Applying Area, Perimeter, and Volume to Real World Experiences
End of the Unit Measurement Project

Name: Cassandra Bozikis
Lesson Plan Title: Applying Area, Perimeter, and Volume to Real World Experiences
Subject Area: Mathematics
Grade Level: 5th Grade

Brief Overview of the Finished Lesson Plan:
Fifth grade students are usually very good at developing and applying formulas for perimeter and area of triangles, rectangles, and parallelogram, and finding the volume of rectangular prisms once they have been taught. However, once they begin working with all three formulas together, many students begin to mix up the definitions and appropriate units for area, perimeter, and volume. Also, even if students can identify the differences among area, perimeter, and volume on a worksheet, does this really mean they can identify the differences in their everyday lives? This lesson plan was developed using the backward design approach and my knowledge of TPACK to create a great activity in which technology will be used to support the lesson’s goals, assessments, pedagogy, and the students’ overall learning process.

After teaching my students everything they needed to know about area, perimeter, and volume, including definitions, formulas, and units, they will participate in this “End of the Unit Project” to see if they can apply their knowledge about area, perimeter, and volume to real world experiences. For this end of the unit project, my students will be working with an assigned partner to create a story book using the iPod app called Story Kit. This Story Kit app will provide my students with the opportunities to take pictures, record their voices, and text written response regarding area, perimeter, and volume.

Objectives/Indicators
Ohio Academic Content Standard:
Measurement Standard: Grade Level Indicator (4.) Demonstrates understanding of the differences among linear units, square units and cubic units.
Measurement Standard: Grade Level Indicator (6.) Uses strategies to develop formulas for determining perimeter and area of triangles, rectangles and parallelograms, and volume of rectangular prisms.

National Educational Technology Standards for Students:
(1.) Creativity and Innovation
a. Students apply existing knowledge to generate new ideas, products, or processes.
b. create original work as means of personal or group expression.

(2.) Communication and Collaboration
a. Students interact, collaborate, and publish with peers, experts, or others employing a variety of media and formats.
b. communicate information and idea effectively to multiple audiences using a variety of media and formats.

(4.) Critical Thinking, Problem Solving, and Decision Making
a. Students identify and define authentic problems and significant questions for investigation.
b. Students plan and manage activities to develop a solution or complete a project.
c. Students collect and analyze data to identify solutions and/or make informed decisions.

(5.) Digital Citizenship
a. Students advocate and practice safe, legal, and responsible use of information and technology.
b. Students exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.

(6.) Technology Operations and Concepts
a. Students understand and use technology systems.
b. Students select and use applications effectively and productively.
c. Students transfer current knowledge to learning of new technologies

Lesson’s Objectives:
(1.) The students will be able to identify three different objects in their everyday lives that represents area, perimeter, and volume by taking a picture of those objects using an iPod camera.
(2.) The students will be able to explain in their own words the definitions of area, perimeter, and volume by using the voice recording tool on the Story Kit app.
(3.) The students will be able to identify the appropriate unit that represents their area, perimeter, and volume pictures by typing a short text description of the correct unit below their picture using the Story Kit app.

Prior Knowledge/Prerequisites
The students must have prior knowledge on and understanding of area, perimeter, and volume in order to be successful with this lesson. The students have already defined and developed formulas for determining the area, perimeter, and volume of objects. They have also already discovered and worked with the necessary units for area, perimeter, and volume.

Identify and Discuss Pedagogical Decisions

Assessments
Pre-Assessment – At the beginning of our Measurement Unit, I pre-tested my students using our SMART Response System. I decided to pre-test my students so I knew where my students were struggling and what skill they had already mastered. Pre-tests always help me decide how much time I need to spend on each topic and how much I need to back track or skip over. Only when pre and post assessments are given can I determine whether or not true learning has occurred by measuring their growth between the two assessments.

