; time management

Vocationally applied techniques: assembly of equipment and materials; manipulative skills; techniques of making or constructing items to achieve acceptable results; recording the stages of each process

Health and safety: health and safety requirements and precautions

4 Be able to a report on a dental technology practical project

Retrieved information: relevance of retrieved information; summarise information; use research to support the practical component

Practical analysis: analysis of the practical component using logical methods; report on the methods of the accuracy and quality of the practical component

Preparation of a formal report: introduction; aims and objectives; methods and techniques; material information; researched information; analysis, evaluation and conclusions; referenced bibliography

Presentation: methods of presentation; textual, display chart, photographic, digital projector, flipchart, whiteboard

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 produce a plan for a suitable work-based project, to include a written and practical element, with substantial guidance [IE2]	M1 produce a plan for a suitable work-based project, to include a written and practical element, with limited guidance	D1 discuss the suitability of the work-based project plan that has been produced
P2 produce a logbook containing evidence relating to the practical component [CT1]	M2 create photographic evidence of each stage of construction of the practical component	D2 provide a detailed costing of materials and time taken for the practical component
P3 construct the practical component to a clinically acceptable standard, with substantial guidance [SM3, 5] [TM 4] [RL4]	M3 construct the practical component to a clinically acceptable standard, with limited guidance	D3 construct the practical component to a clinically acceptable standard, working independently
P4 produce a report on the manufacturing procedures used in the dental technology practical project	M4 present the report to an audience	

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery and assessment guidance

Learners need access to a fully equipped dental laboratory that provides a service for all specialist areas of dental technology. They also need contact with a dental team to enable them to complete their project.

Delivery

This unit involves independent learning but learners attempting pass and merit level may require tutor support and guidance throughout the assignment. The underpinning knowledge for this unit would have been provided throughout the learning period and covered in relevant previous units. Learners and work-based mentors should be briefed on the nature of the unit and of the evidence required to achieve the outcomes.

In learning outcome 1, planning of the assignment topic is expected to be delivered through personal study and personal tutorials with the tutor and the work-based mentor. The work for this unit may be part of a learner's normal workload or some activity specially designed to deliver the required evidence. In either case the planning should be complete before starting the practical work.

For learning outcome 2, the work-based logbook will be completed by learners but it is expected that the tutor and work-based mentor would review the logbook periodically to sign off after each stage of construction and provide feedback.

For learning outcome 3, construction of the practical component will be completed solely by the learner with various degrees of guidance related to the assessment grade. Health and safety and quality standards must be adhered to throughout this learning outcome.

For learning outcome 4, the preparation of the written report based on the investigation of the practical component will be delivered through personal study and tutorials.

Outline learning plan

The outline learning plan has been included as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives an indication of the volume of learning it would take the average learner to achieve the learning outcomes. It is indicative only and is one way of achieving the credit value.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment

Introduction to the unit and structure of the programme of assignments

Learning outcomes 1 and 2

Introduction to the unit and discuss specialist areas.

Select and research a specialist area of dental technology.

Arrange and visit dental laboratories.

Discuss with tutor your specialist area and identified laboratory.

Discussion of specialist area with work-based mentor.

Research theory regarding planning and producing a project.

Identify aims and objectives for the project.

Identify necessary materials, equipment and techniques.

Plan the layout of a logbook and discuss with tutor for approval.

Use ICT to produce a logbook.

Discuss the use of the logbook with tutor and mentor.

Produce a timetable for the practical component.

Produce images of each stage, printed copies to be included in report.

Maintain the logbook and ensure all evidence is validated by mentor.

Personal study.

Assignment 1: Produce a Plan and Accompanying Logbook for a Suitable Work-based Project (P1, P2, M1, M2, D1, D2)

Learning outcomes 3 and 4

Assess identified workplace regarding supervision, equipment and materials to complete practical component.

Pre-plan practical tasks.

Identify standard operating procedures for each stage.

Identify health and safety precautions.

Construct and record each stage of the process for the chosen appliance.

Analyse each finished stage using a quality check sheet.

Be present at each clinical stage to be available for any adjustments.

Document in logbook any problems incurred at each stage.

Discuss completed stages with the dentist and other DCPs and document.

Collate relevant documents that relates to selected topic.

Personal study time.

Assignment 2: Construction of the Appliance (P3, M3, D3)

Identify methods of presentation for the report, types of software, photographs, flipchart, slides, overhead or digital projector.

Assignment 3: Report and Oral Presentation of a Dental Speciality (P4, M4)

Review of unit and programme of assignments.

Assessment

Generic guidance on assessment

All learners are entitled to initial guidance in planning their work, but the level of assistance required should be taken into account when their work is assessed. In the assessment and grading criteria grids, reference is made to learners working with 'substantial guidance', with 'limited guidance' and 'independently'. When assessing the work, assessors should apply the following guidelines.

'Substantial guidance': Learners have to be guided and advised throughout to ensure that progress is made. Learners rely on the support of the tutor, who has to assist in most aspects of the work. This level of support restricts learners to a pass grade, irrespective of the quality of the evidence.

'Limited guidance': The tutor supports learners initially in the choice of topic for investigation. Thereafter, the tutor reacts to questions from learners and suggests a range of ideas that learners act upon. Learners frequently check matters of detail. The tutor needs to assist in some aspects of the work. This level of support restricts learners to a pass or a merit grade, irrespective of the quality of the evidence.

'Independently': The tutor supports learners initially in the choice of topic for the investigation or task. Thereafter, the tutor occasionally assists learners, and only when asked, but monitors progress throughout. This level of support gives access to all three grades; pass, merit and distinction.

Unit-specific guidance on assessment

For P1, learners must show they are able to plan a work-based dental technology practical project. This will include identifying a topic and investigating information relevant to the identified practical component. Learners are permitted substantial guidance from their tutor.

For P2, learners must complete a logbook which is signed off by their mentor. It must record stages of construction, clinical visits, mentor feedback and personal reflection. Logbook entries should be dated and completed either during or immediately after each period spent on the practical; photographic evidence should be gathered at each stage of construction for inclusion in the report. Entries should also include details of materials, tools, equipment and times.

P3 will be the completed practical component. This piece of practical work will be chosen from their specialist area of dental technology. It is expected that learners may receive substantial guidance from the tutor and work-based mentor.

For P4, learners must produce a report regarding the procedures utilised during the various construction stages; it must be presented in a recognised format.

For M1, learners must produce a comprehensive plan for a work-based dental technology practical project, with limited guidance from their tutor. This will include identifying a topic and investigating information relevant to the identified practical component.

