Design Your Own Classroom Bookshelf

<table>
<tr><td rowspan="4">Integration</td><td colspan="3">21st Century Themes: Critical thinking and problem-solving</td></tr>
<tr><td rowspan="2">Concepts for STEAM Disciplines</td><td>Mathematics
Measurement and geometry
Proportions and scaling</td><td>Science

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<tr><td>Technology
GeoGebra 3D</td><td>Arts
Design</td></tr>
<tr><td colspan="3">Prerequisite Knowledge

Mathematics
Basic measurement skills
Basic geometry skills

Information Technologies
GeoGebra 3D

Arts
Basic design principles
Basic sketching</td></tr>
<tr><td colspan="3">Learning Outcomes

Grade Level: 15-17 years old
Duration: 300 minutes

Learning Outcomes for Mathematics
Apply measurement skills to accurately measure and scale.
Apply geometric concepts.

Learning Outcomes for Information Technologies
Use GeoGebra 3D software to create and manipulate a 3D model.

Learning Outcomes for Visual Arts
Apply design principles such as balance and proportion.
Use sketching skills to develop and refine their ideas before creating a 3D model.</td></tr>
<tr><td rowspan="4">Real World Context</td><td colspan="3">Problem Situation
We have a wonderful opportunity for us all to work together and create something amazing for our classroom. How about we create a classroom bookshelf?</td></tr>
<tr><td colspan="3">Materials
● Laptops or desktop computers with Geogebra 3D software installed
● Sketch paper and pencils</td></tr>
<tr><td colspan="3">Research to Prepare Lesson
The following questions will be sought answers for preparing the lesson plan.

● What key elements should be included in the design of our bookshelf?

● What are the space requirements for our bookshelf? What measurements do we need to consider to make it functional and comfortable?</td></tr>
<tr><td colspan="3">Resources

● https://www.geogebra.org/
● https://www.geogebra.org/m/aWhYSpvy</td></tr>
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STEAM Activity	**Ask** The teacher will begin the class by asking the students to participate in a brainstorming activity about bookshelves. The students will share everything they know about bookshelves, including the different types of bookshelves they have seen, their sizes, and the materials used to build them. Then, the teacher will encourage open-ended questions to spark discussions and critical thinking, such as what factors the students would consider when designing a bookshelf, such as the space available in the classroom, the number of books it needs to hold, and the overall design aesthetic. Finally, the teacher may supplement the discussion by using multimedia resources, such as pictures of different bookshelves, to help the students identify the features they like or dislike about each one.
	Research The teacher will guide the students in conducting research on bookshelf design. This may include looking up different types of bookshelves and studying their dimensions, materials and features. The students will explore how bookshelves fit into different room configurations and consider different design elements, such as the height of shelves, and the distance between shelves. The students will also consider the needs and preferences of their classmates when designing their bookshelves.
	Imagine The teacher will inspire and motivate the students to unleash their creativity and let their imaginations run wild as they brainstorm and sketch out their bookshelf designs. The teacher will prompt the students to consider various design elements, such as the overall shape and structure of the bookshelf, the number of shelves, the spacing between them, and the materials used for construction. They will encourage the students to think about how their bookshelves will fit into the classroom space and consider the needs and preferences of their classmates.
	Plan The teacher will guide the students in turning their bookshelf designs into concrete plans that can be implemented using GeoGebra 3D. The teacher will encourage the students to consider the materials and measurements necessary to bring their bookshelf designs to life. They will prompt the students to think about the overall dimensions of the bookshelf and the placement and spacing of shelves. To help the students in their planning process, the teacher may provide them with resources, such as online tutorials or instructional videos, that demonstrate how to use GeoGebra 3D to create detailed and accurate models of their bookshelf designs. The teacher will also be available to offer guidance and support to the students as they work through it. The teacher will encourage the students to think critically about their plans, ensuring that they are feasible and practical to implement. They may provide feedback and suggestions to help the students refine their plans and make any necessary adjustments or any design challenges or questions that arise.
	Create The students will use the dynamic 3D modelling capabilities of GeoGebra to bring their bookshelf designs to life. With GeoGebra 3D, students can experiment with different shapes, sizes, and materials to create intricate and detailed digital models that accurately reflect their original vision.
	Test Once they are satisfied with their designs, the students can present their bookshelves to the class for feedback and discussion. They will use GeoGebra AR to project their bookshelf designs onto the physical classroom space, allowing them to see how their bookshelves will look and fit in the real world. This will provide a unique and engaging way for the students to share their ideas and receive feedback from their peers. During the feedback session, the teacher will encourage the students to share their thoughts and opinions on each other's designs, providing constructive criticism and suggestions for improvement.
	Improve Students could also create a physical model of their bookshelf designs after testing and refining them in GeoGebra 3D. Additionally, the class could vote on the best bookshelf design, and the winning design could be constructed and installed in the classroom for everyone to use and enjoy.

Materials	This part will be completed by the teacher after the lesson plan is implemented in the classroom
Test	This part will be completed by the teacher after the lesson plan is implemented in the classroom.