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Lesson Plan Title: 3D Shapes & Volume Quest

Describe audience, context, and constraints:
This lesson will be taught to 16, seventh grade special needs students. They are in an online environment. The lesson will be delivered using the conferencing software, Blackboard Collaborate. The students will log into the live session on time. They will have their mobile devices ready. The App they will be using is available for Android OS and iOS for Apple products.

Objectives/Indicators

1. Students will identify the correct 3D shapes from the clues given.
2. Students will calculate the volume of each shape using the correct formula.

Ohio's New Learning Standard.
7.G.6 Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

ISTE
1. Empowered Learner: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

> 1a. Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.
>
> 1c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.
>
> 1d. Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

2. Digital Citizenship: Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.

> 2b. Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices.

2c. Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.

3. Knowledge Constructor: Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

3c. Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.

Prior Knowledge/Prerequisites

Students will need the following prior knowledge to be successful in this lesson:

1. Naming 2D shapes
2. Finding area and perimeter
3. Using formulas
4. Solving Equations

These concepts are needed to be successful working with 3D shapes. The 2D shapes are used to construct the 3D shapes and the knowledge of using formulas will help them solve problems related to volume and surface area. Mastery of the concepts in working with 2D shapes will be an asset when working with 3D shapes. One very important skill the students need to know is how to take the measurements they are given from the shape and plug those numbers into the correct formula will be successful with this lesson.

Identify and Discuss Pedagogical Decisions

The lessons in this unit are delivered by direct instruction using interactive slides in an online environment. The students use a popular conferencing software to connect with other students in the class and the teachers. Students are given opportunities during the lesson to participate by using classroom polling as a type of formative assessment. The lesson progresses to deliver new information and there is time used to reteach a concept, depending on the polling results. Students will collaborate to solve problems. They will use prior knowledge to apply to their construction of new information of 3D shapes. Students are encouraged to volunteer to work on the board, work in groups during the lesson and work with an individual teacher, depending on their need. Students can move themselves into different breakout rooms that will meet their needs. The option of moving themselves to a room where they need extra help, gives the student a sense of independence and autonomy. This also gives the students the self-advocacy skills that they need to develop as they grow older and progress through their education.

These lessons combine teacher lead and student lead lessons. The students are always collaborating with each other by communicating in chat or on the mic to help each other work out problems on the board. The collaboration is always positive and helpful. Sometimes, having peer tutoring and peer teaching help the students understand math concepts better because the peers can talk to each other on a level that all will understand.

Pre-Assessment

One pre-assessment is needed to see if the students have mobile devices that they can use for this project. A Google Survey will be sent to each student. Here is the Link The students who do not have access to a mobile device will be given an alternate way to complete the objectives. The data collected from this survey will let us know which students will be able to participate using the Metaverse app and those who will need an alternative method.

Another pre-assessment is needed to gauge students' prior knowledge about identifying two-dimensional shapes and their understanding of how to calculate the area and perimeter for those shapes. The students will be given a short 5 question Google Quiz where they must solve problems calculating the area of a shape and the perimeter of a shape will be given. The data collected from this pre-assessment will let us determine if a review is necessary for the whole class, a small group, or no students at all. Here is the link.

Formative Assessment

Formative Assessment will be done during the live classes by using polling, chat and student participation. The students will have opportunities to show understanding during the delivery of the lessons. There are many places during the lesson that asks the students to use their polling tools to choose the correct answer to questions. Our rule is that if most of the students do not answer correctly, then we go over another similar problem, describing each step and give a reason for the procedure. Then, the students are given another opportunity to show mastery using their polling tools. Students who need extra practice or who express that they do not understand are taken to a breakout room and given direct, small group instruction.

Summative Assessment

Type of Assessment	Reasons for This Type of Assessment
Metaverse Math Adventures APP	To motivate students 24-hour accessibility using mobile device Differentiation for tactile learners
Online Multiple-Choice Test	For students who do not have access to a mobile device.
Paper and Pencil Test	For those students who feel more comfortable printing and writing answers on paper.

Metaverse Math Adventures APP

The students will be evaluated at the end of the unit by how many items they have collected by correctly identifying solids and by calculating their correct volume. This method of assessment was chosen because it closely resembles how a gamer gets rewarded for their progress in a video game. They collect objects that are then used to move ahead in the game. In this way, the students who correctly identify the solids and can compute their volume are the students who are learning the concepts and meeting the learning objectives. The students will earn points for each quest they complete correctly. The students are given the option to take a photo or post a

comment with their device to share on a class wall when they have completed each quest. I know that many of the students will want their picture on the wall to show that they have completed the quests, but there will be a few who will not be able to post their picture due to parent restrictions. The data collected from the students who completed the quests will be compared to the data collected from the unit test.