For M2, learners must record the stages of construction in photographic form and include it in their logbook.

M3 will be the completed practical component. This will be a piece of practical work chosen from one specialist area of dental technology. It is expected that learners may receive limited guidance from the tutor and the work-based mentor.

For M4, learners will present their completed report to an audience, ie their peer group or a dental technology study group.

For D1, learners should be able to discuss aspects of the suitability of their work-based project plan. This could include discussions as to why the plan is fit-for-purpose. They could, for example, give reasons why or how certain goals in the plan have been set, or discuss the choice of techniques and materials to complete the practical components.

For D2, learners should provide detailed costing for materials used and time taken to construct the practical component and record this in their logbook.

D3 will be the completed practical component. This will be a piece of practical work chosen from one specialist area of dental technology. It is expected that learners will work independently.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1 P2, M2, D2	Produce a Plan and Accompanying Logbook for a Suitable Work-based Project	You have been asked to produce a plan and accompanying logbook for a suitable work-based project. Produce the plan and logbook.	
P3, M3, D3	Construction of the Appliance	Construct your appliance using your timetable, selected materials and recognised techniques.	Completed appliance
P4, M4	Report and Oral Presentation on a Dental Speciality	You have completed your report and have been asked to present your topic to the rest of the dental laboratory. Deliver your presentation.	Completed report Oral presentation

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Nationals in Dental Technology. This unit has particular links with:

Level 3
Unit 1: Fundamentals of Dental Technology
Unit 2: Medical Emergencies, First Aid and Communication in the Dental Team
Unit 3: Dental Technology Techniques
Unit 4: Dental Anatomy, Oral Biology and Disease
Unit 5: Basic Dental Biomaterials Science
Unit 6: Legislation, Professionalism and Ethics in Dentistry
Unit 7: Dental Public Health and Preventative Dentistry
Unit 8: Removable Complete Prosthodontics
Unit 9: Removable Partial Prosthodontics
Unit 10: Dental Radiology and Imaging
Unit 11: Design of Fixed Prosthodontics
Unit 12: Complex Dental Materials Science

Level 3

Unit 13: Techniques for Manufacturing Fixed Prosthodontics

Unit 14: Quality Assurance in Dental Technology

Unit 15: Principles of Orthodontic Therapy Regimes

Unit 16: Design, Manufacture and Modification of Orthodontic Appliances

Unit 17: Advanced Dental Technology, Techniques and Procedures

Essential resources

Facilities required for this unit include a fully-equipped dental laboratory with PPE, infection control and safety equipment and a wide range of dental materials. Learners should be equipped with a full dental toolkit and a selection of trimming burs for a variety of materials.

It is important that learners have access to hospital and commercial dental laboratories that provide a range of dental technology services. Learners will need access to clinical areas and other dental team members.

Staff delivering this unit should be competent, experienced, registered dental technicians. Ideally, they should have recent laboratory experience within dental technology and show evidence of regular contact with the industry and/or technical updating. Work-based supervisors should be agreed with learners and the tutor prior to commencement of the construction of the practical component.

Learners will need access to library and ICT facilities with a range of relevant books, journals and software applications.

Employer engagement and vocational contexts

It is important that links are established between centres and local private and hospital dental laboratories. Learners will need access to a fully-equipped laboratory in terms of equipment and technical staff that supports their selected specialist dental area. Learners should have contact with the patient and all members of the dental team.

Indicative reading for learners

Textbooks

Basker R M and Davenport C J – *Prosthetic Treatment of the Edentulous Patient* (Blackwell, 2002)
ISBN 0632059980

Carr A, McGivney G P and Brown D – *Mc Crackens Removable Partial Prosthodontics* (Mosby, 2004)
ISBN 0323026281

Isaacson K G, Muir J D and Reed R T – *Removable Orthodontic Appliances* (Butterworth-Heinemann, 2000)
ISBN 0723610533

Rosentiel S F, M F Land and J Fujimoto – *Contemporary Fixed Prosthodontics, 3rd Edition* (Mosby, 2001)
ISBN 081515559X

Van Noort R – *Introduction to Dental Materials* (Mosby, 2007) ISBN 0723434047

Journals

Dental Lab Journal

The Dental Technician

Dental Technologies

Private Laboratory

Quintessence Journal of Dental Technology

Websites

www.bracon.co.uk

www.derweb.co.uk

www.dla.org.uk

www.dta-uk.org

www.us.elsevierhealth.com

www.qjdt.co.uk

www.zahndental.com

Bracon Dental Suppliers

Dental Education Resources

Dental Laboratories Association

Dental Technicians Association

Journal of Prosthetic Dentistry

Quintessence Journal of Dental Technology

Zahn Dental Suppliers

Delivery of personal, learning and thinking skills

The following table identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	[E2] planning and carrying out their research to identify and decide on a suitable work-based project, being aware of the consequences if they are unable to complete the practical component
Creative thinkers	[CT 1] generating ideas regarding how their project logbook should be set out and completed
Reflective learners	[RL3] receiving feedback from more-experienced technical staff and/or tutors regarding each stage of construction of the appliance
Self-managers	[SM3, SM5] organising their time and resources to complete each process of the practical, dealing with other practical work separate from their project

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Team workers	[TM 4] working with other members of the dental team to complete the treatment plan
Effective participators	[EP 1] discussing issues of concern with other dental team members during the various patient treatment sessions

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	using the in-house ICT system to find information relating to the specialist area they have selected designing a work logbook
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	compiling information, images and transferring into allocated files reflecting on the finished work and the way it was compiled
Manage information storage to enable efficient retrieval	saving information and assignment work in a folder
Follow and understand the need for safety and security practices	aware of keeping their password safe and not disclosing it to others
Troubleshoot	able to identify a fault and know how to report it
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	collecting information from books, journals, the internet and handouts supplied by the tutor
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	obtaining information from identified websites and assessing whether it suits the purpose of the task
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	making sure that the information they require is obtainable from a website, eg images of dental appliances and equipment taking digital photographs of the different stages of the report and uploading into the appropriate file compiling a table of materials used and their costings organising a timetable for the different stages of construction and patient appointments
Bring together information to suit content and purpose	creating a single document that has all the information for their report
Present information in ways that are fit for purpose and audience	presenting the information in the way it has been requested in the brief, eg a report and an oral presentation
Evaluate the selection and use of ICT tools and facilities used to present information	discussing how the document can be improved
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	using email to send centre produced work to own address. Keeping own messages and replies safely in a folder creating a contact list of suppliers regarding materials and equipment
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	calculating costings for the practical task

Skill	When learners are ...
Identify the situation or problem and the mathematical methods needed to tackle it	
Select and apply a range of skills to find solutions	
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	discussing construction techniques for the practical tasks presenting their report to the class
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading handouts given during lectures
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	writing their report creating a handout for their presentation. Presenting their report to an audience

Further information

For further information please call Customer Services on 0844 576 0026 (calls may be recorded for training purposes) or visit our website (www.edexcel.com).

