Unit 24: Undertake Small Scale Design for Blacksmithing and Metalworking

Unit reference number: R/602/0721
QCF Level 3: BTEC National
Credit value: 10
Guided learning hours: 60

Aim and purpose

This unit aims to introduce learners to the skills and knowledge for small scale design for blacksmithing and metalworking, and how these can be applied in practice. It is designed for learners in centre-based settings looking to progress into the sector or on to further/higher education.

Unit introduction

Communicating with clients to establish a design working brief and the ability to research and establish potential solutions to the established brief play a major role in successful design. Communicating technical information about design development and experimenting with alternative ideas are at the core of this unit.

In learning outcome 1, learners will understand and work to a brief for a small scale design project. This unit introduces 2D and 3D design methods and problem-solving and production techniques to manufacture small scale models or prototypes.

Learning outcome 2 looks at developing and communicating design ideas effectively using a variety of media. The considerations and experimentation within the design process and the construction of prototypes are all important skills within the communication process and are fundamental to this unit.

In learning outcome 3, learners will make models and prototypes which satisfy functional and aesthetic criteria supported by purposeful research. Learners will develop a clear understanding of the importance of anticipating manufacturing problems in the early design stages before construction of the final pieces and understand the economic impact this has on the success of a product.

Learning outcome 4 covers the analysis, review and evaluation of working methods to realise an effective design outcome.

Learning outcomes

On completion of this unit a learner should:

1 Understand a small scale design project brief

2 Be able to develop and communicate small scale design ideas

3 Be able to make small scale models and prototypes

4 Be able to assess working methods to realise an effective design outcome.

Unit content

1 Understand a small scale design project brief

Interpretation and analytical techniques to assess the requirements of a brief for small scale designs: brief variations according to the nature of the 3D design eg sculptural, architecture, mechanical, educational or retail; brief clarification (clear communication, identifying aesthetic and functional requirements together with the needs of the client, consumer and others)

2 Be able to develop and communicate small scale design ideas

Small scale design brief investigation, planning and implementation: information sources eg personal, ergonomic, economic, environmental, health and safety factors; client and/or user needs in terms of aesthetic and functional factors, materials, techniques and processes; production of effective concept and detailed plans for small scale design projects using drawings, photographs and visual presentations; scheduling time management, materials preparation, making processes, sequences, modifications and the involvement of clients, consumers and/or users towards a final design solution; costs

3 Be able to make small scale models and prototypes

Production method for models, mock-ups and samples of an appropriate scale and precision for small scale 3D products: material selection and construction methods to meet the brief requirements (strength, durability, weight, size, manageability, one-off or mass manufacture processes); client requirements; ergonomics and situation dimensions; safety and functional considerations tested and assessed using the model to demonstrate the potential of design ideas; health and safety; risk assessment; personal protective equipment (PPE)

4 Be able to assess working methods to realise an effective design outcome

Ongoing analysis to review the progress of design work in the production of small scale 3D products to meet set briefs: review of design outcomes to evaluate time management, costs, development of analytical skills and understanding; communication and presentation of design ideas and devising evaluation criteria to make judgements about aesthetic and functional qualities of work under consideration

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 relevant aesthetic research for a selected small scale design project to meet given objectives	**M1** develop and communicate selected design ideas effectively using appropriate research sources and media	**D1** review and evaluate a selected small scale design project making appropriate recommendations for improvement.
P2 produce relevant research for a selected small scale design project to meet the functional requirements	**M2** produce time/cost projections for a selected small scale design project	
P3 produce a brief for a selected small scale design project to meet given objectives [IE]		
P4 produce a range of initial concept proposals to meet a selected small scale design brief	**M3** carry out purposeful and innovative design development to produce models and/or samples.	
P5 develop selected concept proposal(s) to final specification stage to meet a selected small scale design brief		
P6 produce appropriate working specifications and drawings to meet a selected small scale design brief		
P7 present and explain design ideas to meet a selected small scale design brief [CT, RL]		
P8 make a model and/or samples which satisfy given functional and aesthetic criteria [TW, SM]		
P9 review working methods and final design for a selected project.		

