PROGRESS IN PRODUCT DESIGN YEARS 12-13

Grade	Y13	Y12	**AO1:** Identify, investigate and outline design possibilities to address needs and wants. **15%**	**AO2:** Design and make prototypes that are fit for purpose. **25%**	**AO3:** Analyse and evaluate: • design decisions and outcomes, including for prototypes made by themselves and others • wider issues in design and technology. **25%**	**AO4:** Demonstrate and apply knowledge and understanding of: • technical principles • designing and making principles. **35%**
A*			• Excellent rationale provided for the context selected, with continuous reference throughout the project to the end user and the constraints that need to be considered in formulating a final solution. • Student employs a comprehensive range of strategies and techniques, including both primary and secondary methods of investigation, practical experimentation and disassembly, to thoroughly explore design opportunities. All sources have been fully referenced. • First concepts are both fully relevant to the context and feasible for further development and are clearly communicated through a fully appropriate variety of methods and techniques. • All investigations relate directly to the design context, issues are identified and fully addressed and the student demonstrates a detailed and perceptive understanding of the information gathered. • A comprehensive, clearly	• In the development of innovative design proposals the student will demonstrate clear evidence of originality, creativity and a willingness to take design risks. • Comprehensive and fully detailed manufacturing specification produced which makes specific reference to relevant quality control checks and allows fully accurate interpretation by a third party. • Project management for manufacturing allows for further development of design proposals in response to ongoing evaluation, testing and full consideration of contingency planning as prototype development takes place. • Significant complexity or challenge is involved throughout the production of prototype(s). The student demonstrates excellent manufacturing skills combined with an excellent understanding of the need for dimensional accuracy and precision. • Clear evidence throughout the manufacturing process that appropriate health and safety	• Comprehensive evidence of analysis and evaluation throughout the process, which has clearly informed the chosen context, client or user and the subsequent development and manufacture of the prototype	Advanced level understanding of: Material classifications Investigating materials. Performance characteristics of materials. Enhancement of materials. Forming, redistributing and additional processes. Including woods, metals, polymers, smart, composite, elastomers, biopolymers. Advanced level understanding of: Adhesives, fixings, jigs, surface finishes, printing processes, scales of production, computer systems, CAD/CAM. H&S, EDI, PPC, Design influences and design movements. Advanced understanding of: Wood processes, metal processes and polymer processes. Advanced understanding of: Socio economical influences, SME, Product life cycle, 6Rs, Testing, conservation and sustainability.

			stated and challenging design brief resulting from a thorough consideration of investigations undertaken, that fully addresses both the context and the needs and wants of the intended user(s).	processes have been both considered and employed.		
A			• Student employs a broad range of strategies and techniques, which may include primary and secondary methods of investigation and/or practical experimentation to explore design opportunities. Most sources have been fully referenced. • Student employs a broad range of strategies and techniques, which may include primary and secondary methods of investigation and/or practical experimentation to explore design opportunities. Most sources have been fully referenced. • The student has produced a comprehensive, detailed and well explained design specification which will fully guide the student's design thinking. • A detailed project management approach to prototype development, including time management and determining quantities and costs of materials, has been fully integrated into the specification	• The rationale for design decisions is clearly documented and fully justified with constant reference being made to the design brief, specification and investigations throughout the development of their design proposal. • Excellent justification provided for selection of appropriate materials and components and proposed techniques and processes, demonstrating an excellent understanding of material properties to ensure excellent quality prototype(s) that are fit for purpose. • The student has selected and used appropriate tools, machinery and equipment, including CAM where required, and worked with a high level of skill, precision and accuracy to produce their prototype(s). • Excellent use of a variety of modelling techniques to support ongoing development work throughout. This is supported by the use of drawings, sketches, annotations and notes showing clear evidence of design thinking. • Excellent ongoing development of design proposals, achieved through exploration of and experimentation with different	• Testing is carried out in a focused and comprehensive way with clear evidence of how the results have been used to inform the design and any modifications to the prototype. • Student has provided a well-reasoned critical analysis of their final outcome which links clearly to their design brief and specification and provides full justification for the extent to which the prototype is both fit for purpose and meets the needs of the client/user. • A comprehensive critical evaluation of their final prototype, clearly identifying how modifications could be made to improve the outcome, together with a full justification for these modifications and full consideration provided for how the prototype could be developed for different production methods.	Excellent level understanding of: Material classifications Investigating materials. Performance characteristics of materials. Enhancement of materials. Forming, redistributing and additional processes. Including woods, metals, polymers, smart, composite, elastomers, biopolymers. Excellent level understanding of: Adhesives, fixings, jigs, surface finishes, printing processes, scales of production, computer systems, CAD/CAM. H&S, EDI, PPC, Design influences and design movements. Excellent understanding of: Wood processes, metal processes and polymer processes. Excellent understanding of: Socio economical influences, SME, Product life cycle, 6Rs, Testing, conservation and sustainability.

