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STUDENT PERCEPTION OF USEFULNESS OF WEB-BASED DYNAMIC ASSESSMENTS IN ALGEBRA II DEVELOPED IN POWERPOINT

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ABSTRACT

Dynamic assessment is founded on zone of proximal development research from Vygotsky (1978) and later zone of proximal development researchers. The graduated prompts system of dynamic assessment is consistent with the ideas of the National Council of Teachers of Mathematics Assessment Principle (NCTM, 2000), the problem-solving principles established by Hiebert and Wearne (2003), and the strands of mathematical proficiency established in a book edited by Kilpatrick, Swafford, and Findell (2001). Researchers such as Wang (2011), Hauk and Segalla (2005), and Butler and Zerr (2005) have attempted to implement web-based dynamic assessment in college classrooms and high school classrooms with various levels of success. Their research involved assessments using software such as WeBWorK, WebAssign, Blackboard, The Cognitive Tutor software, and software authored by Wang. Since a school must purchase the aforementioned software before any teacher in the school can use it, a teacher whose school has not purchased such software does not have access to such potentially effective methods. This study determines student perception of usefulness of a web-based dynamic assessment created in Microsoft PowerPoint that any teacher familiar with PowerPoint could create. I created five web-based dynamic assessments in PowerPoint and assigned them to my Algebra II students during my student teaching experience. After assigning all five, I issued two anonymous surveys about student perception of the usefulness of the dynamic assessments. Data from the surveys indicate students perceived the dynamic assessments to be useful.

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Chapter 1

The Importance of Web-Based Dynamic Assessment

A web-based dynamic assessment is an assessment that simultaneously assesses student understanding and teaches content to students in a web-based environment. Users of web-based dynamic assessment utilize the internet to create homework assignments, quizzes, and tests that provide students the opportunity to learn and teachers the opportunity to assess what students already understand and have the potential to learn. The argument for using a system like this is based in principles for helping students learn mathematics with understanding.

Problem-Solving Principles

Hiebert and Wearne (2003) outlined principles for understanding mathematics based on problem-solving. The two main principles they outlined were:

1. Allow the mathematics to be problematic, and
2. Tell students the right things at the right time.

Web-based dynamic assessment accomplishes both of these principles. By "allowing the mathematics to be problematic" (p. 6), Hiebert and Wearne emphasize that we must not hold students' hands when they do not need to be held. "The key to allowing mathematics to be problematic for students is for the teacher to refrain from stepping in and doing too much of the mathematical work too quickly" (p. 7).

Why does this help students? Consider how a mechanic comes to understand how a vehicle, or any machine, functions. He does not spend hours poring over a manual or being told exactly how an engine works before ever opening the hood himself and having a look. No,

instead he learns by examining how it works for himself. My father always told me that his mechanical understanding came from taking apart old watches and toasters and examining for himself what made them function. Nobody took it all apart for him and told him how each part worked. That would have deprived him of his independence and autonomy, and the discoveries he made would not have been his own. However, since he had the opportunity to have these watches and toasters "be problematic" for him, he overcame these problems and learned mechanics deeply. The same principle applies to mathematics. Students need to struggle with challenging problems without teachers coming in and clearing everything up for them right away if they are to learn the mathematics deeply.

Web-based dynamic assessment allows mathematics to be problematic for students. When students engage in these assessments, they solve problems without a teacher present. These are usually assignments to be completed at home, in which case it is the same as my father sitting at home tinkering with a broken watch. Students have the problems to complete and whatever tools they desire, and no teacher will step in prematurely to help them get the answer. The most successful web-based dynamic assessments work on a system of graduated prompts (to be discussed later) that provide students with help when they submit incorrect answers, but they do not just give students the answer. Feedback on paper-and-pencil assessments often tells students only whether their answers were correct or incorrect and possibly the correct solution if they answered incorrectly. Web-based dynamic assessment, contrarily, provides more than correct or incorrect feedback and the correct solution. If students answer incorrectly, the assessment provides a minimally revealing prompt. This prompt gives students a boost without revealing the solution and spoiling the challenge. It balances helping the student and keeping the mathematics problematic.

Hiebert and Wearne discussed one other highly relevant principle: telling students the right thing at the right time. That is, prompting students when they cannot make any more

progress on their own. The graduated prompts in web-based dynamic assessments are created to be the "right things" at the "right time" for students. I do not doubt that my father often reached a point of frustration in trying to fix broken toasters and clocks, at which point he would have benefited from a hint revealing just enough to liberate him from his frustration. We want to be there to provide students the prompt that will liberate them from frustration that hinders further progress. For this reason, among others, teachers are highly relevant. Students cannot just go and learn everything they can about mathematics on their own. With teachers allowing the material to be problematic, students will unavoidably hit walls of frustration where they can go no further. At these moments, we want to tell students what they need to know in order to move forward without revealing too much.

Again, this is where the graduated prompts approach of web-based dynamic assessment comes into play. For example, if students struggle to solve a problem just because they struggle to translate the given information about building a fence for a field of maximal area into algebraic notation, we would not want to prompt them by telling them exactly how, for example, to translate the information, find the derivative, set it equal to zero, factor, and find the maximums. If all that they needed to know was how to write the area of fenced-in field in algebraic terms, we spoiled every other learning opportunity for them by telling them the rest. To avoid this, the graduated prompts approach starts with simple prompts and gradually becomes more and more revealing. So if students fail to translate the problem, they will first be prompted about how to translate the problem into mathematical terms. If they submit an incorrect answer again after being given that prompt, the next prompt would explain how to organize that translated information into a coherent structure. In each successive prompt, only the next bit of information is revealed so that we avoid telling students the wrong thing at the wrong time. Instead, students will keep attempting the problem with more information revealed until they get the piece of

information that was holding them back, the "right thing at the right time," and they can proceed to solve the problem successfully.

It must be mentioned that problem solutions are not always linear, and even when they are, linear prompts are not always the most effective. There are often many different solution paths for a problem. When this is the case, the prompts should be made more general. For example, consider a problem that requires students to reduce a matrix to row echelon form. Prompting students with each step in the row reduction would be excessive and ineffective. Rather, an effective series of prompts in this case would consist of the definition of echelon form followed by a reminder of the three elementary row operations. When problem solutions are not linear, the prompts should stay general like this.

Therefore web-based dynamic assessment indeed accomplishes both problem-solving principles. It allows the mathematics to be problematic while telling students the right thing at the right time. In order to help students learn mathematics with understanding, we must also be sure to develop all aspects of mathematical proficiency.

Developing All Strands of Mathematical Proficiency

Kilpatrick, Swafford, and Findell (2001) conceptualize mathematical proficiency as consisting of five interconnected strands: conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition. Conceptual understanding and procedural fluency refer to students' comprehension and skill with mathematical ideas and procedures respectively. Strategic competence refers to problem-solving skills, and adaptive reasoning refers to students' use of logical thinking and analysis of those problems. Finally, students have productive dispositions about mathematics if they believe it is meaningful and useful.

According to their analysis, the focus of mathematics education in the twentieth century shifted between procedural fluency and conceptual understanding followed by a reform movement focused on adaptive reasoning. The push in the mathematics education field lately has been to increase proficiency in conceptual understanding, strategic competence, and adaptive reasoning. For example, the National Council of Teachers of Mathematics Learning Principle (2000) emphasizes the important role of conceptual understanding and states, "Being proficient in a complex domain such as mathematics entails the ability to use knowledge flexibly, applying what is learned in one setting appropriately in another" (Learning mathematics with understanding is essential, paragraph 1), which is adaptive reasoning.

How can web-based dynamic assessment help students to develop conceptual understanding, strategic competence, and adaptive reasoning? How can it be developed so that we are not reinforcing procedural fluency alone? For example, in the discussion of finding maximums in the section entitled *Problem-Solving Principles*, we want to develop an assessment that not only helps students hone their ability to use a procedure of finding maximums but also helps them develop the other four strands as well. Through allowing the mathematics to be problematic, dynamic assessment preserves opportunities for students to practice analyzing and strategizing. Since the purpose of dynamic assessment is for teachers to understand what students are capable of learning and is not just a performance assessment of what students already learned, this type of assessment more than any other type focuses on strategy development and reasoning. With dynamic assessment we try to assess how students strategize and reason to solve a problem, and we provide them aid in these two aspects when they are frustrated to see how far they can get with assistance. When students answer incorrectly, we give them prompts about the question without using specific values from the question. Therefore they must use reasoning to relate the general prompt to their specific problem.

Dynamic assessment does not just serve a purpose of evaluation, but it also serves as a learning experience for students. Before receiving each graduated prompt, students must re-strategize and re-reason with the problem. Once they receive the prompt that enables them to solve the problem, it is supposed that they will recognize what insight gave them the boost they needed to solve the problem. Presumably, they will have the opportunity to evaluate their strategic competence after each problem since they will know what information enabled them to formulate their strategy. In addition, an important aspect of adaptive reasoning is reflection, and using the graduated prompts approach, each time students receive a prompt, they encounter the same problem with that little bit of additional information provided to them. This encourages students to re-evaluate what they can do in the problem at each step, encouraging reflection. Regarding conceptual understanding, prompts focus on strategy and concepts and avoid giving away the procedure until last so that students' opportunity to understand the concept is maximized before they are given the complete solution.

Achieving All Aspects of Assessment

The main point of NCTM's Assessment Principle (2000) is that assessment should be used to enhance student learning. It should not just be a "looking-back" to see what students have learned so far, but "rather, it should be an integral part of instruction that informs and guides teachers as they make instructional decisions. Assessment should not merely be done *to* students; rather, it should also be done *for* students, to guide and enhance their learning" (The Assessment Principle, paragraph 1).

This is precisely what dynamic assessment aims to do. It is not just a performance assessment, but it is an assessment of learning potential that is used to guide future instruction. In this way, dynamic assessment is set apart from static assessment. In static assessment, "the

examiner's role is to elicit and record all relevant behavioral indicators without in any way directly influencing the estimation of the subject's present cognitive level" (Allal & Ducrey, 2000, p. 138). Dynamic assessment, contrastingly, seeks to find out what a student *can learn* in addition to what he or she *already learned*, and teachers can use that to inform their future instruction. Dynamic assessment does both formative and summative assessment.

In addition, the Assessment Principle states "To maximize the instructional value of assessment, teachers need to move beyond a superficial 'right or wrong' analysis of tasks to a focus on how students are thinking about the tasks" (Assessment is a valuable tool for making instructional decisions, paragraph 7). This is what the best models of web-based dynamic assessment have done. Originally, the most useful aspect of web-based assessment was thought to be the instantaneous feedback students receive about their answers. Instantly, every student knows "right" or "wrong" and is not left wondering until the teacher has the opportunity to grade every assignment. However, web-based dynamic assessment took web-based assessment to a new level. No longer does it just provide the superficial "right or wrong analysis" condemned by the Assessment Principle; it now utilizes the graduated prompts approach described in *Problem-Solving Principles*. In this approach, students are given problem translation and problem strategies as they fail to answer the problem. Therefore they are not just told "incorrect" and forced to move on. On top of that, they are not just told "incorrect" and given the actual full solution and then forced to move on. Rather, they are given, as needed, pieces of the solution that give them the boost to *understand* the problem and solve it for themselves, and if they still cannot solve it after all of the prompts, they are given the complete solution. Thus web-based dynamic assessment achieves the principles outlined by experts in mathematics education.

This thesis explores the use of dynamic assessment in a high school Algebra II class. In particular, it considers student perception of the usefulness of teacher-made dynamic assessments that reflect the literature discussed thus far.

