

Student Led Instruction vs. Teacher Led Instruction on beginning of class Warm Ups

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Abstract

The purpose of this study was to compare student-led instruction on beginning of class warm ups to teacher led instruction on beginning of class warm ups. Would combining two known effective strategies prove more efficient for achieving maximum student comprehension in mathematics compared to the traditional method of direct teaching instruction? Two pairs of advanced math and standard math students participated in the study. One group from each level was exposed to one of the strategies for an entire math unit for approximately four weeks. Students completed a pre-test to set a benchmark to measure student growth. Each week students completed small assessments to show any short term growth, and at the end of the four week unit all students completed a comprehensive unit exam. The study showed that the null hypothesis was supported when comparing the assessments on academic growth between the two groups except during the week three assessment which rejected the null hypothesis. Therefore the results from the study show that further research needs to be done to determine the achievement benefits from student-led instruction during the beginning of class warm ups.

CHAPTER I

INTRODUCTION

Overview

With the focus on math significantly increasing, educators are exploring more efficient strategies to reach all students. Kroeger and Kouche (2006) along with Conderman, Breshanhan, and Hedin (2012) believe that peer teaching is a powerful teaching strategy that can be utilized to help struggling learners. Webb and Rule (2014), supported by a variety of other studies have shown the importance of an effective introduction to a lesson. Peer teaching and warm ups, used as introductions to lessons, are proven effective teaching strategies. Combining a daily routine such as a warm up with an instructional strategy, such as student led instruction, may increase class understanding of a concept.

Student-led instruction can simply be described as one student teaching another student. There are a variety of different ways that this can be implemented. Student-led instruction can be peer to peer, small group, or entire class being taught by a single student. Each method has benefits and purpose. The study in this review will focus on an entire class being led by a single student, in essence the student become the teacher and going through the beginning of class warm up with the class.

Student-led instruction is a subset of differentiating instruction used to increase student comprehension. It allows content to be presented to students through a different view other than the way the general educator interprets it. Giving different perspectives of a concept increases the possibility that more students will understand the concept. Student teaching creates a community in the classroom where some students may feel more comfortable to ask questions if they are asking them to a peer or friend rather than an adult. Student-led instruction benefits the

teaching student by reinforcing his or her understanding of the concept. This also allows the general educator to observe the depth of understanding that the teaching student has on the topic. It also allows the teacher to move around the classroom and observe students while allowing students to persevere and build their independence.

This study focused on individual students explaining to a class of approximately 30 math students how to solve the beginning of class warm up. To do this the student will allow the class to complete the warm up and then explain to the class step by step procedures on how to solve the warm up problem(s). If the student does not understand how to complete the warm up or if he/she is struggling then the student will call on the class to help them complete it. In a sense, the lead student becomes the teacher during this time.

Reaching all students is a challenge, so finding ways to engage and integrate students' active involvement in the lesson is a strategy to influence more students. Giving students the tools and empowering them to complete the introduction of the lesson is a way to increase student involvement in the lesson. A classroom is a community within itself, with different students adding different dynamics to an ever evolving environment. Students need to feel comfortable and secure in the environment to be successful. Empowering the students to take on the responsibility of the warm up is another strategy used to build the community of the classroom.

Direct instruction has given way to differentiated instruction or DI. Many studies have shown that differentiated instruction is a more effective tool than direct instruction. A warm up is a staple to any good lesson, as it is used as a review, an understanding check, or a pre-teaching activity to what will be taught. Student-led instruction is a proven effective teaching strategy. Combining the two strategies may enhance student learning more than a teacher simply going

over the warm up. There are also benefits of having a teacher give direct, step by step instruction on how to complete the warm up as a good review to a concept that the students may not have completely understood the day before. It is also important to understand why a new strategy is better than the alternative, which in this case would be direct instruction.

Statement of Problem

The purpose of this study was to compare direct teacher instruction versus student-led instruction on completing the beginning of class warm up. Specifically, is it more beneficial for students to collaboratively check their warm-ups relying on peers to walk them through how to correctly answer the question; or is it more effective to have the educator go over step by step instructions on how to correctly answer the warm up?

Hypothesis

The null hypothesis for this study was that there would be no significant differences in academic growth between the standard and advanced selected student groups receiving student led instruction on how to solve the beginning of class warm up versus the standard and advanced selected student groups receiving teacher led instructing on how to solve the beginning of class warm up.

Operational Definitions

Student-led instruction is defined by this study as an individual student teaching his or her class of peers on how to solve a problem, or working with the class on how to solve a problem.

Warm up is defined by this study as a short problem set used as a lesson introduction, usually a review, a pre-teaching activity, or an attention getter to the day's lesson.