For this pre-assessment, all the questions were related to area, perimeter, and volume. Below are a few screenshots of the pre-assessment I gave my students using the SMART Response Clickers.
Formative and Summative Assessments

For this end of the unit project, I will be administering formative and summative assessments to evaluate my students’ mastery of the units and definitions related to area, perimeter, and volume.

I will conduct formative assessments on my students through observations. While my students are taking pictures of objects in their everyday lives that represent area, perimeter, and volume, I will be observing them to make sure their pictures correctly reflect what they want them to. I will also be asking my student if they can explain why they chose specific objects to represent area, perimeter, and volume. This way I can determine whether or not my students have a full understanding of the units and definitions of area, perimeter, and volume. I chose observations as a formative assessment for this lesson because I can support my learners during their learning process.

Even the students’ finished “end of the unit project” will be a formative assessment. This project will serve as a formative assessment because students are working with a partner and are bouncing ideas off of one another. I will be able to observe their conversations and their ideas as a group. There is no way I can tell if each individual student has mastered the skills of area, perimeter, and volume from this project alone because it was a group effort. However, I can definitely tell if both students are struggling with a skill if their pictures, definitions, or units are
incorrect. I decided that the “end of the unit project” will be a formative assessment instead of a summative assessment because I will be giving them a post-test after this project. Therefore, this project will serve as a formative assessment in which their misconceptions can be clarified before the post-test.

For a summative assessment, I will be giving my students the exact same SMART Response System assessment that I gave them for their pre-test. This way each student will be showing their individual skills that they have learned. Also, I decided to give the same assessment for their pre and post tests so I can compare their exact answers and identify their individual growth from their pre-test to their post-test.

Technology plays a large role in this lesson’s evaluation process. Technology is used during both the formative and summative assessment processes. The SMART Response System is used to give both the pre and post assessment to the students. Also, the iPod and the Story Kit app are used during the formative assessment. Without these technology tools, the evaluation process would be more complex and time consuming.

These technology tools allow me to share my students’ data with others rather easily. By using the SMART Response System, I am able to share my students’ pre and post test scores easily with my principal, intervention specialist, and my fifth grade partner teacher. I can easily print the scores or e-mail them as an html or an excel document. My principal just loves the data that I can provide her with on my students’ progress. I love that the SMART Response System provides me with organized data on each of my students individually so I can analyze and share the data with my intervention specialist and partner teacher. Also, the iPod app, Story Kit, allows the students to share their projects with me, the principal, and their parents through e-mail. I can easily grade my students work at home through my e-mail. All the students have to do is select “Start Sharing” and they are able to find my e-mail addresses already programmed in a dropdown box. I think it is great that the students can also send their projects home via e-mail to share what they are doing at school with their parents.

- Please copy and paste the following html into your internet address bar to see my students’ post-assessment scores. Students’ first and last names were mixed up to protect their privacy.
  
  F:APV Post Test Gold Group.html

- Below you will find two screenshots of how my students are able to share their Story Kit projects via e-mail.
Models of Instruction/Instructional Strategies

This lesson follows the strategies for student-centered and constructivist approaches to instructions. Since my students did receive direct instruction from previous lessons regarding this topic, I believe it is time for them to construct their own meanings through their own experiences. In this lesson I am providing my students with the opportunities to discover and apply their ideas regarding area, perimeter, and volume themselves. I strongly believe that students must be given the opportunities to discover and transform complex skills through their own experiences in order to make those skills relevant to them. During this lesson, my students will be able to revise and apply their knowledge about area, perimeter, and volume by taking pictures of objects in their everyday lives and by explain how these objects represent area, perimeter, or volume. The students will play a much more active role in their learning process than I will as their teacher. I will be more of the “guide on the side” while the students will be learning from one another and will develop their own understanding of area, perimeter, and volume.

