# **Happy birthday, SUIS!**

Kamila B

Unit Name:  Happy birthday, SUIS! **(CAD/CAM Unit)**

Unit duration: 13 weeks

Subject Area: Design technology

Grade Level(s): 7

**Introduction**:

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| **Unit Introduction** |
| **Background:**  In this unit, students will explore the integration of computer-aided design (CAD) and computer-aided manufacturing (CAM) to create a custom clock that would serve as a birthday gift to school. The focus will be on developing their skills in Inkscape, a powerful open-sourse vector graphics editor, to design the clock face and any additional elements with school logo or a birthday theme. Students will then utilize a laser cutter and engraver to cut and engrave the acrylic plastic components, ensuring a professional-looking final product.  **Essential Ideas**  **Theme and Branding:** Brand identity is important to companies and corporations. Students will start by researching their school's history, logo, and any existing branding elements. They will then brainstorm ways to incorporate these elements into the clock design, creating a cohesive and visually appealing product that reflects their school's identity.  **CAD Design:** Using Inkscape, students will create the clock face design, including the school's logo, any text or graphics, and the arrangement of the clock hands and numerical indicators. They will explore Inkscape's vector tools, layers, and exporting options to ensure their design is optimized for laser cutting and engraving.  **Laser Cutting and Engraving:** Students will learn how to prepare their Inkscape designs for the laser cutter and engraver. They will experiment with different settings, such as power and speed, to achieve the desired cutting and engraving results on the acrylic plastic material.  **Assembly and Finishing:** Once the laser-cut and engraved components are ready, students will assemble the clock, including the clock mechanism, the clock face, and any additional decorative elements. They will focus on precision, attention to detail, and overall aesthetics to create a high-quality final product.  **Presentation and Reflection:** Students will showcase their completed clocks and discuss the design process, the challenges they faced, and the lessons they learned. They will also reflect on how the integration of CAD and CAM techniques has enabled them to create a unique and personalized product.  **The students will be able to:**  - Develop their skills in CAD and CAM, while also fostering their creativity, problem-solving abilities, and appreciation for the design process.  - Engage in a meaningful and authentic learning experience that connects their design work to their school community by creating a clock with a school birthday theme.  - Analyze the roles of brand identity and brand image.  - Experiment with CAD and CAM software and tools, learna nd apply these knowledge in future design units.  - Create a meaningful, unique product by integrating CAD and CAM techniques.  - Effectively showcase the product, provide and receive constructive feedback.  - Follow safety precautions at all stages when working with CAM - laser cutter and engraver.  **Multidisciplinary theme:** Design technologies (CAD, CAM (laser cutting/engraving)), design thinking, project management, art |
| **Guiding Question(s) and/or Real-World Connections** |
| ***Consider how you would make the unit relevant to students. What real-world connections or guiding questions would you use to hook your students?*** |
| 1. What are the key elements of our school's brand, including the logo, colors, and any other distinctive features? 2. How can we incorporate these elements into the design of a custom clock that celebrates our school's birthday? 3. What design principles and considerations should we keep in mind to create a visually appealing and cohesive clock design? 4. How innovative ideas could be used to create an artistic product? 5. How can we communicate brand identity in an innovative way? 6. How can we use Inkscape's vector graphics tools to design the clock face and any additional elements? 7. What techniques can we employ to ensure our design is optimized for laser cutting and engraving? 8. How can we experiment with different layouts, typography, and visual elements to create a unique and eye-catching clock design? 9. What settings and techniques do we need to consider when preparing our Inkscape designs for the laser cutter and engraver? 10. What safety precautions and best practices should we follow when operating the laser cutting and engraving equipment? 11. How can we effectively showcase our completed clocks and share the design process with our peers and the school community? 12. What lessons have we learned throughout this design technology unit, and how can we apply these learnings to future design projects? 13. How has the integration of CAD and CAM techniques impacted our ability to create a unique and personalized product? |