Chapter 2

Dynamic Assessment Research

Web-based dynamic assessment is grounded in what Vygotsky (1978) coined the student's *zone of proximal development* (p. 82). I studied how the zone of proximal development relates to assessment in general, and I then researched how it has been used specifically in web-based contexts. This informed my development of my own web-based dynamic assessments, and this research will be discussed in this chapter.

The Zone of Proximal Development

This zone of proximal development describes the difference between how well a student performs independently and how well he or she can perform with expert help. Vygotsky describes a student's independent performance as the *actual developmental level* (p. 82). Teachers assess the actual developmental level through what typically comes to mind regarding assessment: a series of questions at a range of difficulties designed to evaluate just how well a student can succeed on his or her own. Results from actual developmental level assessments were regarded as the only relevant information regarding student developmental level. As Vygotsky says, "In studies of children's mental development it is generally assumed that only those things that children can do on their own are indicative of mental abilities" (Vygotsky, 1978, p. 85).

Vygotsky proposes a counterargument such as the following: Suppose we test two students through standard static, summative assessments in mathematics, and these two students are determined to be at the same actual developmental level mathematically; assume for example

they are at the eighth grade level. Ordinary assessment might end there and conclude that these students are at the same level and can be taught in the same way. However, suppose we then test both of these students dynamically by having them complete a series of advanced tasks beyond what they could do on their own, and we provide them with expert help while they complete these tasks. On these tasks, one student performs up to a twelfth grade level while the second student performs up to a ninth grade level. It would be erroneous to claim that these students function at the same level mathematically. Therefore their instruction should not be identical, and the actual developmental level does not suffice in providing a complete picture of a student's abilities.

Results from assessments of actual developmental level indicate what a person already learned and understands completely. This knowledge can be likened to the "*flowers*" that have blossomed on the person's tree of learning. Knowing the flowers is an important part of the picture, and only these flowers are the focus of most tests that students take nowadays such as the SAT (formerly the Scholastic Assessment Test), state standardized testing (e.g., Keystone Exams [retrieved from http://www.pdesas.org/module/assessment/keystone.aspx on February 15, 2013]), and any form of summative assessment. Summative assessment alone, however, does not give the complete picture of that tree of learning. What we seek to discover through determining the student's zone of proximal development are the "*buds*" of the flowers on that tree of learning, and those buds tell us as much about the student's abilities and developmental level as the already-blossomed flowers. See the actual developmental level flowers and zone of proximal development buds in Figure 2-1. These buds represent what a person *can* or *will learn* as opposed to the flowers which represent what a person *has already learned*. Educational psychologists Allal and Ducrey (2000) call the zone of proximal development the "educability" of the person. We determine these buds through what has been called dynamic assessment, learning potential assessment, learning tests, testing-the-limits, and other names. Understanding a person's *flowers* and *buds* gives us the complete picture of his or her tree or learning, and this is

why the zone of proximal development, the extent of the person's buds, is so important. Since the flowers have already blossomed, education must focus on the buds and leading them to blossom: the upper portion of Figure 2-1.

Figure 2-1: Depiction of the zone of proximal development

The Zone of Proximal Development and Assessment

Now that we have established the importance of the zone of proximal development, let us examine how it relates to assessment in general. How do we dynamically assess, that is determine the buds of, our students in their zones of proximal development? Since Vygotsky developed the concept of zone of proximal development in the 1930s, researchers have taken many directions with it. We seek to determine the best way to discover a student's zone and push those buds to blossom.

Allal and Ducrey (2000) discuss how this has been accomplished in two mutually exclusive ways: integration of assessment in teaching and integration of teaching in assessment.

Integration of dynamic assessment in teaching seeks to do assessment in the zone of proximal development. Educators following this path identify the zone of proximal development and then teach and assess in that zone. The zone of proximal development is thus just a waypoint pointing the teacher to where education should take place. This is a basic, logical approach one would take after recognizing the existence and importance of the zone of proximal development.

Integration of teaching in assessment, however, is the advanced, next-level progression after integration of assessment in teaching. This interpretation and use of the zone of proximal development is most innovative, and it is the interpretation I will expand upon. Through integrating teaching in assessment, dynamic assessment is born. Not only can we determine students' learning potential but we can *teach them as we assess*. This is the foundation of dynamic assessment into which we now delve further.

Sternberg and Grigorenko (2001) define two general types of dynamic assessment: the sandwich format and the cake format. In the sandwich format, students are given a static pre-test, instructed on the material from the pre-test, and then post-tested with an alternate form of the pre-test. Using our terms from the previous section, this format is dynamic in that it first identifies the buds through the pre-test, seeks to bring those buds to blossom through instruction, and then evaluates progress through the post-test. That is, first identify the zone of proximal development, deliver instruction in that zone, and reevaluate the zone.

In the cake format, individual students are given an item to solve, and if they solve it, they move on. If they answer incorrectly, they are given a graded series of hints until they solve it. This *is* the instruction. This cake format is the graduated prompts approach described earlier to be discussed further later regarding Wang's (2011) graduated prompting assessment module. This format is dynamic in that with each question, it determines if the knowledge required by that question is a flower or a bud for that student. If it is a flower, we move on; if it is a bud, we teach it as we assess it through the graduated prompts approach. That is, question-by-question, we

determine if the knowledge required is already learned and part of the actual developmental level or if it is part of the zone of proximal development. If it is in the zone of proximal development, we deliver instruction in that zone.

Guthke (1990) proposed using a system of graduated prompts that go from general to specific. Beginning prompts would offer basic hints or questions that could be asked about any problem like, "What are we looking for here?" Gradually, the hints become more problem-specific. Some developers of web-based assessments utilize or adapt Guthke's method, but some resort to only instant correct-or-incorrect feedback as is most commonly found in web-based assessments.

Web-Based Assessment Research

I classify three hierarchical levels of web-based assessment research where the software is utilized better as the levels increase. Level 1 software gives only "correct" or "incorrect" instant feedback and performs summative assessment; Level 2 software gives instant feedback with detailed solutions and performs summative assessment; Level 3 software gives instant feedback with graduated prompts and performs dynamic assessment.

Level 1: Right or Wrong Only

One early example of partially utilizing the opportunities available in a web-based environment is Hauk and Segalla's (2005) study of student perceptions of the web-based homework system WeBWorK. Hauk and Segalla used WeBWorK in a college algebra class as

an online means for assigning and grading homework. Instructors enter a database of problems from a textbook into WeBWorK, and then for homework assignments, students are given a random selection of problems from this database. This serves as an alternate form of paper-and-pencil homework. As students complete a WeBWorK assignment, they receive instantaneous feedback about whether each response entered is correct or incorrect and thus can learn more from their mistakes on each assignment. Also, the instructor need not spend hours grading homework assignments. Hauk and Segalla compared the effectiveness of this method of homework to the effectiveness of paper-and-pencil homework, found no significant difference in student performance, and thus endorsed WeBWorK as a useful time-saver for teachers and a provider of instant feedback for students.

Though it may save time and does provide beneficial instant feedback, WeBWorK does not fully utilize the online environment. It provides instant feedback, but that feedback is not nearly as useful as it could be. If students miss a problem, they instantly know they missed it, but why did they miss it? What do they understand and not understand? WeBWorK tells them nothing about what went wrong and thus deprives them of the opportunity to immediately learn from their mistake or correct their misconceptions. Paper-and-pencil feedback, even if done quickly, could at least have given them an idea about what went wrong. So WeBWorK does have the benefit of being a time-saver and provider of instant feedback, but it does not nearly take advantage of the opportunities available in a web-based environment.

Another common web-based homework environment is WebAssign. Many colleges use WebAssign, and Cox and Singer (2011) studied their use of it in a first-year calculus course. Most of the features of WebAssign are the exact same as WeBWorK; students complete problems from a database of problems entered by instructors, can complete assignments repeatedly, and receive instant feedback about whether each answer is right or wrong. Like Hauk and Segalla, Cox and Singer found that students did not perform significantly better or worse using

WebAssign instead of paper-based assignments. Cox and Singer collected data on student opinions about WebAssign, found mostly positive reactions, and concluded, "The results of this study may encourage mathematics teachers reluctant to use technology for homework purposes to reconsider their position and be more confident about the usefulness of such an assessment approach" (p. 518).

Again, WebAssign may be a decent alternative to paper-and-pencil homework, but it certainly is not useful enough for an instructor to use it who does not have it readily available or is content with the status quo paper-and-pencil homework system. Studies on WebAssign and WeBWorK have shown us the potential of web-based environments; they provide unique things like instant feedback, and they are viable alternatives to paper-and-pencil. These systems form the most basic level, what I call Level 1, of web-based assessment. This data is just the beginning what can be done in this environment, and more advanced software like Blackboard takes it to the next level.

Level 2: Right or Wrong with Full Solutions

At first glance, Blackboard has many similarities to WeBWorK and WebAssign. Students might have a weekly Blackboard assignment that they can take as many times as they desire, and they receive instant feedback about the correctness of their answers. The distinguishing factor between Blackboard software and WeBWorK and WebAssign software is that Blackboard can provide detailed solutions when students answer incorrectly. No longer are students left wondering where the correct answer came from. With this feature, Blackboard asserts itself ahead of standard paper-and-pencil homework, for not only do students receive a complete, correct solution when they answer incorrectly (something an instructor could give students on paper-and-pencil homework if he or she really put the time in), but they receive it

instantly. Thus Blackboard accomplishes the detailed solution feedback that paper-and-pencil homework can accomplish and accomplishes it instantly. This separates it from WeBWorK and WebAssign. In Butler and Zerr's (2005) study of the implementation of Blackboard-based homework assignments at the University of North Dakota, students believed strongly in the usefulness of the program and had significantly high homework grades. With Blackboard we see the beginning of a good thing—feedback that is instant and detailed. Blackboard elevates itself above WeBWorK and WebAssign to Level 2 of web-based assessment, but still cannot accomplish everything that paper-and-pencil homework accomplishes. That is, Blackboard cannot give *personalized* feedback specific to how each student thought about the problem as paper-and-pencil feedback can. This is where Level 3 software joins the conversation.

Level 3: Graduated Prompting

Intelligent software tutors like the one developed by Carnegie Mellon University are becoming increasingly common in high schools, and like Blackboard, we can see in them the potential for web-based homework, assessment, and teaching environments. As Blackboard transcended the accomplishments of paper-and-pencil homework, WeBWorK, and WebAssign, intelligent software tutors transcend the accomplishments of Blackboard. Again, we see a computer-based environment, this time without the internet, taken to a whole new level: Level 3.

Software such as The Cognitive Tutor not only provides feedback for students but also actually monitors the work done by students as they work through problems. The Cognitive Tutor "'watches' the steps that the student is performing. If the student's actions suggest that the student is confused or harboring a misconception, the system will intervene and present a message to get the student back on track" (Ritter, Haverty, Koedinger, Hadley, & Corbett, 2008, p. 161). In addition, The Cognitive Tutor utilizes a simplified version of what Guthke (1990) and

others described in the graduated prompts approach of dynamic assessment; the student can ask for a hint at any time when solving a problem, and The Cognitive Tutor will respond with a hint *specific to the student's solution path* for that problem. On top of that, the system even monitors students' development of skills in particular areas. For example in the area of Algebra I, the system monitors identifying units, finding *y*, finding *x*, working with slope and intercept less than 100, working with integer slope and intercept, changing axis bounds, changing axis intervals, and more. Students are constantly monitored, instructed, and assessed simultaneously. This is the dynamic assessment ideal we find in Sternberg and Grigorenko's (2001) cake format of dynamic assessment. Instruction and assessment occur simultaneously. The software is truly transcendent.

