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Task-based assessment in middle school mathematics

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TASK-BASED ASSESSMENT IN MIDDLE SCHOOL MATHEMATICS

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Abstract

This thesis explores tasks as an appropriate classroom tool for assessing student understanding in the age of the Common Core State Standards. I describe numerous tasks that I composed and piloted in my 6th and 7th grade mathematics classrooms, common errors and problems that the students encountered and the difficulties and challenges that I had in developing, implementing and evaluating tasks. Making good tasks is time-consuming, and meaningful judgments of task quality can only be made when student work is carefully analyzed.

Introduction

The Common Core State Standards (CCSS) strive to improve mathematical understanding among students and improve their College and Career Readiness (CCR). To accomplish these goals, the CCSS focuses on fewer standards so that students may develop a deeper understanding of the mathematical content. The implementation of the new standards depends on support from all participants and a communal will to enhance the quality and rigor of education in the U.S.

The development of common standards that students will strive for across state borders having been achieved, development of assessments for measuring student understanding is the next step. The creation of end-of-course (EOC) exams and benchmark (BM) tests that will be a faithful expression of the content and rigor is underway, but students spend the majority of the school year performing small formative assessments developed and implemented by their teachers. The development of classroom activities is not directed centrally, as are the large-scale assessments used to judge student growth, but implementation of the CCSS depends on these daily classroom activities. In order for student understanding and problem solving abilities to improve, they need to hone these skills. Authentic assessments are ideal for filling that need.

Task-based assessments are a type of authentic assessment similar to project-based assessments but smaller in scale. Tasks set short-term problem goals that are solvable within a class period. The nature of tasks defines the nature of classroom life. Thus, tasks should pose interesting problems, make connections between prior knowledge and problem solving methods, and entice students to think on important

mathematical ideas. If "practice makes permanent," students that practice problem solving develop problem-solving skills.

The role of the teacher in a task-based classroom is that of a tightrope walker balancing between discovery and procedure. We don't want students to be given too much information because we want students to make their own discoveries and observations, but too little information can cause frustration. These things need to be kept in mind in designing tasks.

Teachers are the most important factor in student learning. They require support and the necessary tools to develop and implement well thought out tasks that are faithful to the CCSS. With the goals of the CCSS in mind, this thesis explores the implementation process and reports on my own findings concerning the challenges of developing and implementing task-based assessments in my classroom.

While implementing these tasks, I was employed at the Math, Science and Arts Academy in Iberville Parish. I taught both middle- and high-school classes. As a public school teacher in Louisiana, I must adhere to the Louisiana Comprehensive Curriculum (LCC). The sample tasks that I present here are aligned to the LCC, but I include observations on possible alignment to the CCSS with each task.

In 2010, Iberville Parish Schools received a grant from the U.S. Department of Education to implement "TAP™: The System for Teacher and Student Advancement", a "performance-based compensation system." The purpose of the grant is "to determine if pay-for-performance affects student achievement and principal mobility" (TIF, 2011). As a result of the TAP program, my school employs two "Master Teachers." These people have special job assignments in which they lead teacher meetings, advise and

supervise teachers regarding instructional practices and observe and evaluate teachers. Master Teachers are assisted by "Mentor Teachers." All teachers are observed annually by: 1) the Master Teacher, 2) the Mentor Teacher, 3) the Principal and 4) an administrator and are marked on a rubric. Teachers' eligibility for pay bonuses is dependent on student test scores and on their scores on the rubrics. The details are complicated, but are not relevant to the present discussion.

On August 18, 2011, a Master Teacher emailed a lesson rubric to all teachers at my school, instructing teachers that lesson plans must be prepared in a table of the following form shown in Figure 1: (See original in Appendix A.)

Identify Need Standards/ Objectives	Obtain New Learning (I Do-Activity)	Develop Teacher and Students Do (We do-Activity)	Apply Students Do (They Do-Activity)	Evaluate (Assessment)
Objectives: GLE:	Teacher Model:	Activities:	Homework (if applicable):	Evaluation:

Figure 1. Iberville Math, Science and Arts Academy East: 2011-12 lesson plan template.

As I understand the process, the "I Do" involves the teacher modeling the problem or need. The "We Do" involves guided practice and the "You Do" involves independent practice. Because we are compelled to use these terms in preparing our lessons and are evaluated based the presence of these parts, I will also use these terms in this paper. Often the processes overlap during a lesson. For example, the "You Do" might be used to evaluate the impact on student performance. This structural requirement affects the process of implementing task-based assessment in my classroom, and therefore the terms, "I Do", "We Do" and "You Do", will appear throughout this thesis.

It is interesting to note that the five columns are based on a five-step process for effective learning that seem to originate from a TAP Cluster Handbook and have been widely quoted in TAP implementation documents. (TAP, 2004)

Chapter 1: Literature Review

The purpose of this section is to paint a more detailed portrait of the national landscape, focusing on the changes that are occurring due to the implementation of the Common Core State Standards (CCSS) and how these changes will affect student assessment. The research then focuses on the importance of how we assess students and why task-based assessment is appropriate in fulfilling the goals of the CCSS. Lastly the teacher's role and importance in task-based assessment is explored.

1.1 The National Picture

> "Thirty years ago, the United States ranked 1st in the quality of its high school graduates. Today, it is 18th among twenty-three industrial nations."
>
> (Chen, 2010, pp. 2)

A country's educational system profoundly affects the security and quality of life of its citizens. Milton Chen writes in his book, *Education Nation,* issues as great as national security and environmental defense depend on a people's education. Chen challenges us to create an "Education Nation", where all citizens value and support education. The Common Core State Standards (CCSS) are a move toward this direction and evidence of a political will for necessary change. (Chen, 2010)

Many of the world's nations possess centralized educational management, a coherent national strategy. The United States is different. It does not bare an educational grand design, but would benefit from one. Often U.S. schools use curriculums that are outdated. A large percentage of public high schools use a science curriculum developed in the 19th century. The country holds pockets of exemplary educational systems, schools with innovative and effective teachers and administrators. The CCSS would allow states to work together, bringing those pockets to scale. (Chen, 2010)

High school students are expected to be Career and College Ready (CCR) after graduation. This is a nearly universal expectation, not bounded by state borders, but currently in the United States two high school students could take the same course in the country but one gets a “hard” teacher and the other gets an “easy” teacher. If they were to complete the course with the same credit hours and letter grade, it doesn’t imply that the knowledge obtained by one student is equivalent to the knowledge obtained by the other or that both students are college and career ready. High common state standards provide an equal opportunity for all students by allowing all participating states to meet CCR expectations. The CCSS were built on the top state and international standards and illustrate a clear and focused progression of learning from kindergarten to high school. The CCSS close the gap between what is takes to receive a high school diploma and what it takes to be successful after high school. (On the Road)

The Partnership for Assessment of Readiness for College and Careers (PARCC) is a group of 26 states committed to building a next generation assessment system for grades 3 through high school. The system will be anchored by CCR tests in high school, and will include a combination end of the year assessment and “through-course” assessments administered throughout the school year and all computer based. The system will also be anchored around college and career ready benchmarks, clear goals for teachers to aim for and success will come from collaboration between teachers, administrators, and schools which include colleges since we need college input when judging what it means to be “college ready”. Currently, many of our students aren’t prepared for life after high school. “⅓ (students) enter postsecondary classrooms unprepared for credit-bearing courses” (Partnership, 2008, pp. 34) PARCC aims to fix

that problem through a common assessment system that can be used to show us where "gaps" exist in curriculum. (Partnership, 2008)

