Unit 96: Human-scale Design

Unit code: T/502/5268
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 research creative human-scale design through the work of professional practitioners. They will apply their knowledge of ergonomics and anthropometrics to the design and production of objects for human use in different contexts.

Unit introduction

The process of designing artefacts, products and equipment for human use is a complex and absorbing one, in which the designer is constantly engaged in the process of research, development and testing of ideas. In this unit learners will develop a range of skills and processes, which they will apply to produce outcomes to suit the requirements of realistic briefs.

This unit focuses on the study of human-scale, 3D design, enabling learners to put their ideas into practice within a professional context. Learners will apply their understanding of ergonomics and anthropometrics to the design and production of designed objects for human use. They will gain skills in the practical design and making of models, prototypes and products such as furniture, goods for the domestic commerce and entertainment markets and different kinds of human-scale transport.

Learners will develop the skills to enable them to interpret the aesthetic and functional requirements for human-scale 3D design briefs for a variety of specialist design areas in the domestic and wider world. Learners will be taught how to identify and apply functional criteria to meet the ergonomic and anthropometric requirements of the brief.

Functional criteria will vary according to learners' intentions but could include size, scale, weight, strength, textural qualities, fit, comfort, effectiveness in use, and health and safety. Learners will use their developing understanding of the physical nature of the human figure in producing designs, working drawings, test models, considering skeletal structure, muscles and movement, drawings and visual analysis of the figure, and anthropometrics.

Learning outcomes

On completion of this unit a learner should:

1 Be able to research a brief for human-scale design

2 Know about ergonomic and anthropometrical principles in meeting the functional criteria of design briefs

3 Be able to plan, design and make creative models and prototypes for human-scale products

4 Understand working methods, design development and effectiveness of final human-scale design outcomes.

Unit content

1 Be able to research a brief for human-scale design

Research: work of others; materials, eg traditional, non-traditional; techniques; processes

Aesthetic requirements: eg appearance, style, materials, relationship to environment, end user

Constraints: costs of materials; production; time; material properties; legal, eg health and safety, building regulations; production processes

Needs of the clients and others: quantities; durability; life span of product; environment; suppliers; manufacturers

2 Know about ergonomic and anthropometrical principles in meeting the functional criteria of design briefs

Ergonomics: anatomy; physiology; psychology; equipment and systems; working posture; working environment

Anthropometrics: human dimensions, eg male and female differences, international variations; reaching zones (horizontal, vertical, seated, standing); field of vision, eg visually impairment

3 Be able to plan, design and make creative models and prototypes for human-scale products

Plan: eg establish a timetable, organise meeting schedule, allocate time, resources

Design: record ideas, eg written notes, sketches, technical drawings, concept models; modify initial ideas, eg alternative materials, stylistic alterations, physical alterations; feedback eg consultation, clients, other users

Make creative models and prototypes: eg experimental, scale models, mock-ups, exploratory 3D concepts; test material properties, eg sampling, fixings, finishes, functional properties, aesthetic qualities

4 Understand working methods, design development and effectiveness of final human-scale design outcomes

Working methods: eg design process, technical process, planning, time management, health and safety, coordination with others, collaboration, meeting client needs, creative response, quality assurance

Design development: eg starting point, response to feedback, opportunities, constraints, choice of materials, aesthetic considerations, time management; justifications, decisions, outcomes

Effectiveness: eg against brief, purpose, strengths, weaknesses, success, feedback, user experience, comfort, security, durability, accessibility, environmental impact

Human-scale design outcomes: context; setting, eg domestic, social, open space, commercial, industrial, mixed use, architectural, workplace, spatial requirements; materials, eg textures, surfaces, finish, detailing, colour, sound qualities; artefact, eg chair, handle, fastening, doorway, table, keyboard, hand-held device

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 research a brief for human-scale design [IE, RL, SM]	**M1** show independence in carrying out experimental and purposeful design development in realising an effective final outcome that meets the design brief	**D1** show an individual, exciting and perceptive approach and theoretical understanding in creating and presenting a functionally and aesthetically assured human-scale design development and final outcome.
P2 identify ergonomic and anthropometrical principles when meeting the functional criteria of design briefs [IE, CT, RL, TW]	**M2** use analysis, testing and evaluation throughout the project to produce a final outcome that exploits ergonomic principles and the creative potential of human-scale design within anthropometric limits.	
P3 plan, design and make creative models and prototypes for human-scale products [CT, RL, TW, SM]		
P4 discuss working methods, design development and effectiveness of final human-scale design outcomes. [CT, RL, TW, EP]		

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

This unit focuses on the study of human-scale, 3D design, enabling learners to put creative ideas into practice within a professional context. Learners will apply their understanding of ergonomics and anthropometrics to the design and production of objects for human use.