Instructor-Made Assessments

Unfortunately, an individual teacher cannot easily obtain software like this. The Cognitive Tutor is a massive, expensive project developed at Carnegie Mellon University. An entire district would need to purchase the software in order for a teacher to use it, and therefore the teacher at an average district will never get to use the software. The moment we find the closest thing to the ideal computer-based mathematics software, something at Level 3, we realize that it is out of our reach. How can teachers in districts without the buying power necessary to purchase The Cognitive Tutor or comparable software take advantage of this breakthrough in computer-based mathematics education? One researcher, Tzu-Hua Wang, took ideas like those used in development of The Cognitive Tutor and the graduated prompts approach proposed by Guthke (1990) and implemented them into his own assessment software.

Wang (2008, 2011) used what he named the web-based assessment and test analysis software: WATA. Using this software, Wang developed different modules with various features

designed to enhance the standard testing experience. He considered all of his modules to be examples of formative or dynamic assessment, and they increased in intricacy as he developed more modules. He developed the Game Assessment Module, or GAM-WATA, first. In this module, students took a standard formative assessment but had the opportunity to use the "Ask-Hint Strategy" feature of the software as they took the test. This feature provided them two options. First, they could use the "Prune Strategy" to remove one of the wrong answers to a multiple choice question with which they struggled. Second, they could use the "Call-in Strategy" which functions like phone-a-friend on Who Wants to be a Millionaire. With this strategy, students are shown the proportions of students who already took the test who selected each multiple choice answer. These hint strategies can be limited to a specific number of uses by the instructor. Students using GAM-WATA scored significantly better on the same post-assessments than students taking a normal web-based test or a paper-and-pencil test.

GAM-WATA scratches the surface of what a dynamic web-based testing experience could be in the same way Blackboard scratched that surface, and I put it at Level 2. Adding hint strategies to the test makes for a more opportune learning experience while taking the test than standard tests. When students did not know an answer on a normal web-based test or paper-and-pencil test, they could do nothing other than guess. When students did not know an answer on GAM-WATA, they could use one of their "Ask-Hint Strategies" to get a new perspective on the question. Thus, given additional information, we can liberate students from their frustration (telling them the right thing at the right time) while avoiding telling them too much (allowing the mathematics to be problematic). They have the opportunity to reflect on the question given new information without having the answer given to them prematurely. As when we discussed dynamic assessment's impact on a student's adaptive reasoning, the student can consider, "I'm dealing with this same problem, but now I have this small bit more of information. So I know

everything I did before, and now I also know this. How does this change the way I think about this problem?" Such reflection is an integral part of adaptive reasoning.

As Blackboard does not accomplish enough and fails to take full advantage of the web environment, GAM-WATA does not take full advantage of Wang's software. Adding the "Ask-Hint Strategy" improves the assessment, but it has major drawbacks. The Prune Strategy does not give students any prompts to move them forward; it just makes the number of possibilities for answers a bit less daunting. The strategies may promote finding the right answer more than understanding the right answer. If they do not understand what the problem asks or what mathematical strategy is necessary, they are no closer to a solution than before they used the strategy; they are just slightly more likely to guess correctly. Similarly, the Call-in Strategy does not actually prompt students in any mathematical way; it just tells them, "Most people chose this answer." This could just lead students to choose the answer everyone else chose. Who are they to go against the pack when they needed to use one of the Ask-Hint Strategies to answer the question anyway? Thus, GAM-WATA is the beginning of a good thing but not good enough.

Wang's (2011) later development, the Peer-Driven Assessment module, is an evolution in his formative assessment development skills. In this module, PDA-WATA, Wang improves upon GAM-WATA in terms of promoting self-regulation. This module has five new, unique features that really take advantage of the web-based assessment environment.

For each question, students have the option to "Add Answer Notes" about why they chose their answer. In addition, students can "State Answer Confidence" for each question to show how sure they are of their answers. Not only does this provide much more formative assessment for the instructor to analyze, but also every student can "Read Peer Answer Notes," "Recommend Peer Answer Notes," and "Query Peers' Recommendations on Personal Answer Notes" for every question they attempt. This provides tremendous opportunity for self-regulation. Students compare their understanding and interpretation of the question to their peers,

and they also strive to achieve good ratings from the peers for their answer notes. They are motivated by the "Recommend Peer Answer Notes" function in the same way users are motivated to give helpful answers on sites like yahoo! answers. Thus every student can compare his or her ideas about the question to his or her peers' ideas while also providing the instructor valuable formative assessment information. This is a gold mine that I categorize between Levels 2 and 3.

Peer interaction and availability of peer information on this scale could only be achieved in a web-based environment. Thus, in the evolution from GAM-WATA to PDA-WATA, we see a leap in efficacy similar to the leap made from Blackboard to The Cognitive Tutor. PDA-WATA more effectively utilizes opportunities available in a web-based environment than GAM-WATA in the same way The Cognitive Tutor more effectively utilizes those opportunities than Blackboard.

The peak of Wang's web-based assessment module mastery came with the Graduated Prompting Assessment Module: GPAM-WATA. Here we have the realization of Guthke's (1990) graduated prompt system of dynamic assessment and a Level 3 web-based assessment. We achieve everything we set out to accomplish: allowing the mathematics to be problematic, telling students the right thing at the right time, integration of teaching in assessment, and the cake format of dynamic assessment. This is our paragon of web-based dynamic assessment.

Wang (2011) developed his series of graduated prompts based on "the mathematical problem-solving theory of Mayer" (p. 1063). Mayer systematizes problem-solving into two steps, each with two sub-processes as follows:

> Step 1. 'Problem representation': In this step, learners need to transform problem statements (texts or figures) into mental representations. This step involves two sub-processes:
>
> > Sub-process 1. 'Translation': Translating each sentence or phrase into a mental representation. To do this, learners need to have 'linguistic knowledge' and 'semantic knowledge.'

Sub-process 2. ‘Integration’: This requires learners to combine the information about problem into a coherent structure. To integrate problems, learners need to have ‘schematic knowledge.’

Step 2. ‘Problem solution’: In this step, learners begin to solve problems and find answers. This step involves two sub-processes:

Sub-process 3. ‘Planning and monitoring’: Learners are required to have ‘strategic knowledge’ about how to develop and monitor a plan to solve problems.

Sub-process 4. ‘Execution’: Learners must correctly and effectively use the plan to solve problems based on ‘procedural knowledge.’

These first two sub-processes form prompts one and two, and the last two sub-processes combine to form the third prompt. With these prompts, students are empowered in all the ways described earlier. They are enabled to be the mechanic and get under the hood of the mathematics, but they are given prompts to liberate them from their frustrations when they get stuck. We teach and assess them in their zone of proximal development. The buds on their tree of learning are developed and assessed based on which questions they require prompts for and how much prompting they require. Students performed significantly better on this assessment than they did on paper-and-pencil or normal web-based tests, and students who required many prompts for earlier questions did not require prompts for the same kinds of questions later. This is proof that teaching and learning occurred during assessment – the cake format described by Sternberg and Grigorenko (2001).

I sought to develop such an effective Level 3 system of assessments myself. Next, I will discuss the dynamic assessments I created in Microsoft PowerPoint, how I used them in my classroom, and how I examined student perceptions of those assessments.

Chapter 3

Methods

For my study, I wanted to answer the questions, "Can a classroom teacher with available tools and limited programming capability develop web-based dynamic assessments, and do students find those assessments to be useful?" This chapter describes the process I used to address this question, including creating web-based dynamic assessments, recruiting participants, collecting data, and analyzing data.

The Dynamic Assessments

I created five dynamic assessments in Microsoft PowerPoint. A full version of one of those assessments can be found in Appendix A. Each assessment has five multiple choice questions. Each question has different paths that depend on students' answers. Observe the topmost slide in Figure 3-1. This is where all students begin each question, and they click on the blue action button next to their answer. Follow the two arrows from that question slide in Figure 3-1 to see the two possible places students go depending on their answers. If they select the correct answer, they are sent to a page that says, "That is correct!" and explains why that answer is correct. If they select an incorrect answer, they are sent to a "fork in the road" page that leads to different prompts depending on students' choices. This "fork in the road" page asks students which aspect of the problem they need to know more about in order to correctly answer the question. The number of aspects to learn more about range from one to three. They must choose one of those aspects of the problem to learn more information about, and after clicking the action button for that problem, they are sent to a prompt page that explains that aspect of the problem in

detail. Follow the two arrows from the incorrect answer page in Figure 3-1 to see two examples of prompt pages. From whichever prompt page they chose, they are sent back to the original problem to try again after having been prompted. See the looping arrow at the bottom of the flowchart.

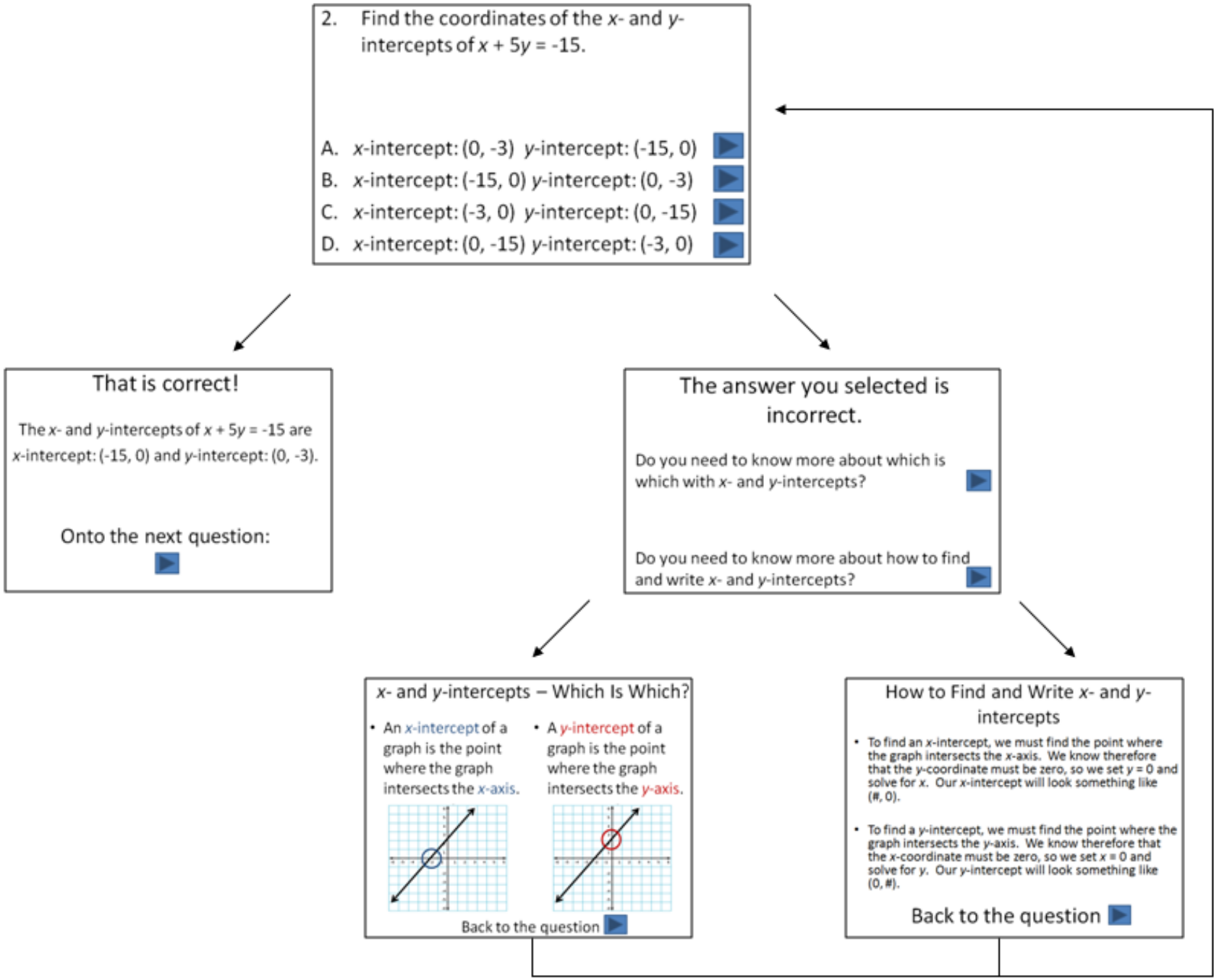


Figure 3-1: PowerPoint dynamic assessment flow

Allowing students to choose the prompt path makes it even more autonomous than the system of graduated prompts described earlier where prompts are automatically delivered to students in a fixed order. This autonomy makes the assessments personalized like The Cognitive Tutor software (Ritter et al., 2008), and as discussed with Wang's GPAM-WATA (2011), I follow four principles described in chapters 1 and 2: (a) allow the mathematics to be problematic, (b) tell students the right thing at the right time, (c) integrate instruction in assessment, and (d) use the cake format of dynamic assessment.

