I created the unit plan with AI assisting me with idea generation.

Introduction

The Sustainable Product Design unit I have created is aimed at Year 11 students who attend Chatswood High School, which is in Chatswood, NSW. I have designed this unit to span over a period of 10 weeks, which will provide students an in-depth understanding of sustainable design principles. This unit has been designed to highly develop students' critical thinking, creative design, and collaborative problem-solving skills. By the end of the unit, students will have gained knowledge and practical experience in the design process, which will have a focus on sustainability, material selection, prototyping, and refining designs which will be based on user feedback.

The unit that I have created is aligned with the NSW Design and Technology Stage 6 Syllabus and includes key outcomes such as the evaluation of design solutions, the use of creative problem-solving techniques, and the application of knowledge on sustainable practices. This unit has been developed to not only meet the HSC requirements but to also help students prepare and adapt for real-world challenges in relation to design. Students will be exploring how a variety of design decisions can impact the environment, economy, and society. This approach that has been taken, holds an emphasis on higher-order thinking by implementing Bloom's Taxonomy into all tasks, which ensures that students will engage in tasks that require remembering, understanding, evaluating, and creating.

An important part of this unit is the implementation of the use of AI tools such as ChatGPT. AI has grown significantly in the last few years, so it was integral to include activities that students will connect with and understand how these tools can be used in appropriate ways. Chat GPT has been utilised in activities in this unit to assist with researching sustainable materials and for generating ideas. The tools will ultimately help students think innovatively and use technology responsibly. The unit has been developed to scaffold students' learning, which involves a focus on sequencing lessons to gradually build students' knowledge and skills. This also includes the differentiation provided to support students with a range of diverse learning needs. This will ensure that every student can engage with each part of the unit content at their own level.

Reflection

The development process for the Sustainable Product Design unit for year 11 students studying at Chatswood High School has incorporated purposeful decisions in relation to the pedagogy, curriculum alignment, and student differentiation. The choices that were made were ultimately chosen by the need to foster higher-order thinking skills, ensuring that student engagement was effective, and the unit aligns with best-practice pedagogy as well as the NSW Design and Technology Stage 6 Syllabus. In this reflection I will be critically examining the various pedagogical strategies that I have incorporated into the unit, as well as learning theories, educational frameworks, and curriculum standard that will explain and justify my decisions.

The scaffolding and sequencing used with in this unit were critical regarding building students' knowledge in a progressive manner. It also ensured that the learning that was taking place in this unit was both comprehensive and engaging. According to Bruner's Theory of Scaffolding, effective learning requires a structure where students are able to build on existing knowledge, then advancing to more complex ideas with appropriate support (Bruner, 1960). In relation to the designed unit, the first few weeks have been created to provide students with a foundational understanding of sustainable design principles, which includes the environmental, social, and economical impacts of design. Once students have built upon their understanding on these topics, the unit will then move into more practical learning, which includes material research, prototyping, and user feedback integration.

I have incorporated Bloom's Taxonomy (Wilson, 2016) within this unit as it was central in structuring a gradual progression of learning. The early weeks of the unit held a focus on remembering and understanding key concepts of sustainability. Later weeks included students moving to more hand-on tasks, which had a shift towards analysing, evaluating, and creating design solutions. This structure was essential to ensure that students were continuously building on their cognitive skills and progressed towards higher-order thinking. An example is when students were researching sustainable materials in week 2, they initially remembered the types of materials that they could use, they then understood the environmental impacts before they moved to creating their prototypes that incorporated sustainable materials.

The teaching and learning strategies that were used within this unit weer chosen to align with the NSW Design and Technology Stage 6 Syllabus, which ensured that students were able to develop key skills, which include creativity, collaboration, and problem-solving,

which are all essential components around design (NSW Education Standards Authority, 2017). To allow for active learning in this unit, I have incorporated a mix of direct instruction, inquiry-based learning, and collaborative learning. The use of all these methods is supported by the constructivist pedagogy, which mentions that learning is most effective when students have the ability to actively engage with content through hands-on activities and real-world problem-solving (Piaget,1976; Vygotsky, 1978).

An example of this is in week 3 when students used user-centred design principles to create user personas and gain feedback on their product ideas. This activity in the unit required all students to participate in collaborative learning with their class peers which allowed students t to apply theoretical knowledge to practical scenarios. The technique of peer collaboration is in line with Vygotsky's theory of social learning, which has a large emphasis on the role of interaction and feedback in cognitive development (Vygotsky, 1978). Inquiry-based learning has also been incorporated into the unit, when students are required to research sustainable materials and generate product ideas with the assistance of Chat GPT, which fosters a problem-solving mindset (Bransford et al. 2000).