**Content Standards**:

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| **Content Area** | **Standard(s) Addressed, unit expectations** |
| Design (MYP IB Design Cycle) | **Standards** and Criteria for success:   1. **Inquiring and Analyzing 1 page**   ~~i. explain and justify the need for a solution to a problem for a specified client/target audience~~  **ii. identify and prioritize primary and secondary research needed to develop a solution to the problem** - mindmap and fill out the table.  ~~iii. analyse a range of existing products that inspire a solution to the problem~~  **iv. develop a detailed design brief, which summarizes the analysis of relevant research.**   1. **Developing Ideas 1 page**   **i. develop design specifications, which clearly states the success criteria for the design of a solution**  ii. develop a range of feasible design ideas (optional)  **iii. present the chosen design and justify its selection**  **iv. develop accurate and detailed planning drawings/diagrams and outline the requirements for the creation of the chosen solution** - drawing   1. Creating the solution   ~~i. construct a logical plan, which describes the efficient use of time and resources, sufficient for peers to be able to follow to create the solution~~  **ii. demonstrate excellent technical skills when making the solution**  ~~iii. follow the plan to create the solution, which functions as intended~~  iv. fully justify changes made to the chosen design and plan when making the solution (optional).   1. **Evaluation (1 page)**   **i. design detailed and relevant testing methods, which generate data, to measure the success of the solution -** Peer feedback (2), staff feedback (2)  Self-reflection:  **ii. critically evaluate the success of the solution against the design specification**  **iii. explain how the solution could be improved**  **iv. explain the impact of the solution on the client/target audience** |

**Literacy Standards**:

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| **Content Area** | **Standard(s) Addressed** |
| **Language Arts** | CCSS.ELA-LITERACY.W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. |
| **Speaking and Listening** | SL.8.2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.  SL.8.4: Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.  SL.8.1.D: Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.  Common Core: English Language Arts |
| **Reading: Informational Text** | RI.8.1: Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.  RI.8.2 Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text. |

**Overarching Goals**:

**Develop CAD and CAM Skills:**

- Provide students with the opportunity to practice and refine their skills in computer-aided design (CAD) using Inkscape, a vector graphics editor.

- Introduce students to the workflow of computer-aided manufacturing (CAM) by utilizing a laser cutter and engraver to create the physical components of the clock.

- Encourage students to explore the capabilities and limitations of CAD and CAM tools, and how to optimize their designs for these manufacturing processes.

**Foster Creativity and Design Thinking:**

- Challenge students to develop a unique and visually appealing clock design that incorporates their school's branding and identity.

- Encourage students to engage in the design process, including ideation and iterative refinement, to create a personalized product.

- Promote students' creativity and problem-solving skills as they navigate design challenges and make decisions throughout the project.

**Enhance Project Management:**

- Require students to plan and manage their time effectively to complete the various stages of the project, from design to manufacturing and assembly.

- Develop students' communication and presentation skills as they showcase their completed clocks and share their design process with their peers and the school community.

**Promote Technological Literacy and Safety Awareness:**

- Expose students to the practical applications of CAD and CAM technologies in the design and manufacturing of products.

- Demonstrate safety precautions at all stages when working with CAM - laser cutter and engraver.

**Connect to Real-World Applications:**

- Provide students with a meaningful and authentic learning experience by challenging them to create a product that celebrates their school's identity and history.

- Demonstrate the relevance of design technology skills in various industries and applications, beyond just academic settings.

- Encourage students to see the practical applications of their learning and how it can be applied to solve real-world problems or create tangible products.

**Objectives**:

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| **Content-Area and Literacy-Area Objectives** |
| Students will be able to:  Week 1: Identify the task and show areas that need to be considered in a mind map, fill out the table with definitions related to this unit, provide a design brief.  Week 2: Develop design specifications, which clearly states the success criteria for the design of a solution.  Week 2: Develop a range of feasible design ideas (optional), present the chosen design and justify its selection, develop an accurate drawing and outline the requirements for the creation of the chosen solution - drawing.  Weeks 3-4: Examine inkscape tutorials, experiment with inkscape tools, bitmapping, converting from png/jpeg to vector.  Week 5-11: Develop a product: Demonstrate excellent technical skills when making the solution.  Week 12: Receive at least two peer feedback and two staff feedback.  Critically evaluate the success of the solution against the design specification - Self-reflection.  Explain how the solution could be improved.  Explain the impact of the solution on the client/target audience.  Week 13: Remediation/Enrichment. |

