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Formative Assessment Design Version 2.0

For comparison, Formative Assessment Design Version 1.0 can be found at the end of this document, or it can be linked to in a separate document here.

Assessment can be used for a variety of purposes, including giving grades to students and even evaluating teachers and schools. Classroom assessment, on the other hand, is the kind that "can be used as a part of instruction to support and enhance learning" (Shepard, 2000, p. 4). It can be used to inform teaching and provide feedback to students.

Formative Assessment to Support Learning and Inform Instruction

By moving assessment from the end of the unit to the middle, it becomes formative and can be useful for helping students learn. Formative assessment is dynamic assessment, giving teachers the opportunity to find out what students are able to do on their own or with adult help and guidance (Shepard, 2000).

Formative assessment can make students' thinking visible and open to examination, and it can reveal what a student understands and what misconceptions they hold (Trumbull & Lash, 2013). It also provides opportunities for scaffolding steps between one activity and the next, for each individual student (Shepard, 2000).

In Understanding by Design, Wiggins & McTighe (2005) identify three types of "uncoverage" (p. 46) to help teach for understanding so that students can learn more, avoid forgetfulness, and be able to transfer what they know to other situations. Through "focused questions, feedback, and diagnostic assessment" (p. 46), teachers can uncover misunderstandings, questions, assumptions, and core ideas of a subject to inform instruction.

Taking it a step further, teachers must use what they discover and uncover through formative assessment to inform their instruction. By doing that, they help to bridge the gap between what students know and what they are learning, allowing students to construct their knowledge.

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Assessment/Instruction Plan

5th Grade Robotics: Programming a Robot to Move 3 Plastic Blocks Autonomously

As part of this unit of study, students program a robot to move autonomously (with minimal human intervention). This formative assessment that is one assessment in a multipart unit is the focus of Formative Assessment Design 2.0.

The following steps precede the formative assessment that is the focus of FAD 2.0:

First, students learn how to create a digital representation of their physical robot in Modkit for VEX, an app that allows students to autonomously control a robot built with VEX IQ. Students configure the various input and output devices that connect to the robot brain.

Next, students learn the basics of block-based coding in Modkit, including how to write code for each robot device, how to pair their iPad with their robot, and how to download their program to their robot.

After learning the basics of the robot coding environment, students program the robot to move autonomously in a straight line and then a square.

The focus of Formative Assessment Design 2.0:

After coding the robot to autonomously move in a square, students program the robot to complete a task of moving three plastic blocks into a single collection zone.

This task is anchored by a real-world problem and could have multiple solutions. The completion of this task requires students to understand how to modify their physical robot to effectively move the plastic blocks, how to apply what they have learned about coding to write their program, and how to use computational thinking skills to determine a path for their robot to follow.

The transition from driving their robot in a square to solving the real-world problem is a challenging one. This authentic performance-based task shows "evidence that students are able to use their knowledge in context" (Wiggins & McTighe, 2005, p. 152). It requires that they "do" the subject, using innovation and judgment, and allows them to participate in the feedback loop of "rehearse, practice, consult resources, and get feedback on and refine performances" (Wiggins & McTighe, 2005, p. 153).

<u>Following Formative Assessment Design 2.0:</u>

I co-teach my curriculum with all the classroom teachers in two buildings, so my time with students in each class is limited. Whether or not students move onto the final challenge depends on whether they are able to successfully complete the challenge of moving three plastic blocks into a single collection zone with time still remaining for the unit. If they do, they move onto one final challenge in which they program their robot to autonomously move different colored plastic blocks into separate collection zones depending on the color of the plastic block.

<u>Integration of Assessment and Instruction</u>

To be most helpful for students and for me, assessment and instruction must be integrated. In my Feedback Plan which follows, I describe in detail how I will check in with students in person or collect videos and screenshots of their work in process in Seesaw. I will provide feedback to them, either in person or through Seesaw.

The feedback that I collect from individual groups and from multiple groups will inform my instruction. While I am working with many groups that are at different steps in the larger process, I will individually teach or whole-group teach, based on the issues that I see students having.