Procedures/Activities

• Prior to this lesson, students have already defined area, perimeter, and volume, they have developed formulas for each, and they have identified the differences among linear, square, and cubic units. Also, prior to this lesson the students were given a pre-test over area, perimeter, and volume through the SMART Response System.
• This lesson was created to see if students could apply their knowledge about area, perimeter, and volume into their everyday lives.
• To begin this lesson I will give the students a brief overview of their expectations for this project and will provide them with the rubric below.
Measurement Project

Expectations: For this project you will be using the *Story Kit* app on our school’s iPods to help you demonstrate your understanding of area, perimeter, and volume.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Possible Points</th>
<th>Points Earned</th>
</tr>
</thead>
</table>
| Step 1: Take three separate pictures:  
1. one that represents area  
2. one that represents perimeter  
3. one that represents volume | 3 | |
| Step 2: Record your voice describing what your picture is and why it represents area, perimeter, or volume | 6 | |
| Step 3: Type the correct unit used to appropriately describe the picture shown.  
a. Linear Units  
b. Square Units  
c. Cubic Units | 3 | |
| **Total:** | **12** | |

- Next, I will assign students their partners so no one is left out. (Some students that struggle with technology may be placed with a student this is a little more technology savvy to help guide them throughout this lesson.) Then I will give each group one iPod to work on together. Since this is the first time we have used iPods in class, I will provide my students with a brief overview on how to operate them and how to use the *Story Kit* app. Most of my students own their own iPod so they know how to use one but, none of my student have ever used the *Story Kit* app. Therefore, I will use my Document Camera to project my iPod onto the SMARTboard screen so my students can follow along with me as I show them how to use the *Story Kit* app.
- Below are a few screenshots of the *Story Kit* app.

*Find the Story Kit Icon*
Once the brief introduction on how to use the iPods and Story Kit is done, the students will begin walking around the classroom and down the school’s hallway to begin taking pictures of objects that they believe correctly represent area, perimeter, and volume. At this time I will be walking around with my students to observe their conversations and pictures and also to provide any technology support with the iPods and Story Kit app.

Once each group has at least one picture that represents each of the three types of measurements: area, perimeter, and volume, the students may begin to record their voices (students may use their EDM Student Reference Book glossary or their math note cards if needed).

For the voice recordings, the students must include what their picture is and why it represents area, perimeter, or volume. They can do this by defining area, perimeter, and volume in their own words.
Next, the students must type what units (linear, square, or cubic) matches with area, perimeter, and volume (students may use their EDM Student Reference Book glossary or their math note cards if needed).

The students are creating visual, audio, and written examples of area, perimeter, and volume which helps with students’ diverse needs and learning styles.

Once the students have completed their story book, they will e-mail it to me (required) and to their parents (if they want). Once all the students have completed their story books, I will open them up through my e-mail and present them on the SMARTboard screen. This way the students can share what they have created with their classmates and learn from one another’s projects. This will help reinforce their knowledge about area, perimeter, and volume and clarify any misconceptions.

The next day, I will begin class by giving them a post test over area, perimeter, and volume to see what they have learned and if they technology has impacted their learning. This post test will be the exact same as the pre-test given through the SMART Response System. I will then be able to compare their pre and post test scores to see if growth was made and if they have mastered the content.

Identify and Discuss Technological Decisions

Resources
In order to support this project, I will need the following resources:

- End of the Unit Measurement Project Rubric
- EDM Student Reference Book – Glossary
- Student made math note cards

The students will be allowed to use their EDM Student Reference Books or their math note cards to assist them with their project and mastery of the lesson’s objectives. Because this project will be used as a formative assessment I am fine with them looking things up if needed. This will show me whether or not my students are confidence in their ideas or need extra support. Also, the End of the Unit Measurement Project Rubric is needed to provide my students with a list of their expectations. It is important to provide students with their expectations before they begin a project so they know exactly what is expected of them.