Differentiated instruction is defined by this study as different techniques to present material to students to help them understand the concept.

Teacher direct instruction is defined by this study as a teacher lecturing and writing down step by step instructions on how to solve a problem.

Raw score is defined by this study as a student's score, divided the number of points they get correct, by the total number of points possible, multiplied by 100.

Assessment is defined by this study as any instrument used to measure student understanding of a concept.

STEM 7/8 is defined by this study as an advanced seventh grade math class. Students who successfully complete this class would move onto Algebra in eighth grade.

Common Core 7 is defined by this study as a standard seventh grade math class. Students who successfully complete this class would move into STEM 8 in eighth grade, which continues building the foundations for Algebra.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this literature review is to identify the importance of student led instruction and beginning of class instruction. The review is broken down into three sections. Section one analyzes the importance of student led instruction. Section two analyzes the balance between direct and student led instruction within the classroom Section three explores beginning of class instruction through warm ups.

The Importance of Student Led Instruction

Student led instruction or peer teaching has become a popular teaching strategy due to its ability to build community within the classroom, differentiate instruction, and allow for different perspectives of teaching.

To have an effective learning environment there must be a sense of community within a classroom. Kroeger and Kouche (2006) found that peer teaching helps develop “appropriate social skills in a natural setting” (p.6). Students develop a significant amount of their social skills in the school building where they are interacting with their peers and spending most of their time. Students need to have a feeling of belonging and safeness to be willing to open up to new ideas and feel comfortable expressing their own ideas and beliefs. In an educational setting that requires students to work with peers, students need to know that their peers respects them. Effective peer teaching develops the “reciprocity between students with stronger and weaker skills” (p.8). This allows both types of students to learn from each other and helps build the community in the classroom. Sharma (2015) identifies that “most people will not take risks in an emotionally unsafe environment” (p.290), so a classroom must be an area where students feel safe and willing to take risks. Risk taking can include getting up in front of a class and

explaining their work, or having the confidence to teach another student how to solve a problem. The community in the classroom must be safe, and peer teaching builds upon the community and strengthens it.

Content can be delivered through different means, and Conderman, et al. (2012) believes that “varied instruction, simultaneously engages all students, and conducts ongoing informal assessment of students’ skills” (p.33). The peer teaching model can be one student teaching another student, a single student teaching a small group, or even a single student leading the class through a problem. Even when students are collaboratively working as a group to solve a problem, peer teaching may be taking place. Any time a student is teaching another student peer teaching is occurring. When surveying teachers on the social implications of peer teaching Allsopp (1997) found that the teachers felt that peer teaching was especially helpful for students who were low achieving. These students are the ones who don’t learn well from direct instruction and need differentiation to be more successful. Every student learns differently and by differentiating an educator has a better opportunity to reach all of his or her students. “Active engagement occurs when students process information through talking, moving, writing, manipulating, interacting, reading, discussion, and exploring values and attitudes rather than just watching a listening” and when peer teaching affects so many different interactive teaching methods, more students are going to understand the concept being taught (Conderman, et al., 2012, p.34).

A teacher teaches and views the class through the lens of an educator, while students view the class through the lens as a student. Therefore a teacher and a student have two different views of what and how content is being taught. By allowing peers to teach other peers they are teaching them through the lens of a student. A struggling student may have a better chance to

understand the information if it is being presented to them through a different point of view than from the teacher's. When students are teaching other students, it is important that the teacher "becomes a facilitator to the student discussion, while being careful not to take away from the student's initiative and ownership" (Francisco, 2013, p. 436). As a facilitator the teacher directs the students' discussion but does not over take it. This allows the students to share their perspectives and develop responsibility and ownership in the learning process.

Balance Between Direct Instruction and Student-Led Instruction

Education experts have developed many different teaching methods, but direct instruction and peer teaching are two fundamental teaching approaches that are frequently used to educate students. Each strategy has its own benefits and drawbacks depending on the situation and an effective educator will utilize them to maximize student learning.

Direct instruction is purposeful and effective, although it has come under scrutiny for being less effective than other strategies. Direct instruction is when the teacher gives direct instruction/information to the students on a topic. Lectures, notes, and examples are all forms of direct instruction. The benefit to direct instruction is that it is the most efficient way to get information out to students. The problem with a lecture style teaching is that it does not meet the need of all students; Schwerdt and Wuppermann (2011) found that lecture style teaching "is strongest among higher-achieving and more-advantaged students" (p.66). Therefore the less advantaged students end up falling behind as well as the non-auditory learners. Direct instruction by itself is not nearly as effective, as using it in correlation with some other strategies, specifically peer teaching.