Assessment Instructions for Learners

These assessment instructions will be provided to students in Seesaw. I will also include a voice recording to support students who have difficulty reading. I will provide screenshots or other images to support the written instructions, as needed. I am in the process of drafting a Keynote presentation that I will convert to PDF so that students can access it easily.

The following instructions will apply after you have finished programming your robot to drive autonomously in a square and shared a video of your robot with me in Seesaw (tagging all group members).

1. In Modkit for VEX, make a copy of your square program and rename it before modifying it to move three plastic blocks.
2. In Inkling Axis, click on the button to open Project: Programming Challenge.
   a. With your group, read the Introduction about autonomous robots.
   b. Read the Procedure, keeping the design criteria and constraints in mind. (Remember you can click on the links in Inkling Axis to read the definitions of these words.)

3. Think back to Activity 3, Presentation Part 4 in Inkling Axis, and consider what you learned about the distance your robot travels when you code the motor to rotate 1.0 revolutions. How far does the robot travel? (A: 8 inches)
4. Now look at the image of the robotics challenge board setup with three plastic blocks (image in Inkling Axis, Project). Think about how many squares the robot must travel before it turns.
   a. What distance does each square on the board represent? (A: 12 inches)
   b. How many squares will the robot cover before it turns? (A: 2.5 squares)
   c. Altogether, how far does the robot travel before it turns? (A: 30 inches)
5. How can you apply what you know about the robot traveling in a square and apply it to making the robot move the three blocks off the board? Consider the following:
   a. Will your robot brain need all the code that it needed to make it drive in a square?
   b. What parts of your code can you modify so that your robot moves forward the distance you need it to before it turns? (Will you change the code on the brain, on the motors, or something else?)
6. Based on your answers to 4 and 5, do a few calculations on paper before you begin to change your program for your robot.
7. Remember to test often. Follow the cycle of:
   a. Change the program
   b. Save the program
   c. Download the program to the robot
   d. Test the program
   e. Consider what worked (or didn't)
   f. Repeat
8. During work time each day, I will attempt to see as many groups as possible. When I come to you, I'd like to discuss the following:
   a. How is it going with your group? Are group members finding ways to contribute? Are you having problems within your group?
   b. Does the design of the physical robot work for moving blocks? (Note: most groups solved this problem in an earlier module and did not change their robot again in this module.)
   c. What is happening with your program and your robot so far? Is your robot traveling far enough or too far before it turns? What does the code look like that makes it do that?

9. About ten minutes before the end of class each day, I would like you to reflect on what you did during class and what questions you have. In Seesaw, do the following:
   a. If I did not meet with your group today, or if I did but you still have concerns at the end of class, do the following:
      i. Use Seesaw to record a video of your robot attempting to move the three plastic blocks on the competition field. Tag all group members in your Seesaw post.
      ii. Use the iPad to take screenshots of all code for all input and output devices (brain, motors, etc.). Remember you can take a screenshot by holding the power button and the home button at the same time.
   b. Whether or not I met with your group, please reflect on (think about) the following. Twice a week I will ask you to individually put a note in Seesaw, reflecting on these items.
      i. Did my group work well together today? (Why or why not?)
      ii. How is my group progressing toward solving the problem of moving the three blocks?
10. Tomorrow, open Seesaw and look in the journal for any of your group members. You will find notes from me where I reviewed your video and screenshots of code and gave you feedback to think about as you continue to work through the problem.
11. Once you have moved all three blocks into the collection zone, take a video of your robot in Seesaw, and tag all the members of your group.
12. After you have shared a video in Seesaw of your robot successfully moving all three plastic blocks, use Inkling Axis to move onto Problem: Autonomous Vehicle Challenge.

Feedback Plan

Feedback to students in this formative assessment will be in the form of in-person conversations, screencasts, audio recordings, and students' screenshots of code that I have marked-up and sent back to them.