Technology Resources
In order to support this project, I will need the following technology resources:

- SMART Response System with 24 clickers
- 13 of the school’s iPods with internet connection for e-mails
- Story Kit app on all iPods
- Document Camera
- SMARTboard
- Infocus projector
- Teacher Laptop with internet access

The SMART Response System was chosen as a technology resource to help with the pre and post testing for this unit. The SMART Response System allows the students to
answer questions individually and then provides the teacher with immediate data regarding their students’ scores. I used the SMART Response System to pre-test my students and then printed out their scores. This allowed me to see what skills my students had previously mastered and what skills that they were struggling with. It provided me with quick and accurate data that helped guide my lesson planning for this unit. Then I used the SMART Response System a second time to post-test my students using the same test created for the pre-test. I was then able to print off my students’ post-test scores and compare them to their pre-test score. This way I was able to document student progress and identify those students who were excelling and those who were struggling.

- After I decided what the learning goals were going to be and what my assessment strategies were, I knew that the iPods and Story Kit app would perfectly support this lesson’s objectives and my student’s learning. I knew I wanted my students to take pictures of objects in their everyday lives that represent area, perimeter, and volume but I knew I only had access to two cameras. Also, I knew I wanted my students to create some type of presentation in which they could type text and record their voice. At first I thought my students could share the cameras I had and then create iMovies or PowerPoint presentations. After much thought about what technology resources would best support my students learning I turned to our school’s iPod lab and an app one of our Language Arts teachers likes to use. This is when I decided that the students would use the iPod lab and the Story Kit app to complete this unit’s project. Each iPod has the ability to take pictures which would solve my problem of limited cameras. Also, the Story Kit app provides the students with the opportunity to organize their pictures on individual pages with audio and text. The backward design greatly helped me identify which type of technology and activity would best support the lesson’s objectives.

- I will assess my students’ learning during their presentations and will evaluate their overall learning from the post-test.

- The Document Camera, Infocus Projector, SMARTboard, and teacher laptop were all technology resources that were necessary tools used to help present material. Without these resources the students would not be able to see the iPod features enlarged on the screen and I could not present my students projects to the whole class.

Lesson Reflection

My thought process in the development of this lesson was to use my knowledge of TPACK and backwards design to create a lesson that incorporated technology to benefit my students’ learning outcome. Before this graduate program I believe that I was more “technocentric” in the fact that I chose my technology tools first instead of looking at my students’ and content needs. After learning about TPACK and backwards design, this knowledge has greatly influenced the way I develop lessons is several ways.

As I began planning this lesson I first looked at the Ohio Academic Content standards that my students needed to master and came up with the learning objectives. Then I thought about the best ways to gather formative and summative information that would reveal what my students were learning and how well my students were learning it. Then I had to decide what type of pedagogical strategies I would use to support my students needs and the lesson’s objectives. I decided that a student-centered and constructivist approach to instructions would work best for this project. I decided this because I knew I wanted to be more of a facilitator and allow my students to apply their knowledge and find ways to make their math information
meaningful and relevant to their everyday lives. I wanted to design a lesson where my students were active participants in their learning process and were able to apply complex skills and learn more through hands-on experiences.

Next, I had to develop an activity and sequence it appropriately to maximize student learning. When thinking of an activity that would reflect a student-centered and constructivist approach related to area, perimeter, and volume I knew I wanted to create an activity where students had to find examples of area, perimeter, and volume in their everyday lives. I decided that the best way to do this was to take pictures of these objects and present them in an organized manner. In this way my students would be applying their math knowledge to their everyday lives making math more meaningful and relevant to them.

