MULTIMEDIA STYLED LECTURES: HOW DO THEY CORRELATE WITH COMPREHENSION?

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Abstract

This study asks which style of lectures students perceive their comprehension better and which they comprehend better; traditional lectures or lectures with multimedia? The sample was 22 first grade students, 11 female and 11 male students, in one classroom. The study was conducted using a Perceived Comprehension Assessment and Comprehension Assessment comparing the delivery of traditional lectures and lectures including multimedia. Results were compared between the Topic Assessments and gender; comparisons were made using paired t-tests. This study determined that traditional lectures were considered the best teaching method for this sample of students. This study does not generalize the results found to other population but used the results to determine the best practice for delivering content to this specific target sample.

Multimedia Styled Lectures: How Do They Correlate with Comprehension?

Comprehension is an important matter in a classroom, as many teachers strive to find the best process to present information that their students can learn. There are several styles of teaching including traditional lectures and lectures including multimedia. Evaluating the substance of multimedia in the classroom is important because it is a fairly new method of teaching that some suggest is best teaching practices. The aim of this study is to see the correlation between traditional lectures and lectures including multimedia for overall comprehension levels. This study used looking at both perceived comprehension and comprehension as means to improve methods of delivering information through lectures.

Literature Review

For the purpose of this study the following review of literature is compiled of relevant research on comprehension and lectures in the classroom. It is organized by relevant definitions and central themes found in existing research. The use of existing research aided in the foundation and interpretation of this study.

For the purpose of this study, a lecture was defined as direct instruction where information was delivered to students. This study will use two styles of lectures, traditional lectures and lectures including multimedia. Traditional lectures were defined as a teacher presenting the information with visual aids in a non-electronic format. Non-electronic aids included charts, graphs, and tables delivered on large easel paper. Rahman & Ziden (2013) defined multimedia "elements as text, graphics, video or animation" (p.212) presented using a facet of technology. Text graphics were written language presented in an electronic format; typically, this included key words or

definitions. Graphics were pictures that related back to the lecture. Animations were graphics that moved across the electronic whiteboard. Videos were recorded content presented in an electronic format. This study used these definitions if any of these elements were provided in an electronic format it was multimedia.

Gill (2008) suggested that "a teacher's definition of comprehension can affect how he or she teaches comprehension" (p. 108). Some comprehension theories used in research include: transactional theory, constructivist theory, mental models, and schema theory. Transitional theory focuses on comprehension and the experiences that the reader brings to the reading (Gill, 2008). One example of transitional theory would be when a teacher reads *Stargirl* by Jerry Spinelli. The teacher will have a much different experience than a student in seventh grade – even if they are reading the exact same words based on their life experiences. Transitional theory is more about the interpretation of words than the physical presence of words on paper. Alternately, constructivist theory implies that the reader builds his or her knowledge (Gill, 2008). Mental modal theory, also known as situation model theory, referred back to reading comprehension and "assume[s] that readers construct situational representations in conjunction with such text-based representations" (Radvansky & Zwaan, 1998, p162). Schema theory does not generalize information; everything is pulled from a person's specific experience. All of these comprehension theories focused on the common thread of the reader building or bringing something to comprehension. This common thread research was identified by Gill (2008) who argued that many comprehension theories were the building of prior knowledge, experiences and/or connections.

The common thread of many comprehension theories was picked up in Schema theory. Schema theory described comprehension as to pull from organized prior knowledge (Anderson, 1984; Gill, 2008). For there to be comprehension there needed to be context of the content to make logical sense of what the student had read or heard during a lecture. Gill (2008) described comprehension using the schema theory as the ability to access the mental file before you can use the current information at hand. Anderson (1984) explained, "Comprehension proceeds so smoothly that we are unaware of the process of cutting and fitting a schema in order to achieve a satisfactory account of a message" (p. 243). According to the schema theory, the mental file includes the prior knowledge and functions as the foundation of comprehending new information. The ability to organize one's thoughts, new and old, in mental files, to access from their filing cabinet is described as schema theory. For the purposes of this study, comprehension is defined as the ability to recall information delivered via traditional lecture or lecture including multimedia elements via the end of topic assessment. The end of topic assessment or the Comprehension Assessments in this study is the demonstrated understanding of and/or connection with prior lectures delivered to be applied to the current skills being measured.