The unit incorporates both formative and summative assessments. Formative assessments, which include peer review and self-assessments, were designed for students to obtain on ging feedback and ultimately help students in the process of monitoring their progress. The summative assessment comes at the end of the unit, which includes students presenting their final prototypes, the evaluation of their designs, and reflecting on how they incorporated sustainability into their designs and process. This approach fits into (Wiggins & McTighe, 2005) framework of Understanding by Design, which holds an emphasis on the importance of backward design, by starting with the end goal such as the final presentation and aligning assessments with those outcomes.

An integral part of this unit was to develop students' literacy, numeracy, and digital capabilities, due to these areas being essential for the success both in the HSC and in future careers. In connection with Bandura's Social Cognitive Theory (1986), students' learning was scaffolded by explicitly teaching students the necessary vocabulary and literacy skills for discussing various design concepts, that include material properties and sustainability. It is these concepts that were reinforced through the means of written reflections and project documentation, which requires students to justify and unpack their design decisions in both verbal and written forms.

Numeracy has been developed in this unit through the analysis of material costs, environmental impact assessments, and the quantitative aspects in the prototyping phase. The method of calculating cost-benefit analysis and evaluating material properties, enables students to apply numerical reasonings to their design choices. This method also aligns with (Fisher & Frey, 2014) emphasis on

the integration of numeracy in the curriculum that ultimately ensures that students are prepared to participate in problem solving tasks and activities.

Digital capabilities were exposed to students with the use of various CAD tools and AI resources as well as their presentation preparation and research programs and tools. The digital tools that were used allowed students to model their designs in a digital format, research sustainable materials, and create and document resources for their presentation. The integration of these digital tools was essential to prepare students for real-world application, especially in the digital workforce, which aligns with Bennett and Maton's (Bennett & Maton, 2010) research that investigates the importance of digital literacy in modern education. By incorporating the use of AI and other modern tools into the classroom, this helps students generate design ideas, research sustainable materials, and ultimately allows students to develop their critical thinking and problem-solving skills.

The use of differentiation was an essential focus in the development of the unit, which ensured that all students, regardless of ability or background, could access the content and succeed in an equitable way. The unit that was developed utilises a universal design for learning (ULD) approach, which has an emphasis on providing multiple means of engagement, representation, and expression to ultimately cater towards students with diverse learning needs (CAST, 2011). An example of this in the unit is that EAL/D students were provided with visual aids, simplified language, and additional time and support for tasks and activities. Peer collaboration was implemented and played a key role in supporting EAL/D students, as it allowed for mutual support and created a space of understanding through social interaction.

Students that have learning challenges, were provided with scaffolding which included a step-by-step guide for Fusion360 (CAD tool) and a simplifies rubric for help with assessing their prototypes. The approach mentioned aligns with (Tomlinson, 2001) principles of differentiated instruction, where ethe use of content, process, and product are adjusted to ultimately meet students' diverse needs. This was also seen with advanced students, who were encouraged to complete additional work or conduct more research to help develop their skills in the variety of areas that were covered in this unit.

The pedagogical decisions that were made in this unit were integrated to align with well-established educational theories and practices that promote active learning, higher-order thinking, and critical problem-solving. The incorporation of constructivist principles, Bloom's Taxonomy, and the universal design for learning, have all contributed to a unit that covers a wide range of student diverse needs while

also making sure that all students are taking part in meaningful and challenging activities and tasks. This unit has a focus on sustainability, which not only supports the curriculum requirements but also provides students with a deeper awareness of the impacts of design decisions on the environment, society, and economy. It is through these pedagogical strategies that I hope to provide students with the required skills to succeed tin the HSC and in their futures, for the vast areas in design, technology, and sustainability.

Unit Plan

Subject: Design and Technology

Summary This unit explores the principles of sustainable product design, which will have a focus on environmental responsibility, resource management, and user-centred design. In this unit students will research sustainable materials, create prototypes of a product, and finally present their research and findings, which will demonstrate the students understanding of sustainable practices within design. The unit has a summative assignment which includes a final project where students' will be presenting to the class their designs and prototypes, which will demonstrate the students' understanding of sustainable practices.	**School** Chatswood High School **Location** Chatswood, NSW **Duration** 10 Weeks (Term 1) **Year Level** Year 11
Unit background information This unit has been created in line with the **NSW Design and Technology Stage 6 Preliminary Syllabus** and has been designed to help students develop a vast understanding of sustainable practices in design. This unit covers fundamental processes within design, user centred approaches, research in sustainable materials, and techniques of prototyping. This unit will allow students to explore the social, environmental, and economic impacts that design decisions can make. This unit has been	**Resources overview** Classroom resources: - Students: BYOD (Bring Your Own Device), stationary, workbooks, prototyping tools and materials, sketchbook. - Teacher: Laptop/Computer, projector/smart board, Google classroom, internet, prototyping tools and materials. Digital resources: - Google Classroom, Padlet, ClickView, YouTube, Google Forms, Google Slides, Kahoot.