				materials, techniques and processes leading to an excellent quality design of a prototype for manufacture. • Prototype(s) fully address the design brief, satisfying all major points of the specification and take into account all amendments/modifications to their original design proposals as necessary. • Student makes all required modifications to the prototype in a fully considered manner in light of feedback from user trials and third party feedback and as a result of testing and evaluation carried out against earlier iterations of the prototype. • Quality assurance is evident throughout and it is clear where planned quality control checks have been applied throughout the process to ensure consistency and safety.		
B			• Good rationale provided for the context selected with clear reference to the end user and the constraints that need to be considered in formulating a final solution. • First concepts are mostly relevant to the context and feasible for further development and are communicated through a variety of methods and techniques which are mostly appropriate. • Most investigations relate directly to the design context, issues are identified and	• The rationale for design decisions is documented and justified with regular reference being made to the design brief, specification and investigations throughout the development of their design proposal. • In the development of their design proposals, many of which will demonstrate an innovative approach, the student will demonstrate evidence of originality, creativity and a willingness to take design risks. • Good use of modelling techniques support ongoing development work throughout,	• Good evidence of analysis and evaluation at most stages of the process which has informed the chosen context, client or user and the subsequent development and manufacture of the prototype. • Testing is carried out in a focused manner with some evidence of how the results have been used either to inform the design or to make any modifications to the prototype.	Good level understanding of: Material classifications Investigating materials. Performance characteristics of materials. Enhancement of materials. Forming, redistributing and additional processes. Including woods, metals, polymers, smart, composite, elastomers, biopolymers. Good level understanding of: Adhesives, fixings, jigs, surface finishes, printing processes, scales of production, computer systems,

			addressed and the student demonstrates a good understanding of the information gathered. • A well-considered design brief with a degree of challenge, resulting from well considered investigations, that addresses the context and most of the needs and wants of the intended user(s). • The student has produced a detailed and partially explained design specification which will help to guide the student's design thinking. • There is evidence of a project management approach to prototype development including time management and determining quantities and costs of materials, but may be lacking in detail.	showing clear evidence of design thinking supported by the use of drawings, sketches, annotations and notes. • Good ongoing development of design proposals, achieved through exploration of and experimentation with different materials, techniques and processes leading to a good quality design of a prototype for manufacture. • A detailed manufacturing specification is produced which includes reference to relevant quality control checks and allows for mostly accurate interpretation by a third party. • Project management for manufacturing allows for some further development of design proposals in response to ongoing evaluation and testing with some consideration of contingency planning as prototype development takes place. • Good justification provided for selection of appropriate materials and components and proposed techniques and processes demonstrating a good understanding of material properties to ensure good quality prototype(s) that are fit for purpose. • There is some complexity or challenge involved throughout the production of prototype(s). The student demonstrates good manufacturing skills combined with a generally sound understanding of the need for dimensional accuracy/precision. • The student has selected and	• Student has provided a reasoned critical analysis of their final outcome which links to their design brief and specification and provides some justification for the extent to which the prototype is fit for purpose and meets most of the client/user needs. • A good evaluation of their final prototype together with clear justification for modifications that could be made to improve the outcome and informed consideration provided for how the prototype could be developed for different production methods.	CAD/CAM. H&S, EDI, PPC, Design influences and design movements. Good understanding of: Wood processes, metal processes and polymer processes. Good understanding of: Socio economical influences, SME, Product life cycle, 6Rs, Testing, conservation and sustainability.