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

Delivery of this unit will involve practical assessments, written assessment, visits to suitable collections and will have links to industrial experience placements.

Tutors delivering this unit have opportunities to use as wide a range of techniques as possible. Lectures, discussions, seminar presentations, site visits, supervised practicals, internet and/or library-based research and the use of personal and/or industrial experience would all be suitable. Delivery should stimulate, motivate, educate and enthuse learners.

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 made aware of the requirements of this unit prior to any work-related activities so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to produce scaled models, and they should be encouraged to ask for observation records and/or witness statements to be provided as evidence of this. Guidance on the use of observation records and witness statements is provided on the Edexcel website.

Whichever delivery methods are used, it is essential that tutors stress the importance of health and safety within practical sessions, sound time management and the need to log and credit the research sources.

Health and safety issues relating to working in the workshop, welding and fabrication 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 for this unit with other relevant units and assessment instruments learners are taking as part of their programme of study.

This unit is closely related to *Unit 25: Undertake Small Scale Working for Blacksmithing and Metalworking*, which should normally be delivered as a natural development of this unit within the complete programme. It is, however, possible to devise an integrated programme within which the two units are not separated, except for assessment purposes. If this method is preferred, care must be taken to ensure that sufficient exploratory and preparatory work is undertaken in order to provide a sound basis for design development leading to properly finished work. Understanding of professional practice should be further emphasised in this unit.

Learning outcomes 1 and 2 should, where possible, use realistic practical credible briefs which will give integrity to interaction between client and designer and personal development. These learning outcomes are likely to be delivered through lectures, group and client discussions, workshop development and independent learner research.

Learning outcome 3 covers the practical application and technical skills needed within the unit. This learning outcome should be delivered through demonstration, practical and workshop activity and group discussion.

Learning outcome 4 looks at the analytical review of the proposed design process and the resultant product. This could be achieved through formal lectures, presentations, testing and product evaluation techniques.

Outline learning plan

The outline learning plan has been included in this unit 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 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 and overview of the unit.
Assignment 1: Small Scale Design (P1, P2, P3, M1, M2, D1) Tutor introduces the assignment brief. Interpretation and analytical techniques to assess the requirements of a brief for small scale designs.
Learner research of design considerations.
Learner assessment/feedback.
Assignment 2: Practical Small Scale Design (P4, P5, P6, P7, P8, P9, M3) Tutor introduces the assignment brief. Production method for models, mock-ups and samples of an appropriate scale and precision for small scale 3D products. Learners review and evaluate small scale design project and make recommendations for improvement.
Student assessment/feedback.
Guest speaker, workshop/site visits.
Unit review.

Assessment

For P1, P2 and P3, learners must research and provide information on a brief for a selected small scale design project to meet given objectives. Tutors should identify the design project and objectives or agree them through discussion with learners. Objectives could be based on research needed, client/tutor interaction etc. Learners must communicate with a client (actual or simulation) and record clearly the design requirements. Evidence could take the form of the production of a detailed brief with supporting notes and data.

P4, P5, P6 and P7 require learners to develop and communicate design ideas to meet a selected small scale design brief. Tutors should identify the small scale design brief or agree this through discussion with the learners. Learners should use a range of communication media and established design processes to produce a possible solution to the brief. This could take the form of scrapbooks of design solutions using photos, sketches, plans and illustrations. A final detailed plan would evolve from this draft work, giving technical details as required from the brief.

For P8, learners must make a model and/or prototypes which satisfy given functional and aesthetic criteria. Tutors should identify the functional and aesthetic criteria or agree them through discussion with learners. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. They should construct a model or working prototype which communicates the design idea/ideas developed within P2 to a satisfactory standard. The assessment of the finished model or prototype could play an important part of P3 but could also be assessed directly by the tutor during practical activities. If this format is used then suitable evidence from guided activities would be observation records completed by learners and the tutor.