This unit has been designed to engage learners in realistic projects through the presentation of professional briefs. Typically, projects should be set to reflect current professional practice. Depending on the choice of specialist area, projects should be set for a wide range of media, materials and processes. Tutors should use realistic scenarios in order to motivate, inspire and stimulate learners.

This unit might best be delivered through a programme that is predominantly practical, so that learners gain an understanding of design methods through experience rather than theory. In particular, learners should gain enough exposure to professional practice to recognise the significance of a methodical approach to solving the specific design problems of human-scale design and develop their practical skills in relevant areas.

It is equally important to demonstrate that there is no single method or design process that can be applied to all creative work. There is a difference between the free exploration and origination of ideas, and the means whereby they can be developed to meet specified design requirements.

Learners need to be guided through current legislation such as the Disability Discrimination Act (DDA) and Building Regulations and Copyright Law.

For learning outcome 1, learners need to be taught how to analyse and clarify a brief in order to establish its specific requirements and restrictions. They need to be taught also how to use selected relevant information and reference materials from specific, targeted research.

For learning outcome 2, learners need to be made aware of the importance of ergonomics and anthropometrics in designing for human use and learn to recognise these influences in their own and others' work.

Learning outcomes 1 and 2 offer the opportunity to link research to the specifics of a brief as determined through analysis. Learners need to be taught the concept of design development in response to a given brief, the discussion of ideas with other parties and the role of ergonomics and anthropometrics in human-scale design. Tutors should encourage learners to participate in the analysis and questioning of the briefs directives. Learners should be taught where to seek legislation and other documentation relevant to their design area and how to apply these to their own work.

For learning outcome 3, learners need to demonstrate their understanding of the necessity of planning, modelling and prototyping when responding to briefs. Learners should develop their understanding of this cycle and their ability to apply it in a variety of different contexts.

Learning outcome 3 has links with learning outcome 4 and learners should be encouraged to test their ideas through prototypes, proofs, maquettes or other appropriate pre-production models and mock-ups. Tutors should encourage learners to participate in the analysis and evaluation of their own and others' work at all stages. Learning outcome 3 is predominantly craft based and learners should be given instruction and opportunities in all relevant 2D and 3D design skills. The link between outcomes 3 and 4 should be used to emphasise the importance of regular analysis and evaluation of ideas and alterations during the development stage. Learners should be taught how to question and test their ideas and to critically assess the success of outcomes.

For learning outcome 4, tutors should encourage to explore 3D ideas and to investigate a range of learners of alternative materials in the process of creating a final outcome. Learners should creatively experiment with materials and processes and record critical opinions via worksheets or sketchbooks. While engaged in any 3D making activities, learners should be fully aware of all relevant health and safety requirements for the materials and the processes they are using.

Learners need to develop their critical skills through ongoing analysis to review the progress of their own and their peers' work in designing human-scale 3D products to meet briefs.

Group and individual presentations should be encouraged where learners will develop their use of the correct technical terms when talking about the materials and techniques they have used and how they meet the aesthetic and functional criteria identified in the brief. Regular feedback should be given to learners through day-to-day discussion and formal and informal interim assessment. Evidence of evaluation for learning outcome 4 can take the form of notes, formal evaluative statements and records of verbal feedback.