Rahman & Ziden (2013) discussed how the combinations of text, graphics, video and/or animation in an electronic format makeup the elements of multimedia content. Giam Kah How argued that multimedia elements not only visually attract students to a lesson, but also accommodate various learning intelligences within the lesson (as cited in Rahman & Ziden, 2013). Gardner (1983) described "intelligence can be used as a means of acquiring information" (p.350). These intelligences are the means in which students

gather information included linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, and personal. "Even as various intelligences can be exploited as means of transmission, the actual material to be mastered may itself fall squarely within the domain of a specific intelligence" (Gardner, 1983, p.350) Multiple intelligences were used to determine the different types of learner that could be found within the classroom context. Armstrong (1994) explained how students fit into numerous categories within Gardner's multiple intelligences, and teachers "should avoid pigeon-holing a child in only one intelligence" (p. 32). Armstrong (1994) described multiple intelligences as how a student processes information. Linguistic learners think in words. Musical learners think with tempos, songs and musical patterns. Logical-mathematical learners think by reasoning. Spatial learners think in images and pictures. Bodily-kinesthetic learners think with movement. Finally, personal learners break into two categories; interpersonal learners and intrapersonal learners. Interpersonal learners think through conversation with others, whereas intrapersonal learners think within themselves. Gardner (1983) described the reason to use intelligences in a classroom setting was to "explain why certain contemporary educational efforts have achieved success while many others have met a less happy fate" (348-349).

Traditional lectures are most effective on linguistic learners as words are the best tool for that style of learning. Lectures with multimedia elements have the ability to focus a variety of types of learners. This study used a domain specific intelligence of logical-mathematical intelligence based on the content of both lectures styles. Although, delivery of the content could focus other intelligences, the material itself remained domain specific (Gardner, 1983). Traditional lectures and lectures including multimedia

elements targeted a linguistic learner with the electronic audio or teacher's voice (Armstrong, 1994). Lectures including multimedia elements have the ability to target a musical learner with the incorporation of music videos or an interpersonal learner who requires conversation and invited participation or dialogue (Armstrong, 1994).

The schema theory of comprehension calls for the specific recall of information. One way to measure comprehension was through cloze assessments. Open-ended cloze assessment used blanks assigned to the n^{th} sequence, known as cloze units, to determine the overall comprehension of a given reading text. Taylor (1953) explained that the cloze assessment was used for assessing the effectiveness of verbal communication

> A method of intercepting a message from a 'transmitter' (writer or speaker), mutilating its language patterns by deleting parts, and so administering it to 'receivers' (readers or listeners) that their attempts to make the patterns whole again potentially yield a considerable number of cloze units. (p. 416)

Ari, et al (2011) demonstrated that open-ended cloze assessment yields measureable results when measuring comprehension. Fotos, Helfeldt, & Henk (1986) agreed, describing the cloze testing as follows:

> During traditional cloze testing, every fifth word is typically removed from a 250-500 word reading passage and is replaced with a standard-length blank space. The only exception is that no words are omitted in either the first or last sentence of the passage. (p. 216)

A cloze assessment would recall information from the mental file as discussed in the schema theory of comprehension measuring a given student's ability to recall the file.

Arguelles & Schumm (2006) argued that "assessment should provide teachers with useful diagnostic information that can be linked to classroom instruction" (p. 5). The aim of this study is measure comprehension to improve overall classroom instruction by means of lecture style. A cloze assessment makes that direct connection between assessment and instruction assessing the material learned during a given lecture. Ari et al (2011) described the primary users of this testing method as primary grade students and middle secondary students, the target population of this study.

Another way to look at comprehension is through formative assessment using student-voice. Lipsey & Wilson (1993) showed that of studies where goal setting/rate or rating were in place on average scored greater than those who did not have them present in the classroom. Marzano (2007) described in *The Art and Science of Teaching: A Comprehensive Framework for Effective Instruction* that students rating their level of a particular standard or learning target increases the effectiveness of instruction. Marzano (2007) goes on to suggest this type of formative assessment "might be one of the more powerful weapons in a teacher's arsenal" (p.13). He goes on to suggest that rating of perceived comprehension in a classroom, increase sense of accomplishment for the students. Based on this information, the Perceived Comprehension Assessment used to conduct this research was based upon Marzano's belief in rating standards for understanding.

Blackburn (2008) described rigor as "creating an environment in which each student is expected to learn at high levels" (p.20). Rigor is classified into four categories; high expectations, challenging curriculum, high level of question, differentiation and multiple intelligences. Specifically the difference in level of questioning differed

between the traditional lecture and lecture that included multimedia. The questions provided in the enVision curriculum (2012) did not provide higher levels of thinking for the students using both Bloom's Taxonomy and Ciardiello's Four Types of questions (Blackburn, 2008). According to Bloom's Taxonomy, the questions from lectures including multimedia were low in the levels of Cognitive Process Dimension as they could be categorized as Remember or Understand (Blackburn, 2008). Whereas, traditional lecture left room for interpretation and, based on the teacher, had the opportunity to be categorized as Apply, Analyze, and Evaluate (Blackburn, 2008). Key words used in traditional lecture included organize, show me, how, and why which would require students to think at a higher level. According to Ciardiello (1998) questions classify into four categories: memory, convergent thinking, divergent thinking, and evaluative thinking. Blackburn (2008) described each category as following a cognitive operation. Memory involved "naming, defining, identifying" (Blackburn, 2008, p.23). Convergent Thinking involved "explaining, comparing, contrasting" (Blackburn, 2008, p.23). Divergent Thinking involved "predicting, hypothesizing, inferring" (Blackburn, 2008, p.23). Evaluative Thinking involved "valuing, judging, justifying choices" (Blackburn, 2008, p.23). Ciardiello (1998) described teacher questioning as both the questions the teacher asked and the questions students asked. The ability for students to ask higher levels of questions "stimulate divergent thinking and encourage independent learning" (Ciardiello, 1988, p.210). Traditional lectured allowed for the later stages in Ciadiello's model to be exhibited through the questioning process, therefore, increasing the rigor.