Useful publications

Further copies of this document and related publications can be obtained from:

Edexcel Publications

Adamsway

Mansfield

Nottinghamshire NG18 4FN

Telephone: 01623 467 467

Fax: 01623 450 481

Email: publications@linneydirect.com

Related information and publications include:

- *Guidance for Centres Offering Edexcel/BTEC QCF Accredited Programmes* (Edexcel, distributed to centres annually)
- Functional Skills publications – specifications, tutor support materials and question papers
- *Regulatory Arrangements for the Qualification and Credit Framework* (Ofqual, August 2008)
- the current Edexcel publications catalogue and update catalogue.

Edexcel publications concerning the Quality Assurance System and the internal and external verification of vocationally related programmes can be found on the Edexcel website and in the Edexcel publications catalogue.

NB: Most of our publications are priced. There is also a charge for postage and packing. Please check the cost when you order.

How to obtain National Occupational Standards

General Dental Council

37 Wimpole Street

London

W1G 8DQ

Email: CAIT@gdc-uk.org

Phone: 0845 222 4141 (UK local rate) or 020 7887 3800

Fax: +44 (0)20 7224 3294

The GDC also offers a 'typetalk' facility for customers with impaired hearing. This can be accessed by calling 18001 0845 222 4141 on your typetalk/minicom handset.

Professional development and training

Edexcel supports UK and international customers with training related to BTEC qualifications. This support is available through a choice of training options offered in our published training directory or through customised training at your centre.

The support we offer focuses on a range of issues including:

- planning for the delivery of a new programme
- planning for assessment and grading
- developing effective assignments
- building your team and teamwork skills
- developing student-centred learning and teaching approaches
- building Functional Skills into your programme
- building in effective and efficient quality assurance systems.

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Our customer service numbers are:

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GCSE	0844 576 0027
GCE	0844 576 0025
The Diploma	0844 576 0028
DIDA and other qualifications	0844 576 0031

Calls may be recorded for training purposes.

The training we provide:

- is active – ideas are developed and applied
- is designed to be supportive and thought provoking
- builds on best practice.

Our training is underpinned by the LLUK standards for those preparing to teach and for those seeking evidence for their continuing professional development.

Annexe A

The Edexcel BTEC qualification framework for the dental technology sector

Progression opportunities within the framework.

QCF Level	General qualifications	BTEC full vocationally-related qualifications	BTEC Short Courses	NVQ/occupational
8				
7				
6				
5				
4				
3	GCE Sciences: Chemistry, Physics, Biology/Human Perspectives on Science; Psychology	Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF)		
2	GCSE Science; Additional Science; Astronomy; Chemistry; Physics; Biology; Psychology	Edexcel BTEC Level 2 in Applied Science		
1				
Entry		Foundation Learning Tier (Applied Science)		



Annexe B

Grading domains: Level 3 BTEC generic grading domains

Grading domain 1	Indicative characteristics – merit	Indicative characteristics – distinction
<p>Application of knowledge and understanding</p> <p>(Learning outcome stem <i>understand or know</i>)</p>	<ul style="list-style-type: none"> Shows depth of knowledge and development of understanding in familiar and unfamiliar situations (for example explain why, makes judgements based on analysis). Applies and/or selects concepts showing comprehension of often complex theories. Applies knowledge in often familiar and unfamiliar contexts. Applies knowledge to non-routine contexts (eg assessor selection). Makes reasoned analytical judgements. Shows relationships between pass criteria. 	<ul style="list-style-type: none"> Synthesises knowledge and understanding across pass/merit criteria. Evaluates complex concepts/ideas/actions and makes reasoned and confident judgements. Uses analysis, research and evaluation to make recommendations and influence proposals. Analyses implications of application of knowledge/understanding. Accesses and evaluates knowledge and understanding to advance complex activities/context. Shows relationships with P/M criteria. Responds positively to evaluation.
Grading domain 2	Indicative characteristics – merit	Indicative characteristics – distinction
<p>Development of practical and technical skills</p> <p>(Learning outcome stem <i>be able to</i>)</p>	<ul style="list-style-type: none"> Deploys appropriate advanced techniques/processes/skills. Applies technical skill to advance non-routine activities. Advances practical activities within resource constraints. Produces varied solutions (including non-routine). Modifies techniques/processes to situations. Shows relationship between P criteria. 	<ul style="list-style-type: none"> Demonstrates creativity/originality/own ideas. Applies skill(s) to achieve higher order outcome. Selects and uses successfully from a range of advanced techniques/processes/skills. Reflects on skill acquisition and application. Justifies application of skills/methods. Makes judgements about risks and limitations of techniques/processes. Innovates or generates new techniques/processes for new situations. Shows relationship with pass and merit criteria.

Grading domain 3	Indicative characteristics – merit	Indicative characteristics – distinction
<p>Personal development for occupational roles</p> <p>(Any learning outcome stem)</p>	<ul style="list-style-type: none"> • Takes responsibility in planning and undertaking activities. • Reviews own development needs. • Finds and uses relevant information sources. • Acts within a given work-related context showing understanding of responsibilities. • Identifies responsibilities of employers to the community and the environment. • Applies qualities related to the vocational sector. • Internalises skills/attributes (creating confidence). 	<ul style="list-style-type: none"> • Manages self to achieve outcomes successfully. • Plans for own learning and development through the activities. • Analyses and manipulates information to draw conclusions. • Applies initiative appropriately. • Assesses how different work-related contexts or constraints would change performance. • Reacts positively to changing work-related contexts. • Operates ethically in work-related environments. • Takes decisions related to work contexts. • Applies divergent and lateral thinking in work-related contexts. • Understands interdependence.
Grading domain 4	Indicative characteristics – merit	Indicative characteristics – distinction
<p>Application of generic skills</p> <p>(Any learning outcome stem)</p>	<ul style="list-style-type: none"> • Communicates effectively using appropriate behavioural and language registers. • Communicates with clarity and influence. • Makes judgements in contexts with explanations. • Explains how to contribute within a team. • Demonstrates positive contribution to team(s). • Makes adjustments to meet the needs/expectations of others (negotiation skills). • Selects and justifies solutions for specified problems. 	<ul style="list-style-type: none"> • Presents self and communicates information to meet the needs of a variety of audience. • Identifies strategies for communication. • Shows innovative approaches to dealing with individuals and groups. • Takes decisions in contexts with justifications. • Produces outputs subject to time/resource constraints. • Reflects on own contribution to working within a team. • Generates new or alternative solutions to specified problems. • Explores entrepreneurial attributes.