P9 requires learners to review selected design proposals to realise an effective final outcome. Tutors should identify the design proposals or agree them through discussion with learners. These are likely to be the proposals developed for P2 and P3. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. Learners could analyse and evaluate their own work throughout the design process and make improvements and recommendations for improvement. Evidence could be in the form of a report or project that includes an evaluation of the final work.

For M1, learners must develop and communicate selected design ideas effectively using appropriate research

sources and media. This is likely to be an enhancement of the evidence developed for P1 and P2. Evidence could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector), an annotated poster or a project.

M2 requires learners to produce time/cost projections for a selected small scale design project. Evidence may be in the same format as for P3.

M3 requires learners to carry out purposeful and innovative design development to produce models and/or samples. They must demonstrate and communicate selected functional and aesthetic criteria for a selected small scale design project. Learners should construct a working model or prototype to a competent standard suitable for the communication of ideas appropriate to the design brief. Evidence may be in the same format as for P3.

D1 requires learners to review and evaluate a selected project to produce a final outcome that exploits the potential and limitations of small scale 3D design for further improvement. Tutors should identify the project or agree it through discussion with learners. They should critically analyse and evaluate their work, making detailed recommendations for design development which would impact on a range of design elements such as cost, aesthetics, durability, use and appropriateness to brief requirements.

Selected developmental and finished work should be presented within a portfolio and through 3D displays so that learners can show the range of work covered and the skills obtained. All work should be recorded in a suitable form and records kept safely for future reference during assessment and for the purposes of progression. 3D work should be stored under suitable conditions until required for assessment.

Programme of suggested assignments

The following table 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	Small Scale Design	You are working as a self-employed designer and have been contracted to produce a design for a new installation. You must research interpretative and analytical techniques for small scale design	Assignment. Project.
P4, P5, P6, P7, P8, P9, M3	Practical Small Scale Design	You need to plan, undertake and review the small scale design project.	Practical design. Observation evidence. Work logs or other relevant learner notes and drawings.

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

This unit forms part of the BTEC land-based sector suite. This unit has particular links with:

Level 2	Level 3
Using Ideas to Explore, Develop and Produce Art and Design	Understanding Principles and Methods of Design for Blacksmithing and Metalworking
Building an Art and Design Portfolio	Undertake Small Scale Working for Blacksmithing and Metalworking

This unit also has links with Level 3 National Occupational Standards in Blacksmithing and Farriery.

Essential resources

Learners will need access to a range of visual and technical resources. The workshop should be equipped to a good standard for working with a wide range of materials and should include a separate area for model-making, a heat-treatment area with appropriate extraction facilities, a clean area for drawing and preparation, a finishing area and storage space for work in progress. Appropriate facilities for the preparation and presentation of finished work should be available.

Resources for research should include a permanent collection of reference material for ongoing work, display facilities, PC (preferably with internet connection), as well as access to a good library containing a wide reference to design.

Indicative reading for learners

Textbooks

Grillo P – *Form, Function and Design* (Dover Publications Inc, 1975) ISBN 9780486201825

Heskett J – *Industrial Design* (Thames & Hudson, 1980) ISBN 9780500201817

Huygen F – *British Design: Image and Identity* (Thames & Hudson, 1989) ISBN 9780500275580

Powell D – *Presentation Techniques* (Little, Brown, 1990) ISBN 978031691243 3

Journals

Creative Review

Design

Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS opportunities that have been included within the assessment criteria of this unit:

Skill	When learners are ...
Independent enquirers	producing relevant aesthetic research for a selected small scale design project
Creative thinkers	developing selected concept proposal(s) to final specification stage
Reflective learners	
Team workers	making a model and/or samples which satisfy given functional and aesthetic criteria
Self-managers	

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	carrying out purposeful and innovative design development to produce models and/or samples