Research Question

The large bodies of research regarding comprehension suggest that it is measurable in relation to lectures. In light of this study, I have found the importance of comprehension being a measurable statistic in the classroom to improve teaching practices. The overarching theme found is students' ability to recall the given information is to apply it to a skill in the classroom, which requires good teaching practices. The research available suggested that teachers need measurable checkpoints to know both how students perceive their understanding and measure their mathematical skills. This study asks which style of lectures students perceive their comprehension better and which they comprehend better; traditional lectures or lectures with multimedia?

Methodology

This study was conducted as a quantitative design. This was a Quasi-Experimental Design because the sampling was not randomized; students had been previously assigned to this classroom. This design was a Pretest Posttest Nonequivalent Group because sampling will be assigned out of convenience. This study used the pre-assigned students in a first grade classroom. For the purpose of this study they were grouped as one population of students. The Pretest was the Topic 13 Comprehension Assessment which was determined by students' norms of receiving information in mathematic. The Posttest was the Topic 14 Comprehension Assessment. The results were to show if the level of comprehension increased or decreased with the inclusion of multimedia in lecture. The groups to be compared for the Comprehension Assessment were the topic 13 and topic 14 for all students. Additionally, females and males results

were compared based on each topic assessment. The comparison between the groups was performed using paired t-tests. All calculations were performed using IBM SPSS.

The aim of this study is to know the best way to present educational substance in this first grade classroom. This classroom consists of 22 students, 11 males and 11 females, between to the ages of 6-7 in a suburban middle to high socioeconomic status area. Comprehension level of students was assessed using the end of topic assessments.

The school district used the Common Core State Standard version of EnVision math from Foresman & Wesley (2012) which was an electronic formatted curriculum that included daily mathematic lessons, daily assignments, and topic assessments. The curriculum comes with an end of topic assessment that the district tracked for grading purposes. The data was collected to measure student comprehension on the daily lessons of the unit. The assessments were divided into leveled questions that were ranked between one and four. The assessment from the mandatory curriculum provided questions up to level three and the level four questions were supplemented from the district. According to Common Core State Standards a level 3 was considered mastery at grade level expectations. Level four questions were considered beyond mastery according Common Core State Standards.

Topic 13 was presented using multimedia elements using an ActiveBoard or interactive whiteboard. Students were delivered the content for each lesson via the electronic lecture version of the corresponding enVision curriculum (Foresman & Wesley, 2012) provided through the district website. This style of presentation was navigated entirely through the ActiveBoard. The questions in this lecture form were prebuilt into the presentation and predetermined from the curriculum. Topic 14 was

presented to the students using traditional lecture style excluding the use of multimedia elements and was teacher directed. This lecture style included aids such as tables, diagrams, and manipulatives. The content directly corresponded with the enVision curriculum (Foresman & Wesley, 2012). Key vocabulary and main ideas were provided for each lesson within the topic. Alternatively, the questions were not directly pulled from the curriculum but were based on the direction of the lecture.

The scale used for the Comprehension Assessment ranged from levels 1-4 increasing in 0.5 point increments. Levels were determined by both the frequency and type of questions students answered correctly. Level 2 questions were multiple choice questions and were not considered at standard because they can be decoded for best possible answer. Level 3 questions were "fill in the blank" and offered aids such as tables, diagrams, and manipulatives. The level 4 questions assessed the transfer of knowledge and typically asked for explanation of the mathematical process using domain specific vocabulary learned during the given topic. The scale at which students were scored corresponded with the types of questions being asked on the assessment. For a student to be at standard, a student would have answered all level 3 questions correctly, see Table 1 for the full score distribution.

Table 1

Scoring Rubric Topic Assessments

Level	Points Scored Topic 13	Points Scored Topic 14
1	0	0-1
1.5	1	2
2	2-3	3-5
2.5	4-5	6-7
3	6	8
3.5	7	9
4	8	10

In addition to the end of topic assessment, the students did a self-assessment called Perceived Comprehension Assessment to evaluate their perception of their own success based on their ability to complete the in-class math assignment. These in-class assignments were given with the daily lesson lectures. Students' evaluated themselves with categories from levels 0-4. Level 0 showed students did not understand the material and did not know where they were confused. Level 1 showed students were beginning to understand the material but were still lost. Level 2 showed students were able to follow along with an example or help. Students in this category are still making mistakes on the assignment. Level 3 showed students understand the material and can complete the material without making any mistakes. Level 4 showed students not only understood the material but felt they could teach a peer the material.