1.2 Assessment

"Nothing else matters unless we get assessment right." (Chen, 2010 pp.76) If we want teachers to go beyond "teaching the test" and students to stop asking "Is this going to be on the test?" then we must improve the tests. Dr. Bruce Alberts, professor emeritus in biochemistry at the University of California at San Francisco, observed that his student didn't start asking deeper questions until the faculty started including open-ended questions on exams. Some or our nation's best students did not exhibit more intellectual curiosity when they knew the exams were to be multiple-choice and graded by a Scantron machine. (Chen, 2010)

Performance standards are measurements of student growth and ability. The standards set by the CCSS need a method of being measured and that implies assessments. Performance standards equal assessments. However, if the measurements that we use aren't common then the CCSS are no longer common. It doesn't matter how rigorous the standards are if assessments aren't rigorous. The performance standards must match the CCSS in rigor. (Cizek, 2010)

The goals of assessment according to "On the Road to Implementation: Achieving the Promise of the Common Core State Standards" are:

- Effectively measure the depth and breadth of the CCSS
- Inform and improve the quality and consistency of instruction
- Indicate whether or not students are reaching mileposts that signify readiness
- Hold educators and schools accountable for improving student performance and readying students for postsecondary education and careers.

(On the Road 2010)

It is the states' responsibility to create assessments that measure "knowledge and skills targeted by the CCSS". Assessments should be capable of measuring higher-order thinking skills and analytic skills. The assessments should measure CCR, which will require better communication with higher education. Just as states need to compare current curriculums with the CCSS and make adjustments, states will need to adjust their methods of assessing student learning. The challenge is creating assessments that meet the standards' goals. The plan is that by the 2014-2015 school year a common assessment system will be developed. (Partnership, 2010)

Assessment should not just serve as a method of telling teachers what students are "at risk". To many teachers this seems the only purpose of benchmark tests. This is frustrating to teachers and students. Assessment needs to be formative, providing the teacher with the knowledge of exactly where a student is having problems so that they will know where to intervene. (Shepard)

Often, discussions of assessments focus on high-stakes, end of year exam, but students spend the majority of classroom time participating in formative assessments implemented by their teacher. According to Lorie Shepard in "Formative Assessment: Caveat Emptor", the definition of formative assessment is "assessment carried out during the instructional process for the purpose of improving teaching or learning". This type of assessment should be frequent. Feedback is the critical element so that teachers can make adjustments if necessary. In past two decades formative assessment has really developed in other countries to counter the "external accountability tests" exported by the United States. (Shepard, 2008)

> “An American student drops out of high school every 26 seconds, a total of 6,000 each day” - 2006 National Center for Education and the Economy
>
> (Chen, 2010)

In order to keep students engaged, formative assessments should be authentic. According to Chen, authentic learning is defined as learning that is “relevant to student’s lives, communities and the larger world”. Assessment is authentic when “the assessment of the activity looks very much like the activity”. (Chen 2012) Authentic assessment keeps students more active in the learning process. More active students could lead to fewer high school dropouts and deeper learning. When students can relate assessments to their lives, their performance improves.

Authentic assessment is assessment that “conveys the idea that assessment should engage students in applying knowledge and skills in the same way they are used in the real world”. It shows students have the “ability to do things that are valued in the adult world”. (Marcus, 1996, pp. 5) Students who seem to care about school do well, and the students that don’t seem to care typically perform poorly. This is why authentic assessment is important. It engages them emotionally. The learner is more interested in the material if they can connect it to their lives. (Marcus, 2008)

Project-based learning (PBL) is a type of authentic assessment. Each project is about 2-6 weeks. During the 2008-2009 school year, George Lucas constructed an investigation into the effectiveness of project-based learning which involved two studies. In the first study two high performing schools were chosen. One school employed PBL and the other employed a more traditional learning style. In the second study two lower performing schools were chosen. Again, one school employed PBL as the other employed a more traditional learning style. In both schools the PBL school performed

better than the traditional school on the same AP course at the end of the year. The PBL class from the lower performing school performed as well as the traditional higher performing school. It is important to note the effectiveness of authentic assessment and projects because tasks are another form of authentic assessment that can be completed in a shorter time frame than projects. (Chen, 2010)

1.3 Tasks

According to the "Partnership for Assessment of Readiness for College and Careers: Application for the Race to the Top", the assessments that the states will need to create will be in the form of challenging tasks. Like project-based learning, tasks will most likely be multi-step, multi-answer, and applicable to the real world. The tasks are described as "multi-answer" because different students will respond differently to tasks, depending on their level of math skill. Some students may have sophisticated answers while others may have simpler answers. Unlike the traditional multiple-choice exam, where the answer is right or wrong, students may arrive at the correct answer using a number of methods. Also typical of a multiple-choice exam is the exclusion of real-life problems or authentic problems. Task should link classroom mathematics to real-world mathematics. (Partnership, 2010)

1.4 Role of Teacher

Teachers matter when improving student learning. Thus, we must improve teacher effectiveness in order to improve student achievement. The curriculum, assessments and scoring system have greater influence on student learning if effective teaching practices are engaged. Pasi Sahlberg notes that Finland, Ontario and Singapore, regions where the average student performance is fairly high and the gap between low and high performing

schools is fairly small, have systems with multiple components. One component is teacher and leader development. Not only is initial preparation important, but also teachers need to be given continuous support, i.e. “time to collaborate with their peers to develop curriculum and assessments”. (Sahlberg) States will be responsible for developing professional development that will prepare educators for the standards, creating new assessments and utilizing data from assessments. (On the Road)

Chapter 2: Sample Tasks

In this section I discuss several tasks implemented in my classroom. I include learning objectives as Grade Level Expectations (GLEs) that define what a student should be able to accomplish. Due to the structure of the required lesson plan rubric, the tasks are of the form: "I Do", "We Do" and "You Do". Often sections overlap. I conclude with observations and thoughts I took away from the implementation of each tasks including but not limited to difficulties faced by the students and by me, the teacher.

2.1 Vacation Task

The "Vacation Math" task was adopted and modified from the Louisiana Comprehensive Curriculum (LCC). The original problem read as follows:

> Activity 11: Vacation Math (GLE: 20)
>
> Materials List: Internet access, maps, or atlases, paper, pencil
>
> We're going on vacation! Allow students, in groups of 2, to make use of the Internet, maps, or atlases to locate the distance from home to a destination of their choice. Have the students predict how long it will take to drive at the posted speed limit. This distance with a variety of speeds will be used to determine trip length. Class discussion should focus on the distance formula with students discovering the formula instead of having it given to them. Questions student should explore include the following: If we are going to drive to visit our location, how long will it take to get there if we drive 60 mph? If the car we're using gets 30 miles to the gallon, how much gas will we use to get there and back? If the price of gas is $2.50 per gallon, how much will it cost to go on our trip? Have each group make a presentation to the class sharing information.
>
> (LCC6 2012)

Students should be able to "calculate, interpret, and compare rates such as $/lb., mpg, and mph." as stated in GLE: 20 of the LCC. The task appeared in Unit 3: Fractions Decimals and Parts of the 6^{th} grade LCC. The modified version was administrated to my two 6^{th} grade mathematics classes of 16 students and 15 students, respectively.