Setting and Participants

I conducted my study while student teaching at a large suburban senior high school. The high school has 1310 eleventh and twelfth grade students, and the district has a per pupil expenditure of $15,381. I conducted the study in two of my Algebra II classrooms. For mathematics, the high school has four tracks listed (using pseudonyms) in order from most to least advanced: High Honors, Honors, Standard, and Fundamentals. Students in the High Honors track can take up to AP Calculus BC their senior year, students in the Honors track can take up to AP Calculus AB their senior year, students in the Standard track can take up to Honors or Standard Trigonometry their senior year, and students in the Fundamentals track can take up to Fundamentals of Algebra II their senior year. My two Algebra II classes were in the Standard track. The first class consisted of sixteen students and the second class consisted of thirteen students. The study took place during our unit that addressed linear equations and functions.

I introduced the study to students in the sixth week of the school year. I explained to students that during the next unit we would be doing a special activity called dynamic assessments. I explained to them briefly that dynamic assessments are assessments designed to instruct and assess through a system of prompts. I showed them an example of one on the

interactive white board (a Promethean Board). After describing the dynamic assessments, I described the nature of the study to students in the following way, which parallels the description that I included in the parental consent letter:

> "I plan to conduct a study on how students perceive the effectiveness of these PowerPoint-created dynamic assessments. I will do this through an anonymous survey given online through www.surveymonkey.com the day after I make the last dynamic assessment available. Student responses to this survey will remain completely anonymous. Each student will be designated a code number, and any information from their survey responses used in the study will not be able to be connected to him or her in any way. All students in the class will complete the dynamic assessments as a part of their work for our class, and the only additional work done by those in the study will be the short survey completed after the last assessment.
>
> Before collecting such data, I would like to ask for your consent to do so. Your child has the option to not participate if he or she wishes not to. Participating or not participating will not affect his or her grade in any way."

The parental consent letter can be found in its entirety in Appendix B. I required participants in the study to return their signed consent forms before I made the surveys available. Of the twenty-nine students enrolled in the Algebra II classes, sixteen students participated in the study. I used the dynamic assessments as ungraded, optional homework assignments. Students who participated in the study by completing the surveys received no extra credit or reward. Students likely could finish each dynamic assessment in twenty-five minutes.

Data Collection

The data collection took place through the surveys that were issued after students had completed all five dynamic assessments. I assigned one dynamic assessment per section in the book. I assigned the first dynamic assessment in the sixth week of the school year, and I assigned the fifth and final dynamic assessment in the ninth week of the school year. Immediately after the last assessment was completed, I gave access to Survey 1 using a private www.surveymonkey.com link to the sixteen students who had turned in a parental consent form. One week later, I gave access to Survey 2 in the same way to the sixteen students who had turned in a parental consent form.

Both surveys remained available on www.surveymonkey.com for three weeks and could only be accessed using the web link that I provided students with parental consent. They had access to all five dynamic assessments during the survey period. I directed participating students to complete every question and reminded them that they will remain anonymous. Each student could respond to each survey only once, and students likely could finish each survey in fifteen minutes.

Survey 1 consisted of nine Likert scale questions and one multiple choice question. They were the following:

> 1. If they were assigned as optional homework, how likely would you be to complete PowerPoint dynamic assessments in the future?
>
> very likely / likely / neutral / unlikely / very unlikely
>
> 2. How helpful for your learning are assessments with prompts (such as our PowerPoint dynamic assessments) compared to assessments with the same questions without prompts?
>
> For example, how much more or less helpful is the dynamic assessment for section 2.1 than an assessment with those same five questions without any prompts?

the dynamic assessment is much more helpful / the dynamic assessment is somewhat more helpful / both are equally helpful / the dynamic assessment is somewhat less helpful / the dynamic assessment is much less helpful

3. These assessments help me learn.

strongly disagree / disagree / neutral / agree / strongly agree

4. For homework, if I had to choose to do either a PowerPoint dynamic assessment or a series of textbook problems, I would choose the series of textbook problems.

strongly disagree / disagree / neutral / agree / strongly agree

5. The prompts help me answer questions that I missed on my first try.

strongly disagree / disagree / neutral / agree / strongly agree

6. After receiving a prompt for a question, I can answer the question correctly without trying. The prompts give me too much information.

strongly disagree / disagree / neutral / agree / strongly agree

7. After using a prompt to answer a question of a certain type, I can likely answer that type of question correctly without a prompt in the future.

For example, consider the following question:

"Tell whether the following lines are parallel, perpendicular, or neither:
Line 1: through (3, -1) and (6, -4)
Line 2: through (-4, 5) and (-2, 7)"

Suppose I missed this question originally, then I read a prompt and using that prompt, I answered it correctly on my second try. If a later question asked me to tell whether two lines are parallel, perpendicular, or neither, I would be more likely to answer it correctly without a prompt.

strongly disagree / disagree / neutral / agree / strongly agree

8. When I go back to a question after receiving a prompt, I remember the prompt and use it to answer the question.

strongly disagree / disagree / neutral / agree / strongly agree

9. If I miss the question, the prompts that I read after missing the question…

are very easy to understand / are moderately easy to understand / are neither easy nor difficult to understand / are moderately difficult to understand / are very difficult to understand

10. When you encounter a question for which you need prompts, how many prompts do you normally use?

1 / 2 / 3

Questions 1 through 4 directly address the usefulness of the dynamic assessments. Questions 5 through 10 address the usefulness of the dynamic assessments by asking specifically about the prompts, the unique feature of the dynamic assessments. To avoid acquiesce bias, I included positive statements about the dynamic assessments such as Questions 3 and 5, and I included negative statements about the assessments such as Questions 4 and 6.

Survey 2 consisted of three open-ended problems. Again, students had access to all five dynamic assessments when completing this survey. The survey contained the following three questions:

1. Do you feel that the prompts in the dynamic assessments give you too much information, not enough information, or the right amount of information? Explain. Cite an example from one of the dynamic assessments if possible.

2. What would make the prompts more helpful? Explain.

3. How would you rate the overall effectiveness of these dynamic assessments? Do you consider them to be useful or not useful? Explain.

Question 3 directly addresses student perception of the usefulness of the dynamic assessments. Question 1, like Questions 5 through 10 in Survey 1, addresses the usefulness of the dynamic assessments by asking specifically about the prompts, the unique feature of the dynamic assessments. With Question 2, I sought to find what improvements students would suggest.

Data Analysis

Sixteen students completed Survey 1, and thirteen students completed Survey 2. This small sample size precluded statistical analysis, so I instead looked for overall themes and sentiments in the data. My first analysis consisted of a broad overview to see whether students

responded positively, neutrally, or negatively overall to the dynamic assessments. For Survey 1, I classified the five-answer multiple choice responses using five categories: very positive, positive, neutral, negative, and very negative. Here positive means "positive feelings about the dynamic assessments" and negative means "negative feelings about the dynamic assessments."

If the survey question made a statement of endorsement about the dynamic assessments such as, "These assessments help me learn," I categorized "strongly agree" as very positive, "agree" as positive, "neutral" as neutral, "disagree" as negative, and "strongly disagree" as very negative. I did the reverse for survey statements of dissatisfaction with the dynamic assessments such as "For homework, if I had to choose to do either a PowerPoint dynamic assessment or a series of textbook problems, I would choose the series of textbook problems." In this case, I categorized "strongly agree" as very negative, "agree" as negative, "neutral" as neutral, "disagree" as positive, and "strongly disagree" as very positive.

From here I found the total number of responses in each category and sorted them by question. Then I found the total number of responses in each category and sorted them by student. Using this data, I calculated the overall average number of very positive, positive, neutral, negative, and very negative responses per student.

Finally, I analyzed the data by determining three separate groups of students based on their responses to the prompt questions. I called the three groups "positive feelings about prompts," "mixed positive feelings about prompts," and "negative feelings about prompts." Here, I use the word "mixed" for students who have at least one positive or very positive response and one negative or very negative response. The phrase "mixed positive" in group names means student responses in that group were mixed and positive responses outnumbered negative responses. In order to be in the "positive feelings about prompts" group, students' responses had to be all very positive, positive, and neutral responses to the prompt questions. In order to be in the "mixed positive feelings about prompts" group, students' responses had to include positive

and negative responses where positive responses outnumbered negative responses. To be in the "negative feelings about prompts" group, negative student responses had to outnumber positive student responses for each student. I did not call this group "mixed negative" nor did I have a "mixed negative" group at all because for those students who had more negative responses than positive responses, the negative outnumbered the positive enough that calling their feelings "mixed" would be unsound. I used those distinctions for the three groups so that student responses within the sets would be more similar than student responses between sets. The results of this analysis will be discussed next in chapter 4.

Chapter 4

Results

The research question is "Can a classroom teacher with limited programming experience and available technology develop web-based dynamic assessments that students consider useful?" With this question in mind, I first looked question by question on both surveys for overall positivity or negativity. Then I looked for patterns among student answers.

Overall Results

At the end of the three-week survey period, my student teaching experience ended and no more students completed either survey. The frequencies of each category of answer for Survey 1 are displayed in Figures 4-1 and 4-2. As discussed in chapter 3, the first four questions asked about the dynamic assessments overall (the "direct" questions in Figure 4-1), and the remaining questions asked about the prompts (the "indirect" questions in Figure 4-2).

For the direct questions in Figure 4-1, the horizontal axis contains the questions in order from left to right with brief summaries of what each question asked in quotes. The sum of very positive and positive responses outnumbered the sum of neutral, negative, and very negative responses for every question except the first. In addition, the sum of negative and very negative responses never exceeded 25 percent while the sum of positive and very positive responses was 50 percent or greater for every question except the first.