The Perceived Comprehension Assessment began when the student completed their in-class assignment. The teacher then corrected the in-class assignment with stars for correct answers and circles for incorrect answers. All circles are expected to either be corrected in-class or at home for homework. Students understood that if they were receiving circles Level 3 and Level 4 would not be marked for level of understanding because the assignment could not be completed without help. Students were given approximately the last three minutes of the class period to get a sticky-note and reflect to complete the Perceived Comprehension Assessment. Students then place the given sticky-notes on the designated classroom chart that individually list each student, by first name, to determine their understanding of the lesson. The mean scores for the Perceived Comprehension Assessment were compared between topics and gender. The comparison between the groups was performed using paired t-tests. All calculations were performed using IBM SPSS.

The classroom used a workshop type model where students are grouped based on ability. The class is divided into three groups based on student ability. These groups are divided into high, medium, and low groups. Ability grouping was determined at the beginning of the year with pre-assessment. After one unit, based on abilities, students were divided into low, mid, and high. Students were moved between groups based on improvement of reading abilities and their overall concept grasped through-out the school year. However, during the time data was collected, no students were moved between groups.

Mathematics had a designated 1 hour 30 minute time slot after lunch daily, with the exception of 45 minutes on Wednesdays due to reduced curriculum days. During this

time, direct instruction was given for approximately 9 minutes and this time period was to include or exclude multimedia. This study determined 9 minutes based on standard methods for determining attention span which is average age plus two minutes (Lemov, 2010).

Following the direct instruction the class was divided into the workshop model where the three groups were separated to complete their in-class assignment, play mathematic games, and do mathematic coloring sheets on their own. These groups were divided into high, medium, and low groups as previously discussed.

The curriculum divided each topic into daily lessons and one topic assessment. Comprehension Assessments or topic assessments were given in the designated mathematics allotted time to create the same atmosphere students learned the material. Students were given a privacy folder for their desk to prevent cheating. During the Comprehension Assessment students were read the question twice and clarification was provided to those whom the question was unclear. The class worked at the same pace and those who finished a question early were permitted to read silently from their book boxes. After all assessments were completed they were collected and graded at one time the same day. This allowed for immediate feedback to students before the class moved on to the next topic and consistent grading across all Comprehension Assessments for the sample.

Results

The Comprehension Assessment was given to 22 first grade students, 11 female and 11 male, ranging in ages 6-7. One male student was omitted from the results making the final count 21 first grade students, 11 female and 10 male. The Topic 13 Assessment

or pretest delivered including multimedia, resulted in the mean score of 3.286, see Table 2 for full results. The Topic 14 Assessment or posttest, delivered using traditional lecture, resulted in the mean score of 3.833, see Table 2 for full results. Topic 14 scored significantly higher than Topic 13 (p=.000). In Topic 13, males had a mean score of 3.450 and females had a mean score of 3.136, see Table 3. In Topic 14, males had a mean score of 3.850 and females had a mean score 3.818, see Table 4. Females scored significantly higher on Topic 14 than Topic 13, see Table 3 for full results (p=.002). Males scored significantly higher on Topic 14 than Topic 13, see Table 4 for full results (p= .011). Topic 13 all students scored a minimum of level 2.5, see Table 5 for full score frequency. Topic 14 all students scored a minimum of a level 3, see Table 6 for full score frequency. These results show all students were at standard or a level 3 for only Topic 14.

Table 2

Comprehension Assessment

Topic #	Multimedia	Mean Score	Standard Deviation
Topic 13	Yes	3.286	.4351
Topic 14	No	3.833	.3651

Note. Topic 13 material was delivered with lecture including multimedia. Topic 14 material was delivered with traditional lecture. This table is based on collected results of 21 students. (p=.000)

Table 3

Female Comprehension Assessment

Topic	Mean Score	Standard Deviation
13	3.136	.4523
14	3.818	.4045

Note. Topic 13 material was delivered with lecture including multimedia. Topic 14 material was delivered with traditional lecture. This table is based on collected results of 11 students. (p=.2)

Table 4

Male Comprehension Assessment

Topic	Mean Score	Standard Deviation
13	3.450	.3689
14	3.850	.3375

Note. Topic 13 material was delivered with lecture including multimedia. Topic 14 material was delivered with traditional lecture. This table is based on collected results of 10 students. (p=.011)

Table 5

Frequency – Topic 13 Comprehension Assessment

Score	Frequency	Percent
2.5	2	9.5
3.0	8	38.1
3.5	8	38.1
4.0	3	14.3
Total	21	100.00

Note. Frequency refers to the amount of times a score was received by each student. This table is based on collected results of 21 students. Topic 13 material was delivered with lecture including multimedia.