2.1.1 Guided Practice "I Do/ We Do"

I began the lesson with a warm-up problem taken from the "6th Grade iLeap Assessment Guide":

> Mr. Jones drove 345 miles on 15 gallons of gas. What was Mr. Jones' average number of miles per gallon?
> A. 11.5
> B. 13.8
> C. 23
> D. 69
> Correct Response: C
>
> ("Testing" 2012)

The "I Do" took about 5-10 minutes of class time.

Students were acquainted with rates; a previous task performed in class involved finding the best buy by comparing unit rates of similar products of different price and size. The warm-up was to be quick review prior to today's planned task.

2.1.2 Collaboration "We Do/ You Do"

Students were allowed to work with a partner to complete the "Vacation Math" worksheet, which was in 6 parts:

Part 1 – Use computer to research how many and how much time it would take to travel to Disney World from you home.

Part 2 – What is the rate traveled in miles per hour?

Part 3 – What is the unit rate in miles per hour?

Part 4 – If your car gets 30 miles to the gallon, how much gas will you need to get to Disney World?

Part 5 – If the price of gas is $3.50 per gallon, how much will it cost to go on our trip?

Part 6 – Repeat 1-5 with a destination of your choice.

Students took about 50 minutes to complete the task.

2.1.3 Conclusions

In implementing this task, I encountered several unanticipated issues. I did not expect Part 1 to be the most challenging portion of the task, but the students did not have the Internet research abilities that I had supposed. Students were unfamiliar with web mapping service applications. This delayed getting to the math. Part 2 presented another unanticipated problem. Popular mapping service applications give students the expected travel time in hours and minutes. For example, a student might discover that it would take 713 miles of driving and 11 hours and 34 minutes of travel time to reach Disney World by car. Using the warm-up problem as a guide, students decided they could calculate average miles per hour by dividing the miles traveled by the time. I observed many students erroneously put "t = 11.34" in their calculators instead of converting minutes to hours. During the first administration of this task, I paused the task to initiate a classroom discussion concerning conversions from minutes to hours. Teaching students to convert units of time correctly was not the goal of this task, and we were pressed for time. So, I simply had students round their values to the nearest half hour – a task simple enough for most students. Thus, 11 hours and 34 minutes became 11.5 hours. After challenges in part 1 and part 2 were addressed, students had little difficulty completing the rest of the task.

During the task, I came to recognize that where the students' needed guidance and where I had expected to engage them were very different. I was being observed during the implementation of this task. As stated in the introduction, step one of TAP's five-step process for effective learning is to identify the problem or need. If I had not had observers in my room, I would have stopped the task, and redirected the lesson to

converting units of time when the problem arose, but I was afraid that I would be penalized for not sticking with my objective if I had done this during the observation. Teachers are commonly pressured to "stick to objectives" even when the objectives cease making sense, due to an astonishing inflexibility of the evaluative framework.

I think with a few modifications, this is an appropriate task. It was authentically problematic, enticing students to think about important math in a real-world situation. Before giving the task, it is necessary to know what skills, abilities and understanding will be required to complete it. The teacher needs to have a way to check to see the required skills are in place and a plan to deal with deficiencies, if they are detected.

The questions could and should be worded to enhance this aspect of the task. If I were to implement this activity in my classroom again, I would combine the parts into one paragraph, such as:

> Ms. Gaboury and her husband are planning a summer vacation to Disney World. They are debating whether it would be cheaper to drive or fly from their residence in St. Gabriel, LA. Ms. Gaboury thinks it would be cheaper to fly, but her husband claims driving would save them money. Who do you believe is correct? Justify your answer.

This posed problem would be more authentic. The incidental details, such as names and places, could be. These revisions would allow students to develop their own methods for approaching similar problems. In groups, students could discuss and apply those methods.

Future implementations of this task in my classroom would not include a warm-up problem similar to the one given. Students were able to find the solution by randomly submitting the numbers 345 and 15 to various mathematical operations until a multiple

choice solution is derived, thus discovering that "division" is the appropriate operation for such tasks and no more thought was required from them.

2.2 Measurement Tasks

The LCC requires student to "Measure length and read linear measurement to the nearest sixteenth-inch and millimeter" (LCC). This GLE appears three times in the 6th grade curriculum. It is one of ten GLEs in Unit 3: Fraction, Decimals and Parts, a four-week unit; one of five GLEs in Unit 4: Operating with Fractions and Decimals, a four-week unit; and one of thirteen GLEs in Unit 5: Geometry, Perimeter, Area, and Measurement, a five-week unit. We examined three closely-related measurement tasks. These are grouped together in this section.

2.2.1 Magnified Inch

The "Magnified Inch" task was taken from the Louisiana Comprehensive Curriculum. (LCC, 23) My students were having difficulties measuring with inches. The rulers we were using in class were divided into sixteenths and students were struggling with subdivisions. For example, some students would write 1 ¼ inch as 1.4 inches because they counted four ticks on their ruler.

2.2.1.1 Independent Practice: "You Do"

For this task students were given a piece of paper and asked to fold it in half producing a short fat fold; "hamburger style", versus "hot-dog style" which produces a long skinny fold. They were to mark a line on the fold and count the parts produced from the fold. They counted one half and two halves, realizing that two halves are equivalent to one whole. They labeled ½ on the paper. When then refolded the paper, and folded a second time. This time when students unfolded the paper, it was subdivided into four

parts. We again counted the pieces; one out of four, ¼; two out of four, $\frac{2}{4}$; three out of four, $\frac{3}{4}$; and four out of four, $\frac{4}{4}$. Many students made the observation that $\frac{2}{4}$ is equivalent to ½ and $\frac{4}{4}$ is equivalent to 1 whole. They made marks on the folds and labeled them appropriately. They repeated this process until their paper was divided into sixteenths. Students hole-punched the finished product, after I checked for correctness, into their binders as a future reference.

2.2.1.2 Conclusions

This task was fun for students. Many students hole-punched the final product into their binders, creating a useful reference tool. It had students thinking about representations of equivalent fractions.

2.2.2 Measuring Lines

The "Measuring Lines" task was performed in Units 4 and 5 in my 6th grade classroom.

2.2.2.1 Independent Practice: "You Do"

The "Measuring Lines" task involves a worksheet with sixteen lines of varying lengths. (This task was obtained from the LSU Cain Center.) The teacher should cut off the key and ruler attached to the worksheet. I alternated three versions in order to eliminate cheating. Students were given the worksheet and ruler and asked to measure to the nearest sixteenth-unit. The students must use the rulers attached to the worksheet for the keys to work. The unit on the ruler is close to an inch, but not precise. The key and the worksheet have corresponding numbers printed on them. The task is straightforward. Students are simply asked to measure lines accurately.