				used appropriate tools, machinery and equipment, including CAM where required, and worked with a good level of skill, precision and accuracy to produce their prototype(s). • Prototype(s) mostly address the design brief, satisfying the majority of major points of specification and takes into account some amendments/modifications to their original design proposals as necessary. • Student makes some well thought out modifications to their prototype in light of feedback from user trials and third party feedback and as a result of testing and evaluation carried out against earlier iterations of the prototype. • Quality assurance is evident at most stages in the process and it is clear where planned quality control checks have been applied to ensure consistency and safety. • There is evidence throughout the manufacturing process that appropriate health and safety processes have been both considered and employed.		
C			• First concepts show some relevance to the context and may be feasible for further development and are communicated through a limited variety of methods and techniques that may not be appropriate. • Student employs a limited range of strategies and techniques, which may include some practical activities, to	• The rationale for design decisions is documented with some justification and reference to the design brief, specification and investigations throughout the development of their design proposal. • In the development of their design proposals, some of which will demonstrate evidence of	• Adequate evidence of analysis and evaluation at some stages of the process which has had some influence on the chosen context, client or user and the subsequent development and manufacture of the prototype. • Student has provided	Adequate level understanding of: Material classifications Investigating materials. Performance characteristics of materials. Enhancement of materials. Forming, redistributing and additional processes. Including woods, metals, polymers, smart, composite, elastomers, biopolymers.

			explore design opportunities. Some sources have been referenced. • Some investigations relate to the design context, issues are identified but may not be fully addressed and the student demonstrates an adequate understanding of the information gathered. • There is some evidence of a basic project management approach to prototype development including time management and determining quantities and costs of materials related to the development of the prototype, but it is not fully integrated into the specification.	innovation, there will be elements of originality, creativity and a willingness to take design risks. • Adequate use of modelling techniques to support development work. There is evidence of drawings, sketches, annotations and notes which can be seen to inform subsequent design thinking. • Some ongoing development of design proposals, achieved through exploration of and experimentation with different materials, techniques and processes leading to an adequate quality design of a prototype for manufacture. • Project management for manufacturing allows for some further development of design proposals in response to evaluation and testing and enables the made outcome to be achieved in a realistic and achievable timescale • Adequate justification provided for selection of appropriate materials and components and proposed techniques and processes demonstrating an adequate understanding of material properties to ensure adequate quality prototype(s) that are mostly fit for purpose. • There is some complexity	an analysis of their final outcome with some links to their design brief and specification and makes reference to how the prototype is fit for purpose and meets some client/user needs. • An adequate evaluation of their final prototype together with some justification for modifications that could be made to improve the outcome as well as some consideration given to how the prototype could be developed for different production methods.	Adequate level understanding of: Adhesives, fixings, jigs, surface finishes, printing processes, scales of production, computer systems, CAD/CAM. H&S, EDI, PPC, Design influences and design movements. Adequate understanding of: Wood processes, metal processes and polymer processes. Adequate understanding of: Socio economical influences, SME, Product life cycle, 6Rs, Testing, conservation and sustainability.

				or challenge within aspects of the prototype. The student demonstrates adequate manufacturing skills combined with some understanding of the need for dimensional accuracy/ precision. • The student has selected and used appropriate tools, machinery and equipment, including CAM where required, and worked with an adequate level of skill, precision and accuracy to produce their prototype(s). • Prototype(s) partially address the design brief, satisfying some of the major points of specification, but do not always take into account amendments/modifications to their original design proposals. • Student makes some superficial modifications to their prototype(s) in light of feedback from user trials and third party feedback and as a result of testing and evaluation carried out against earlier iterations of the prototype. • Quality assurance is evident at stages in the process and it is clear where quality control checks have been applied to ensure consistency and safety. • There is some evidence during the manufacturing		