Table 6

Frequency – Topic 14 Comprehension Assessment

Score	Frequency	Percent
3.0	3	14.2
3.5	1	4.8
4.0	17	81.0
Total	21	100.00

Note. Frequency refers to the amount of times a score was received by each student. This table is based on collected results of 21 students. Topic 14 material was delivered with traditional lecture.

The Perceived Comprehension Assessment was a self-evaluation given to all 21 first grade students, 11 female and 10 male, ranging in age 6-7. These students were

from the same sample as the Comprehension Assessment and were based on the same lectures. The Topic 13 results yielded a mean score of 3.4048 from 4 days of lessons, see Table 7 for full results. Lesson 13-01 resulted in a mean score of 3.7 and lesson 13-03 resulted in a score of 3.4. Lesson 13-02 and 13-04 both resulted in a mean score of 3.8. The Topic 14 results yielded a mean score of 3.1714 from 5 days of lessons, see Table 7 for full results. Lessons 14-01, 14-02, and 14-04 all resulted in a mean score of 3.5. Lessons 14-03 and 14-04 both resulted in a mean score of 3.4.

Table 7

Perceived Comprehension Assessment

Topic #	Multimedia	Mean Score	Standard Deviation
Topic 13	Yes	3.4048	.14483
Topic 14	No	3.1714	.19918

Note. This table is based on collected results of 21 students.

Discussion

This study found students rated themselves higher with the use of multimedia on the Perceived Comprehension Assessment. However, students did better on the Comprehension Assessment when traditional lecture methods were used to deliver the content. This suggested the students' perception of comprehension was altered by the use of multimedia. One possibility for this misconception for the perceive comprehension is the given population having many parents working in the technology field. Although, previous research suggested the inclusion of multimedia would have increased the comprehension level based on accommodating more learning styles (Armstrong, 1994) this study found contradicting results. Based on the teaching methods followed in this

study on this sample, it suggested that students did have better comprehension with traditional lectures. Students continued to score level 3 or higher on the remaining two Comprehension Assessments for the school year.

This study used the means for self-evaluating the perceived level of comprehension with an existing system that was pre-established in the school year by the mentor teacher. The students were well versed in the existing system using it in reading, writing, and mathematics. The self-evaluating system scores were placed on a classroom chart. The scores for this system were not evaluated for a grade but were for the teacher to know individual understanding level on the topic. Students demonstrate authenticity in their perception of their understanding. While data may have been skewed because students knew this was not worth a grade, it is suggested to have been authentic because the students in this class showed a genuine responsibility for their own learning throughout the year.

One possibility for the results is the mid to high socioeconomic status of the families; no students were on free or reduced lunch at the time this study was conducted. In addition, the parent involvement in the classroom was classified as high, with every family having one parent who volunteered once a month and 1/3 of the parents volunteered once a week. The high involvement of parents did not end in the classroom; it led to the students working on math at home daily with completing homework, playing games, or attending tutoring services. In addition, due to the high socio-economic area and parent involvement, the PTSA was capable of raising large amounts of funds which have gone to additional mathematic materials for the classroom and the Math Adventure Program which worked to supplement the learning standards for each grade level run by

parents. This caliber of parent involvement with all students in the classroom suggests normalization of the data collected because it can be assumed all students were receiving additional support outside of the classroom.

This study also found male across the results rated their understanding higher than females. Further research would be needed to discover if students in first grade, with the difference in perceived comprehension, is higher in males in all subjects or only mathematics. Students' gender did show a difference in their overall achievement of the Comprehension Assessment results showing males with higher mean scores for both Topic 13 and Topic 14; see Table 3 and Table 4. Speculations can be made of both the Comprehension Assessment and Perceived Comprehension Assessment based on gender and given a larger population, further differences may be found.

There was no difference in outcomes based on gender. This likely occurred because all students in the classroom were taught the same material in the same environment. The classroom culture established that every student is a mathematician and is equally capable. Students were not treated differently based on sex and were never segregated based on gender at any portion of the lesson, including even separation in the rotation groups. The workshop model could have affected the study's outcomes because students did receive additional assistance after the lecture. In addition, the required use of the workshop model could have affected the stylistic choices made in the classroom management, which could have changed results. Previous units were co-taught with the mentor teacher. The investigator became the sole teacher of mathematics at the beginning of this study. These being the first full units taught as the primary teacher of the classroom also affected the classroom management of the classroom. Students were

adjusting to a new environment in the process of being evaluated on comprehension. Therefore, the new environment could have resulted on students decrease in scores with the use of lectures including multimedia. Although, based on units that preceded this study, the students of this classroom continued to perform better with the exclusion of multimedia in lectures.