2.2.2.2 Conclusions

Recall the three requirements for an appropriate task defined by Hiebert et al. It should be problematic, make connections, and have students thinking about important mathematics. Some of my 6th graders, despite measurement activities performed in Unit 3, were still having difficulties measuring accurately. When I first assigned this task, I asked for student feedback, many students declared the task to be “easy”, “boring” and “stupid”. I graded the task for accuracy and had a class average of 67%. The next day we discussed the importance of being able to measure accurately. Students reviewed their papers and completed the task again. Again, I asked for feedback. Many students wrote that after seeing their first task graded, they felt they needed more practice measuring. The student average improved to a 76%. Student results are illustrated in Figure 2.

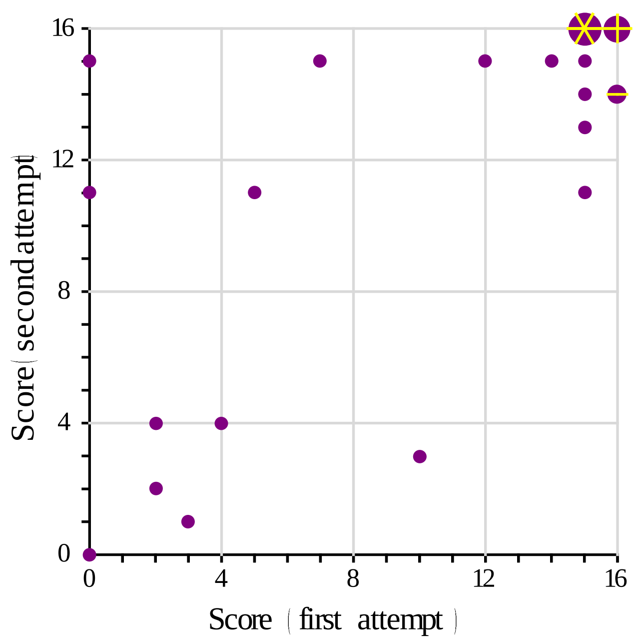

Figure 2. Students’ Results (16 = perfect score).

The averages don’t really tell the whole story. Many students could measure when given the task. In Figure 2, those students are represented in the top right-hand corner. Towards the top left, we see a couple dots that represent students that scored low the first

time they participated in the assignment, but their scores improve on the second attempt. The class average improved because of the several students who scored really low the first time they completed the task, realized their errors and scored significantly better the second time the completed the task. Two of those students didn't have difficulty measuring, but erroneously counted the subdivisions on the ruler. One student wrote 2 1/16 units as 2.01 units and the other wrote 2.1 units. Therefore, they both scored a 0/16 on the first attempt, but correctly measured 11 and 15 lines respectively out of 16 on the second attempt. A third student that improved his score would sometimes erroneously subdivide the ruler into twelfths. He did not do this consistently. On the second attempt, he did not make this error at all.

When students initially completed the task, I observed that many students' measurements were not drastically far from the correct answer. When we went over the graded assignment, many felt the incorrect measurements should have been correct because they were "close enough" to the correct response. "Close enough" varied among students, but most felt if they were a sixteenth-unit from the correct answer, it was correct. It appears that one of the students that scored poorly on the first attempt, but drastically improved his score on the second attempt, may have been affected by the "close enough" mentality. The first attempt had many wrong answers that were a sixteenth of a unit from the correct answer, but the second attempt had only one error.

The circles on the bottom left represent students that fared poorly both times they completed the task. The one student who scored a zero both times was measuring the lines from the beginning of the ruler, not the zero mark. Two of the other students that scored poorly on both attempts at the task seemed to make this error some of the time.

This task is useful for honing a skill that is necessary for more challenging tasks involving measurement. However, many of the thirty students given this task scored well on their first attempt. For these students, this task doesn't have much to offer. In future implementations of this task, I would continue to give the task to struggling students, but have other students work on a more challenging task.

Immediate feedback is necessary for this task to successfully aid the students that struggle with the skill. I graded, but did not review the attempts at the task in a timely manner. The error of measuring from the beginning of the ruler, not the zero mark, could have been addressed right away. I would have students grade their own papers next time I implement this task.

As previously stated, students used rulers that had units divided into sixteenths. Having the ability to change the length and subdivisions of the unit would improve this task. Students became more proficient at measuring to the nearest sixteenth, but on later assignments students became confused when asked to measure in centimeters, where measuring to the nearest tenth of a unit was required.

2.2.3 Measurement (Understanding Units)

The "Understanding Units" task was given after the "Measuring Lines" task in Grade 6 Unit 4. This task was made by me for this thesis. The purpose of this task was to "measure length and read linear measurements to the nearest sixteenth-inch and millimeter" (LCC GLE 18), "demonstrate an understanding of precision, accuracy, and error in measurement" (LCC GLE 31) and "decide which representation (i.e., fraction or decimal) of a positive number is appropriate in a real-life situation" (LCC GLE 5). Thirty 6^{th} grade students participated in this task.

2.2.3.1 Guided Practice: "I Do/ We Do"

For the "I do" I estimated the length of a foot on the board. I then used a yardstick to see how my estimation compared to a much more accurate and precise measurement. As a class we discussed whether the comparison of the actual and estimated foot made me a good estimator. We also discussed estimation tools that we could use as indicators of an actual foot, such as using your actual foot as an indicator of a unit foot.

2.2.3.2 Independent Practice: "You Do"

Students were then given the "Measurement (Understanding Units)" tasks. They were asked to estimate a centimeter and an inch and then instructed to use a ruler to accurately measure their guesses to the nearest millimeter and sixteenth inch. At this point, some students were caught trying to change estimates so that they accurately represented an inch and a centimeter. I explained to students that they were not being graded on how close their estimates were to the actual units. They were then asked, "How good are you at estimating a centimeter? An inch?" Then find a part of their hand that can serve as a reminder of the length of a centimeter and an inch.

2.2.3.3 Conclusions

I requested student feedback for this task and many commented that the task was easy. However, through personal observations I saw the task more problematic for students than their responses asserted. Only 3 students responded that the task was "challenging". One of the 3 students commented, "This task was confusing because it was saying to measure centimeters in meters and inches in millimeters." As students worked through the task, I observed a lot of confusion dealing with the units. Students

had to measure both their "centimeter-guess" and "inch-guess" to the nearest millimeter and sixteenth-inch and students often wrote incorrect units or left off units completely.

Students enjoyed discovering bodily reminders of units in the "Measurement (Understanding Units)" task, but I ponder whether students will remember those reminders when appropriate situations arise for their use.

2.2.4 Overall Conclusions for Measurement Tasks

A drawback to all the measurement tasks was that many students found them boring. Modifications allowing students to measure or estimate in authentic situations could add interest to the task. I observed students making connections between measurement tasks. Some students used their "Magnified Inch" as a reference when measuring lines. I also noticed that students were better at estimating a measurement in inches than in centimeters. This may have to do with the "Measuring Lines" task using a unit that was close to an inch and was divided into sixteenths such as an inch on a ruler, but also, inches are just much more common.

2.3 Planet Task

The "Planets" task was modified from the 6th grade Louisiana Comprehensive Curriculum. The goal of the original activity was to "demonstrate the meaning of positive and negative numbers and their opposites in real-life situations". (LCC6, 2012) The activity appeared in the last unit, Unit 8, of the LCC. My goal in this task was to improve student performance on problems involving operations that dealt with negative integers. Every student in our school from grades 6th to 12th possesses a laptop computer. I decided to make this activity more interesting for students by utilizing those computers.