Throughout this unit, students work cooperatively in small groups. Each group may be at a different point within the module at a different time, and as groups proceed from one activity to the next, they independently access the content in Inkling Axis on the iPad. They may also access additional supporting information that I provide to them in Seesaw.

Before they begin coding, I will guide students through the process of thinking about how far their robot drives with one revolution of the motor. I will also get them to consider how far the robot needs to drive across the robotics field we use. Finally, I will ask them to consider the code that will be required to make the robot drive that distance before executing a 90-degree turn.

They will then go through the loop of programming, testing, and modifying their code until their robot completes the task of moving the three plastic blocks into a collection zone.

As students work through this loop, I will meet daily during class with as many groups as possible while they are working. We will discuss their group's social dynamics and we will discuss their progress on solving the problem and meeting learning goals.

If I am not able to meet with a group on a given day, or if they have concerns about their code at the end of class, I will ask them to use Seesaw to record and share a video with me of their robot executing the code in progress. I will also ask them to take screenshots of their code and share them with me. I can then review the code and the video and share back questions to help them to clarify their thinking and move them forward in their coding.

As groups need information, I will help them to access it. If I see the same points of confusion among multiple groups, I will stop the class, call students together, and do a mini-lesson focused on the issue at hand.

Technology Integration

This assessment will include the following digital tools. I have full-time access to an iPad cart with enough iPads for all of my students. Typically, students share the iPads within their group so that one iPad is used for programming the robot and the other iPads are used for accessing content and capturing video.

Robots built using VEX IQ

Students will build, configure, and program robots to drive autonomously using the VEX IQ robotics system. This is the system that is recommended by our curriculum providers. It is complex enough to be challenging for students who have prior building experience, yet is accessible for students who do not.

ModKit for VEX

Students will use [ModKit for VEX](#) on the iPads to configure and program VEX IQ robots using a block-based coding environment.

Inkling Axis

Students will access vendor-provided content including videos, vocabulary, and more using [Inkling Axis](#) on the iPads. Inkling Axis is not a CMS but it acts as an interactive, digital textbook where students can find course content. I cannot edit the contents of Inkling Axis so I will provide additional content to students using Seesaw.

Seesaw

When I want to share information with students, I will do so through [Seesaw](#). I can share videos, audio files, photographs, PDFs, slideshows and more through Seesaw. Students can download, copy, and edit documents as they need to, or they can simply view items I share with them. Seesaw is a natural choice for communicating with my students because its interface is easy for students to use. At the same time, it offers lots of features for annotating shared files, all in one integrated system.

Using Seesaw, students will record videos of their robots at work. They can send those videos directly to me through Seesaw and can tag each of their group members. If students want to provide context for their video, they can add audio or text. Students will also take screenshots of their code in Modkit for VEX and will upload those through Seesaw. Again, students can tag all of their group members when they share items with me.

Students may also share screenshots of code with me. If I see specific items that I want to annotate or highlight, I will use Seesaw's drawing feature to draw on the image, and I will use the audio recording feature to record voice notes to my students.

Seesaw also offers a social component that students love. They are able to comment on each other's videos and notes. This gives us an opportunity to discuss digital citizenship in a real-world context.

QuickTime Player with iMovie and Reflector

In order to support students in providing instructions through multiple means of representation, I will create screencasts of directions. Depending on whether I record from my iPad or from my laptop computer, I will use different applications. When

screencasting my laptop screen, I will use [QuickTime Player](#), along with [iMovie](#) for editing.

If I screen record my iPad, I will use [Reflector 2](#) to display from my iPad to my computer and record my computer screen. If I need to edit my screen recording, I will use iMovie.

The most recent iOS includes the ability to record the screen directly on the iPad. Unfortunately, updating my iPad to iOS 11 will cause a few of my older applications that I use regularly to stop working. So I will continue using iOS 10.3.3 on my iPad and do the workaround for reflecting from my iPad screen onto my computer screen and recording that.

Design Rationale

This Formative Assessment Design 2.0 includes multiple factors that make it motivating for students. It involves active learning in which students work cooperatively in groups at their own pace, and the assessment is performance-based and anchored by a real-world problem for students to solve.