<table>
<tr><td>developed for students to understand future challenges they may face, in an environmentally conscious world by incorporating technology, creativity and sustainability.</td><td>- AI design tools (ChatGPT), research databases, Adobe Illustrator, Fusion360 (CAD software for designing), lifecycle assessment tools.
Physical Resources:
- Sustainable materials (recyclable materials, prototyping supplies).
- Safety equipment (PPE – Safety glasses, aprons).
- Prototyping tools (cutters, saws, hot glue guns).</td></tr>
<tr><td>Outcomes
P1.1 examines design theory and practice and considers the factors affecting designing and producing in design projects.
P2.1 identifies design and production processes in domestic, community, industrial and commercial settings.
P2.2 explains the impact of a range of design and technology activities on the individual, society and the environment through the development of projects.
P4.1 uses design processes in the development and production of design solutions to meet identified needs and opportunities.
P4.3 evaluates the processes and outcomes of designing and producing.
P5.1 uses a variety of management techniques and tools to develop design projects.
P5.2 communicates ideas and solutions using a range of techniques.
P5.3 uses a variety of research methods to inform the development and modification of design ideas.
P6.2 evaluates and uses computer-based technologies in designing and producing</td><td>Vocabulary
- Sustainability
- User-Centred Design
- Prototyping
- CAD (Computer-Aided Design)
- Functionality
- Lifecycle Assessment</td></tr>
<tr><td colspan="2">Assessment Task</td></tr>
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The assessment task for this unit involves students designing, creating and presentation a sustainable prototype. The assessment task for this unit will be split into two components:

- Prototype development:
  Students will be creating a functional prototype of a product of their choice, that will include sustainable design principles. Students will need to choose materials that are appropriate, apply various user-centred design concepts, and adapt CAD software and sketching to help with the design process. It is essential that students must include sustainability efforts, which can include using recycled or biodegradable products, and then needing to address the environmental, social, and economic impacts of their product.
- Final presentation:
  Students will then present their prototype and findings to the class, which will include students explaining the design process, the variety of sustainability principles they used. Students' presentation should include a variety of visuals, such as photos, sketches and diagrams, include a demonstration of the functionality of the product, and have an explanation of where they used user feedback to adjust their design. After the student's presentation there will be a class discussion and Q&A which will question the student about their design choices and sustainability considerations.

Assessment Criteria:

- Functionality and usability of the prototype.
- The extent of sustainability practices is integrated in the design process.
- Clarity and coherence of the presentation.
- The reflection on design decisions and to ability to integrate user feedback into the product.

Formative assessments are carried out weekly through feedback from both peers and the teacher and reflections. Formative assessments throughout the unit, assist with the summative assessment with the prototype and presentation.

Weekly content organisation

Week	Learning Outcomes	Topic Focus and Brief Description
1	P1.1, P2.2	Introduction to Sustainable Design Week 1 will include an introduction to sustainability, and it will be connected to its relevance in design. Students in week 1 will discuss a variety of key principles and will

		explore and identify different examples of sustainable design, through research and physical products.
2	P2.1, P4.1	Research and Ideation Week 2 will involve students researching a variety of sustainable materials which include biodegradable plastics and recycled materials etc., and the materials application in product design. Students will be thinking of ideas for their sustainable products. Students will also be considering different materials choices and they feasibility aspects. This week's theme will be the starting blocks for the ideation and conceptualisation for the product that the students will be designing.
3	P1.1, P4.1, P5.3	User-Centred Design Week 3 will have a focus on understanding the needs of the user in regard to sustainable design. Students will be creating user personas that will represent a variety of demographics and will be conducting interviews to gain feedback on initial design products. By students following this approach, this will ensure that the product design will meet the users' needs while also considering and aligning with sustainable practices.
4	P4.1, P6.1, P5,2	Concept Development In week 4 students will start the process of transforming their own ideas into tangible design concepts. Students will then create virtual models using CAD software (SketchUp) and draw out sketches. This week will also include peer feedback from classmates. Students will need to present their initial concepts to the class and receive constructive criticism for ways that they can improve and refine their designs.
5	P2.1, P4.3, P5.3	Material Selection and Feasibility In week 5 students will be assessing a variety of materials based on factors such as sustainability, cost, and feasibility which will be used in their prototypes. Students will finalise their material choices for the product, by following the lifecycle assessment which will help them evaluate their product including environmental impacts. Week 5 will ensure that students choose materials that are sustainable, cost-effective, and appropriate for their design goals.
6	P4.1, P4.3, P5.1	Prototyping