2.3.1 Guided Practice "I Do/ We Do"

In preparation of the "Planets" task, students were presented with a warm-up problem. They were asked, "If Mercury's maximal and minimal surface temperatures are 870 °F and -300 °F, respectively. What is the difference of Mercury's maximum and minimum surface temperatures?" I gathered the temperatures from http://www.kidsastronomy.com/the_planets.htm. The solution was discussed as a class; this took approximately 10 minutes of class time.

2.3.2 Independent Practice "You Do"

Students were given a worksheet to complete comprised of 6 parts:

1. Use your computer to find the average surface temperatures of Jupiter, Mars, Earth, Saturn and the moon.
2. Plot each temperature on the attached number line.
3. Write three inequalities using < or > symbols, comparing the surface temperatures.
4. Use your computer to research the maximum and minimum surface temperatures for Earth and its moon.
5. What is the difference between Earth's maximum surface temperature and its minimum surface temperature?
6. What is the difference between the moon's maximum surface temperature and its minimum surface temperature?

Students finished the worksheet at different paces. The shortest time was 20 minutes, while others did not finish during the class period.

2.3.3 Conclusions

The issues students faced in the "Vacation Math" task surfaced again in the "Planets" task. Students' Internet research abilities were below expectations. Students had difficulties making use of Internet search engines in order to find the required data to fill in the worksheet. This wasted time getting to the math. As a remedy, I would recommend that the necessary data should be researched by the teacher prior to class and

given to students. Unfortunately, this takes away the students' use of technology. An alternate suggestion would be to give the students specific websites to look at.

The math in this task was problematic for many of the students. Students often had difficulty simplifying expressions involving addition/subtraction and negative numbers. Plotting the numbers on a number line, and then being asked to pay attention to the difference between two numbers, of which one or both or none might be negative, seemed useful practice. When students look at a number line, it helps illustrate whether the derived simplifications to those expressions make sense. This is more helpful to the students than memorizing a bunch of rules that they have a difficult time keeping track of. For example, I often hear students reason that $-5 - 6 = 11$ because "two negatives make a positive". They will even insist that I or a former math teacher taught them that. However, when students are given a number line, they are less likely to make this mistake.

2.4 Hiring Firemen Task

The "Hiring Firemen" task focuses on interpreting a real-life situation in terms of a linear equation or inequality, a skill many students struggle with, particularly in translating from a word problem to a mathematical representation and vice-versa. This task is a modification of problem 6.EE Firefighter Allocation from the *Illustrative Mathematics Project* website (IMP 2012). With this task, I hoped to aid students in developing a method for approaching algebraic word problems.

The students had been working with similar problems, but were having trouble. This problem was prepared to aid students in developing a method of approaching like problems.

Standards Addressed:
The Common Core State Standards:
Domain. EE: Expressions and Equations
Cluster. Reason about and solve one-variable equations and inequalities.
Standard. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
Standard. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.

(IMP 2012)

The corresponding GLEs needed to complete this task appear in Unit 3 of the LCC but reappear in Unit 8 – both are four-week units.

GLE 14. Write a real-life meaning of a simple algebraic equation or inequality, and vice versa.
GLE 16. Solve one- and two-step equations and inequalities (with one variable) in multiple ways.

(LCC7 2012)

2.4.1 Guided Practice: "I Do/ We Do"

I combined the teacher-demonstration and guided-practice steps. I created a worksheet, modifying the original problem with the addition of scaffolds. This extra support, I hoped, would increase student clarity without giving away too much of the solution.

In the original IMP problem students are asked to write an equation to represent how many firemen a town could hire in a year, given the wages and benefits paid per fireman annually:

> A town's total allocation for firefighter's wages and benefits in a new budget is \$600,000. If wages are calculated at \$40,000 per firefighter and benefits at \$20,000 per firefighter, write an equation whose solution is the number of firefighters the town can employ if they spend their whole budget. Solve the equation.

(IMP 2012)

The task I posed:

> How many firemen can we hire? A New Hampshire town's total budget for firemen's wages and benefits (such as insurance and retirement) in the coming year is $630,000. Wages are calculated at $40,000 per fireman for the year and benefits at $20,000 per fireman in the year.

The total budget was changed from $600,000 to $630,000 because I did not want the total budget to be evenly divisible by the number of firemen the town could hire, thus requiring students to use an inequality rather than an equality. I planned to embed the task in a sequence of exercises, so I wanted to include enough incidental details to distinguish the next version.

In the first part of the worksheet, students worked together to find the cost of hiring one fireman, two firemen, etc. They continued this process utilizing Table 1:

Table 1. Hiring Firemen Worksheet Excerpt

Number of firemen hired	Cost for wages	Cost for benefits	Total cost
1	40,000	20,000	
3			
6			
9			
10			
11			
12			
…	…	…	…
N			

(Reference)

The purpose of parts 3, 4 and 5 of the worksheet was to create a step-by-step process for writing an inequality that compared the number of firemen the town could hire with the town's total budget. Parts 6 and 7 were steps in solving the inequality. In Part 8 students were asked, "Will the town would have any money left over?" My goal

was to complete the “I Do/ We Do” as a class, then have the students work the “You Do” – a similar assessment problem, but with less scaffolding.

I worked along with student, using an Elmo so that students could check their answers. Occasionally I walked around the room to check that all students were participating. The last row gave many students trouble; however, several students did discover a pattern for computing the cost for wages and the cost for benefits, allowing them to come up with an expression involving a variable in the last row of the table.

Completing this worksheet as a class took approximately 55 minutes, the whole class period and more time than I anticipated. I decided to let students take the worksheet home as a review sheet for the assessment problem. I told them they would work a similar problem when they came into class the next day. I told them that they would get two grades: One, for returning the worksheet problem and two, for completing the assessment problem.

2.4.2 Independent work “You Do”

The assessment problem was basically the same problem worked in class. The numbers were changed and a New Hampshire town became a Louisiana town. Twenty 7th grade students performed the assessment problem, consisting of three parts. In the 1st part students were asked to “write an expression that gives the cost of hiring *N* firefighters”, corresponding to parts one and two of the “I Do/ We Do” problem. The 2nd part of the assessment problem corresponded with parts 3 through 6 of the worksheet problem. Students had to come up with an inequality comparing the cost of hiring *N* firemen with the total budget and then solve for *N*. The last part corresponded with parts

7 and 8 of the worksheet, solving the inequality and computing how much of the town's budget would remain.

2.4.3 Conclusions

I hoped the "I Do/ We Do" worksheet problem would give students a method for approaching for similar problems. I expected most students to create a table like we did on the worksheet problem in class the previous day. Eight of the twenty students created a table or made an attempt of creating a table. Four of these students created a table illustrating the total cost of hiring one to thirteen firemen. These four students were able to deduce that the town would be able to hire 12 firemen. Four of those students arrived at the correct number of firemen through the tables they created. Out of the remaining 4 students that made a table, one correctly listed the cost of hiring 1 through 4 firemen. He also wrote an expression that accurately gave the cost of hiring N firemen, but still did not arrive at the correct answer for part 3, "What is the maximum number of firefighters that the town can hire?" The remaining 3 students that created a table did not accurately represent the situation described in the problem.