This type of active learning where each group works at its own pace draws "on the constructivist learning theory, which postulates that students have to construct their own knowledge in interaction with the social and authentic learning environment" (van den Berghe, Ros, & Beijaard, 2013, p. 342). Within an active learning environment, which is different from a traditional learning environment, feedback should be facilitative rather than directive. Also, it is important to provide students with feedback about their metacognition and social learning and to provide feedback explicitly related to the learning goals (van den Berghe, Ros, & Beijaard, 2013).

As stated earlier, the transition from driving their robot in a square to solving the real-world problem is a challenging one. This authentic performance-based task shows "evidence that students are able to use their knowledge in context" (Wiggins & McTighe, 2005, p. 152). It requires that they "do" the subject, using innovation and judgment, and allows them to participate in the feedback loop of "rehearse, practice, consult resources, and get feedback on and refine performances" (Wiggins & McTighe, 2005, p. 153).

Unit-specific goals are based on the formal goals found in the Next Generation Science Standards:

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

• Science and Engineering Practices – Using Mathematics and Computational Thinking – Builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

The assessment rubric that I developed, [Rubric 4.0](#), identifies ten criteria that I think are necessary for a well-designed assessment. As part of designing this formative assessment, it makes sense to see how well it is designed as compared with my criteria for an effective assessment.

Some of the criteria could be judged as met or not met, depending on the circumstances. I will clarify below what circumstances should be in place in order for each criterion to be met.

1: Timely feedback

My plan is to provide feedback to students early enough that they can improve their work before submission of a final project. Feedback will be given verbally, either in person or through voice recordings or videos.

2: Direct and specific feedback

Rubric 3.0 calls for summative feedback to be written, provided in a timely manner, and specific to the student (does not compare students with each other). This formative assessment may provide feedback in writing or verbally, in person or digitally. All feedback given will be specific to the individual student or the student group and will not compare students with other students.

3: Aligns with established goals

As noted earlier, established goals are from the Next Generation Science Standards (NGSS). Unit-specific goals have been identified based on NGSS. Criteria for meeting the unit-specific goals have been written in a rubric for the final summative assessment. The formative assessment described in this document takes place as students are working to meet the criteria of the summative assessment.

4: Transparent learning targets

Learning targets are provided to students at the beginning of the process. They are available to students within the learning management system we use for the course.

They may refer to those learning targets at any time, and if they are ever unclear about what the learning targets are, they may ask me for clarification.

5: Self-assessment component

Self-assessment occurs naturally within this project as students work to build and modify their robot, code it to complete the task, and evaluate their design. Each time that they test their robot with the objective in mind, they are able to self-assess and revise.

6: Multiple means of representation (requires only target knowledge, skills, and abilities (KSAs) to complete)

Target KSAs for this task are:

- knowledge of how to use an iPad, including several applications
- the ability to sign in on two applications
- fine motor skills to build their robots
- coding skills to program their robots
- computational thinking skills to calculate the path for their robot

One non-target KSA for this unit is that it requires a lot of reading. Instead of requiring students to read the introductions to each lesson, we typically read and discuss them as a whole group. I also plan to record voice-overs of the instructions and may create screencasts of directions.

7: Requires transfer of knowledge to demonstrate understanding

This assessment requires students to complete an authentic performance-assessment that is based on a real-world problem. According to Wiggins & McTighe (2005), an authentic performance-assessment should include at least one facet of understanding. This one includes three facets of understanding: interpret the problem, apply what they know to solve an open-ended problem, and explain what they have learned.

8: Social component

This assessment includes a small group (2-4 students) in which students work collaboratively to build and program a robot across multiple class periods. This task does not have a pre-determined solution but is one in which students must solve an open-ended problem without one right answer. As part of the assessment, students must

navigate social situations such as determining a course of action, assigning group roles, or helping an absent group member understand or catch up.