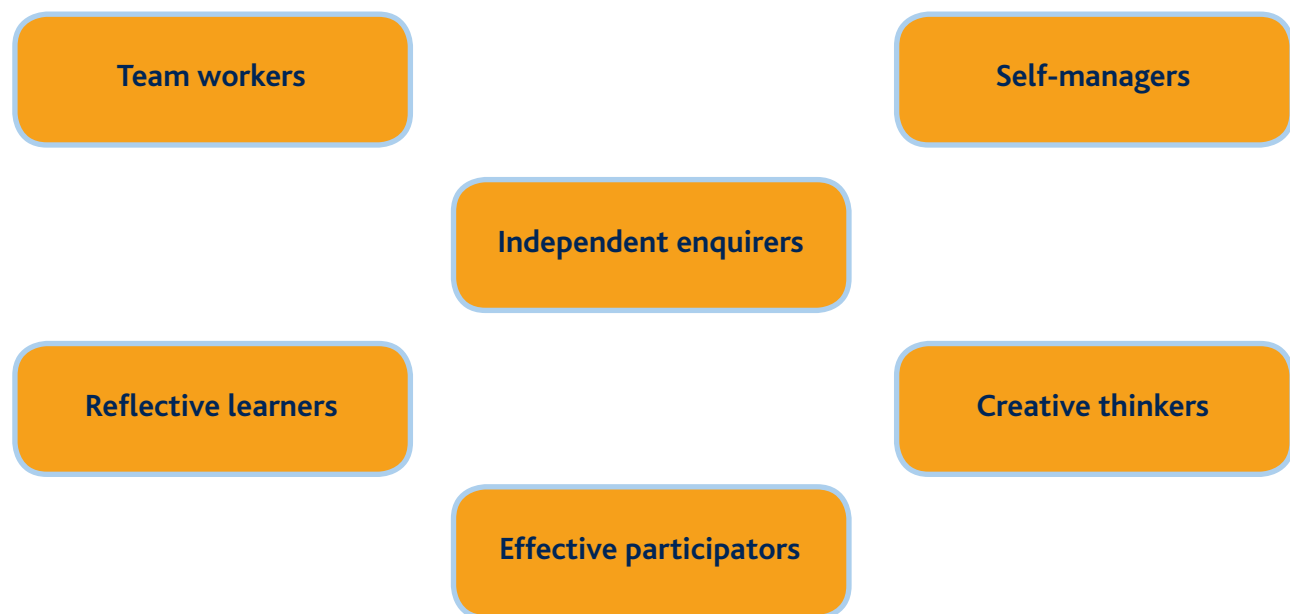
Annexe C

Personal, learning and thinking skills

A FRAMEWORK OF PERSONAL, LEARNING AND THINKING SKILLS 11-19 IN ENGLAND

The framework comprises six groups of skills that, together with the Functional Skills of English, mathematics and ICT, are essential to success in learning, life and work. In essence the framework captures the essential skills of: managing self; managing relationships with others; and managing own learning, performance and work. It is these skills that will enable young people to enter work and adult life confident and capable.

The titles of the six groups of skills are set out below.



For each group there is a focus statement that sums up the range of skills. This is followed by a set of outcome statements that are indicative of the skills, behaviours and personal qualities associated with each group.

Each group is distinctive and coherent. The groups are also inter-connected. Young people are likely to encounter skills from several groups in any one learning experience. For example an independent enquirer would set goals for their research with clear success criteria (reflective learner) and organise and manage their time and resources effectively to achieve these (self-manager). In order to acquire and develop fundamental concepts such as organising oneself, managing change, taking responsibility and perseverance, learners will need to apply skills from all six groups in a wide range of learning contexts 11–19.

The Skills

Independent enquirers

Focus:

Young people process and evaluate information in their investigations, planning what to do and how to go about it. They take informed and well-reasoned decisions, recognising that others have different beliefs and attitudes.

Young people:

- identify questions to answer and problems to resolve
- plan and carry out research, appreciating the consequences of decisions
- explore issues, events or problems from different perspectives
- analyse and evaluate information, judging its relevance and value
- consider the influence of circumstances, beliefs and feelings on decisions and events
- support conclusions, using reasoned arguments and evidence.

Creative thinkers

Focus:

Young people think creatively by generating and exploring ideas, making original connections. They try different ways to tackle a problem, working with others to find imaginative solutions and outcomes that are of value.

Young people:

- generate ideas and explore possibilities
- ask questions to extend their thinking
- connect their own and others' ideas and experiences in inventive ways
- question their own and others' assumptions
- try out alternatives or new solutions and follow ideas through
- adapt ideas as circumstances change.

Reflective learners

Focus:

Young people evaluate their strengths and limitations, setting themselves realistic goals with criteria for success. They monitor their own performance and progress, inviting feedback from others and making changes to further their learning.

Young people:

- assess themselves and others, identifying opportunities and achievements
- set goals with success criteria for their development and work
- review progress, acting on the outcomes
- invite feedback and deal positively with praise, setbacks and criticism
- evaluate experiences and learning to inform future progress
- communicate their learning in relevant ways for different audiences.

Team workers

Focus:

Young people work confidently with others, adapting to different contexts and taking responsibility for their own part. They listen to and take account of different views. They form collaborative relationships, resolving issues to reach agreed outcomes.

Young people:

- collaborate with others to work towards common goals
- reach agreements, managing discussions to achieve results
- adapt behaviour to suit different roles and situations, including leadership role
- show fairness and consideration to others
- take responsibility, showing confidence in themselves and their contribution
- provide constructive support and feedback to others.

Self-managers

Focus:

Young people organise themselves, showing personal responsibility, initiative, creativity and enterprise with a commitment to learning and self-improvement. They actively embrace change, responding positively to new priorities, coping with challenges and looking for opportunities.