I was disappointed in the results of this task. Students are expected to convert real-life word problems into algebraic expressions, equations and inequalities in Unit 3 of the LCC. My students began that unit in mid-October and had spent more than the recommended four weeks, because I felt that possessing the ability to write equations and inequalities that represent real-life situations is a very important skill for students to master in order to be successful in higher-level math courses. I expected this task not only to aid students in developing a method for working similar problems, but also to increase their confidence when presented with word problems.

The inequality students were asked to derive is $14{,}000N + 28{,}000N \leq 520{,}000$ or $42{,}000N \leq 520{,}000$. To solve, students divide both side of the equation by $42,000. Two students came to the correct solution of 12 firemen with only the division worked out on their paper. A third student did not show his work. Seven students in the class came up with the correct number of firemen the town could hire.

This task failed in my main goal of aiding students in creating a method of approaching similar types of problems, since so few students created a table to help them derive the appropriate expression and inequality asked for in parts 1 and 2 of the assessment problem. The well thought out task should have an appropriate balance of discovery and procedure. I fear my modifications to the task gave too much procedure and the lack of discovery did not help students approach a similar assignment. Looking over the assignment, I felt students tried to remember the procedures instead of understand them. The result for most students was numbers, and a variable scattered randomly among operators. One student had the problem worked out correctly, if I had not changed the numbers from the “I Do/ We Do” on the “You Do”. In future implementations of this task, I would remove some scaffolding and see if any of the students in the class develop their own methods of completing the task. Then, have those students share their methods with the class.

Chapter 3: Discussion and Conclusions

The goal of this thesis was to develop and implement tasks aligned with the Common Core State Standards and to share my experience and attained knowledge with other teachers. In this section, it is my intention to review what I have learned and what I hope others will take away from my experience, I will describe what is necessary for success in the task-based classroom, including flexibility in the evaluation framework, immediate feedback, and time set aside for student reflection. I will also discuss how I feel tasks can be crafted to best suit the goals of the new standards by adding a writing component.

Tasks need to build on previous knowledge, and as a result flexibility in the evaluation framework is required. In the “Vacation Math” tasks, students were required to calculate miles per hour, but students were thwarted by their inability to convert hours and minutes to simply hours. I did not address this issue because I was being observed at the time and felt pressured into sticking to my objectives. Teachers need to be able to adjust parameters of the task to fit the cognitive state of their students.

Not only will the skills covered by a task need to be carefully determined, but also the format of the task. Students need to be prepared to interpret correctly the implicit messages in future assessments. To illustrate this point consider what happened when I gave my 6th and 7th grade students the following assessment shown in Figure 3 as a warm-up problem in the Geometry units of the 6th and 7th grade curriculum:

The dots are equally spaced in a square grid. Compare the areas of the illustrated triangles. Which have greater area? Which have less? Which have the same area? Are some areas impossible to compare? Explain why you answered as you did.

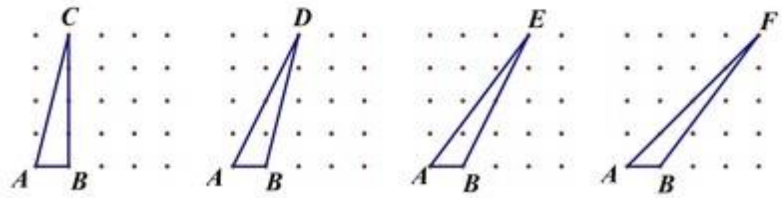

Figure 3. Sample Assessment

Both grades had worked problems on computing areas of geometric shapes on grid paper. Despite having experience working similar problems on grid paper, this task tripped up many of my students. They had never been given grid paper that contained only dots, and the lack of lines confused them. This is a single example, but in my experience it appears evident that many students will perform poorly if the classroom activities do not resemble the assessment. Teachers are not accurately evaluating students' mathematical abilities if the assessment bewilders a child. When we design tasks, or curriculum in general, we need to provide experiences that build tacit understandings that support future work.

I found that immediate feedback is essential not only in task-based assessment but in any form of assessing students. As in the "Measuring Lines" task, students that performed poorly on the first attempt continued to make the same mistakes on future attempts. Their scores did not improve until someone was able to point out their mistake. I understand that for many teachers, time is the biggest constraint on addressing this issue, but feedback doesn't always have to come from the teacher. It could come from a peer or from the student him or herself. This task was designed in such a way that students could grade a friend's paper or students could grade their own papers. They may have discovered their mistakes on their own. If we as educators cannot find the time to

provide a little useful feedback to our students, then I feel the time spent creating and implementing an assessment is in vain.

To make sense of problems, students need time to reflect time after, and perhaps even before, working on them. Reflection time after a problem is a logical corollary of immediate feedback. It makes sense that students will require time to assimilate the feedback. Concerning reflective time before beginning a task, let’s return to the “Hiring firemen” tasks. I felt I had given too much scaffolding in the implementation of this task. In lieu of this, maybe some time for students to read and reflect on the problem would be appropriate. Often, the most difficult issue for students when given a word problem involves figuring out what they are ultimately being asked to do and how the mathematical work fits into the problem. Many students have trouble connecting number work to other kinds of reasoning or thinking. To these students, math is numbers, and they can’t find the math when words are involved in a problem. I think time to read, alone or in small groups, and discuss the task first would be good practice.

How can we prepare teachers to be able to look at how students think about their problems, and discern what logical or illogical steps they made to reach their conclusions? We cannot simply look inside a student’s brain and analyze a student’s thought processes. This is an important reason for including a writing component. In my classroom, I demanded that students justify their answers using mathematical expressions, but often this led to little more than uninformative expressions and equations scattered on paper, and this does little to help me gauge student understanding. Given a word problem, it often appeared that students picked out numbers, selected random operations and chugged away without comprehending what is being asked of them.

Multiple-choice problems often let the get away with this technique, since they can plug and chug until one of the multiple-choice answers appears in their solutions. In future version of the tasks, I would continue to have students justify their solutions using mathematical expressions, but would also require justifications written in complete sentences. In this way, I would be able to see if students added, subtracted, divided and/or multiplied for well-considered reasons or simply relied on key words, and/or guesswork.

Finally, I have learned from my experience that designing tasks is a time consuming process. I worked at a school where teachers had multiple preps and it would have been impractical for each teacher to spend the time developing and reviewing task-based assessments for each course they taught. Some on-line resources, such as *Illustrative Math Project*, provide teachers with support in developing and implementing tasks as learning and assessment tools in their classrooms. The *Illustrative Math Project* aims to create "a community that can meaningfully discuss, critique, and revise tasks" (IMP 2012). This website and others like it exemplify the type of online resource teachers must have access to in order to successfully implement task-based assessment.

Implementing tasks changed my outlook on teaching. I found the process difficult to do well. Though my students made progress and benefited from the tasks, they remained far from reaching the goals of the Common Core State Standards and PARCC assessments, because the deficits were large to begin with. Despite challenges, I believe tasks allow teachers to be more aware of their students' cognitive processes and worth the effort. This thesis offers insights that I hope will be useful to my peers interested in task-based assessments.