The study started as 22 first grade students, however, one student, a male, was omitted from the study because the student did not have viable data on four days of lessons. He missed one lecture using lecture with multimedia, three lectures using traditional lectures. In addition, the controlled variables such as the environment and schedule were altered on those days. The final count of students was 21, 11 female and 10 males. This study had a small sample size and the outcomes could have been affected by the given size and population. However, given this sample size data providing in comparing the Comprehension Assessment and Perceived Comprehension Assessment was determined significant, see Table 2 and Table 7. The external validity showed these results were applicable to this classroom but cannot necessarily be used to be generalized. However, the results yielded did improve the teaching of these specific students for the remaining portion of the school year. The information found directed how the remaining two topics in mathematic were taught. The students were taught using traditional lecture and all students performed at a minimum of level 3 on the topic assessments.

Although results may be applicable to other populations, it was not the aim of this study to identify the causal relationship between lecture style and comprehension, or the effects that may impact results in a group different from this particular demographic. Assumptions were made as to ways that the investigator could improve their instruction

in this given classroom, but this study does not assume that those recommendations are applicable the general population of elementary age students. Rather, this study looked to improve the methods of teaching precisely for this population through the delivery of information through lectures in this given environment.

During the time this study was conducted topic 14 was recorded via videotape, whereas, topic 13 was not recorded. The camera may have altered the results because students did act differently during the recorded lecture. The camera may have motivated the students to become more engaged to the lecture. The investigator during this time was being videotaped for an outside teaching evaluation. This evaluation may have motivated the investigator to provide better teaching and management methods than demonstrated on Topic 13. Working with technology was not the forte of the investigator but overtime improved. Delivering content with traditional lecture, allowed for better management of the classroom. These factors could have caused higher scores with traditional lecture methods.

The increase in rigor through higher leveling of questioning is one possible reason to the increase in performance on traditional lectures. Lectures including multimedia had questions prebuilt into the content that ranked low on both Bloom's Taxonomy and Ciadiello's model of questioning. Traditional lectures offered room to ask and answer better questions throughout the lecture. In addition, the experimenter's bias on the results could have affected the teaching methods. It was expected that students would perform better with lectures including multimedia. It can be speculated that subconsciously less effort was put into the lectures with multimedia because students were expected to do

better. Reversely, more effort could have been put for traditional lectures to show that the teaching was as good as the lectures with multimedia.

This study was initially proposed using students in a middle school Social Studies class with a cloze assessment to assess comprehension. However, circumstances were changed three months into the study with the change of the investigators student teaching placement and the collected information was only pertaining to lectures including multimedia. The study was adapted to students in a first grade classroom during mathematics. Due to the drastic change in age level the cloze assessment was no longer developmentally appropriate. Students in the classroom were at varying levels for reading and writing skills. Cloze assessments require students to be able to articulate verbatim from the lecture and the variation in these skills would not have been a fair representation of the comprehension level for all students in the classroom. In addition, comprehension was measured by the application of knowledge taught during the lecture and not simply the recitation of the lecture content.

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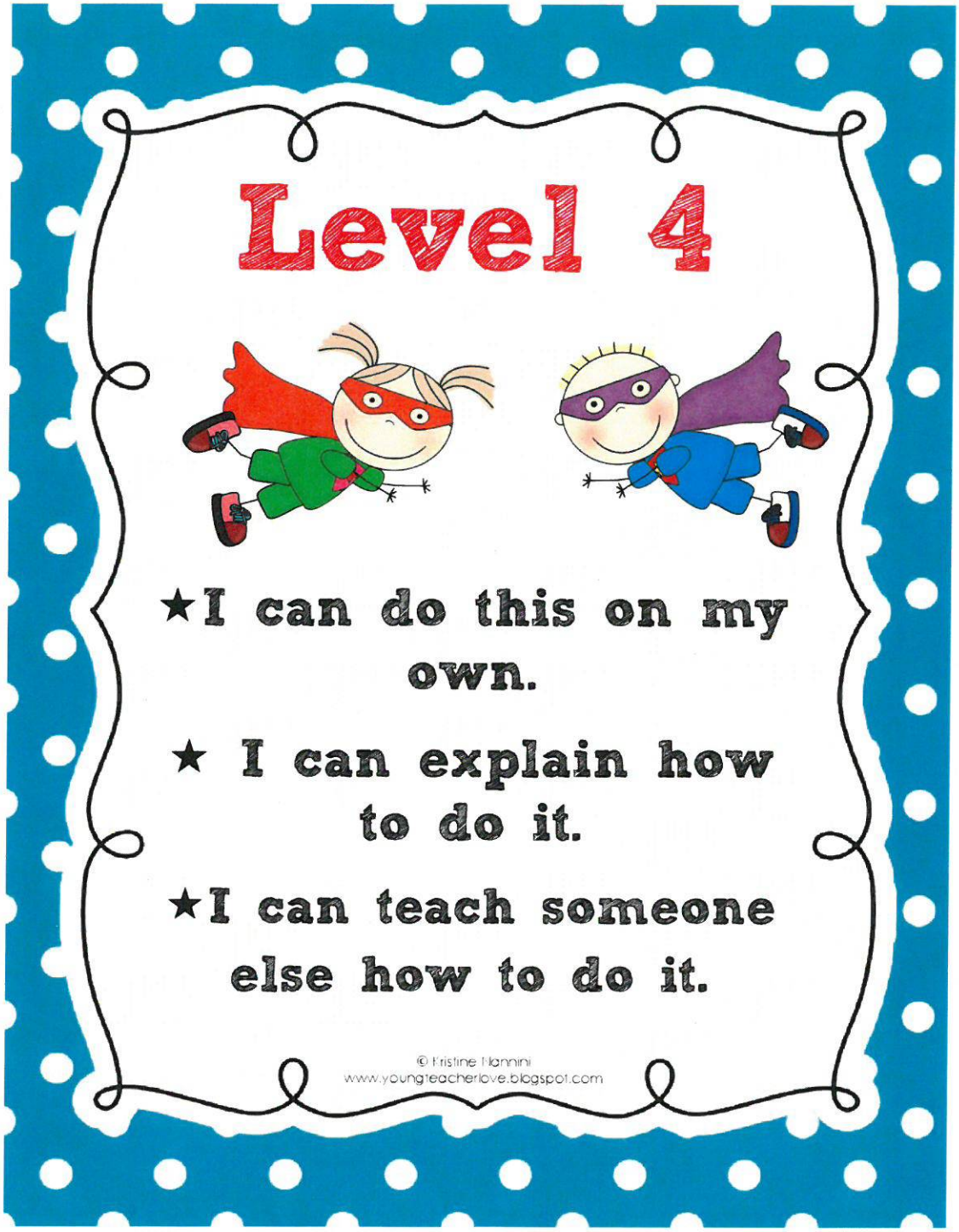
Appendix A