Online Multiple-Choice Test
The students will be given the choice to take the online test that is included in the learning management system that they are accustomed to. This option is also available for those students who do not have access to a mobile device or are not permitted to download anything to their mobile device.

Paper and Pencil Test
This option will be for students who feel more comfortable printing a paper copy of the test and using a pencil to solve the problems. This is also for students who are have the accommodation of modified and reduced work.

Models of Instruction/Instructional Strategies

- Direct systematic and explicit instruction using visual representations
- Modifying instruction based on data from formative assessment of students (such as classroom discussions or quizzes)
- Setting Objectives
- Reinforcing Effort/Providing Recognition
- Cues, Questions & Advance Organizers
- Rewards based on a specific performance standard
- Learning feedback that is detailed and specific

Procedures/Activities

Day 1-3	Day 4
1. The students will participate in a lecture and discussion about 3D solids. During the presentations, the students will have the opportunity to learn the characteristics of the solids and use a matching activity to identify the solids. 2. Students will use Play Dough at their desks at home to model the 3D solids that are being presented. 3. The students will be given the link and/or the QR code to enter the experiences of identifying 3d shapes using a list of clues. 4. They will be given one week to complete their experiences. 5. Those who do not participate in the mobile adventures will be given a traditional paper test worth 18 points to show mastery.	1. The students will participate in a lecture and discussion about finding surface area and volume of 3d solids. During the presentations they will have the opportunity to practice matching the formulas to the shapes and calculating the values being asked for. 2. The students will be given instruction on building a foldable to keep the formulas organized and then used as a study guide. 3. The students will be given the link or the QR code to enter the experiences of calculating the volume of several solids to crack the code to earn their points. 4. They will be given one week to complete their experiences.

Identify and Discuss Technological Decisions

Students are required to log onto a conferencing software program where they will have access to a live discussion, lecture, and collaboration with other students and the teacher. This is a requirement of the online school where the students are enrolled

We chose the Metaverse app to give the students the opportunity to show their mastery of naming 3D shapes and finding the volume and surface area for the summative assessment. Using the Metaverse App for the summative assessment will be in place of an online, multiple choice unit test or a paper and pencil unit test. This method of delivery of the summative assessment was chosen due to the popularity and successfulness of using mobile devices to enhance the educational experience.

Resources & Technology Resources

- Play Dough: Students will use Play Dough to model 3D Solids during the lesson. This will help with differentiation and give students a hands-on experience.
- Calculator: Students can use this to aid in calculations. Students will be given the opportunity to use a calculator so they can concentrate more on the concept of using a

formula and filling in the correct information instead of being concerned about whether they are multiplying or dividing correctly.

- Formula book for surface area and volume: The graphic organizer will give them an organized way to reference the formulas.The graphic organizer is a way for the students to keep their formulas organized and all in one place. They will be able to add their own examples and drawings to help them make sense of the material.
- Metaverse App installed on their mobile device: This will give the students a different format to practice their knowledge and keep them engaged to do the homework. This mode of technology was chosen to give the students a more engaging and fun way to practice the material that they were presented with.
- Blackboard Collaborate is the conferencing software that is provided through the school. It provides a way for students to communicate, access resources, and participate. It allows the teacher to communicate, collect data, and present information.
- Student provided Android OS or Apple iOS devices in order to access the Metaverse app.
- An internet connection.
- Google Sheets: We used this to collect the data of which students had successfully completed which Metaverse experience.
- Google Forms: We used this to create the two pre-assessment surveys. We chose this because it is a format that the students are familiar with and it is a convenient form for collecting data.

Lesson Reflection

Discuss your thought process in the development of this lesson. After learning about TPACK how has this knowledge influenced the way you developed this lesson?

Content

We started planning our lesson with the content area in mind and chose the objective from the state standards for 7th grade math. We started thinking about how we were going to teach it our lesson after we chose the core content. In planning the lesson, we knew we wanted to relate the 3D objects to real life objects, and we thought this was demonstrated in an updated way through augmented reality. This is how we chose what type of technology we wanted to integrate. After looking through a couple different augmented reality apps that were able to display 3D shapes, help you build them, and even solve equations related to them, we ultimately chose to integrate the Metaverse application because we could include much more. With the Metaverse app, we were able to create experiences that had the student reading, writing, and problem solving while they went on a quest to collect an item. This gaming type of environment seemed like a great tool for getting the students excited about learning different 3D shapes and how to find their volume.

Technology

Now having a better understanding of TPACK and ISTE standards, we could effectively choose technology to integrate that meets the needs of 21st century learners. Because we had enough content knowledge and pedagogical knowledge and technology knowledge, we felt that our

choice of technology integration would be a good fit for the lesson. We still used the backwards model to develop the lesson, but we thought that that made it even easier to integrate the technology we wanted to use.