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Appendix A: Lesson Plan Template

Name____________ Subject____________ Week of ____________

Day	Identify Need Standards/ Objectives	Obtain New Learning (I Do-Activity)	Develop Teacher and Students Do (We do-Activity)	Apply Students Do (They Do-	Evaluate (Assessment)
Monday	Objectives: GLE:	Teacher Model:	Activities:	Homework (if applicable):	Evaluation:
Tuesday	Objectives: GLE:	Teacher Model:	Activities:	Homework (if applicable):	Evaluation:
Wednesday	Objectives: GLE:	Teacher Model:	Activities:	Homework (if applicable):	Evaluation:
Thursday	Objectives: GLE:	Teacher Model:	Activities:	Homework (if applicable):	Evaluation:
Friday	Objectives:	Teacher Model:	Activities:	Homework (if applicable):	Evaluation:

Appendix B: Vacation Math

Name:
Date:
Unit 3, Activity 11 “Vacation Math”

1. Use computer to research how many miles and how much time it would take to travel to Disney World from your home. (You can use Google maps.)

2. What is the rate traveled in miles per hour?

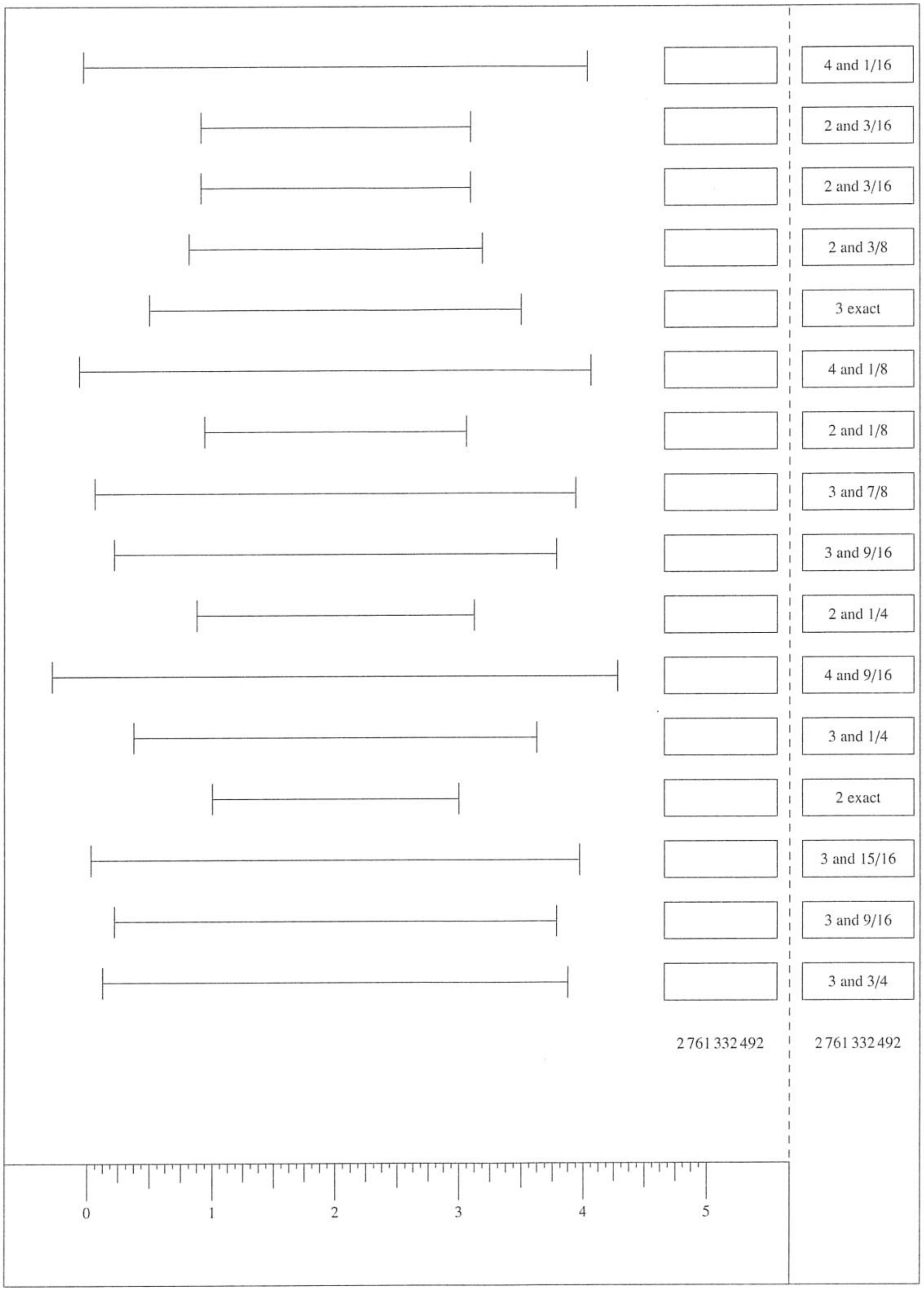
3. What is the unit rate in miles per hour?

4. If your car gets 30 miles to the gallon, how much gas will we use to get to Disney World?

5. If the price of gas is $3.50 per gallon, how much will it cost to go on our trip?

6. Repeat 1-5 with a destination of your choice.

Appendix C: Measuring Lines



Appendix D: Measurement (Understanding Units)

1) On the line below, put two tick marks that you think are 1 centimeter apart. Do not use a ruler. There is no wrong answer.

____

2) On the line below, put two tick marks that you think are 1 inch apart. Do not use a ruler. There is no wrong answer.

____

Your teacher will now hand out rulers. Do not erase your answers to problem numbers 1 and 2. Using the ruler, measure the distances between the marks you made above.

3) To the nearest millimeter, how long was your "centimeter-guess"? _______________

4) To the nearest 1/16 inch, how long was your "centimeter-guess"? ________________

5) To the nearest millimeter, how long was your "inch-guess"? ____________________

6) To the nearest 1/16 inch, how long was your "inch-guess"? _____________________

7) How good are you at estimating a centimeter? An inch?

8) Find a part of your hand that you can use as a reminder of how long a centimeter is. What part did you pick?

9) Find a part of your hand that you can use as a reminder of how long an inch is. What part did you pick?

Appendix E: Planets

Name ___________________________________ Date _________________

1. Use your computer to find the average surface temperatures of Jupiter, Mars, Earth, Saturn and the moon.

Name	Average Surface Temperature (F°)
Jupiter	
Mars	
Earth	
Moon	
Saturn	

2. Plot each temperature on the attached number line.

3. Write three inequalities using < or > symbols, comparing the surface temperatures.

    1.

    2.

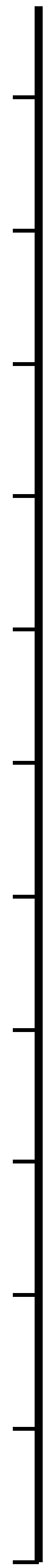
    3.