**Literacy and 21st Century Goals**:

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| **Literacy Skills** |
| **Oral language skills** (when answering questions, presenting their findings, summarizing reading, when working in groups, brainstorming, discussing)  **Self-regulation and self-monitoring** (while reading, speaking, writing, when working in groups, brainstorming, discussing, presenting in groups)  **Connecting background knowledge to the information in the text/video** (reading,when researching, reading/watching/listening primary/secondary, online resources, preparing presentation, searching for examples online )  **Reading comprehension** (reading with purpose, when researching, reading primary/secondary, online/paper resources)  **Writing** (working on formative/summative assessments) |
| **Vocabulary** |
| Design-specific **vocabulary identification, comprehension, utilization** in formative/summative assessments via reading/speaking/writing  Matching terms and definitions  Providing definitions  Creating mind maps |
| **21st-Century Skills** |
| The students, through independent and collaborative activities, will be able to practice the following 21st century skills:  **Critical thinking** (when answering questions and working on formative/summative assessments)  **Creativity** (when working in groups, brainstorming, researching independently, providing examples, working on formative/summative assessments)  **Collaboration** (when working in groups, brainstorming, discussing, presenting in groups)  **Communication** (when working in groups, brainstorming, discussing, presenting in groups)  **Information literacy** (when researching, reading primary/secondary, online/paper resources)  **Media literacy** and **Technology literacy (**when researching, reading/watching/listening primary/secondary, online resources, preparing presentation, searching for examples online**)** |

**Prerequisite Skills:**

- No special prerequisites

**Assessments:**

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| **Summative Assessment**  (Include projects, performances, tasks, or traditional tests you will implement for students to demonstrate that they have met the overarching goals and objectives.) | |
| Description(s) | Modifications |
| Criterion A: 1 page (mindmap, table, design brief)  Criterion B: 1 page (design specifications and drawing)  Criterion C: product: clock svg file, laser cut product on cast acrylic plastic (with/without engravings)  Criterion D: 1 page (peer/staff feedback, self-reflection) |  |
| **Formative Assessments**  (Include checks for understanding, quizzes, activities, and other progress monitoring as students move toward mastery of the overarching goals and objectives.) | |
| Description(s) | Modifications |
| 1. Pair-share: Discuss with a partner the role of brand and why brand identity is important to companies and corporations. What are the key elements of our school's brand, including the logo, colors, and any other distinctive features? 2. Brainstorm success criteria for your product. 3. Research how to use inkskape. Complete 5 Inkscape tasks before proceeding with your work. 4. Examine safety precautions and best practices that should we follow when operating the laser cutting and engraving equipment. 5. Prepare evaluation questions to rate your product (on a scale, Y/N questions) so that your peers and staff members could assess your product/provide feedback. 6. Gallery walk - feedback collection. Prepare a brief introduction for your product. |  |

**Lessons:** How will you sequence the lessons, formative assessments, and summative assessment in this unit? Briefly describe each lesson including techniques you could use to differentiate the product, content, process and/or leading environment for the diverse needs of the students.

* Lesson 1
  + Objective:
  + Prerequisite Skills: described above in Prerequisites section

Description:

Differentiation:

**Remediation & Next Steps:**

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| **Remediation Activities** | * Analyze errors before retakes （after or during each formative assessment） * Provide options for tutoring (students can stay after class(es), during lunch period, they can always ask questions (that may be addressed before or after class - if not relevant to current activity)) * Encourage reviewing (provide time to review and discuss (optional)), reverse the roles and ask the student to explain it to you * Work on organization and study habits (Show the student how to use a graphic organizer   Work on the student’s note organization  Share strategies on good note-taking)   * Introduce differentiated instruction (various resources, various format of activities, grouping, flexible seating, vary time, etc.) |
| **Review Activities** | * Have students review the assessment to analyze their errors. Ask students to determine exactly where they went wrong and if they have any ideas on how they can do better. * Group studies after/during class |
| **Extension Activities** | Raise awareness of the role of technology in modern design and production processes, and how these tools can be leveraged to create customized and high-quality products.  Encourage students to consider the implications of technological advancements, such as the environmental impact and ethical considerations of manufacturing processes. |

**References:**

[MYP Design cycle](https://sites.google.com/view/designandinquiry/myp-design)