Perceived Comprehension Assessment

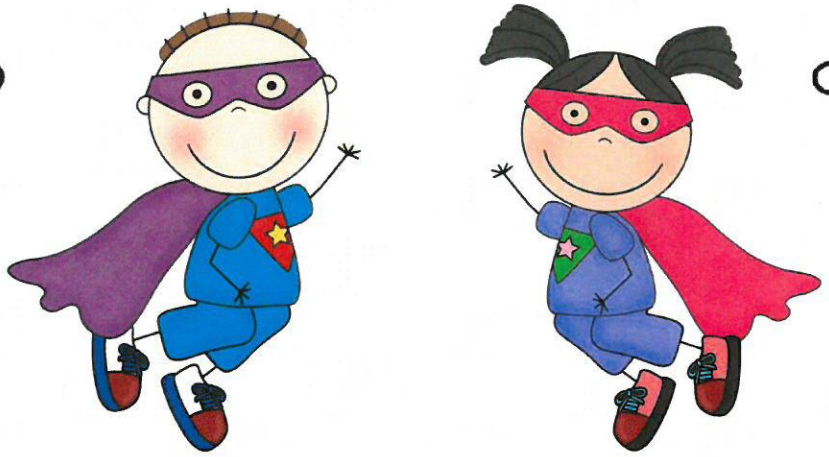


Level 3

★I can do this on my own without help.

★I can show I understand.

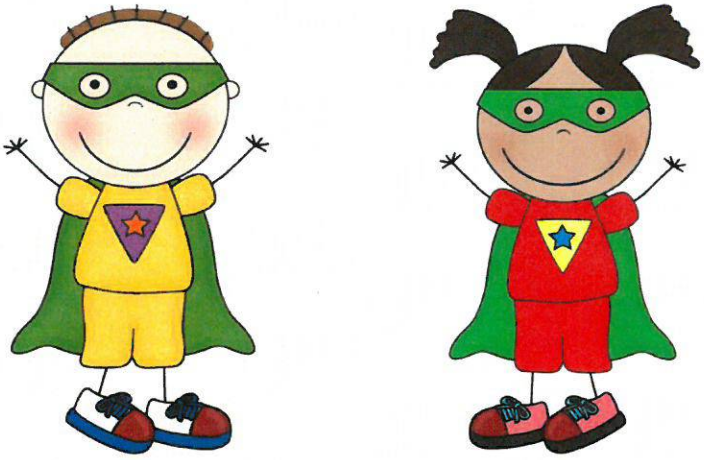
Level 2



★I can do this with help or an example in front of me.

★I kind of get it, but may make a mistake.