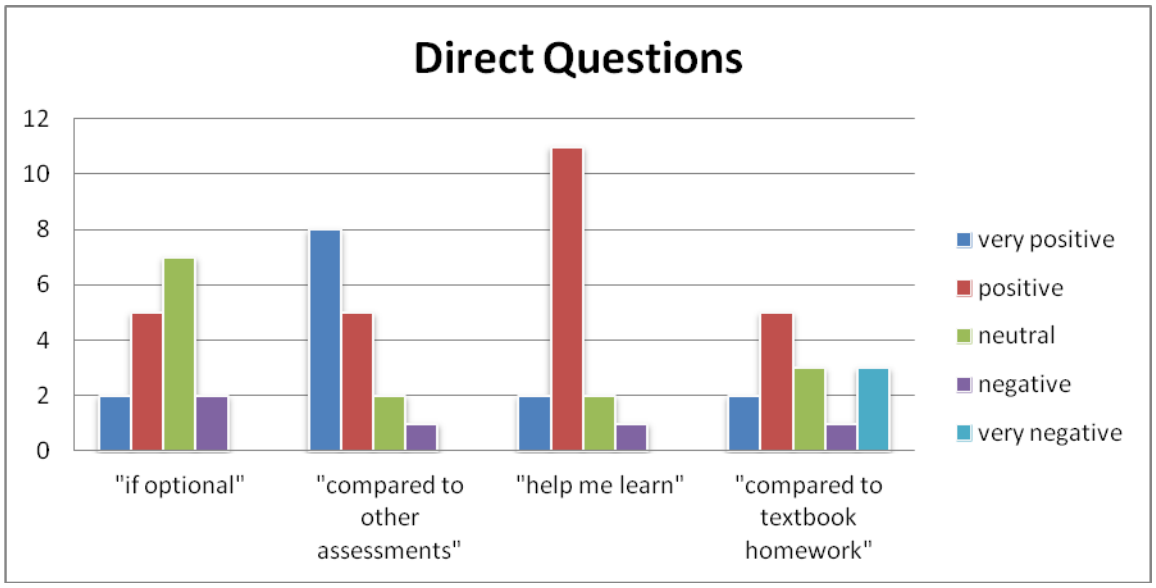


Figure 4-1: Questions that asked directly about the dynamic assessments

For the indirect questions in Figure 4-2, the horizontal axis again contains the questions in order from left to right with brief summaries of what each question asked in quotes. Here the sum of very positive and positive responses outnumbered the sum of neutral, negative, and very negative responses for every question. Similar to the direct questions, the sum of negative and very negative responses never exceeded 25 percent while the sum of positive and very positive responses was 50 percent or greater for every question.

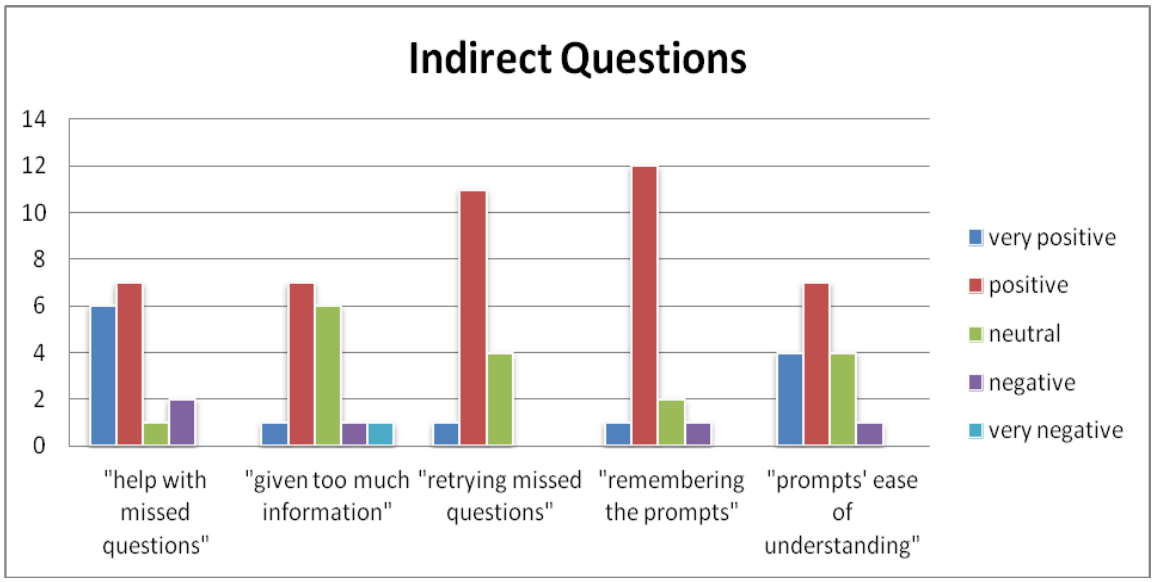


Figure 4-2: Questions that asked about prompts

On the student level per nine questions, students averaged 0.25 very negative responses, 0.75 negative responses, 1.81 neutral responses, 4.37 positive responses, and 1.81 very positive responses. The total number of responses for Survey 1 organized by response type is represented by the bar graph in Figure 4-3. With sixteen students responding to nine questions, we have a total of 144 responses. Survey 1 had a total of 70 positive responses which far exceeded any other response category. We see the bar graph skewed towards positive responses as the sum of positive and very positive responses total more than six times the sum of negative and very negative responses.

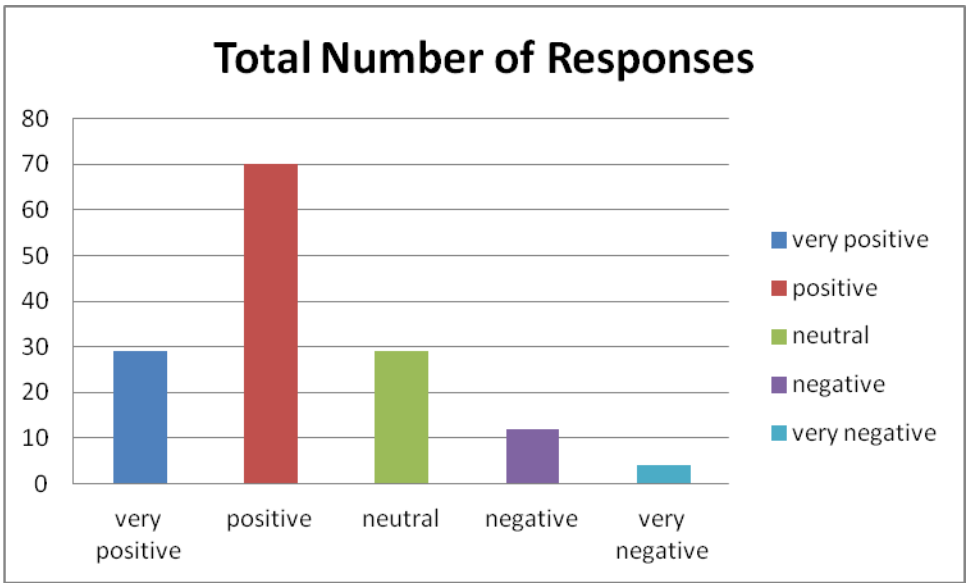


Figure 4-3: Total number of responses by response type

To make this overwhelming positivity even clearer, the portions of responses organized by response type for Survey 1 are represented by the pie chart in Figure 4-4. Viewing the data with this part-whole perspective, we can even more clearly see how much greater a share of the total very positive and positive responses have over negative and very negative responses. This dominating positivity and underwhelming negativity on both the individual question response level and total number of student responses level indicates an overall positive sentiment for the dynamic assessments on Survey 1.

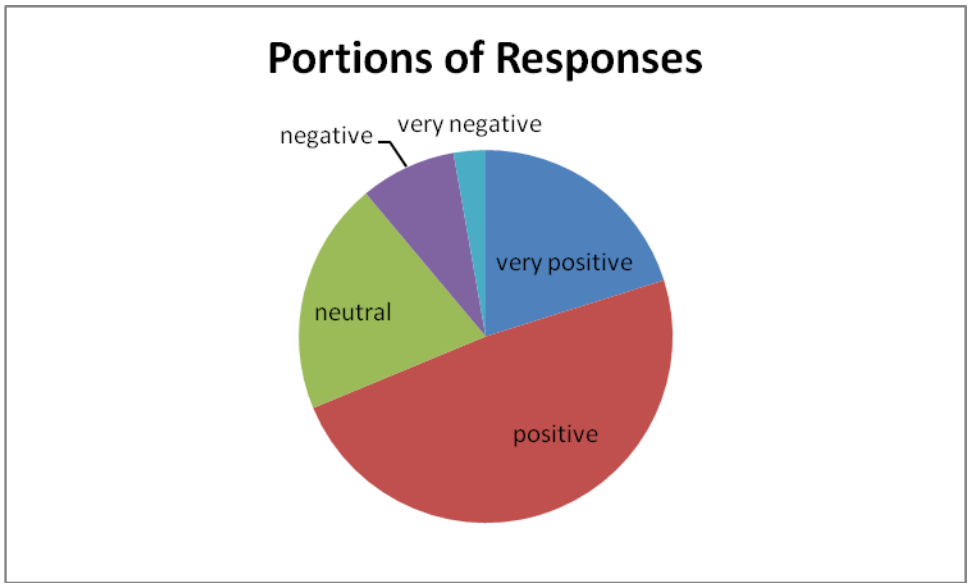


Figure 4-4: Portions of responses by response type

I analyzed Survey 2 using a positive, neutral, negative analysis and again found dominating positivity. Question 1 asked if the prompts gave the right amount, too much, or too little information, and ten of thirteen students responded positively saying "the right amount" while the remaining three responses were neutral. Question 2 asked what would make the prompts more helpful and will be discussed in the Detailed Analysis section. Question 3 asked for an overall rating of the effectiveness of the dynamic assessments, and ten of twelve students responded with a positive assessment while two others were neutral. Like Survey 1, these responses indicate that students overall found the dynamic assessments to be useful. We will look at these responses more closely in what follows.

Detailed Analysis

As further analysis, I looked for patterns among student answers. For Survey 1, I looked for patterns among student responses to different questions. For Survey 2, I looked for how open-

ended student responses about the dynamic assessments relate to the principles we established for the assessments in chapters 1 and 2.

Survey 1

For Survey 1, I will first describe the connection between student responses to questions that directly and indirectly ask about the dynamic assessments. Then I will describe two questions whose responses appear to be outliers in terms of negativity when compared to the other questions. I will follow up on those questions in chapter 5. The complete set of student responses to Survey 1 can be found in Appendix C.

Useful Prompts Make for a Useful Assessment

I wanted to know whether or not students considered my dynamic assessments to be useful. As discussed earlier in this chapter, the first four questions asked about the dynamic assessments overall (the "direct" questions), and the remaining questions asked about the prompts (the "indirect" questions). Since the prompts are the distinctive feature of the dynamic assessments, I hypothesized that positive feelings about the prompts imply positive feelings about the dynamic assessments, mixed feelings about the prompts imply mixed feelings about the dynamic assessments, and negative feelings about the prompts imply negative feelings about the dynamic assessments. If this hypothesis is true, the indirect question responses tell as much about student perception of usefulness of the dynamic assessments as direct questions. As discussed in chapter 3 in describing student responses to these questions, I use the word "mixed" for students who have at least one positive or very positive response and one negative or very negative response. "Mixed positive" means their responses were mixed and positive responses

outnumbered negative responses. There were no "mixed negative" students. That is, if they had any negative responses, the number of negative responses outnumbered positive and neutral responses, so those students belonged in the "negative" group.

Ten of sixteen students gave very positive, positive, or neutral responses for all five indirect (prompt) questions, and their number of very positive and positive responses outnumbered their number of neutral responses. Let these ten students be the "positive feelings about prompts" group. Of this group, seven of the ten students also gave very positive, positive, or neutral responses for all four direct questions. The remaining three students in the set gave very positive, positive, or neutral responses for three of the four direct questions and had only one negative or very negative response. Thus positive feelings about the prompts did indeed correspond to positive feelings about the dynamic assessments.

Of the remaining six students not in the positive group, four of them gave a mix of positive, negative, and neutral responses to the indirect (prompt) questions where the number of both positive and neutral responses were greater than or equal to the number of negative responses. Let these four students be the "mixed positive feelings about prompts" group. Of this group, all four gave at least as many positive responses as neutral or negative responses to the direct questions. Thus mixed positive feelings about the prompts did indeed correspond to mixed positive feelings about the dynamic assessments.