9: Technology component

This assessment will afford many opportunities for students to interact with technology. They will build and program a robot, and they will use several iPad apps, including ModKit for VEX, Seesaw, and Inkling Axis.

10: Multiple means of action and expression

Of my ten Rubric 4.0 criteria, this is one that may not be met in Formative Assessment Design 2.0. The only way that I can think of for students to demonstrate understanding of coding a robot is for them to program their robot and execute the program. However, one mitigating factor is that each student will be part of a group of 2-4 students, and therefore will not be alone in trying to accomplish the task. Further, if individual students would like to propose an alternative means of expression to actually programming the robot and executing the program, I will be open to it.

References

Shepard, L. (2000). The role of assessment in a learning culture. Educational Researcher, 29(7), 4-14.

Trumbull, E. & Lash, A. (2013). Understanding formative assessment: Insights from learning theory and measurement theory. San Francisco: WestEd. Retrieved from www.wested.org/online_pubs/resource1307.pdf

van den Berghe, L., Ros, A., & Beijaard, D. (2013). Teacher feedback during active learning: Current practices in primary schools. British Journal of Educational Psychology, 83, 341-362. doi:10.1111/j.2044-8279.2012.02073.x

Wiggins, G.P. & McTighe, J. (2005). Understanding by design. Alexandria, VA: Association for Supervision and Curriculum Development. Retrieved from http://p2047-ezproxy.msu.edu.proxy1.cl.msu.edu/login?url=https://search-ebscohost-com.proxy1.cl.msu.edu/login.aspx?direct=true&db=e000xna&AN=133964&scope=site

Formative Assessment Design Version 1.0

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Assessment can be used for a variety of purposes, including giving grades to students and even evaluating teachers and schools. Classroom assessment, on the other hand, is the kind that "can be used as a part of instruction to support and enhance learning" (Shepard, 2000, p. 4). It can be used to inform teaching and provide feedback to students.

Formative Assessment to Support Learning and Inform Instruction

By moving assessment from the end of the unit to the middle, it becomes formative and can be useful for helping students learn. Formative assessment is dynamic assessment, giving teachers the opportunity to find out what students are able to do on their own or with adult help and guidance (Shepard, 2000).

By making students' thinking visible and open to examination, it can reveal what a student understands and what misconceptions they hold (Trumbull & Lash, 2013). It also provides opportunities for scaffolding steps between one activity and the next, for each individual student (Shepard, 2000).

In Understanding by Design, Wiggins & McTighe (2005) identify three types of "uncoverage" (p. 46) to help teach for understanding so that students can learn more, avoid forgetfulness, and be able to transfer what they know to other situations. Through "focused questions, feedback, and diagnostic assessment" (p. 46), teachers can uncover misunderstandings, questions, assumptions, and core ideas of a subject to inform instruction.

Name and Purpose of the Assessment

5th Grade Robotics: Programming a Robot to Move 3 Plastic Blocks Autonomously

As part of this unit of study, students program a robot to drive autonomously (with minimal human intervention). After learning the basics of the coding environment and programming the robot to move autonomously in a straight line and a square, they program the robot to complete a task of physically moving three plastic blocks. The final task is anchored by a real-world problem and could have multiple solutions. The completion of this task requires students to

understand how to modify their physical robot to most effectively move the plastic blocks, how to apply what they have learned about coding, and how to use computational thinking skills to determine a path for their robot to follow.

The transition from driving their robot in a square to solving the real-world problem is a challenging one. This authentic performance-based task shows "evidence that students are able to use their knowledge in context" (Wiggins & McTighe, 2005, p. 152). It requires that they "do" the subject, using innovation and judgment, and allows them to participate in the feedback loop of "rehearse, practice, consult resources, and get feedback on and refine performances" (Wiggins & McTighe, 2005, p. 153).

At this point in the unit, they will have already successfully driven in a square, demonstrating the ability to autonomously move the robot straight and to make turns. For the purposes of Formative Assessment Design Version 1.0, they are at the step of trying to solve the real-world problem with their robot. Students have multiple opportunities to go through the loop of programming, testing, and modifying their code until their robot completes the task.