		In week 6, students will be starting the construction of their prototypes with the materials that they have previously chosen. They will be utilising their CAD designs and peer feedback to construct a functioning prototype. Week 6 will include a range of hands-on learning and activities, safety in the workshops, and the incorporation of sustainable materials and design principles.
7	P4.3, P5.2, P6.2	Testing and Evaluation In week 7, students will be having a focus on user testing and gather feedback on a variety of factors that include functionality, usability, and sustainability of their prototype. The students will then analyse the data that they have been provided with and adjust their product for improvements. This week will focus on students ensuring that their prototype and product is meeting both the users' needs and sustainability goals.
8	P4.3, P5.2, P5.1	Refinement and Finalisation In week 8, students will be making their final adjustments to their prototypes, which will include the integration of feedback from the testing phase and peer review. Students this week will begin their design documentation that will include them reflecting on the iterative design process, which will include the changes that were made to improve functionality and sustainability. Students will also be preparing their final presentations which will be worked on in the following week.
9	P5.2, P5.3, P4.1	Presentation Preparation In week 9, students will be working on their presentation which will be due in the following week. Students will be focusing on how to clearly communicate their design journey which will include applied sustainability principles, and the final product. Towards the end of the week, students will be working on refining their presentation sides to ensure they cover all relevant content and to practice their public speaking skills. Peer review and feedback will be required from students to help with critical feedback for improvement on their presentation.
10	P4.1, P5.2, P6.2	Summative Assessment Presentation In week 10, students will be presenting their finalised prototypes and will be explaining the design process and decisions they took that guided their project. At the end of the student's presentation there will be a Q&A session, which will allow for students to reflect

		on their work and how their design meets environmental, social and economic needs. The summative assessment for this unit will be evaluating the final product, presentation, and reflection on the design process.

Week	Students Learn about:	Students Learn to:	Teaching, Learning and Assessment	Student Diversity
1	Sustainable Design Principles - Key concepts about sustainability in design. - Environmental, economic, and social impacts in choices of design. - Sustainable design and the role we play in addressing global challenges such as climate change.	- Identify various key sustainability principles and will apply them to real-world design scenarios. - Evaluate elements of the environment, social, and economic impacts of product design. - Build an understanding of how design decisions affect the world we live in.	**Summary:** During week 1 students will be introduced to the core principles of sustainable design. Students will learn about its impact on the environment, economy, and society. **Teaching and Learning Activities:** Teacher will provide a PowerPoint presentation which will outline the key principles of sustainable design. Students will engage in group discussions about current sustainable products and will talk about their impact on the environment. Students will watch "The Story of Stuff" and TED Talk "What is sustainable design" and take notes during the videos. Students will upload a "take-away" from the videos they just watched and will upload to a Padlet. **Formative Assessment**	**Bloom's Taxonomy:** Remembering: Ss will recall key concepts and terminology in relation to sustainable design. Understanding: Ss will explain the impacts of design choices. Applying: Ss will apply key principles of sustainability to real world scenarios. Analysing: Ss will analyse the impacts of non-sustainable practices in relation to the environment and society. **High-order thinking:** Students will evaluate case studies of sustainable design. Students will discuss its implications for the future. **Low-order thinking:** Students will define sustainability. Students will list examples of eco-friendly products.