Two students did not belong to either previous group. Each of these students gave more negative responses than positive for the indirect (prompt) questions. Let these two students be the "negative feelings about prompts" group. For the direct questions, one student from this group gave four negative responses for all four questions. The other student gave three neutral responses and one positive response for the direct questions. Thus negative feelings about the prompts sometimes corresponded to negative feelings about the dynamic assessments.

Based on this analysis, the hypothesis seems to be valid for positive feelings and mixed positive feelings and uncertain for negative feelings. Therefore we can consider positive responses to indirect questions to be as informative as positive responses to direct questions. Based on this confirmation, the positively skewed data in both Figures 4-1 *and* 4-2 which represent the direct and indirect questions respectively indicate an overall positive sentiment towards the dynamic assessments.

Discrepancies

Responses to Question 1 "if optional" and Question 4 "compared to textbook homework" received more negative responses and fewer positive responses than any other question. Question 1 asked, "If they were assigned as optional homework, how likely would you be to complete PowerPoint dynamic assessments in the future?" Two students responded negatively and seven students responded neutrally. However, of these nine non-positive responders, six responded positively or very positively to over half of the total questions. This indicates that they had positive feelings about the dynamic assessments overall.

Similarly, Question 4 asked, "For homework, if I had to choose to do either a PowerPoint dynamic assessment or a series of textbook problems, I would choose the series of textbook problems." This question received four negative or very negative responses. Three of these four students responded very positively or positively to at least six of the eight other questions, so they had positive feelings for the dynamic assessments overall. Possible reasons for these aberrations of negativity will be discussed in chapter 5.

Survey 2

For Survey 2, I first sought to compare student answers to the survey with Hiebert and Wearne's (2003) problem-solving principles. Student responses indicated that the dynamic assessments indeed aligned with the principles. Then I compared students' suggestions for improvements side-by-side with their overall ratings of the assessments to get a complete picture of their perceptions. The complete set of student responses to Survey 2 can be found in Appendix C.

Accomplishing Problem-Solving Principles

In chapter 1, I wrote about how effective web-based dynamic assessment accomplishes Hiebert and Wearne's (2003) problem-solving principles of allowing the mathematics to be problematic and telling students the right things at the right time. My research question pertains to student perceptions of the usefulness of my assessments, so here I wanted to analyze their perceptions of usefulness in light of those problem-solving principles. Question 1 of Survey 2 asked students to explain if the prompts gave too much, not enough, or the right amount of information. I will underline the most relevant portions of student responses concerning these principles.

Regarding prompts potentially giving too much information, student 3 said, "I thought that the prompts gave the right amount of information. They were almost like hints but they were helpful without giving the answer directly." Similarly, student 1 said, "They give perfect amount of information so that you need to deduce the answer by yourself" and student 7 said, "I felt they gave just enough information. It reviewed the most important areas and did not take up a lot of time to read. The information was not excessive and supplied the most important aspects of how

to solve that particular problem." Not one student responded that the prompts gave too much information. Thus, the prompts still "allowed the mathematics to be problematic" – they did not give the answer away.

In addition, responses indicate that the prompts did give students enough information to retry the problem. Student 8 said, "They give me the right amount. The needed information is always there." Similarly, student 6 said, "The prompts in the dynamic assessments give me the right amount of information. In each dynamic assessment (2.1-2.4), the information is helpful, easy to understand, and contained enough information. If there had been any more or less information, the dynamic assessments wouldn't have been as helpful." Not one student responded that the prompts gave too little information. Thus we can say with confidence that we "told students the right thing at the right time" according to student responses to the first question. We met both of Hiebert and Wearne's principles according to students.

Suggestions for Improvement and Overall Ratings

To determine exactly how useful students found the dynamic assessments, it is helpful for us to examine what faults students found with the assessments side-by-side with their overall ratings of the assessment. This will help judge the severity of the faults and fully illuminate students' perceptions. We will first examine students who gave no criticisms, then students who shared a common criticism, and finally the remaining students.

Question 2 on Survey 2 asked students to explain what would make the prompts, the unique feature of the assessments, more helpful. Three students said nothing should be done to improve them, and all three of them gave very positive ratings for the effectiveness of the dynamic assessments overall. One student said, "I believe they were very effective. They were shorter than a homework assignment so I was more inclined to do them unlike the regular

homework. This means I was able to practice more because I was willing to put in the time towards this instead of a worksheet. With worksheets, I can also get stuck on a problem and give up where as [sic] this showed me what I did wrong and guided me in fixing it so I learned more from doing these than the regular homework." These students' positive responses obviously give more support for the argument that students perceive the usefulness of the assessments positively. More can be learned from those who did offer suggestions for improvement.

The most common suggestion was step-by-step explanations for each solution. Students said that the prompts would have been more helpful "if you had an option to show the problem from start to finish after you faliled [sic] all possible options." Now, to judge the severity of this fault in the assessment, we examine these students' responses to Question 3: "How would you rate the overall effectiveness of these dynamic assessments? Do you consider them to be useful or not useful? Explain." All three students that gave the step-by-step solution suggestion responded positively to Question 3. Two of them gave actual ratings to the assessments, 8 and 9 out of 10 respectively. The third student called the assessments, "useful, a great tool to used [sic] for studying the necessary material." These three students thought critically enough about the assessments to suggest a concrete improvement, yet they still rated the assessments very positively and as "useful." We see this pattern again with the remaining students.

The remaining suggestions from students were to use better examples, clearer language, more visual aids, more examples, and more direct prompts. No two of these remaining students offered the same suggestion. Among the five students who offered these suggestions, three of them gave positive responses for Question 3 and two of them gave neutral responses. Among the positive answers, some simply called the dynamic assessments "very useful" while others gave detailed explanations: "I would say that the dynamic assessments were very helpful. They broke down the lessons and made them easier to understand. I loved that if you got a question wrong, you would see your mistake and learn from it. They were very useful to me." The student who

suggested clearer language in the prompts said, “If you need more than extra help, then yes, the prompts are helpful. However, if you are not in that situation, the prompts are a nuisance” and the student who suggested including more problems gave the assessments a rating of 5.35 out of 10.

Analyzing the suggestions for improvement side-by-side with overall ratings gives us a full look at students’ perceptions. Like Survey 1, we find in Survey 2 that despite some negative feelings, the dynamic assessments are perceived as useful overall.

Summary

Based on their responses to both Survey 1 and Survey 2, students perceive the web-based dynamic assessments developed in PowerPoint to be useful. The prompts made the assessments useful and aligned with both of Hiebert and Wearne’s (2003) problem-solving principles. The implication of these results will be discussed in chapter 5.

Chapter 5

Discussion

We see that students in this study found the PowerPoint web-based dynamic assessments to be useful. In this chapter, I will discuss what makes these particular dynamic assessments useful, the role of time from the instructor's perspective, and the aberrations of negativity in our data from chapter 4. At this point, I will also bring into the discussion Khan Academy's adaptive assessment environment. Like our web-based dynamic assessments developed in PowerPoint, Khan Academy's adaptive assessments are dynamic, available for free, and require limited programming experience from teachers. Since this study seeks dynamic assessment opportunities for teachers with limited programming experience, Khan Academy should be included in this discussion.

Usefulness

Students in this study perceived these web-based dynamic assessments to be useful. Why are they useful? Does the format alone make them useful? If this is so and dynamic assessments are always superior to static assessments, then that would imply that dynamic assessments with low quality questions and prompts would always be superior to static assessments with high quality questions. This obviously is not the case. Questions and prompts that match the quality of useful static assessments make for more useful dynamic assessments. The questions need not even be the exact same questions as those on static assessments.

Responses to Question 2 on Survey 1 support this point. It asked, "How helpful for your learning are assessments with prompts (such as our PowerPoint dynamic assessments) compared to assessments with the same questions without prompts?" Thirteen of sixteen responded very positively or positively to this question. Thus the majority of students agree that if the prompts and questions of dynamic assessments are created with the same quality as static assessment questions without prompts, dynamic assessments are more helpful.

This is a valuable finding. This study shows the positive potential of classroom teachers with limited programming experience and available technology creating their own dynamic assessments, and it also guides our direction in creating these dynamic assessments. We must create dynamic assessments with prompts and questions that match the quality of excellent static assessments. We cannot expect the dynamic assessment format alone to bring about positive results in our classroom, just as we cannot expect technology or group work alone to automatically bring positive results. Methods that have been shown to be effective or have potential should be executed with attentiveness and skill.

Therefore we should create dynamic assessments with effective and extensive questions, prompts, and solution explanations. Everything that is important in creating effective static assessments remains important in creating dynamic assessments. We should follow the four principles described in chapters 1 and 2: (a) allow the mathematics to be problematic, (b) tell students the right thing at the right time, (c) integrate instruction in assessment, and (d) use the cake format of dynamic assessment.

Time

On average, it took me one hour to create each dynamic assessment. Students completed each assessment once for homework and then had them available as a study tool later, but no

assessment data was collected from students by the dynamic assessments. Using this method, the teacher's time is being used positively, but I believe it could be used more effectively. This section will describe methods and situations in which teachers' time will be used most efficiently.

Since the action buttons used in the Microsoft PowerPoint dynamic assessments are not programmed to collect data on their use, teachers do not know how students performed on the assessment. Therefore it would be constructive to collect data for each dynamic assessment using a supplementary means such as a questionnaire distributed with each dynamic assessment. For each question on the dynamic assessment, this questionnaire could ask which prompt students used (if any). Then the teacher would have data on how many tries students needed for each question and what information they needed prompted to them. This would give the input of one hour per dynamic assessment much greater output – the assessments would now be a student aid *and* a provider of valuable student data.

Teachers who will be teaching the same course many times will be able to make the most effective use of their time creating the dynamic assessments. They can use the same dynamic assessments year after year with no need to re-develop them each year. They will likely find aspects to improve each year, but this will take less time than creating a whole new one. Therefore teachers in this situation have an especially auspicious outlook for efficiency in creating web-based dynamic assessments in PowerPoint.

Also, teachers' time could be used more efficiently if they created dynamic assessments as a team. Teachers could create a pool of dynamic assessments for whatever topics they share. The larger the team, the fewer dynamic assessments each individual teacher would have to develop. Not only would this save time, but it would encourage teachers to share experiences about where students struggle and have misconceptions. These experiences are particularly relevant in developing high quality prompts, so creating dynamic assessments as a team is even more apt than creating static assessments as a team.

Discrepancies

As discussed in chapter 4, Question 1 and Question 4 on Survey 1 received more negative responses and less positive responses than any other question on either survey. Question 1 asked, "If they were assigned as optional homework, how likely would you be to complete PowerPoint dynamic assessments in the future?" Question 4 gave the statement, "For homework, if I had to choose to do either a PowerPoint dynamic assessment or a series of textbook problems, I would choose the series of textbook problems" and students responded with their extent of agreement or disagreement. What accounts for these aberrations of negativity?

For Question 1, the negativity seems to be attributed to views of the dynamic assessments that, however favorable or unfavorable, are not strong enough for some students to warrant completing them when there are no points associated with them. As one student said in response to Question 2 on Survey 2, "In order for the students to actually complete the assessments you spent hours creating, they should be mandatory in future classes." This suggests that however positive the overall sentiment is, it is not powerfully positive enough to motivate students to do the dynamic assessments for their intrinsic benefits only which is what Question 1 asked about.