Young people:

- seek out challenges or new responsibilities and show flexibility when priorities change
- work towards goals, showing initiative, commitment and perseverance
- organise time and resources, prioritising actions
- anticipate, take and manage risks
- deal with competing pressures, including personal and work-related demands
- respond positively to change, seeking advice and support when needed
- manage their emotions, and build and maintain relationships.

Effective participators

Focus:

Young people actively engage with issues that affect them and those around them. They play a full part in the life of their school, college, workplace or wider community by taking responsible action to bring improvements for others as well as themselves.

Young people:

- discuss issues of concern, seeking resolution where needed
- present a persuasive case for action
- propose practical ways forward, breaking these down into manageable steps
- identify improvements that would benefit others as well as themselves
- try to influence others, negotiating and balancing diverse views to reach workable solutions
- act as an advocate for views and beliefs that may differ from their own.

PLTS performance indicator (suggested recording sheet)

Name:	Date:				
	Level of success 1 = low, 5 = high				
Independent enquirers					
Identify questions to answer and problems to resolve	1	2	3	4	5
Plan and carry out research, appreciating the consequences of decisions	1	2	3	4	5
Explore issues, events or problems from different perspectives	1	2	3	4	5
Analyse and evaluate information, judging its relevance and value	1	2	3	4	5
Consider the influence of circumstances, beliefs and feelings on decisions and events	1	2	3	4	5
Support conclusions, using reasoned arguments and evidence	1	2	3	4	5
Creative thinkers					
Generate ideas and explore possibilities	1	2	3	4	5
Ask questions to extend their thinking	1	2	3	4	5
Connect their own and others' ideas and experiences in inventive ways	1	2	3	4	5
Question their own and others' assumptions	1	2	3	4	5
Try out alternatives or new solutions and follow ideas through	1	2	3	4	5
Adapt ideas as circumstances change	1	2	3	4	5
Reflective learners					
Assess themselves and others, identifying opportunities and achievements	1	2	3	4	5
Set goals with success criteria for their development and work	1	2	3	4	5
Review progress, acting on the outcomes	1	2	3	4	5
Invite feedback and deal positively with praise, setbacks and criticism	1	2	3	4	5
Evaluate experiences and learning to inform future progress	1	2	3	4	5
Communicate their learning in relevant ways for different audiences	1	2	3	4	5

Team workers					
Collaborate with others to work towards common goals	1	2	3	4	5
Reach agreements, managing discussions to achieve results	1	2	3	4	5
Adapt behaviour to suit different roles and situations, including leadership roles	1	2	3	4	5
Show fairness and consideration to others	1	2	3	4	5
Take responsibility, showing confidence in themselves and their contribution	1	2	3	4	5
Provide constructive support and feedback to others	1	2	3	4	5
Self-managers					
Seek out challenges or new responsibilities and show flexibility when priorities change	1	2	3	4	5
Work towards goals, showing initiative, commitment and perseverance	1	2	3	4	5
Organise time and resources, prioritising actions	1	2	3	4	5
Anticipate, take and manage risks	1	2	3	4	5
Deal with competing pressures, including personal and work-related demands	1	2	3	4	5
Respond positively to change, seeking advice and support when needed	1	2	3	4	5
Manage their emotions, and build and maintain relationships.	1	2	3	4	5
Effective participators					
Discuss issues of concern, seeking resolution where needed	1	2	3	4	5
Present a persuasive case for action	1	2	3	4	5
Propose practical ways forward, breaking these down into manageable steps	1	2	3	4	5
Identify improvements that would benefit others as well as themselves	1	2	3	4	5
Try to influence others, negotiating and balancing diverse views to reach workable solutions	1	2	3	4	5
Act as an advocate for views and beliefs that may differ from their own	1	2	3	4	5

Note to learner: The circled number represents an indication of your PLTS performance so far.

Note to tutor: Indicate the level of success by circling the appropriate number during your feedback with the learner.

Summary of the PLTS coverage throughout the programme

Personal, learning and thinking skills	Unit																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Independent enquirers		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Creative thinkers	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reflective learners	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓		✓
Team workers		✓			✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓
Self-managers	✓		✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Effective participators	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
✓ – opportunities for development																		

Annexe D

Wider curriculum mapping

Study of the Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) gives learners opportunities to develop an understanding of spiritual, moral, ethical, social and cultural issues as well as an awareness of citizenship, environmental issues, European developments, health and safety considerations and equal opportunities issues.

The Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) makes a positive contribution to wider curricular areas as appropriate.

Spiritual, moral, ethical, social and cultural issues

The qualification contributes to an understanding of:

- spiritual issues – for example in *Unit 6: Legislation, Professionalism and Ethics in Dentistry* where learners consider the importance of working effectively with other people in dental team, appreciating why it is important to show respect for diversity, equality and the wellbeing of others within the workplace. Also in *Unit 7: Dental Public Health and Preventative Dentistry* which considers the impact of individual beliefs and values on oral health.
- moral and ethical issues – for example in *Unit 6: Legislation, Professionalism and Ethics in Dentistry* where learners become aware of the ethical considerations involved in the treatment of patients.
- social and cultural issues – for example in *Unit 7: Dental Public Health and Preventative Dentistry* where learners consider the sociological, environmental and economic factors which contribute to oral health and illness.

Citizenship issues

Learners undertaking Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) will have the opportunity to develop their understanding of citizenship issues, for example in terms of their rights and responsibilities in a dental technology workplace.

Environmental issues

Learners undertaking the Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) will have the opportunity to develop their understanding of environmental issues through the experience of the dental technology sector in most of the units.

European developments

Much of the content of the Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) applies throughout Europe even though delivery is in a UK context.

Health and safety considerations

The Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) are practically based and health and safety issues are encountered throughout the units. Learners will develop awareness of the safety of others as well as themselves in all practical activities. In the majority of the units, learners will also explore health and safety issues across the dental technology sector.

Equal opportunities issues

Equal opportunities issues are implicit throughout the Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF).