		- Develop a mindset that will put eco-friendly solutions first.	Teacher will observe the class participation and collect brainstorming ideas. By the end of the week, students will submit a short reflection on their understanding of sustainable design which will need to be uploaded to Google Classroom. **Resources:** PowerPoint, "The Story of Stuff" video, Ted Talk "What is sustainable design" video, Padlet, Google Classroom, Laptops/Devices.	**Differentiation:** EAL/D students: Provide visual aids to EAL/D students to help build content understanding and provide students will simple definitions of key terms. Extension students: Advanced students should be encouraged to explore innovative sustainable designs from a variety of industries.
2	Researching Sustainable Materials - Important factors of material selection in sustainable design. - Types of sustainable materials (biodegradable plastics, recycled materials, natural fibres).	- Research and evaluate a variety of sustainable materials. - Apply the research to make informed choices about material for product design. - Understand how properties of materials have an impact on the	**Summary:** Students will be learning about a variety of sustainable materials which include biodegradable plastics, bamboo, and recycled products. **Teaching and Learning Activities:** Teacher will introduce students to ChatGPT. Teacher will guide students on how to use this tool to generate ideas and evaluate materials for the factors of sustainability, cost, and performance. Students will be working in pairs or small groups to use ChatGPT to	**Bloom's Taxonomy:** Remembering: Ss will recall a variety of sustainable materials. Understanding: Ss will explain how the materials used lead to the overall sustainability of the product. Applying: Ss will utilise AI tools (e.g. ChatGPT) to conduct research on materials for their designs. Evaluating: Ss will assess the materials based on cost, sustainability, and feasibility. **High-order thinking:**

	- How to evaluate the cost, availability, and sustainability of materials.	product's functionality and sustainability. - Create material selection chart that will be based on sustainability criteria.	research sustainable materials. Students will need to research materials such as biodegradable plastic, bamboo, or recycled product of their choice and evaluate the cost, feasibility, and sustainability. Students will then present their research on the material properties for the class using Google slides. Students will need to upload their research on their chosen material onto a Padlet, which will be used to collaboratively brainstorm product ideas, which will integrate sustainable practices. **Assessment:** Formative Assessment: Research presentation, the submission of their research on the Padlet which should include material evaluations. Resources: ChatGPT, Padlet, Google slides, Google docs, Laptops/Devices.	Students evaluate the trade-offs of different sustainable materials and relate them to their real-world application. **Low-order thinking:** Students list material properties and can categorise them in relation to sustainability. **Differentiation:** EAL/D Students: EAL/D students will be provided with scaffolding with templates which will help guide students for their research and presentations. Extension students: Advanced students will be encouraged to explore cutting-edge sustainability technologies or materials for design.
3	User-Centred Design Principles - The role of users' needs in	- Create user personas which will be based on	**Summary:** Week 3 will have a focus on user-centred design, where students will	**Bloom's Taxonomy:** <u>Remembering:</u> Ss will recall key components of user-centred design.

	relation to sustainable product design. - Collecting and analysing user feedback which will be used to improve designs.	demographic groups such as elderly, children and eco-conscious consumer. - Conduct research through user interviews and gain feedback which will be used to inform design decisions. - Refine and adapt ideas and designs based on real-world user needs and provided feedback.	be focusing on the needs of the user. **Teaching and Learning Activities:** Teacher will explain the principles of user-centred design along with the importance of user personas within the design process. Teacher will show TED Talk of "User-centered Design: Aga Sxostek." Students will create user personas for a variety of different demographics such as elderly and children etc. Students will then conduct interviews to gather user feedback on their own initial ideas. **Assessment:** Formative: Students submit user personas and a summary of user interviews. Resources: User persona templates, Google Forms for the surveys, Interview guides, TED talk "User-centered Design: Aga Sxostek", Laptops/Devices.	Understanding: Ss will explain how user feedback has an influence on product design. Applying: Ss will apply ser-centred design factors when creating user personas. Analysing: Ss will analyse the user feedback to make changes and refine their design for improvement. **High-order thinking:** Understand and adapt user feedback and refine individual design based on real-world user needs. **Low-order thinking:** Collect and organise user feedback into key ideas and themes. **Differentiation:** EAL/D Students: EAL/D students will be paired with a classmate for the interview process and will be provided with advanced visuals which will help explain user-centred design. Extension students: Advanced students will be encouraged to create additional