For Question 4, I speculate that these students prefer the simplicity and familiarity of completing problems from a textbook. As one student said in response to Question 3 on Survey 2, "i [sic] think that they're useful but sometimes a text book [sic] might actually be easier to access for a kid with no laptop or smart phone." If the cause was actually negative feelings towards the dynamic assessment overall, most students would not have responded positively and very positively to the other questions like they did. Therefore, neither of these negative results in our data indicate negative feelings overall about the dynamic assessments, so we have even more sound evidence that students have positive feelings towards the dynamic assessments.

Compared to Another Web-Based Option

In my research, I sought to find and use a dynamic assessment system that was free and required limited programming experience, so I developed the Microsoft PowerPoint system discussed thus far. At this point, I must include the highly relevant Khan Academy adaptive assessment environment in the discussion because it also is free, dynamic, and requires limited programming experience. It will serve as a useful foil for our Microsoft PowerPoint system.

Khan Academy is a not-for-profit web site consisting of over 3900 instructional videos for biology, chemistry, physics, and kindergarten through twelfth grade mathematics. Most relevantly, the K-12 mathematics topics each have an associated "adaptive assessment environment" (retrieved from https://www.khanacademy.org/about on February 18, 2013). These assessments randomly generate tasks for whichever topic the user requests. The tasks have multiple choice or numerical answers. For each task, the user can ask for one or many hints. The assessment arranges these hints in the manner of the graduated prompts system proposed by Guthke (1990). Also, after submitting an incorrect answer, the user has the option of seeing the solution step-by-step. These solution steps are the exact same prompts given when the user selects "hint" before answering. At any point after submitting an incorrect answer and viewing any number of solution steps, the user has an unlimited number of chances to retry the task. The user also has the option of seeing the solution steps after submitting a correct answer. For example, the following problem and prompts are based on problems and prompts from the adaptive assessment for multi-step equations:

Solve for *x*:

$$\frac{-3x-5}{-3x-7}=8$$

where $-3x-7\neq 0$.

Prompt 1:

Multiply both sides by $-3x-7$:

$$\frac{-3x-5}{-3x-7}(-3x-7)=8(-3x-7)$$

$$-3x-5=-24x-56$$

Prompt 2:

Now add 24*x* to both sides:

$$(-3x-5)+24x=(-24x-56)+24x$$

$$21x-5=-56$$

Prompt 3:

Now add 5:

$$(21x-5)+5=-56+5$$

$$21x=-51$$

Prompt 4:

Divide by 21:

$$x=-\frac{51}{21}$$

Figure 5-1: Example problem based on Khan Academy adaptive assessment environment problems

Why bother creating web-based dynamic assessments in PowerPoint when such a tool is already freely available? Khan Academy's adaptive assessment system seems to follow our four principles: (a) allow the mathematics to be problematic, (b) tell students the right thing at the right time, (c) integrate instruction in assessment, and (d) use the cake format of dynamic assessment. If it seems to accomplish what we sought to accomplish with web-based dynamic assessments in PowerPoint, why should we dedicate time to make our own? To answer that question, there are two important differences between Khan Academy and our web-based dynamic assessments in PowerPoint.

First, creating our own dynamic assessments enables us to adapt our assessments as much as possible to meet the needs of our students. As classroom teachers, we should know best where our students struggle and have misconceptions. We know their zones of proximal development, their "buds." Therefore, when we create our own dynamic assessments, we create prompts in those areas where our students struggled and focus on correcting those misconceptions we know our students have. This personalization to each classroom cannot be achieved using pre-created assessments such as those from Khan Academy.

Second, creating our own dynamic assessments enables us to use a non-linear prompt system where *students choose* how they are prompted. This feature is unique to my PowerPoint web-based dynamic assessments that I created for my study. Only with dynamic assessments developed in PowerPoint that allow student choice of prompt do students have such autonomy. This improves upon our first point. Not only do we create prompts specific to the "buds" of our students, but using our format, students themselves also identify their buds. Thus students and teachers work together to identify students' zones of proximal development; teachers do it through creating the questions and prompts, and students do it through selecting the prompts. On Khan Academy, the hints follow a preset order that gives students the solution path. Not only

does this force all solutions into a linear format when mathematical solutions are certainly not always linear, but it does not give students as much autonomy as our web-based dynamic assessments in PowerPoint. Also, the Khan Academy prompts give students part of the solution (doing some of the work for them) while my PowerPoint prompts give students information, not the solution (allowing the mathematics to be problematic).

Therefore the PowerPoint assessments are uniquely valuable. According to the group of students who participated in this study, these assessments are useful. As discussed, they also have features unique to them that cannot be equaled by pre-made assessments, even pre-made dynamic assessments like Khan Academy. Nonetheless, I find Khan Academy quite helpful. Ideally, I would like to use both my own web-based dynamic assessments and Khan Academy in my classroom. Research comparing these two methods of assessment would be valuable.

Conclusion

As a teacher with limited programming experience, I created my own web-based dynamic assessments using Microsoft PowerPoint that follow our four principles: (a) allow the mathematics to be problematic, (b) tell students the right thing at the right time, (c) integrate instruction in assessment, and (d) use the cake format of dynamic assessment, and students perceived those assessments to be useful. This study has shown the feasibility and positive potential of such an endeavor. Research into student achievement when using teacher-created dynamic assessments would provide a more authoritative measurement of their value. In addition, research comparing student achievement using teacher-created dynamic assessments to student achievement using Khan Academy adaptive assessments would help give practical direction to classroom teachers looking to use dynamic assessment. Whether they create their own or use pre-made assessments, web-based dynamic assessment is a feasible and useful method

of assessment for classroom teachers with limited available technology and programming experience.

Appendix A

Dynamic Assessment Developed in Microsoft PowerPoint

Section 2.3 Dynamic Assessment

Algebra 2

McDougal Littell

1. What is the slope-intercept form of $4x - 3y = 18$?

A. $y = (4/3)x - 21$

B. $y = -(4/3)x + 6$

C. $y = (4/3)x - 18$

D. $y = (4/3)x - 6$

The answer you selected is incorrect.

Do you need to know more about standard and slope-intercept forms of linear equations?

Do you need to know more solving an equation for y?

Standard and Slope-Intercept Forms

- The standard form of a linear equation is $Ax + By = C$ where A and B are not zero. This form is useful for plotting the x- and y-intercepts. For example $2x + 3y = 3$ is in standard form.
- The slope-intercept form of a linear equation is $y = mx + b$. This form is useful for plotting the y-intercept and using the slope to find a second point on the line. For example $y = 2x + 4$ is in slope-intercept form.

Back to the question

Solving an Equation for y

- To write the equation $4x - 3y = 18$ in slope-intercept form, we must solve for y.
- Our most simple first step would be to subtract $4x$ from both sides of the equation. Then we would have the equivalent form $-3y = -4x + 18$.
- Now, in order to "get y by itself" we must divide both sides of the equation by -3.
- When dividing both sides of the equation, be sure to divide the ***whole side*** of each side of the equation. We must divide both $-4x$ ***and*** 18 by -3.
- What do we have left after dividing by -3?

Back to the question

That is correct!

The slope-intercept form of $4x - 3y = 18$ is $y = (4/3)x - 6$.

Onto the next question:

2. Find the coordinates of the *x*- and *y*-intercepts of $x + 5y = -15$.

A. *x*-intercept: (0, -3) *y*-intercept: (-15, 0)
B. *x*-intercept: (-15, 0) *y*-intercept: (0, -3)
C. *x*-intercept: (-3, 0) *y*-intercept: (0, -15)
D. *x*-intercept: (0, -15) *y*-intercept: (-3, 0)

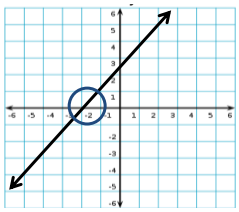
The answer you selected is incorrect.

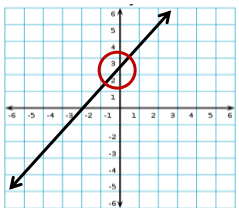
Do you need to know more about which is which with *x*- and *y*-intercepts?

Do you need to know more about how to find and write *x*- and *y*-intercepts?

x- and *y*-intercepts – Which Is Which?

- An *x*-intercept of a graph is the point where the graph intersects the *x*-axis.
- A *y*-intercept of a graph is the point where the graph intersects the *y*-axis.



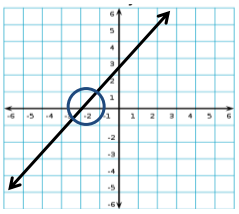


Back to the question

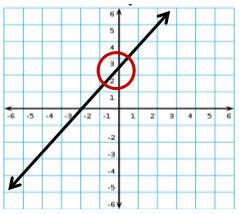
How to Find and Write *x*- and *y*-intercepts

- To find an *x*-intercept, we must find the point where the graph intersects the *x*-axis. We know therefore that the *y*-coordinate must be zero, so we set $y = 0$ and solve for *x*. Our *x*-intercept will look something like (#, 0).
- To find a *y*-intercept, we must find the point where the graph intersects the *y*-axis. We know therefore that the *x*-coordinate must be zero, so we set $x = 0$ and solve for *y*. Our *y*-intercept will look something like (0, #).
- Always think back to these pictures:

x-intercept



y-intercept



Back to the question

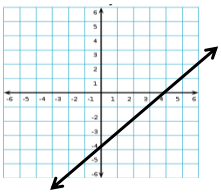
That is correct!

The x- and y-intercepts of $x + 5y = -15$ are x-intercept: (-15, 0) and y-intercept: (0, -3).

Onto the next question:

3. Graph the equation $x - y = 4$.

A.



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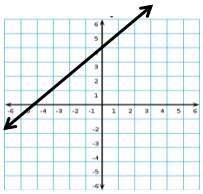
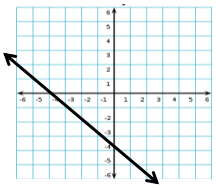
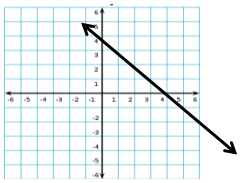


B.



D.



The answer you selected is incorrect.

Click here to learn more about graphing linear equations given in standard form:

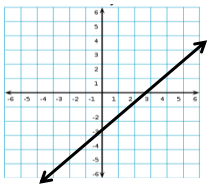
Graphing Lines in Standard Form

- It is easiest to graph a line in standard form by finding the *x*- and *y*-intercepts.
- To find an *x*-intercept, we must find the point where the graph intersects the *x*-axis. We know therefore that the *y*-coordinate must be zero, so we set $y = 0$ and solve for *x*. Our *x*-intercept will look something like (#, 0)
- To find a *y*-intercept, we must find the point where the graph intersects the *y*-axis. We know therefore that the *x*-coordinate must be zero, so we set $x = 0$ and solve for *y*.

Back to the question

That is correct!

The graph of the equation $x - y = 4$ is



Onto the next question:

4. Which of the following equations would have an *x*-intercept but no *y*-intercept?

A. $y = 4$
B. $y = 0$
C. $x = 4$
D. $x = 0$

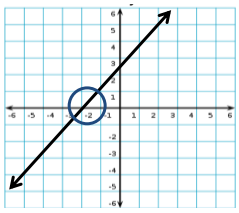
The answer you selected is incorrect.

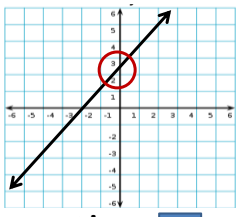
Do you need to know more about *x*- and *y*-intercepts?

Do you need to know more about the graphs of horizontal and vertical lines?

x- and *y*-intercepts

- An *x*-intercept of a graph is the point where the graph intersects the *x*-axis.
- A *y*-intercept of a graph is the point where the graph intersects the *y*-axis.