Lastly, it was time to select the best resources that would help support student learning. I knew that some of my students might need some content support so I decided to allow them to use their Student References Books and/or their math note cards for help. I also, decided that a quick and efficient way to assess my students would be through our SMART Response System. My students use their clickers on a regular basis and are comfortable using this tool. I knew that the SMART Response System would provide me with the efficient data I needed. I could easily e-mail or print the data to share with my principal, intervention specialist, or partner teacher to discuss student progress. Then I had to select the technology tools that would support the type of activity I wanted my students to participate in. In thinking about what technology tools to use, I remembered another teacher in my building talking about an app called Story Kit that she used in Language Arts. Her students took a picture of a drawing they made and recorded their voices explaining what their drawings were about. I decided that this Story Kit app would be perfect for what I wanted my students to accomplish. My students would be able to take picture of objects that represented area, perimeter and volume and would be able to record explanations and type text that showed the appropriate units. I knew that the iPods and Story Kit app were the technologies I needed to support this lesson’s activity.

I believe it is critical for teachers to understand the TPACK framework in order to create effective learning experience with technology for students. The TPACK framework showed me the complex interactions that must occur among content knowledge, pedagogy knowledge, and technology knowledge for successful technology integration to occur within the classroom. It is critical for teachers to have a strong understanding of their content knowledge and be able to use the best instructional methods derived from educational theories of learning yet, this knowledge alone will not guarantee effective teaching with technology. Classroom teachers also need to have a deep understanding of information technology in order to know how and when to apply it productively.

I measured the impact that the technology had on my students’ learning in two ways. The first way is by comparing their pre and post test scores to see if they improved. If their scores showed growth I believe that the technology helped support this growth. If no growth was present I would realize that the technology did not support the lesson’s learning objectives. Luckily, all the students showed progress! The second way I would measure the impact of the technology would be by evaluating whether or not the students could have completed this project without the use of technology. If the answer is no, then the technology tool was used to support and enhance the students’ learning and did impact their lesson. In this case, this lesson could not have been conducted without the use of technology. My students could not have taken pictures, recorded their voices, or typed written text without the use of the iPods and the Story Kit app.
Therefore, I strongly believe that the technology used during this lesson greatly impacted my students’ learning outcomes.

Overall, everything went as expected probably due to my intense lesson planning. It seems that well thought-out lesson plans will usually go as expect since the needed time was put into planning and analyzing. I know that my backwards design greatly helped me create an activity in which the technology truly supported my students learning outcomes. The only problem that arose was that one of the iPods would not connect to the internet and the students were unable to e-mail me their project. I could not seem to figure out what the problem was, however, after restarting the iPod everything was back to normal and the students were able to e-mail me their project.

In the future if I were to execute this lesson again, I would probably allow students to work independently on this project if they wanted to because many of my students are very confident iPod users and always wanted the iPod in their hands. The main reason I had my students work in pairs was to provide them with support throughout this project because it was the first time we were using the iPods in class. Also, I would make sure that I emphasize that they need to create a new page each time they take a new picture. Some of my students skipped that step and had all three of their pictures on one page and had to retake two of their pictures. It is always great to reflect on a lesson and celebrate the successes while making plans for improvements.

Actual Implementation Data:
I actually implemented this entire lesson plan with my fifth grade students this year. Below are the actually scores from this lesson’s pre and post tests. It is very exciting to say that all of my students showed progress towards the skills and most of them have achieved mastery!

- Please copy and paste the following html into your internet address bar to see my students’ pre-assessment scores from the SMART Response System. Students’ first and last names were mixed up to protect their privacy.
  F:\APV PreTest gold group.html

- Please copy and paste the following html into your internet address bar to see my students’ post-assessment scores from the SMART Response System. Students’ first and last names were mixed up to protect their privacy.
  F:\APV Post Test Gold Group.html

Below are a few pictures of my students participating in this lesson’s activity using the iPods.
By clicking on the following links below you can access the story books some of my students created about area, perimeter, and volume using an iPod and the *Story Kit* app.

http://iphone.childrenslibrary.org/cgi-bin/view.py?b=thxhw4po64aq23euvgof

http://iphone.childrenslibrary.org/cgi-bin/view.py?b=j2zbghurlfjromlwwl75

http://iphone.childrenslibrary.org/cgi-bin/view.py?b=2craovc2uppk5u2kniya