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 demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Introduction to the brief/explore aims and requirements of the unit: This project brief is intended to address the criteria for both *Unit 49: Human Scale Working* and this unit, *Human-scale Design*. However it could also stand alone as a project brief for either unit. Presentation, discussion – whole group; brief focus: chair design. • Primary sources for investigation. • Contextual references. • Practical considerations, constraints and factors – materials, time etc.
Assignment 1: Investigation Learners investigate and explore appropriate factors through practical experiments, eg: • using body shape and different seating positions to sketch/photograph • using screen projected own and peers' body shapes to draw possible design ideas to explore ergonomic considerations in potential design ideas • investigating seating design for different purposes/occasions • possible visit to design gallery or visit by professional practitioner • investigating a range of appropriate materials, techniques and processes – see unit content • evaluating potential use and suitability of selected materials for the brief/project • recording test results and prototype developments. Group critical review and self-appraisal.
Learner-initiated private study time.

Topic and suggested assignments/activities and/assessment
Presentation – interim evaluation and assessment. Learners' presentation to the group: • Considering presentation method to the group using the most appropriate techniques and illustrations. • Selecting and preparing annotated roughs and studies showing exploration of body shapes, ergonomic factors and seating positions. • Preparing and collating annotated worksheets, design sheets. • Summarising work researched and collected for appropriate contextual references.
Learner-initiated private study time.
Assignment 2: Development of a Chair Brief • Using research, explorations and feedback the learner negotiates a personal brief with detailed planning. • Creating a series of designs viewed from different angles. • Modifying and refining design ideas – using digital software for 3D drawing systems and 4D developments. • Researching further contextual references to inform and inspire ongoing work. • Exploring and experimenting with a range of appropriate materials. • Producing a range of studies, prototypes, models/maquettes to communicate ideas. • Reviewing and evaluating developmental studies.
Learner-initiated private study time.
Selection and development of final design. • Selecting, modifying, adapting and refining ideas for final design model. • Analysing, reviewing and refining working processes in the use of media and techniques. • Completing final work. • Evaluating whole project. • Identifying appropriate presentations for target audiences.
Learner-initiated private study time.
Final presentation or display/exhibition of work.
Review of unit and assessment.

Assessment

For P1, learners must analyse and respond to a brief and carry out targeted research in appropriate areas. Work referenced must be appropriate.

P2 requires learners to demonstrate a clear understanding of the relationship between ergonomic and anthropometric factors and the design outcome of any given brief.

P3 requires learners to carry out the process of designing and modelling of creative outcomes within a planned timetable. Ideas may be limited and work may lack technical aptitude.

P4 is concerned with the ongoing process and requires learners to systematically consider the progress and qualities of their own and others' work.

Assessment evidence for all learning outcomes should come, primarily, from practical work and should include written analysis and evaluation as well as design visuals and models. Some evidence for P1 and P2 may be gathered through group discussions or individual interviews. Pass level learners may have required assistance and support in the creation of their resolved work but this will not have been constant or intense supervision.

For M1, learners should consistently and independently demonstrate in-depth understanding. At this level learners should explore and act upon the factors that influence human-scale design outcomes. Learners must develop their ideas thoroughly and produce a variety of prototypes and pre-production fabrications. Learners should also carry out regular analysis and evaluation throughout the development. Learners should demonstrate greater independence than is required for pass criteria when planning, selecting and developing outcomes.

For M2, learners should demonstrate a clear relationship between their research, analysis and evaluation and their final outcomes. The changes made during development should show the influence of research and awareness of ergonomic and anthropometric qualities.

For D1, learners must demonstrate creativity in response to briefs and produce professional outcomes. At this level learners are required to improve outcomes in response to extensive research and development. Learners should explore a wide range of ideas, showing an ability to continually review and refine these with regard to functionality and aesthetic considerations. Tasks set should be carried out with greater imagination and creativity and a higher degree of independence than those presented for lower grades.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and 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 D1	**Assignment 1**: Investigation	Designer investigating possibilities for potential brief.	Recordings of discussions with clients, end users, peers and tutors to: • review the brief • establish parameters • clarify any ambiguities. Evidence to include: • documents, diagrams and recordings, which show useful analysis of the brief. Amended brief to include: • any agreed revisions.
P1, P2, P3, P4 M1, M2 D1	**Assignment 2**: Development Chair Brief	3D designer developing chair designs to meet a brief.	Portfolio of evidence containing visual and recorded evidence of: • informed research including historical and contemporary examples relating to large-scale design work • development of ideas, including sketches, concept models, ideas modification, use of alternative materials, aesthetic alterations, physical alterations, experimental or scale models.