				personas and to conduct advanced user testing and surveys.
4	Concept Development using CAD - The process of moving from initial ideas to digital concepts with the use of Fusion360 (CAD software) and sketching. - Understanding how CAD tools such as Fusion360 can improve factors such as precision and functionality in design. - Incorporation of feedback from peers in individual design	- Using Fusion360 to create a variety of detailed, digital prototypes which are based on initial design ideas. - The combination of traditional sketching with digital design to demonstrate ideas. - Apply the use of peer feedback to help with the refinement and improvement of individual designs.	**Summary:** This week will be focusing on the development of product concepts using both CAD and sketching tools. **Teaching and Learning Activities:** Teacher will provide students with a step-by-step process on how to use Fusion360, which will include basic tools which will help students with the creation of their digital prototypes. Students will start to begin designing their product concepts using Fusion360 and by sketching. Students will be putting together a Google slides presentation which will be presenting their concepts to peers for feedback and any constructive suggestions. **Assessment:** Formative: Submit their Fusion360 files, hand in any sketches, write out a explanation of design decision and peer feedback which influences and changes. Resources:	**Bloom's Taxonomy:** Remembering: Ss will recall both concepts and key principles of CAD design. Understanding: Ss will explain the prototyping process and relate it to their designs. Applying: Ss will use CAD software (Fusion360) to create digital prototypes. Creating: Ss will develop functional physical prototypes which are based on CAD designs. **High-order thinking:** Critique and incorporate peer feedback into individual design processes. **Low-order thinking:** Using CAD tools such as Fusion360 to create basic product design and then presenting them to the class. **Differentiation:** EAL/D Students: EAL/D students will be provided more in-depth tutorials in the use of Fusion 360 with the addition of a

	changes and revisions.		Fusion360 (CAD software), Sketch book, pencils, Google slides, Laptops/Devices.	step-by-step guide for the use and relevant tools of Fusion360. Extension students: Advanced students will be encouraged to create more in-depth and advanced 3D models. They will also be asked to explore more advanced CAD features such as rendering.
5	Material Selection for Prototyping - The importance of the appropriate selection of materials based on factors such as functionality and sustainability. - Build an understanding of the lifecycle of materials and how they ultimately	- Evaluation of a variety of materials which will be based on sustainability, cost, and performance for prototyping. - The application to knowledge of material properties to select the most appropriate and suitable materials for their prototypes.	**Summary:** Students will be exploring a variety of material properties and then evaluating them for factors that include sustainability, cost, and functionality. **Teaching and Learning Activities:** Teacher will introduce students to the lifecycle assessment diagram and the material selection criteria. Teacher will pass around material samples for students to physically identify different features and to conduct research. Students will then select their chosen materials for their prototypes which will be based on sustainability and performance. Students will create a materials selection chart and write an	**Bloom's Taxonomy:** Remembering: Ss will recall material properties as well as lifecycle impacts. Understanding: Ss will explain how to select the appropriate materials for sustainability. Evaluating: Ss will evaluate materials regarding their environmental impact and cost. **High-order thinking:** Students to analyse and evaluate the environmental impacts and feasibility that materials hold. **Low-order thinking:** Students to categorise and identify a range of basic material properties such as cost, sustainability and durability.

	impact the environment.		explanation for their material choices. **Resources:** Lifecycle assessment diagram/tool, material samples for students to physically touch and research, Google docs for material chart creation, sustainability criteria sheets.	**Differentiation:** EAL/D students: EAL/D students will be offered simplifies templates and guides which will assist them with material selection for their prototype. Extension students: Advanced students will be encouraged to research emerging materials and technologies that can lead to the improvement of sustainability and effects on the environment.
6	Prototyping and Assembly - The process of creating a functional prototype which is based on design ideas. - How to use a variety of prototyping tools safely and effectively.	- Build a functional prototype with the use of selected material and design concepts. - The documentation of the prototyping process with photos, notes and reflections.	**Summary:** In this week students will be focusing on the Construction of the physical prototype which will be based on the design concepts that were created in the previous weeks. **Teaching and Learning Activities:** Teacher will be demonstrating the safe handling of prototyping tools and materials. Teacher will be emphasising the best practices relating to the product assembly. Students will begin the construction of their prototypes, using their selected materials. Students will be documenting the prototyping process with photos,	**Bloom's Taxonomy:** Remembering: Ss will recall a variety of testing methods. Understanding: Ss will explain how testing will inform their design choices. Applying: Ss will apply testing methods to their own prototypes. Analysing: Ss will analyse the results from user testing and adjust their design. **High-order thinking:** Evaluate and modify the prototype which will be based on real-world testing and provided feedback.