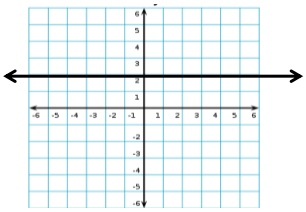


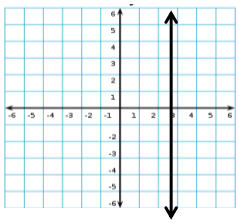


Back to the question

Graphs of Horizontal and Vertical Lines

- The graph of a horizontal line is $y = c$ where c is a real number. This line is horizontal because y must always be the same but x can be anything.
- The graph of a vertical line is $x = c$ where c is a real number. This line is vertical because x must always be the same but y can be anything.





Back to the question

That is correct!

The graph of $x = 4$ would have an x-intercept (4, 0) but it would have no y-intercept because it is a vertical line to the right of the y-axis.

Onto the next question:

5. Which of the following equations would have a y-intercept but no x-intercept?

A. $y = 4$ 
B. $y = 0$ 
C. $x = 4$ 
D. $x = 0$ 

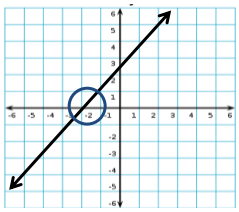
The answer you selected is incorrect.

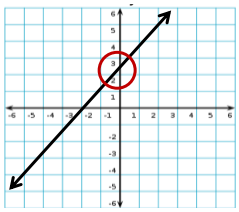
Do you need to know more about x- and y-intercepts? 

Do you need to know more about the graphs of horizontal and vertical lines? 

x- and *y*-intercepts

- An *x*-intercept of a graph is the point where the graph intersects the *x*-axis.
- A *y*-intercept of a graph is the point where the graph intersects the *y*-axis.

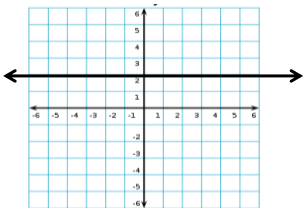


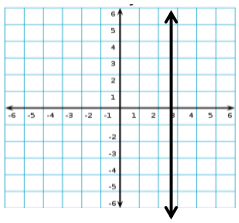


Back to the question

Graphs of Horizontal and Vertical Lines

- The graph of a horizontal line is $y = c$ where c is a real number. This line is horizontal because y must always be the same but x can be anything.
- The graph of a vertical line is $x = c$ where c is a real number. This line is vertical because x must always be the same but y can be anything.





Back to the question

That is correct!

The graph of $y = 4$ would have a *y*-intercept of (0, 4) but no *x*-intercept because it is a horizontal line above the *x*-axis.

You have completed the assessment!

Appendix B

Parental Consent Letter

Dear Parents and Guardians,

I have had the great privilege of teaching your sons and daughters these past weeks as their student teacher in Mr. Bob Bell's Academic Algebra 2 classes, and I look forward to meeting with you at Open House this Thursday. I write to you now about a special activity in which we will be taking part during our second chapter of the course.

As part of my work in the Schreyer Honors College at Penn State University, I have done extensive research into what is called web-based dynamic assessment. This special kind of assessment not only evaluates what students understand, but also and more importantly provides students an unique opportunity to learn *from* the assessment. This is accomplished through a system of specialized prompts from the assessment given as students work through the problems.

Dynamic assessment is usually available only from companies who have created elaborate software specifically designed for this purpose. Such software is very expensive, so many teachers who want to make use of such innovative methods cannot because of budget constraints.

Therefore, as part of my research for the Schreyer Honors College, I created web-based dynamic assessments at no cost through Microsoft PowerPoint.

The dynamic assessments will be the special activity for our class during chapter 2. Students will complete approximately two of these dynamic assessments per week, and they will complete them at home. An example of such an assessment is available at https://dl.dropbox.com/u/72038691/section%201.7%20dynamic%20assessment.pptx.

Using these materials, I plan to conduct a study on how students perceive the effectiveness of these PowerPoint-created dynamic assessments. I will do this through an anonymous survey given online through www.surveymonkey.com the day after I make the last dynamic assessment available. Student responses to this survey will remain completely anonymous. Each student will be designated a code number, and any information from their survey responses used in the study will not be able to be connected to him or her in any way. All students in the class will complete the dynamic assessments as a part of their work for our class, and the only additional work done by those in the study will be the short survey completed after the last assessment.

Before collecting such data, I would like to ask for your consent to do so. Your child has the option to not participate if he or she wishes not to. Participating or not participating will not affect his or her grade in any way. If you consent to your child participating in the study, please sign on this line and have your student return it to me no later than Thursday, September 27:

I, _____, give consent for _____ to participate in Nicholas Hannan's research study on student perception of usefulness of web-based dynamic assessments in algebra 2 developed in PowerPoint.

Thank you very much for your consideration.

Sincerely,

Nicholas Hannan

Appendix C

Complete Student Responses to Survey 1 and Survey 2

Survey 1

The number of student responses to each answer is in parentheses.

1. If they were assigned as optional homework, how likely would you be to complete PowerPoint dynamic assessments in the future?

very likely (2)
likely (5)
neutral (7)
unlikely (2)
very unlikely (0)

2. How helpful for your learning are assessments with prompts (such as our PowerPoint dynamic assessments) compared to assessments with the same questions without prompts? For example, how much more or less helpful is the dynamic assessment for section 2.1 than an assessment with those same five questions without any prompts?

the dynamic assessment is much more helpful (8)
the dynamic assessment is somewhat more helpful (5)
both are equally helpful (2)
the dynamic assessment is somewhat less helpful (1)
the dynamic assessment is much less helpful (0)

3. These assessments help me learn.

strongly disagree (0)
disagree (1)
neutral (2)
agree (11)
strongly agree (2)

4. For homework, if I had to choose to do either a PowerPoint dynamic assessment or a series of textbook problems, I would choose the series of textbook problems.

strongly disagree (4)
disagree (5)
neutral (3)
agree (1)

strongly agree (3)

5. The prompts help me answer questions that I missed on my first try.

strongly disagree (0)
disagree (2)
neutral (1)
agree (7)
strongly agree (6)

6. After receiving a prompt for a question, I can answer the question correctly without trying. The prompts give me too much information.

strongly disagree (1)
disagree (7)
neutral (6)
agree (1)
strongly agree (1)

7. After using a prompt to answer a question of a certain type, I can likely answer that type of question correctly without a prompt in the future. For example, consider the following question: "Tell whether the following lines are parallel, perpendicular, or neither: Line 1: through (3, -1) and (6, -4) Line 2: through (-4, 5) and (-2, 7)" Suppose I missed this question originally, then I read a prompt and using that prompt, I answered it correctly on my second try. If a later question asked me to tell whether two lines are parallel, perpendicular, or neither, I would be more likely to answer it correctly without a prompt.

strongly disagree (0)
disagree (0)
neutral (4)
agree (11)
strongly agree (1)

8. When I go back to a question after receiving a prompt, I remember the prompt and use it to answer the question.

strongly disagree (0)
disagree (1)
neutral (2)
agree (12)
strongly agree (1)

9. If I miss the question, the prompts that I read after missing the question…

are very easy to understand. (4)
are moderately easy to understand. (7)
are neither easy nor difficult to understand. (4)
are moderately difficult to understand. (1)
are very difficult to understand. (0)

10. When you encounter a question for which you need prompts, how many prompts do you normally use?

one (9)
two (6)
three (1)

Survey 2

1. Do you feel that the prompts in the dynamic assessments give you too much information, not enough information, or the right amount of information? Explain. Cite an example from one of the dynamic assessments if possible.

> They give perfect amount of information so that you need to deduce the answer by yourself
>
> The prompts given in the dynamic assessments were not only helpful, but a useful studying tool. An example would be the Function Notation problem in section 2.1-2.4 . If the question was answered incorrectly, the page tells you absolutely everything you need to know about Function Notation.
>
> I thought that the prompts gave the right amount of information. They were almost like hints but they were helpful without giving the answer directly.
>
> Just the right amount of info.
>
> it gives ok help
>
> The prompts in the dynamic assessments give me the right amount of information. In each dynamic assessment (2.1-2.4), the information is helpful, easy to understand, and contained enough information. If there had been any more or less information, the dynamic assessments wouldn't have been as helpful.
>
> I felt they gave just enough information. It reviewed the most important areas and did not take up a lot of time to read. The information was not excessive and supplied the most important aspects of how to solve that particular problem.
>
> They give me the right amount. The needed information is always there
>
> It gives me the right amount of information. The amount of information is good enough for me to get the answer right.
>
> I think that they were very helpful and had pleny of information. I dont think that there was too much

The prompt in the dynamic assessment gave you enough information. My only problem was not knowing which mistake I made therefore I did not know which route to take when I got an incorrect answer. However, I felt this system of these assessments was very helpful and sucessful.

Most were good, but some were to hard to understand.

Great

2. What would make the prompts more helpful? Explain.

The prompts need to be put into normal every-day language. By using unique mathematical terms, figuring out the question is the hardest part of the prompt.

In order for the students to actually complete the assessments you spent hours creating, they should be mandatory in future classes.

I think that if they prompts were a little bit more direct they would be more helpful. But other than that, they are great!

A step-by-step explanation

more relatable specific problems

The prompts currently contain valuable information and are helpful already. Any more information, and the prompt would become confusing or cluttered.

I can not think of anything that would make them more helpful. They were clear and concise.

[No Response]

The prompts now are helpful enough for me to understand.

possibly more of a visual aid might help

If you had an option to show the problem from start to finish after you faliled all possible options.

a step by step instruction.

more examples

3. How would you rate the overall effectiveness of these dynamic assessments? Do you consider them to be useful or not useful? Explain.

If you need more than extra help, then yes, the prompts are helpful. However, if you are not in that situation, the prompts are a nuisance.

Despite math being my worst subject in school, I did find the Dynamic Assessments to be quite helpful. I think they're useful for any student who doesn't want to fail math.

I would say that the dynamic assessments were very helpful. They broke down the lessons and made them easier to understand. I loved that if you got a question wrong, you would see your mistake and learn from it.They were very useful to me.

On a scale of 1 to 10, 8. I found them to be useful because they cleared up anything I may not be so sure about.

5.35 its always between to answers so if its wrong it the other

Overall, I found the dynamic assessments to be useful, especially when I wasn't sure about something we had learned in class. Though I only used the dynamic assessments a few times, I found that when I did use them, I understood the topic better in class the next day.

I believe they were very effective. They were shorter than a homework assignment so I was more inclined to do them unlike the regular homework. This means I was able to practice more because I was willing to put in the time towards this instead of a worksheet. With worksheets, I can also get stuck on a problem and give up where as this showed me what I did wrong and guided me in fixing it so I learned more from doing these than the regular homework.

[No Response]

I would give the an 8.5 out of 10. They are useful and very helpful.

i think that they're useful but sometimes a text book might actually be easier to access for a kid with no laptop or smart phone

I would rate the effectiveness of the dynamic assessments on a scale of 1-10, a 9. I consider them very usefull because they help you narrow down what areas you need to work on.

useful, a great tool to used for studying the necessary material

very useful

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Honors and Awards

Dean's List, 2009-present

Pugh Award, The Pennsylvania State University, 2012

Mathematics: Content Knowledge ETS Recognition of Excellence Award, Education Testing Service, 2012

The Honor Society of Phi Kappa Phi, 2012

The National Society of Collegiate Scholars, 2011

Penn State President's Freshman Award, The Pennsylvania State University, 2010

Lola G. Duff and William H. Duff II Merit Scholarship, 2010

Activities

Alliance Christian Fellowship, 2009-present, officer 2011-2012

Dancer, Penn State Dance Marathon (THON), 2012

College of Education Student Advisory Forum, 2011-2012