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

This unit forms part of the BTEC Art and Design sector suite. This unit has particular links with the following unit titles in the BTEC Art and Design suite:

Level 1	Level 2	Level 3
Introduction to 3D Design Products	Working in Spatial Design	Human-scale Working
Introduction to 3D Design Crafts	Working in 3D Design Crafts	Large-scale Design
	Working in Product Design	Small-scale Design
	Working with 3D Briefs	3D Computer Modelling

National Occupational Standards

This unit also provides development opportunities for some of the underpinning skills, knowledge and understanding of the following National Occupational Standards:

CCSkills Sector Skills Council

Design (revisions in draft form June 2009)

- DES1 Apply research on the history and theory of design to your own design activities
- DES2 Apply design industry knowledge to inform your own design work practice and work
- DES3 Use Critical Thinking Techniques in your design work
- DES4 Communicate the importance of the design brief
- DES5 Follow a design process
- DES6 Work effectively with others in a creative environment
- DES7 Contribute to the production of prototypes, models, mock-ups, samples or test pieces.

Essential resources

Learners need access to a wide range of resources and facilities dependent on their chosen area of specialisation. There should be suitable studio and workshop spaces and tools and materials that will enable learners to develop appropriate 2D and 3D work. For research, learners need access to a learning resource centre and the internet. Suitable computer access with relevant software would enhance the experience and support the achievement of learning outcomes.

This unit requires the support of a well-equipped 3D workshop facility. Learners need access to a variety of hand-held and power tools as well as a variety of sculptural materials, malleable and non-malleable. Access to design areas and drawing studios for recording from primary sources, ideas origination and development is essential. Both specialist and general learning support materials including books, journals, periodicals, computer access to the internet together with a range of design software are necessary to support learners in their historical, cultural and contemporary contextual research.

Employer engagement and vocational contexts

Centres should develop links with practising artists, craftspeople and designers to deliver assignments to learners or to provide work experience.

Links with employers are essential to the delivery of the programme for work experience and future employment.

Vocational learning support resources:

- Learning and Skills Network – www.vocationallearning.org.uk

Business and finance advice:

- local and regional Business Link – www.businesslink.gov.uk

Assignments should be vocationally relevant; centres should consider the delivery of 'live projects', for example, to support the vocational content of the unit and programme.

Creative and Cultural Skills (www.ccskills.org.uk), the Sector Skills Council for Arts, Crafts and Design, has launched the web portal Creative Choices (www.creative-choices.co.uk). This portal has a range of information about careers in the arts, crafts and design sector, including job descriptions.

Indicative reading for learners

Textbooks

Heskett J – *Industrial Design* (Thames & Hudson, 1980) ISBN 978-0500201817

McDermott C – *Essential Design* (Bloomsbury, 1994) ISBN 978-0747519362

Mills J W – *The Technique of Sculpture* (Batsford, 1985) ISBN 978-0713425093

Norbury B – *Furniture Craft and Designer Makers: British Craftsmanship in Wood* (Stobart Davies, 1990) ISBN 978-0854420438

Norman D A – *Emotional Design* (Basic Books, 2005) ISBN 978-0465051366

Norman D A – *The Design of Everyday Things* (MIT Press, 1998) ISBN 978-0262640374

Norman D A – *The Design of Future Things* (Basic Books, 2009) ISBN 978-0465002283

Slack L – *What is Product Design?* (RotoVision, 2006) ISBN 978-2940361243

Weizhi C – *Big Book of Creative Product Design* (Links International, 2008) ISBN 978-8496969254

Journals

AN Magazine

Blueprint

Contemporary

Crafts

Crafts Magazine

Creative Review

Creative Review

Design

Design issues

Design Magazine

Eco Designer

Make

New Ceramics

Schmuck

Space

World of Interiors

Websites

www.burrows.com/found.html	Founders of the Art and Crafts movement
www.coshh-essentials.org.uk	COSHH Essentials
www.designboom.com/eng/education/rockingchair.html	History of rocking chairs
www.designcouncil.org.uk	Design Council
www.designobserver.com/archives/category.html	Catalogue of writings on design and culture
www.desktoppublishing.com/design.html	Links to graphic design sites
www.ergonomics.org	All about ergonomics
www.eyemagazine.com	Eye Magazine
www.roymech.co.uk	Links to design and engineering information
www.vam.ac.uk/?view=compliant	V & A museums and collections