			notes and changes in relation to their designs. **Assessment:** Formative: Students will submit their up-to-date documentation of the prototyping process, which will need to include any challenges they faced and solutions. **Resources:** Cutters, saws, glue guns, sustainable materials, PPE (safety glasses).	**Low-order thinking:** Follow instructions provided by the teacher to assemble the students prototype and make necessary adjustments where appropriate and documenting these changes. **Differentiation:** EAL/D students: EAL/D students will be provided with visuals to help with the understanding of safety and what is expected of them. Students will be provided with a step-by-step instruction for the prototyping phase. Extension students: Advanced students will be provided advanced tasks which include refining heir prototypes and integrating more complex features.
7	Testing and Evaluation - The process of testing prototypes, which will include user feedback and	- Conducting user testing with the use of prototypes and analyse the provided feedback to help with the	**Summary:** Students this week will be testing their prototypes, where they will be provided feedback from peers and teacher. Students will use this data to analyse where their needs to be refinements to their design. **Teaching and Learning Activities:**	**Bloom's Taxonomy Weeks 7 - 10:** Applying: Implementing feedback to refine designs. Evaluating: Evaluating final prototypes for functionality and sustainability. Creating: Developing final product designs and a presentation which

	the analysis of functionality. - How to properly analyse testing data and the refinement of prototypes.	refinement of the designs. - Use the testing data to ultimately make improvements to the design and to increase the products functionality.	Teacher will introduce a variety of testing methods to students that include stress tests and user feedback. Students will conduct user testing on their prototypes. Students will be focusing on the usability and sustainability of their prototype. Students will analyse the results provided form the user testing to modify their designs. **Assessment:** Formative: Students will submit their testing report with their feedback analysis along with design changes. **Resources:** Feedback forms, testing equipment (weights, measuring tools), Google Forms which will be used for the survey collection.	communicates their design process. **High-order thinking:** Analyse the user feedback to make critical design changes and improvements. **Low-order thinking:** Collection and documentation of feedback from peers, along with the organisation of results for analysis. **Differentiation:** EAL/D students: EAL/D students will be provided with simplified feedback templates and additional time for the collection of data for their prototypes. Extension students: Advanced students will be offered to create a more in0depth and detailed testing scenario and to explore areas they can improve functionality.
8	Refinement and Finalisation - Refining their prototypes	- Refine individual prototypes, and the	**Summary:** Students this week will be refining their prototypes, using the feedback they were produced with last week,	**Bloom's Taxonomy: In Week 7 for Weeks 7 – 10.** **High-order thinking:**

	which will be based on the user feedback and the testing results. - Preparing design documentation which will be for the presentation.	integration of feedback from the previous testing phase. - Start preparing final presentation materials such as slides, reports and prototypes.	and focusing on adjusting any final elements of their prototypes before their presentation. **Teaching and Learning Activities:** Teacher will be providing students with guidance on their documentation of any design changes and with the preparation of their final presentations. Students will be finalising their prototypes and writing their reflections on their design changes. After students will be working on the final presentation slides. **Assessment:** Formative: Students to submit their final prototype and their presentation slides by the end of this week. **Resources:** Prototyping tools (listed in last week's resources), Google slides for presentations, Laptops/Devices, Example presentation.	Reflect critically on various design decisions and then justify all improvements and changes made during the iterative process. **Low-order thinking:** The completion of the final prototype adjustments and the documenting of any changes that were made. **Differentiation:** EAL/D students: EAL/D students will be provided with written scaffolds for their reflections and will be provided with addition time to prepare their presentations. Extension students: Advanced students will be encouraged to improve the aesthetics of the presentation or the functionality of their prototypes further. They will also be encouraged to discuss the long-term impact of their design.
9	Presentation Preparation - How to structure a presentation	- Students will develop a clear narrative and overall structure for	**Summary:** In this week students will be focusing on preparing their final presentation. This week will be helping students to organise and	**Bloom's Taxonomy: In Week 7 for Weeks 7 – 10.** **High-order thinking:**

	effectively that will demonstrate and communicate design ideas, sustainability effort, and prototype functionality.	their assignment presentation. - Students will use digital tools such as canvas to create engaging presentation slides for the viewers.	present their design journey, sustainability efforts and their overall final prototype. **Teaching and Learning Activities:** Teacher will be guiding the students with the structuring of an informative presentation that will highlight the key ideas and sustainability efforts. Students will develop their Google Slides document and practice delivering their presentation with a peer. **Assessment:** Formative: Peer feedback will be provided with the practicing of presentations. Questioning and class discussions will also be used to identify further explanation in areas. Resources: Google slides, presentation rubric, Kahoot for review.	Develop a compelling narrative what will link to the design decisions about sustainability efforts. **Low-order thinking:** Organising the presentation so it is clear and has been rehearsed. **Differentiation:** EAL/D students: EAL/D students will be provided with additional time to complete their presentations. Students will also be provided with structuring for their presentations. Extension students: Advanced students will be challenged to explore more advanced presentation techniques that can better explain and represent what they are trying to express such as animation, AI tools or videos.
10	Summative Assessment Presentation - Final presentation of student's	- Students will present the final prototype, design process and how sustainability	**Summary:** In this final week, students will be presenting their presentations along with their finished prototypes. They will be explaining their design process, the testing phases, and	**Bloom's Taxonomy: In Week 7 for Weeks 7 – 10.** **High-order thinking:**