Peer teaching has received praise across the education field, and has shown that "greater academic gains were achieved by students engaged in peer tutoring interventions than non-peer

tutoring instructional arrangements” (Bowman-Perrott et al., 2013, p.49). As successful as peer teaching is as a collaborative activity, Onrubia, Rochera, and Engel (2015) concluded that “students find difficulty in adequate, spontaneous regulation of their own collaborative processes, without specific aids” (p. 204). Students’ need some prompting from the teacher or another source that they can then use to implement peer teaching strategies. Zahner (2011) found that some educators have been resistant to this methodology due to their view that “group mathematical discussion can disrupt the traditional construction of authority in mathematics classrooms” , but he believes that “extended discussion that appears to wander may, in fact, be more productive in terms of student learning” (p.247). The purpose of peer teaching is to present material from a different perspective than what the teacher uses. This allows students who did not understand the concepts being taught by the educator a better opportunity to understand the concept from their peer.

Direct instruction and peer teaching are two educational strategies that improve upon each other when used together in an instructional setting. Direct instruction is used to lay the ground work for what is required, while peer teaching is used to re-enforce the content being taught. The teacher takes on the role of the facilitator/moderator but the focus is still on the students. Using both methodologies together increases the overall academic achievement across a wider range of students.

The Importance of Warm Ups

The start of every lesson should begin with a warm up, as it is a staple to any effective lesson. Warm ups are used as a starting point for a lesson so that an educator can lead into the core concepts that are being taught for that day. As the beginning of almost every lesson they are viewed as part of the classroom routine. Teachers and students use the time during the warm

up to prepare for the lesson and incoming class. Allowing the students to lead the instruction on the warm up allows the educator more freedom to move around the classroom and observe students. Having an effective warm up sets the tone for the entire class, engaging students and exciting them to want to learn, or it could cause an adverse effect.

Warm ups can be used to review, to re-teach, for pre-assessment, or for content spiraling. They can also be used to continue from where the previous day's lesson ended. This allows students to get back into the mindset of the previous day and recall the information more easily. The use of warm ups as a pre-assessment is a strategy educators use to quickly assess what students know about a concept that has not yet been taught. Knowing this lets the educator decide how much time to spend on the concept. Content spiraling is another use for warm ups where a teacher spirals in previously learned content so that students do not forget material taught weeks/months earlier.

A lesson can be broken down into three general areas: the introduction, the activity, and the closure. The introduction is where the warm up falls. An effective warm up gets the students thinking about the subject and preparing them for the activity. Webb and Rule (2014) showed that that an engaging introduction to a lesson can have significant impact on student knowledge and creative performance over a non-engaging introduction. If students are not engaged in the introduction then they are less likely to be engaged in the rest of the lesson. Student led instruction on the warm up would immediately engage the students since they are the ones leading the instruction. Having a strong introduction sets the tone and purpose for the rest of the lesson.

An effective educator lays out his or her rules and expectations during the beginning of the year. The time at the beginning of class can be used efficiently or it can be wasted;

If students don't have a clear understanding of the teacher's rules-and if it has not been demonstrated that the teacher will consistently enforce those rules-they may spend a number of minutes strolling in, speaking to their friends and taking their own, sweet time about getting in their seats and getting out the material they need for class. ("Warm Ups", 2007)

A few minutes at the beginning of class adds up over the course of a school year. The time at the beginning of class is not just for students but for the teacher as well. This "bell work provides a useful learning activity while the teacher takes care of all those necessary administrative chores" (p.2). The warm up is used to help manage the class as well as an important learning tool.

Summary

Warm ups, and peer teaching are two significant teaching methods that can be built into any lesson across any subject. Direct instruction is also an important teaching strategy and should be used when appropriate, but to maximize student understanding educators need to look to new ways to reach all students while maintaining pace in the curriculum. Combining warm ups with student led instruction would be a small step that would meet this need. It would also build class community, increase student responsibility and ownership while meeting the needs of more the students.

CHAPTER III

METHODS

The purpose of this study was to analyze the effectiveness of student led instruction on going over the beginning of class warm-up. The null hypothesis was used in the study. All students in the study were given a probability pre-test to create baseline data before the different teaching strategies were implemented. The study lasted four weeks for each group. Throughout the four weeks the students were monitored with weekly assessments used to reflect any short term differences. At the end of the four week period all students completed an end of unit comprehensive assessment on the entire probability unit. The treatment between the groups occurred in the first few minutes of class during the warm up. Once the warm up was completed, the two STEM 7/8 classes and two Common Core 7 classes received the exact same instruction, activity, closure, and homework as their counterparts.