Delivery of personal, learning and thinking skills

The table below 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	analysing a brief for human-scale design using purposeful research showing clear understanding of ergonomic and anthropometrical principles in meeting the functional criteria of design briefs
Creative thinkers	showing clear understanding of ergonomic and anthropometrical principles in meeting the functional criteria of design briefs planning, designing and making creative models and prototypes for human-scale products analysing and evaluating working methods, design development and effectiveness of final outcome
Reflective learners	analysing a brief for human-scale design using purposeful research showing clear understanding of ergonomic and anthropometrical principles in meeting the functional criteria of design briefs planning, designing and making creative models and prototypes for human-scale products analysing and evaluating working methods, design development and effectiveness of final outcome
Team workers	showing clear understanding of ergonomic and anthropometrical principles in meeting the functional criteria of design briefs planning, designing and making creative models and prototypes for human-scale products analysing and evaluating working methods, design development and effectiveness of final outcome
Self-managers	analysing a brief for human-scale design using purposeful research planning, designing and making creative models and prototypes for human-scale products
Effective participators	analysing and evaluating working methods, design development and effectiveness of final outcome.

Although PLTS 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	researching the brief; selecting contexts and sources for recording originating and develop human-scale design ideas reviewing and refining ideas towards completed work planning and preparing presentations of final human-scale designs
Creative thinkers	recording from sources and contexts in different creative ways using media, materials and processes imaginatively originating and developing creative sculptural design ideas working on final designs presenting work to different audiences creatively and imaginatively
Reflective learners	evaluating the different stages of project development reviewing ideas and listening to feedback at tutorials and crit sessions presenting human-scale design to different audiences in final evaluation
Team workers	working with the group to analyse the brief and develop plans for research and ideas for development taking part in group evaluations and feedback sessions working on final displays or exhibitions and presentations
Self-managers	working independently to further their research studies planning the development of their work to meet the project brief developing ideas and regularly reviewing their progress selecting best ideas and deciding on ways forward planning and preparing presentations
Effective participators	participating in group discussions and evaluations working on group projects taking part in presentations.

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	scanning and developing human-scale design ideas digitally using software programmes to develop sculptural image creation researching contextual and other information for the development of ideas for human-scale design brief
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	planning project briefs and where and how ICT might be used when appropriate evaluating outcomes and the appropriateness of medium
Manage information storage to enable efficient retrieval	researching from internet sources; downloading information creating folders for storage and retrieval
Follow and understand the need for safety and security practices	undergoing induction period – introduction to the ICT centre and systems and working practices
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	researching internet sources, selecting from their research, developing their own response informed by research
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	researching information for different briefs and activities evaluating results of using digital research methods
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	designing digitally using scanners inputting and formatting information from sources
Bring together information to suit content and purpose	developing design ideas digitally importing visual and textual information relevant to brief/activity
Present information in ways that are fit for purpose and audience	using digital means to plan, create and give presentations to different audiences
Evaluate the selection and use of ICT tools and facilities used to present information	assessing their progress and commenting on the appropriateness of their selection of ICT tools and facilities – eg use of software
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	using email to submit written work downloading information from internet sources storing of information and creating folders for access

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	planning an activity and getting relevant information from relevant sources recording visually: scaling, timing, measuring using perspective and other methods of projection
Identify the situation or problem and the mathematical methods needed to tackle it	using measuring and orthographic projection for accuracy, and scaling using software to observe and modify human-scale designs from different viewpoints
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	discussing the project brief describing the physical properties and characteristics of different human-scale design I materials contributing to group discussions and the sharing of ideas evaluating their own and others' human-scale designs and finished work presenting to target audiences
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	researching, reading, selecting text and images annotating, commenting and comparing using contextual texts and images to relate to own human-scale design ideas evidencing understanding through discussion, crit sessions, evaluations and presentations
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	evaluating results of human-scale designs to meet the brief annotating recordings and ideas for judgement of qualities and appropriateness in the use of selected 3D media, materials and techniques analysing and evaluating selected artists' images for the purpose of developing their own work, using personal judgements and relating research to their own ideas preparing presentations of final work.