	product, which will discuss design process, user feedback, and sustainability decisions.	was integrated into their product.	how they implemented sustainability throughout their project. Teaching and Learning Activities: Teacher will be facilitating individual students' final presentations and will be providing students with feedback immediately and post assignment period. Students will be presenting their projects, and presentation. Students will be asked questions and will be responding to these questions by peers. Students will be asked question son sustainability, design, and user feedback by the teacher. **Assessment:** Summative: Final presentation of the prototype, which will include the design process, sustainability efforts, and user feedback integration throughout the project. Resources: Smartboard, Laptop/Device, evaluation rubric, feedback forms, Google Slides.	Answer questions about their own design choices, sustainability, and user-centred design. **Low-order thinking:** Present their final product and its main features to the class and teacher. **Differentiation:** EAL/D students: EAL/D students will be provided with additional time and offered a separate time to present their presentation that will be one-on-one with the teacher if wanted. Students will also be offered additional support before their presentations by the teacher. Extension students: Advanced students can talk about more broad implications that are related to their design choices and for future sustainability.

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Appendices (AI assisted with the appendices – to accompany the unit plan)

Appendix A: Prototype Evaluation Rubric

Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Poor (1)
Sustainability	Uses 100% sustainable materials were used, minimises waste.	Primarily uses sustainable materials within the design with minor waste.	Uses some sustainable materials within the design with moderate waste.	Little to no sustainable materials in the design used.	Does not use sustainable materials or processes in the design.
Functionality	Fully functional, and a user-friendly design.	Mostly functional with minor usability issues.	Functional but needs significant improvements.	Design does not work as intended.	Design is not functional.
Creativity	Innovative and original design solutions.	Creative design with some unique aspects.	Some creativity but lacks originality.	Very basic design with no creativity.	No creativity; standard design.
Aesthetics	Well-presented and aesthetically pleasing.	Visually appealing with minor flaws.	Some visual appeal but lacks polish.	Lacks visual appeal and feels unfinished.	No attention to aesthetics.
User-Centred Design	Design is thoroughly based on user needs and feedback.	Design addresses most user needs with some feedback.	Design considers user feedback but misses key needs.	Limited or no user feedback considered.	No attention to user-centred design.
Environmental Impact	Fully considers lifecycle and impact.	Considers environmental impact, with some areas for improvement.	Basic consideration of environmental impact.	Minimal attention to environmental impact.	No consideration of environmental impact.

Appendix B: User Persona Template

Persona Name:
Age:
Occupation/Role:
Demographic Info:

- **Gender:**
- **Location:**
- **Family Status:**

User Needs:

- Primary needs that the product must address (e.g., eco-friendliness, ease of use).
- Secondary needs (e.g., aesthetic appeal, affordability).

Goals:

- What is the user trying to achieve by using the product?
- How will the product help them solve a problem or improve their lifestyle?

Pain Points:

- What challenges or difficulties does the user face with current solutions?
- What would make the product more convenient or accessible for the user?

Feedback/Comments:

- Quotes or direct feedback from users if available (from surveys or interviews).

Appendix C: Sustainability Criteria Evaluation Sheet

Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Poor (1)
Material Source	100% renewable, recycled, or biodegradable.	Primarily sustainable sources with minor non-sustainable materials.	Some sustainable materials with noticeable non-sustainable components.	Predominantly non-renewable or non-sustainable materials.	No sustainable materials used.
Energy Consumption	Energy-efficient processes and minimal energy usage.	Minor energy inefficiency but overall low energy consumption.	Moderately energy-efficient with areas for improvement.	High energy consumption with inefficient processes.	No consideration for energy efficiency.
Waste Production	Minimal waste production; everything is recyclable or reusable.	Some waste production, but most materials can be recycled.	Noticeable waste produced with few recyclable components.	Significant waste production, most materials cannot be recycled.	High levels of waste with no recyclable components.
Longevity/Functionality	Product is highly durable and long-lasting.	Product is durable, with some potential for improvement in longevity.	Product may have limited lifespan or durability.	Product breaks down or deteriorates quickly.	Product is disposable with no long-term use.
Carbon Footprint	Minimal to no carbon footprint.	Low carbon footprint with some improvement areas.	Moderate carbon footprint that can be reduced.	Significant carbon footprint.	No effort made to minimize carbon footprint.