Wider curriculum mapping

Level 3

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Spiritual		✓				✓								✓				✓
Moral and ethical	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓	✓		✓	✓	
Social and cultural	✓	✓	✓			✓	✓	✓	✓		✓			✓		✓	✓	✓
Citizenship issues		✓				✓	✓					✓		✓				✓
Environmental issues	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
European developments	✓	✓	✓		✓	✓	✓	✓	✓		✓		✓	✓			✓	✓
Health and safety considerations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Equal opportunities issues	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓



Annexe E

Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) (specification start date 01/11/2009) – unit mapping overview

Old units / New units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Unit 1			P															
Unit 2	P	X																
Unit 3			P	F														
Unit 4					F													
Unit 5						F												
Unit 6							X											
Unit 7								F										
Unit 8									F									
Unit 9										F								
Unit 10											F							
Unit 11												F						
Unit 12													F					
Unit 13														X				
Unit 14	P														F			
Unit 15																F		
Unit 16																		F

Old units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
New units									P									
Unit 17																		
Unit 18																		F

KEY

P – Partial mapping (some topics from the old unit appear in the new unit)

F – Full mapping (topics in old unit match new unit exactly or almost exactly)

X – Full mapping + new (all the topics from the old unit appear in the new unit, but new unit also contains new topic(s))

Unit mapping in depth

BTEC National in Dental Technology (specification end date 31/08/2010)/Edexcel BTEC Level 3 Subsidiary Diploma/Extended Diploma in Dental Technology (QCF) (specification start date 01/11/2009)

New units		Old units		Mapping/comments (new topics in italics)
Number	Name	Number	Name	
Unit 1	Fundamentals of Dental Technology	3	Introductory Dental Technology	Learning outcomes 1-2 of the old units are covered
Unit 2	Medical Emergencies, First Aid and Communication in the Dental Team	1	Safe Working Practice and Cross-infection Control in the Dental Environment	Some aspects of learning outcome 1 of the old unit are covered
		2	Medical Emergencies, First Aid and Communication in the Dental Team	Learning outcomes 1-4 of the old units are covered For learning outcome 2, there is an added aspect of demonstrating first aid procedures needed for medical emergencies in the clinical setting or dental laboratory
Unit 3	Dental Technology Techniques	3	Introductory Dental Technology	Learning outcome 4 of the old unit is covered
		4	Dental Technology Techniques	Learning outcomes 1-4 of the old units are covered
Unit 4	Dental Anatomy, Oral Biology and Disease	5	Dental Anatomy, Oral Biology and Disease	Learning outcomes 1-4 of the old units are covered
Unit 5	Basic Dental Biomaterials Science	6	Basic Dental Biomaterials Science	Learning outcomes 2-4 of the old units are covered
Unit 6	Legislation, Professionalism and Ethics in Dentistry	7	Legislation, Professionalism and Ethics in Dentistry	Learning outcomes 1-4 of the old units are covered In learning outcome 1 the aspect of lifelong learning has been added
Unit 7	Dental Public Health and Preventative Dentistry	8	Dental Public Health and Preventative Dentistry	Learning outcomes 1-4 of the old units are covered
Unit 8	Removable Complete Prosthodontics	9	Removable Complete Prosthodontics	Learning outcomes 1-4 of the old units are covered
Unit 9	Removable Partial Prosthodontics	10	Removable Partial Prosthodontics	Learning outcomes 1-4 of the old units are covered
Unit 10	Dental Radiology and Imaging	11	Dental Radiology and Imaging	Learning outcomes 1-4 of the old units are covered

New units		Old units		Mapping/comments (new topics in italics)
Number	Name	Number	Name	
Unit 11	Design of Fixed Prosthodontics	12	Design of Fixed Prosthodontics	Learning outcomes 1-4 of the old units are covered
Unit 12	Complex Dental Materials Science	13	Complex Dental Biomaterials Science	Learning outcomes 1-4 of the old units are covered
Unit 13	Techniques for Manufacturing Fixed Prosthodontics	14	Techniques for Manufacturing Fixed Prosthodontics	Learning outcomes 1-5 of the old unit are covered
Unit 14	Quality Assurance in Dental Technology	1	Safe Working Practice and Cross-infection Control in the Dental Environment	Learning outcome 2 of the old unit is covered
		15	Quality Assurance in Dental Technology	Learning outcomes 1-2 of the old unit are covered
Unit 15	Principles of Orthodontic Therapy Regimes	16	Principles of Orthodontic Therapy Regimes	Learning outcomes 1-4 of the old unit are covered
Unit 16	Design, Manufacture and Modification of Orthodontic Appliances	17	Design, Manufacture and Modification of Orthodontic Appliances	Learning outcomes 1-5 of the old unit are covered
Unit 17	Advanced Dental Technology Techniques and Procedures	9	Removable Complete Prosthodontics	Some aspects of learning outcome 4 of the old unit are covered
Unit 18	Work Based Learning in Dental Technology	18	Work-based Learning in Dental Technology	Learning outcomes 1-4 of the old unit are covered

Annexe F

Links to General Dental Council (GDC) 2009 Learning outcomes for Dental Technicians

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Topic area: Biomedical sciences and oral biology																		
Have knowledge of the biomedical sciences, oral physiology and craniofacial, oral and dental anatomy relevant to dental technology				✓														
Be familiar with those aspects of general anatomy and physiology relevant to the practice of dental technology				✓														
Topic area: Behavioural sciences, communication skills and health informatics																		
Be competent at using information technology		✓																

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be competent at communication with patients, their families and carers, other members of the dental team and other healthcare professionals		✓																
Have knowledge of managing patients from different social and ethnic backgrounds		✓																
Have knowledge of working as part of the dental team		✓																
Be familiar with the social and psychological issues relevant to the care of patients		✓					✓											
Topic area: human disease																		
Have knowledge of the scientific principles of sterilisation, disinfection and antisepsis																		
Be familiar with the main medical disorders which may impinge on dental treatment																		✓

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be familiar with the work of other healthcare workers																		
Be familiar with the place of dentistry in the provision of healthcare																		
Topic area: medical emergencies																		
Be competent at carrying out resuscitation techniques		✓																
Be familiar with the principles of first aid		✓																
Topic area: Law, ethics and professionalism																		
Be competent at maintaining full, accurate clinical records						✓												
Have knowledge of responsibilities of consent, duty of care and confidentiality						✓												
Have knowledge of patients' rights and how to handle complaints						✓												

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Have knowledge of the range of skills of other members of the dental team						✓												
Have knowledge of the regulatory functions of the GDC						✓												
Be familiar with the legal and ethical obligations of registered members of the dental team						✓												
Be familiar with the obligation to practise in the best interests of the patient at all times						✓												
Be familiar with the need for lifelong learning and professional development						✓												
Be familiar with the law as it applies to records						✓												
Topic area: health and safety and infection control																		

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be competent at implementing and performing satisfactory infection control and preventing physical, chemical and microbiological contamination in the clinic and the laboratory					✓					✓							✓	
Be competent at arranging and using the working clinical and laboratory environment in the most safe and efficient manner			✓					✓		✓				✓			✓	
Have knowledge of health and safety legislation as it affects clinical and laboratory practice		✓				✓												
Topic area: dental biomaterials science																		
Be competent at the correct selection and manipulation of dental biomaterials used by the dental technician					✓													