We believe that planning and developing lessons is more efficient with the use of technology. Students have come to expect the creative use of technology in the classroom. We used technology to develop and teach the lesson, collect data, perform assessments, collect artifacts and communicate feedback. Organizing thoughts and information and communicating are so much more efficient through the use of technology, played an important part in the development, execution, and reflection processes of this assignment. Since we are comfortable with using technology for those reasons, we were excited and eager to integrate more technology, since it would be a learning experience for us, and a new tool for the students.

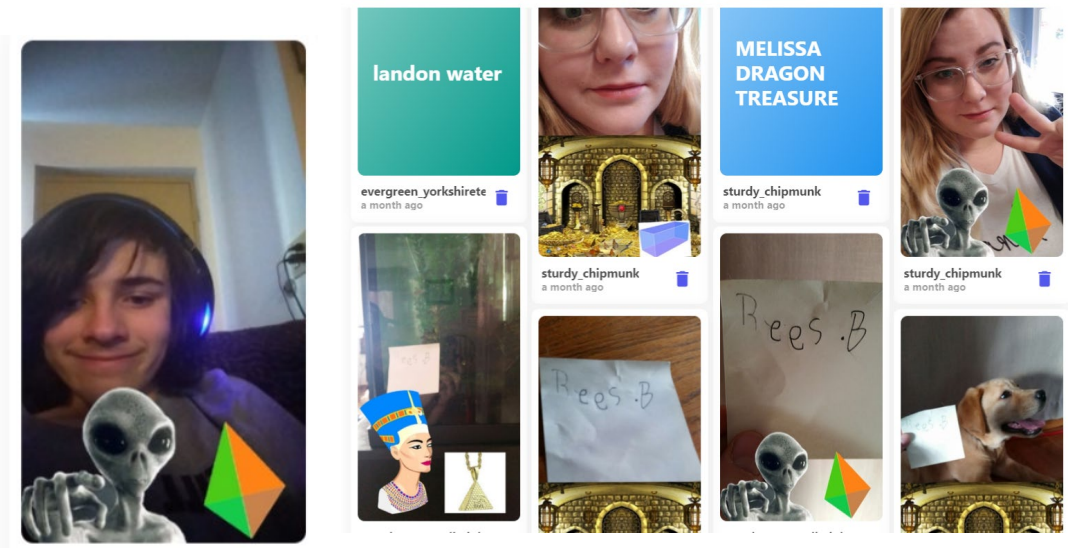
Pedagogy

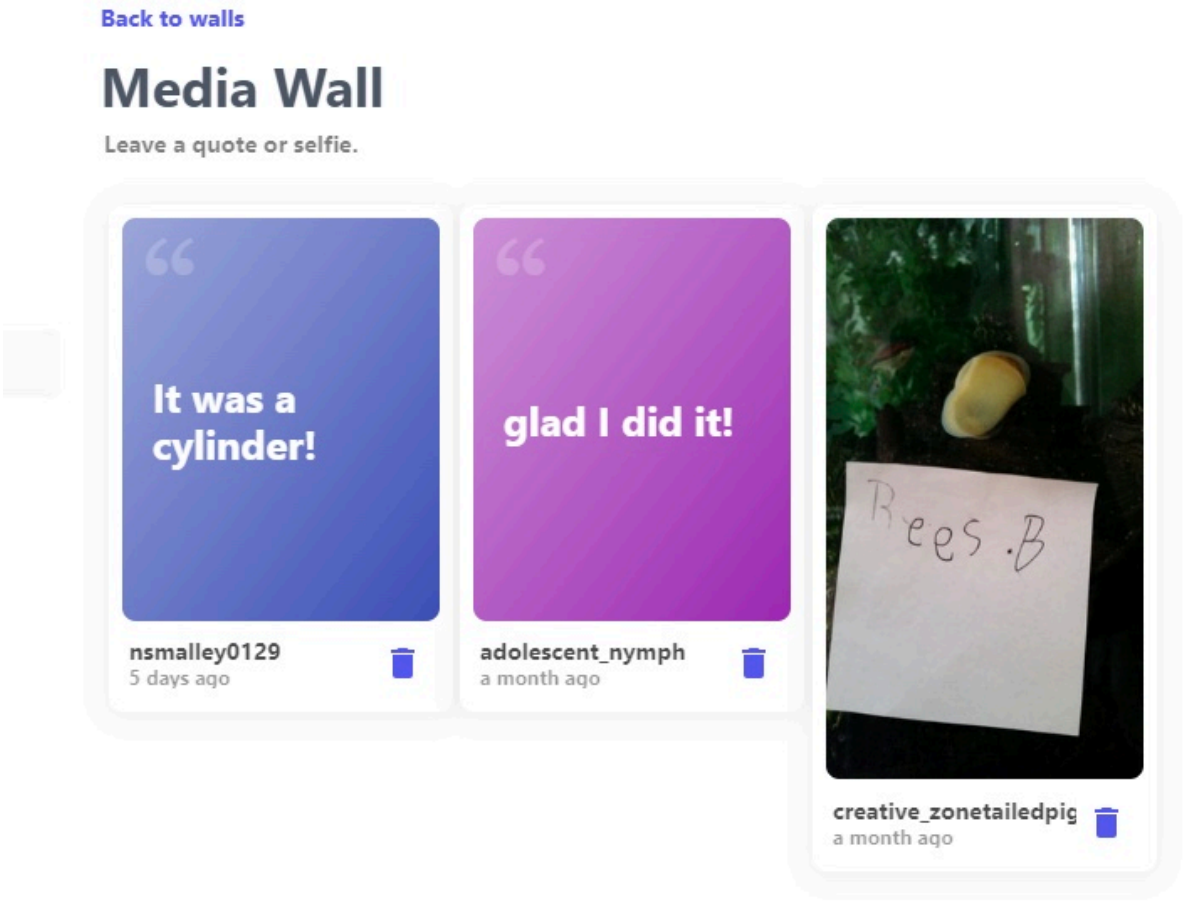
The delivery of the lesson went well. The students were engaged and participated in the online discussion, and collaborative work using the interactive whiteboard. The students were able to practice their problem-solving skills and help each other while the teacher observed and acted as a facilitator.