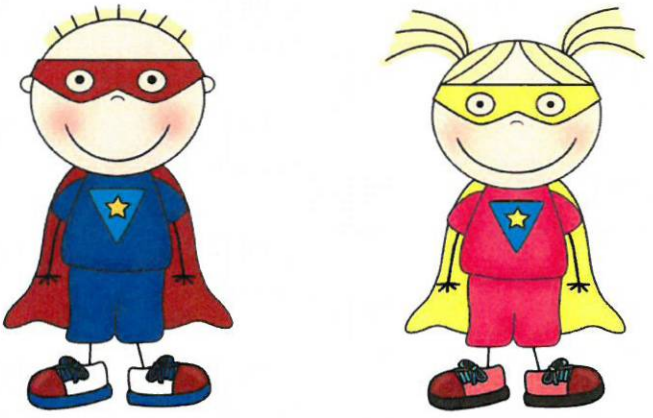
Level 1



★I am starting to get it, but am still confused.

★I am just starting to learn this, but don't understand it completely.

Level 0



★Even with help I still don't understand.

★I can't figure out what I am doing wrong.

Appendix B

Comprehension Assessment - Topic 13

Name_____

Grade 1 Topic 13 Assessment	Score
Cluster 9: Time **Reporting Domain:** Measurement and Data	

1. Which time is shown on the clock?

O A. 7 o'clock

O B. 6 o'clock

O C. 5 o'clock

O D. 4 o'clock

2. Circle the minute hand on the clock.

3. Which clock shows the same time?

O A. 

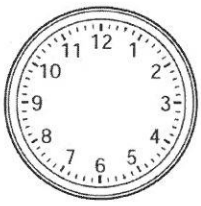
O B. 

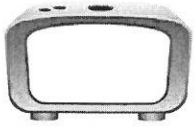
O C. 

O D. 

4. Draw the hands on the clock face. Then write the time on the other clock.

6 o'clock





5. Which clock shows the same time? 

O A 

O B. 

O C. 

O D. 

6.

Time Sam gets out of school.

Time Sam eats dinner.

How much time goes by between when Sam gets out of school and when he eats dinner?

_____

7.

Time a movie started.

Time a movie ended.

How long was the movie?

_____

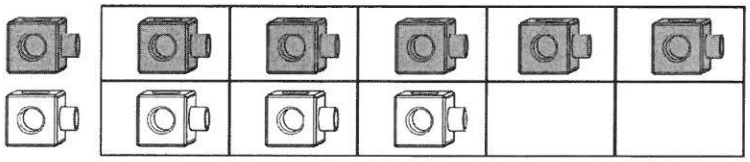
Appendix C

Comprehension Assessment - Topic 14

Name_____

Grade 1 Topic 14 Assessment	Score
Cluster 10: Data Representation **Reporting Domain:** Measurement and Data	

1. Lucas made a graph to show his cubes. Which sentence tells about his cubes?



Ⓐ Lucas has 2 more gray cubes than white cubes.
Ⓑ Lucas has more white cubes than gray cubes.
Ⓒ Lucas has 5 cubes in all.
Ⓓ Lucas has 5 gray cubes and 1 white cube.

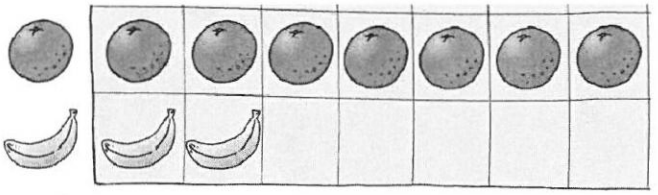
2. Billy makes a tally mark for each bead he counts.
Which shows how many round beads he counts?

Ⓐ 𝍸 |
Ⓑ 𝍸
Ⓒ ||||
Ⓓ |

	Total
 Round	5
 Square	1

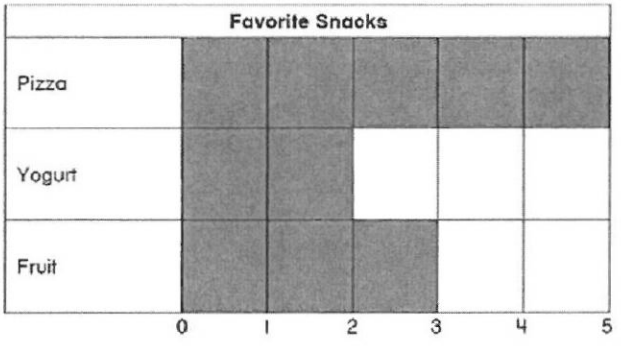
3. Look at the graph.

How many fewer bananas than oranges are there?



1 (A) 3 (B) 4 (C) 5 (D)

Roberta made this graph of her friends' favorite snacks.



4. How many <u>more</u> friends chose Pizza than Yogurt? _____

5. How many <u>fewer</u> friends chose Yogurt than Fruit? _____

6. Use the information in the chart to complete the Tally Marks.

Favorite Flower	Tally Marks	Totals
Rose 		3
Daisy 		6
Tulip 		5

Draw pictures to make a picture graph that matches the chart.

Favorite Flower							
							
							
							

7. Based on the graph in Question 6, which flower is the favorite?

Favorite flower: _____

Explain using words and numbers.

_____

_____

_____