				process that appropriate health and safety processes have been both considered and employed.		
D			• Adequate rationale is provided but lacks focus for the context selected with some reference to the end user and consideration of the constraints in formulating a final solution which may lack clarity. • An adequate design brief which may lack challenge and clarity, resulting from partially considered investigations that only superficially address the context and the needs and wants of the intended user(s). • The student has produced a design specification which is lacking in some detail and will only guide student's design thinking to a limited extent.	• An adequate manufacturing specification produced which makes some reference to quality control checks and allows partially accurate interpretation by a third party. • In the development of their design proposals the student will demonstrate little evidence of innovation, originality, creativity and willingness to take design risks. • Superficial evidence that project management for manufacturing allows for further development of design proposals and which may not enable the made outcome to be achieved in a realistic timescale. • The development of the prototype(s) offers little in the way of complexity or challenge, only basic manufacturing skills are demonstrated, showing little understanding of the need for accuracy and precision. • The student has selected and used appropriate tools, machinery and equipment, including CAM where required, but has worked with only a basic level of skill, precision and accuracy to produce their prototype(s). • Prototype(s) address only few parts of the design brief, and	• Testing is carried out with minimal evidence that the results have been used to either inform the design or to make modifications to the prototype. •	Basic level understanding of: Material classifications Investigating materials. Performance characteristics of materials. Enhancement of materials. Forming, redistributing and additional processes. Including woods, metals, polymers, smart, composite, elastomers, biopolymers. Basic level understanding of: Adhesives, fixings, jigs, surface finishes, printing processes, scales of production, computer systems, CAD/CAM. H&S, EDI, PPC, Design influences and design movements. Basic understanding of: Wood processes, metal processes and polymer processes. Basic understanding of: Socio economical influences, SME, Product life cycle, 6Rs, Testing, conservation and sustainability.

				few of the major points of specification, they do not take into account amendments/modifications to their original design proposals. • Student makes a few minor modifications to their prototype in light of feedback from user trials and third party feedback and as a result of testing and evaluation carried out against earlier iterations of the prototype.		
E			• Limited rationale provided for the context selected with minimal reference to the end user and the constraints that need to be considered in formulating a final solution. • Student employs a single strategy or technique, which may include practical activities, to explore design opportunities. Source referencing is minimal. • First concepts show little relevance to the context and are unlikely to be feasible for further development. These are communicated through basic methods and/or techniques. • Investigations may not relate directly to the design context, a limited number of issues are identified but not addressed and the student demonstrates only a basic understanding of	• The rationale for design decisions is documented but this may not always be justified and may be lacking reference to the design brief, specification and investigations during the development of their design proposal. • Basic use of a single or only simple, modelling technique(s), with limited evidence that this supports any subsequent development work. There is some evidence of drawings, sketches, annotations or notes but these do not always inform their design thinking. • Basic refinement of design proposals, with only basic exploration and experimentation of different materials, techniques and processes leading to a basic quality design of a prototype for manufacture. • A basic manufacturing specification	• Basic evidence of analysis and evaluation which has had limited influence upon the chosen context, client or user and the subsequent development and manufacture of the prototype. • Testing has been carried out but the results may not have been used to inform subsequent design or modifications to the prototype. • Student has provided a superficial analysis of their final outcome which may not refer to the design brief and specification and which does not address the extent to which the prototype is either fit for purpose or meets client/user needs.	Poor level understanding of: Material classifications Investigating materials. Performance characteristics of materials. Enhancement of materials. Forming, redistributing and additional processes. Including woods, metals, polymers, smart, composite, elastomers, biopolymers. Poor level understanding of: Adhesives, fixings, jigs, surface finishes, printing processes, scales of production, computer systems, CAD/CAM. H&S, EDI, PPC, Design influences and design movements. Poor understanding of: Wood processes, metal processes and polymer processes. Poor understanding of: Socio economical influences, SME, Product life cycle, 6Rs, Testing, conservation and sustainability.

			the information gathered. • A basic design brief, lacking both clarity and challenge which makes limited use of the investigations, may not address the context in full and only meets some of the needs and wants of the intended user(s). • The student has produced a design specification which contains minimal detail and does not guide their design thinking. • There is minimal evidence of project management being considered as part of the specification.	produced with limited reference to quality control checks, which may not be sufficiently detailed for a third party to interpret accurately. • Little justification provided for selection of materials and components and proposed techniques and processes, not all of which may be appropriate, only a basic understanding of material properties demonstrated which may lead to the production of an inadequate prototype(s). • Basic quality assurance is sporadic throughout the process and it is not always clear where quality control checks have been applied. • There is little evidence during the manufacturing process that appropriate health and safety processes have been both considered and employed.	• Evaluation of final prototype is superficial and any suggestions for modifications are made with little if any justification and there is little or no consideration as to how the prototype could be developed for different production methods.	