GDC learning outcome						
Have knowledge of the science that underpins the dental biomaterials used by the dental technician						✓
Have knowledge of the limitations of such dental biomaterials	✓					
Be familiar with those aspects of biomaterials safety that relate to the work of the dental technician	✓					
Topic area: integration						
Be competent at receiving work from the clinical area				✓		
Be competent at using a variety of types of information and data to establish the requirements for particular custom-made dental device	✓					
Unit 1						✓
Unit 2					✓	✓
Unit 3						✓
Unit 4						
Unit 5	✓	✓	✓			
Unit 6					✓	
Unit 7						
Unit 8						✓
Unit 9						✓
Unit 10						✓
Unit 11						
Unit 12						✓
Unit 13						✓
Unit 14						
Unit 15						✓
Unit 16						✓
Unit 17						✓
Unit 18						

GDC learning outcome			
Be competent at managing the manufacture of a range of custom-made dental devices within one of the following treatment modalities: – fixed prosthodontics – removable prosthodontics – orthodontics			
Be competent at assessing the fitness for purpose both of custom-made dental devices employed in the manufacture of a dental prosthesis and of the final device itself			
Have knowledge of the procedures used in the design and manufacture of custom-made dental devices for fixed and removable prosthodontics and orthodontics			
Unit 1			
Unit 2			
Unit 3			
Unit 4			
Unit 5			
Unit 6			
Unit 7			
Unit 8	✓		✓
Unit 9	✓		✓
Unit 10			
Unit 11	✓		✓
Unit 12			
Unit 13			✓
Unit 14			
Unit 15			
Unit 16	✓		✓
Unit 17			
Unit 18			

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Have knowledge of the design and manufacture of a range of custom-made dental devices, together with the provision of advice to other members of the dental team on aspects of their manufacture																		
Have knowledge of how to meet the design requirements by re-working and changing of components to meet the patient's needs								✓										
Have knowledge of when it is appropriate to refer a request for dental technician support to a more appropriately skilled colleague and of how to carry out such a procedure						✓								✓				
Have knowledge of quality assurance as it applies to the individual dental technician																		

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be familiar with contract review for clinical cases								✓						✓				
Be familiar with the complex interactions between materials, designs and oral structures when reviewing the manufacture and acceptability of dental services														✓				
Be familiar with product standards in relation to dental devices														✓				
Topic area: preventive dentistry																		
Have knowledge of the ways to design and manufacture dental appliances in a fashion which minimises their potential for causing further oral disease							✓											
Be familiar with the procedures, successes and limitations of preventive dentistry							✓											
Topic area: dental public health																		

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be familiar with the dental team's wider responsibilities towards the community as a whole							✓											
Be familiar with the sociological, behavioural, environmental and economic factors which contribute to oral health or illness							✓											
Topic area: introduction to dental technology																		
Be competent in the stages of manufacture of dental devices in areas relevant to the student's programme	✓		✓															
Be familiar with the design and manufacture of a range of fixed and removable dental devices and orthodontic appliances			✓					✓	✓		✓		✓			✓		
Be familiar with the provision of a comprehensive approach to oral care		✓																

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be familiar with the clinical aspects of a range of restorative techniques that involve the manufacture of dental devices	✓		✓								✓		✓				✓	
Topic area: dental radiology and imaging																		
Be familiar with the principles which underlie dental radiographic techniques										✓								
Be familiar with the application of the radiological and imaging methods to support dental treatment										✓								
Be familiar with the radiographic appearance of various tissues of relevance to dental technology										✓								
Topic area: fixed prosthodontics																		

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be competent at knowing when and how to progress fixed prosthodontic cases within the dental laboratory matched to treatment plans											✓		✓					
Be competent at the initial planning and preparation of fixed prosthodontic appliances for manufacture in the dental laboratory													✓					
Have knowledge of the range of manufacturing methods and materials used to fabricate fixed prosthodontic restorations													✓					
Have knowledge of the various technological procedures used in the dental laboratory during the production of veneers, inlays, crowns, bridges and temporary restorations											✓							

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be familiar with the treatment planning and design requirements related to the range of fixed prosthodontic restorations											✓							
Be familiar with the clinical provision of custom-made aspects of team dental devices																	✓	
Be familiar with dental implants as an option for replacing missing teeth											✓							
Be familiar with the range of dental laboratory techniques which have application in the use of dental implants																	✓	
Be familiar with the forms of precision attachments used as an option when fabricating fixed and removable prostheses																		

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be familiar with the complex nature of the use of precision attachments in both fixed and removable custom-made dental devices																	✓	
Topic area: Removable prosthodontics																		
Be competent at knowing when and how to progress removable prosthodontic cases within the dental laboratory matched to treatment plans								✓	✓									
Be competent at the initial planning and preparation of removable prosthodontic appliances for manufacture in the dental laboratory								✓	✓									
Have knowledge of assessing the feasibility of meeting client requirements for custom-made dental devices								✓	✓									

GDC learning outcome				
Have knowledge of providing technical advice on the feasibility and design of custom-made dental devices				
Have knowledge of the design of complete dentures and:				
– their manufacture				
– the incorporation of soft linings or modifications to improve their strength				
– their repair				
Have knowledge of the design, manufacture, modification and repair of removable prosthetic devices				
Be familiar with the design and manufacture of complex removable prostheses				
Unit 1				
Unit 2				
Unit 3				
Unit 4				
Unit 5				
Unit 6				
Unit 7				
Unit 8	✓	✓	✓	
Unit 9	✓		✓	
Unit 10				
Unit 11				
Unit 12				
Unit 13				
Unit 14				
Unit 15				
Unit 16				
Unit 17				
Unit 18				

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Be familiar with the design and manufacture of occlusal splints, sleep apnoea devices and mouth guards																		
Be familiar with the use of implants and precision attachments for the stabilisation of intra-oral prostheses																		
Topic area: orthodontics																		
Be competent at knowing when and how to progress orthodontic cases within the dental laboratory matched to treatment plans																✓		
Be competent at the initial planning and preparation of orthodontic appliances for manufacture in the dental laboratory																✓		

GDC learning outcome	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14	Unit 15	Unit 16	Unit 17	Unit 18
Have knowledge of the range of manufacturing methods and materials used to fabricate removable orthodontic appliances																✓		
Be familiar with the treatment planning and design requirements related to the range of orthodontic appliances																✓		
Be familiar with the clinical aspects of team provision of removable orthodontic custom-made dental devices															✓			
Be familiar with the inclusion of prosthetic teeth within removable orthodontic appliances																		



Annexe G

Examples of calculation of qualification grade above pass grade

Edexcel will automatically calculate the qualification grade for your learners when your learner unit grades are submitted.