Evidence

The students were demonstrating their growing knowledge of solving problems involving volume and surface area. They had the graphic organizer filled out with the formulas and were able to use them to help choose the correct formula that matched the problem that was presented.

Wall of Fame for some students.





How is the development of your planning with the use of technology changed in terms of how you integrate technology? Describe your implementation of the lesson and results.

Results

We collected feedback throughout the lesson. We administered a pre-assessment survey to see how many students access to a device had that would allow them to use the Metaverse app. We offered the Metaverse experiences as an opportunity to practice their knowledge before the test. The students were also offered bonus points for completing the experiences that could be used towards the test and other assignments. We kept track of which students completed which experiences with a Google Sheet. After the lesson was completed, we sent out a survey to students using Google Forms to collect feedback about what the students thought about using the Metaverse app. We could then use the data that we collected throughout the lesson and correlate it with the results of the test.

We did experience some challenges throughout the process. After looking over the data collected of which students completed the Metaverse experiences, we couldn't understand why so many students didn't take advantage of the exercise. We attributed it to students not conveniently having access to a device like they would if they had a school provided one, and also to parents being reluctant to using the technology on their device or allowing their child to

do so. This is one of the challenges of an online classroom versus a traditional one. We also hoped for more post lesson responses to help us in understanding why more students didn't participate. The feedback that we did receive was somewhat helpful, but it would have been better to hear from all the students. One thing that we would have done differently would have been to model l the use of the technology. Modeling the use of the Metaverse APP during class could have gotten the students more excited about using the APP for their summative assessment. We think that maybe some students didn't participate because the Metaverse experiences were new to them and they did not have a good understanding of how to complete the experiences. We think that we could have done more to get the students excited about using the technology.

Overall, we did have a positive experience with the implementation of the lesson. We had fun learning how to use the Metaverse app and creating the experiences for the students. We are eager to use it in the future in other content areas. From the student feedback, we saw that one student is eager to see it used for language arts.

How do you measure the impact that technology has on your student learning? Did students learn as a result of the integration of technology in your lesson.

Data Analysis

Did you take advantage of the Math Adventures?	**Passed Test?**
Yes	**N/A**
Yes	**Yes**
No	**Yes**
Yes	**Yes**
No	**Yes**
Yes	**No**
No	**Yes**
No	**Yes**
No	**No**
Yes	**No**

10/15 PASSED (66%)
5/15 FAILED (33%)
1 NOT TAKEN

In looking at our data analysis chart, we can see that the data was split with positive and negative outcomes. There were two students who took advantage of the Metaverse experiences and passed the test, and there were two students who took advantage of the Metaverse experiences and did not pass the test. However, another positive outcome was that there were students that did not take advantage of the Metaverse experiences, but still passed the test. The students who passed without taking advantage were the students who were more comfortable with traditional test taking.

In conclusion, we feel that the technology that we integrated into this lesson was successful and had a positive outcome with helping students master the objectives of the lesson. We recognize that changes about how to introduce this technology will improve this lesson in the future. The students' feedback that we received will be helpful in making these changes.