In order to see what students have done so far and to provide feedback, I will require students to take a video of their robot attempting to move their three plastic blocks to the designated area. They will also provide screenshots of their code in process, and they will narrate why they used the code that they did.

Unit-specific goals are based on the formal goals found in the Next Generation Science Standards:

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

• Science and Engineering Practices – Using Mathematics and Computational Thinking – Builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

Learning About Students' Learning Processes

At this point in the assessment, I would like to know the following about students' learning processes:

1. How students use the input and output devices on their robot.
2. How students understand the use of different event blocks in programming.
3. How students understand and interpret the final problem of moving three blocks off the competition field, and how they plan to move the blocks.
4. How students use computational thinking to apply what they have already learned about the distance their robot travels using certain blocks of code to the problem of moving the blocks off the competition field.

Assessing This Formative Assessment Using Rubric 3.0

The assessment rubric that I have been developing, Rubric 3.0, identifies eight criteria that I think are necessary for a well-designed assessment. As part of designing this formative assessment, it makes sense to see how well it is designed as compared with my criteria for an effective assessment.

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Self-assessment occurs naturally within this project as students work to build and modify their robot, code it to complete the task, and evaluate their design. Each time that they test their robot with the objective in mind, they are able to self-assess and revise.

6: Requires only target knowledge, skills, and abilities (KSAs) to complete

Target KSAs for this task are:

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One non-target KSA for this unit is that it requires a lot of reading. Instead of requiring students to read the introductions to each lesson, we typically read and discuss them as a whole group.

7: Requires transfer of knowledge to demonstrate understanding

This assessment requires students to complete an authentic performance-assessment that is based on a real-world problem. According to Wiggins & McTighe (2005), an authentic performance-assessment should include at least one facet of understanding. This one includes three facets of understanding: interpret the problem, apply what they know to solve an open-ended problem, and explain what they have learned.

<u>8: Social component</u>

This assessment includes a small group (2-4 students) in which students work collaboratively to build and program a robot across multiple class periods. This task does not have a pre-determined solution but is one in which students must solve an open-ended problem without one right answer. As part of the assessment, students must navigate social situations such as determining a course of action, assigning group roles, or helping an absent group member understand or catch up.

Digital Tools for Assessment

Digital tools, used thoughtfully, can support the work of providing feedback to students. I am considering the following tools for this formative assessment:

<u>Seesaw</u>

I am considering using Seesaw, a tool that is useful for collecting videos, photos, and screenshots from students, and also for easily providing feedback to the students. Students can capture videos and photos in the Seesaw app, or they can upload files they created in other applications. Seesaw is a learning management system, allowing teachers and students to share files back and forth. But it also allows for annotating by both teacher and the students, with the ability to add text, drawing, or voice-overs to files.

<u>Thinglink</u>

When students share screenshots of robot code with me, they usually need feedback about what the code does, how it works, and what can be improved. Thinglink allows me to add hyperlink tags on images, so I can annotate screenshots of code and draw students' attention to specific places on the image.

<u>QuickTime</u>

I often review and comment on video footage created by students. Occasionally, I also need to share new video content with my students. At times when I want to create a screencast to demonstrate and narrate a coding example that might be useful to my students, Quicktime is one option for me to use. It is free, already on my computer, and I already know how to use it.

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References

Shepard, L. (2000). The role of assessment in a learning culture. Educational
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Trumbull, E. & Lash, A. (2013). Understanding formative assessment: Insights
from learning theory and measurement theory. San Francisco: WestEd.
Retrieved from www.wested.org/online_pubs/resource1307.pdf

Wiggins, G.P. & McTighe, J. (2005). Understanding by design. Alexandria, VA:
Association for Supervision and Curriculum Development. Retrieved from
http://p2047-ezproxy.msu.edu.proxy1.cl.msu.edu/login?url=https://searc
h-ebscohost-com.proxy1.cl.msu.edu/login.aspx?direct=true&db=e000xna
&AN=133964&scope=site