4. Use your computer to research the maximum and minimum surface temperatures for Earth and its moon.

Name	Max. Surface Temperature (F°)	Min. Surface Temperature (F°)
Earth		
Moon		

5. What is the difference between Earth's maximum surface temperature and its minimum surface temperature?

6. What is the difference between the moon's maximum surface temperature and its minimum surface temperature?



(See Appendix E, Problem 2.)

Appendix F: Hiring Firemen Worksheet

Worksheet Problem

Name:_______________________

How many firemen can we hire? A New Hampshire town's total budget for firemen's wages and benefits (such as insurance and retirement) in the coming year is $630,000. Wages are calculated at $40,000 per fireman for the year and benefits at $20,000 per fireman in the year.

1) How much will it cost to hire 1 fireman for the year? 2 firemen? 3 firemen?

2) Complete the following table showing the cost of hiring various numbers of firemen for the year. In the last row, you will create expressions using the symbol "N" in place of the number of firemen.

Number of firemen hired	Cost for wages	Cost for benefits	Total cost
1	40,000	20,000	
3			
6			
9			
10			
11			
12			
…	…	…	…
N			

3) Referring to your table, complete the following statement, writing an expression involving N in the box:

the cost of hiring N firemen for the year =

4) The town cannot hire more firemen than its budget can pay for. Complete the following statement by writing a number in the box, assuming that N is the number of firemen the town hires:

the cost of hiring N firemen for the year $\leq$ $\boxed{}$

5) Using 3) and 4), write an inequality that says that the cost of hiring N firemen is less than or equal to the amount in the budget.

6) Simplify this inequality so you can see clearly what it is saying about N.

7) What is the maximum number of firemen the town can hire? What will it cost to hire them?

8) Will the town have any money left over?

Assessment Problem

Name:_______________________

A Louisiana town's total budget for firefighter's wages and benefits (such as insurance and retirement) in the coming year is $520,000. Wages are calculated at $28,000 per fireman for the year and benefits at $14,000 per fireman in the year.

1) Write an expression that gives the cost of hiring N firefighters.

2) Write an inequality that says that the cost of hiring N firefighters is less than or equal to the amount of money available

3) What is the maximum number of firefighters that the town can hire? How much money will be left over from the budget?

Appendix G: IRB Application for Exemption from Institutional Oversight

Application for Exemption from Institutional Oversight

LSU
Institutional Review Board
Dr. Robert Mathews, Chair
131 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.6792
irb@lsu.edu
lsu.edu/irb

Unless qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, ALL LSU research/projects using living humans as subjects, or samples, or data obtained from humans, directly or indirectly, with or without their consent, must be approved or exempted in advance by the LSU IRB. This Form helps the PI determine if a project may be exempted, and is used to request an exemption.

– Applicant, Please fill out the application in its entirety and include the completed application as well as parts A-F, listed below, when submitting to the IRB. Once the application is completed, please submit two copies of the completed application to the IRB Office or to a member of the Human Subjects Screening Committee. Members of this committee can be found at http://research.lsu.edu/CompliancePoliciesProcedures/InstitutionalReviewBoard%28IRB%29/item24737.html

– A Complete Application Includes All of the Following:
- (A) Two copies of this completed form and two copies of part B thru F.
- (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1&2)
- (C) Copies of all instruments to be used.
  - *If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.
- (D) The consent form that you will use in the study (see part 3 for more information.)
- (E) Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: (http://phrp.nihtraining.com/users/login.php)
- (F) IRB Security of Data Agreement: (http://research.lsu.edu/files/item26774.pdf)

1) Principal Investigator: Jessica Gaboury **Rank:** Graduate Student

Dept: Natural Science **Ph:** (225)671-8241 **E-mail:** jessgaboury@gmail.com

2) Co Investigator(s): please include department, rank, phone and e-mail for each
*If student, please identify and name supervising professor in this space

IRB# E8005 LSU Proposal #
Complete Application
Human Subjects Training

3) Project Title: Task-Based Assessment in Middle School Mathematics

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Exemption Expires: 6/25/2015

4) Proposal? (yes or no) No **If Yes, LSU Proposal Number**

Also, if YES, either
- This application completely matches the scope of work in the grant

OR
- More IRB Applications will be filed later

5) Subject pool (e.g., Psychology students) Middle School Students in Iberville Parish

*Circle any **"vulnerable populations"** to be used: (children <18; the mentally impaired, pregnant women, the ages, other). Projects with incarcerated persons cannot be exempted.

6) PI Signature [signature] **Date** 6/5/12 (no per signatures)

** **I certify my responses are accurate and complete.** If the project scope or design is later changed, I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at LSU for three years after completion of the study. If I leave LSU before that time the consent forms should be preserved in the Departmental Office.

Screening Committee Action: Exempted ✓ Not Exempted ____ Category/Paragraph 1

Reviewer Mathews **Signature** [signature] **Date** 6/26/12

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Exemption Expires: 6/25/2015

Dear Parents,

As your child's math teacher and in order to meet my responsibilities as a teacher, I have developed and used tasks based on the new Common Core State Standards (CCSS) that I am responsible for implementing.

I am currently enrolled the Louisiana Math and Science Teacher Institute (LaMSTI) Master of Natural Science degree program. As part of this I am conducting research on student learning. I would like to be able to use the student work from the past semester as data. No names or identifying information will be included in any public work. Student identity will remain confidential.

I am requesting permission to quote from the work that your child has done. No names will be associated with the work. No one will be able to tell if the work is your child's.

If you have any questions please contact me at jessicagaboury@ipsb.net or 225-571-8241.

Sincerely,
Jessica Gaboury

Signatures:
The study has been discussed with me and all my questions have been answered. I may direct additional questions regarding study specifics to the investigator. If I have questions about subjects' rights or other concerns, I can contact Robert C. Mathews, Chairman, Institutional Review Board, (225) 578-8692, irb@lsu.edu, www.lsu.edu/irb. I will allow my child to participate in the study described above and acknowledge the investigator's obligation to provide me with a signed copy of this consent form.

Parent's Signature:________________________________

Date:____________________

The parent/guardian has indicated to me that he/she is unable to read. I certify that I have read this consent from to the parent/guardian and explained that by completing the signature line above he/she has given permission for the child to participate in the study.

Signature of Reader:________________________________

Date:____________________

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Exemption Expires: 6/25/2015

Child Assent Form

I, ____________________________, agree to allow my regular classroom assignment be used in my teacher's research. I have been informed that my name will not be used, but that the tasks I perform will be used. I understand that the purpose of this is to help students understand mathematics better. I also understand that I will not receive any extra credit for participating and will be graded the same as those who are not participating. I can decide not to allow my assignment to be used and will face no consequences for doing so.

Child's Signature:____________________ Age:_______ Date:__________________
Witness*________________________________ Date:___________________
*(Witness must be present for the assent process, not just the signature by the minor.)

VITA

Jessica Gaboury was born in Houma, LA, to Phillip Gaboury Sr. and Pamela Gaboury. She is the eldest of three children. She taught for four years. The last two years were been spent in the Iberville Parish School District at the Math, Science and Arts Academy (East). For the 2011-2012 school year she taught 6th grade mathematics, 7th grade mathematics, 6th grade science, Advanced Mathematics, Calculus, and Probability & Statistics. She received both Bachelor of Science degree in mathematics and Bachelor of Music degree in organ performance at Louisiana State University in 2008.