The generic examples below demonstrate how the qualification grade above pass is calculated using the following two tables which are also shown in the section earlier on in the specification *Calculation of the qualification grades above pass grade*.

Points available for credits achieved at different QCF levels and unit grades

The table below shows the **number of points scored per credit** at the unit level and grade.

Unit QCF level	Points per credit		
	Pass	Merit	Distinction
Level 2	5	6	7
Level 3	7	8	9
Level 4	9	10	11

Learners who achieve the correct number of points within the ranges shown in the 'qualification grade' table below will achieve the qualification merit, distinction or distinction* grades (or combinations of these grades appropriate to the qualification).

Qualification grade

BTEC Level 3 Certificate

Points range above pass grade	Grade	
230-249	Merit	M
250-259	Distinction	D
260 and above	Distinction*	D*

BTEC Level 3 Subsidiary Diploma

Points range above pass grade	Grade	
460-499	Merit	M
500-519	Distinction	D
520 and above	Distinction*	D*

BTEC Level 3 Diploma

Points range above pass grade	Grade
880-919	MP
920-959	MM
960-999	DM
1000-1029	DD
1030-1059	DD*
1060 and above	D*D*

BTEC Level 3 Extended Diploma

Points range above pass grade	Grade
1300-1339	MPP
1340-1379	MMP
1380-1419	MMM
1420-1459	DMM
1460-1499	DDM
1500-1529	DDD
1530-1559	DDD*
1560-1589	DD*D*
1590 and above	D*D*D*

Example 1

Achievement of pass qualification grade

A learner completing a 30-credit Edexcel BTEC Level 3 Certificate **does not** achieve the points required to gain a merit qualification grade.

	Level	Credit	Grade	Grade points	Points per unit = credit x grade
Unit 1	3	10	Pass	7	$10 \times 7 = 70$
Unit 2	3	10	Pass	7	$10 \times 7 = 70$
Unit 3	3	10	Merit	8	$10 \times 8 = 80$
Qualification grade totals		30	Pass		220

Example 2

Achievement of merit qualification grade

A learner completing a 30-credit Edexcel BTEC Level 3 Certificate achieves the points required to gain a merit qualification grade.

	Level	Credit	Grade	Grade points	Points per unit = credit x grade
Unit 1	3	10	Pass	7	$10 \times 7 = 70$
Unit 2	3	10	Merit	8	$10 \times 8 = 80$
Unit 3	3	10	Merit	8	$10 \times 8 = 80$
Qualification grade totals			Merit		230

Example 3

Achievement of distinction qualification grade

A learner completing a 60-credit Edexcel BTEC Level 3 Subsidiary Diploma achieves the points required to gain a distinction qualification grade.

	Level	Credit	Grade	Grade points	Points per unit = credit x grade
Unit 1	3	10	Merit	8	$10 \times 8 = 80$
Unit 2	3	10	Distinction	9	$10 \times 9 = 90$
Unit 3	3	10	Distinction	9	$10 \times 9 = 90$
Unit 5	3	10	Merit	8	$10 \times 8 = 80$
Unit 6	2	10	Distinction	7	$10 \times 7 = 70$
Unit 11	3	10	Distinction	9	$10 \times 9 = 90$
Qualification grade totals		60	Distinction		500

Example 4

Achievement of distinction merit qualification grade

A learner completing a 120-credit Edexcel BTEC Level 3 Diploma achieves the points required to gain a distinction merit qualification grade.

	Level	Credit	Grade	Grade points	Points per unit = credit x grade
Unit 1	3	10	Merit	8	$10 \times 8 = 80$
Unit 2	3	10	Distinction	9	$10 \times 9 = 90$
Unit 3	3	10	Distinction	9	$10 \times 9 = 90$
Unit 4	3	10	Merit	8	$10 \times 8 = 80$
Unit 5	3	10	Merit	8	$10 \times 8 = 80$
Unit 6	2	10	Distinction	7	$10 \times 7 = 70$
Unit 11	3	10	Distinction	9	$10 \times 9 = 90$
Unit 15	4	10	Merit	10	$10 \times 10 = 100$
Unit 17	3	10	Pass	7	$10 \times 7 = 70$
Unit 18	3	10	Pass	7	$10 \times 7 = 70$
Unit 25	3	20	Merit	8	$20 \times 8 = 160$
Qualification grade totals		120	Distinction Merit		980

Example 5

Achievement of merit merit merit qualification grade

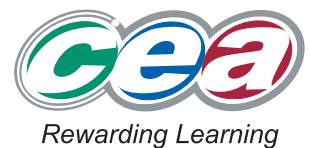
A learner completing a 180-credit Edexcel BTEC Level 3 Extended Diploma achieves the points required to gain a merit merit merit qualification grade.

	Level	Credit	Grade	Grade points	Points per unit = credit x grade
Unit 1	3	10	Merit	8	$10 \times 8 = 80$
Unit 2	3	10	Pass	7	$10 \times 7 = 70$
Unit 3	3	10	Distinction	9	$10 \times 9 = 90$
Unit 4	3	10	Merit	8	$10 \times 8 = 80$
Unit 5	3	10	Pass	7	$10 \times 7 = 70$
Unit 6	2	10	Distinction	7	$10 \times 7 = 70$
Unit 11	3	10	Distinction	9	$10 \times 9 = 90$
Unit 12	3	10	Merit	8	$10 \times 8 = 80$
Unit 15	4	10	Pass	9	$10 \times 9 = 90$
Unit 17	3	10	Pass	7	$10 \times 7 = 70$
Unit 18	3	10	Pass	7	$10 \times 7 = 70$
Unit 20	3	10	Pass	7	$10 \times 7 = 70$
Unit 22	3	10	Merit	8	$10 \times 8 = 80$
Unit 25	3	20	Pass	7	$20 \times 7 = 140$
Unit 35	3	10	Distinction	9	$10 \times 9 = 90$
Unit 36	3	10	Merit	8	$10 \times 8 = 80$
Unit 38	3	10	Distinction	9	$10 \times 9 = 90$
Qualification grade totals		180	Merit Merit Merit		1410

Ofqual




Llywodraeth Cynulliad Cymru
Welsh Assembly Government



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