Design

The design plan used for the study was quasi-experimental. It was quasi-experimental due to the student groups being pre-determined based on the class, and that there was a pre-test compared to post tests; thus, there was no randomization.

Participants

The study was performed in a Maryland public middle school that had a population of 1026 students. The demographics of the classes that participated in the study included 123 seventh grade students ranging from eleven to thirteen years in age. The 123 students included two African American students, three Asian students, 102 Caucasian students, eleven Hispanic students, and five Multi-racial students. These were all spread evenly across the groups. The classes also contained two English Language Learners, one in each of the standard level math

groups. This maintained an appropriate balance for the study, as there was one in the student led instruction group, and one in the teacher led instruction group. There were eleven students with 504 plans spread relatively evenly among the groups. The study groups contained no special education students or students with IEPs.

Instrument

The main instrument that was used in this study to determine change was assessments. These assessments included a pre-test, weekly quizzes, and an end of unit test. All assessments were conducted in an environment where students were silently, independently working on their own. All assessments used for this study were collaboratively created by three veteran math teachers (each teacher having a minimum of five years' of experience teaching middle school mathematics). The assessments were also presented to and approved by the school's mathematics department chair. The assessments used questions pulled from the local board of education approved question banks, as well as questions created in collaborative planning. This allowed for a comprehensive selection of questions. After each assessment, the data was cross checked with the other two math teachers' student test data to support the reliability and validity of the assessments.

There is a school policy that needs to be noted here, which is that if a student puts a good faith effort in completing an assignment, he or she will receive a grade no lower than a 50%. For the study, all student scores were taken as raw scores, and since the measurement of growth was based on content knowledge, any change, no matter how small, or low, needed to be recorded and measured.

The pre-test, quizzes and posttest included a mix of multiple choice, fill in the blank, and short essay response probability questions. Different types of questions produce a

comprehensive view of a student's understanding of a concept. The first assessment was the pre-test that covered all material from the four week unit. The second assessment was a quiz given after one week of instruction on experimental probability and theoretical probability. The third assessment was a quiz focusing on the second week of instruction, which was probability and simulations. The fourth assessment was a quiz focusing on the third week of instruction, which consisted of compound probability, and it spiraled one question from the previous quiz on simulations. The fifth assessment was a comprehensive probability exam that covered all concepts taught in the unit.

There were no validity and reliability statistics for these assessments due to the fact that they were created by a team of teachers at one school and administered to only seventh graders there, which included the study group. It has not been assessed for validity and reliability. It should be noted that based on comparing data from the other seventh grade classes who took the assessments (approximately 360 students in total) that the results were relatively similar.

Procedure

The research focused on the probability unit for two standard and two advanced seventh grade math classes. All classes received the same assessments, and same type of classroom instruction (except for the beginning of class warm up) throughout the unit. One standard and one advanced class received student led instruction on completing the beginning of class warm up. The other two classes received teacher directed instruction on the beginning of class warm up. All four classes received the same pre-test, which gave a baseline measurement for student progress. The probability unit covered a four week period. During this time students received weekly quizzes to measure short term differences. At the end of the unit all students

from all classes completed a comprehensive probability exam, measuring any long term effects that the different warm up strategies had.

Before the implementation of the study the teacher directed the student led group on how to appropriately lead the class through the beginning of lesson warm up. Students were to enter the classroom and complete the warm up for four minutes, and then a student would lead the class through the warm up. Students were selected alphabetically, which allowed all students to lead the class through the warm up. Students were prompted by the teacher the day before, reminding them that they would be doing the warm up the following day. The advanced notice helped prepare students and helped prepare the students who easily get nervous. When a student went over the warmup, he/she would give step by step instructions to the class using their work on the document camera or dry erase board, depending on the problem. If a student did not understand how to complete the warm up, then he/she would ask the class for help and call on another student to help. That student would then explain to the lead student what he/she must do to solve the problem. The lead student would then work through the problem on the dry erase board or document camera, following the steps provided to them by the student. At the end of the student's explanation, he/she would ask the class if there were any questions or comments; this allowed for student talk so students could ask for clarification for any part they did not understand. The teacher would only intervene and assist if the class could not reach the correct answer on the warm up. At that point, the educator would ask leading questions to help guide the class to figure out the solution. At the end of the warm up, the teacher would identify if the answer was, in fact, correct or incorrect. If the answer was correct, then the student was finished; if it was not correct, then the student would have to rework the problem with the help of the class and educator (if need be). The training of the students on how to run the class through

the warm up included a month long trial session. The purpose of the trial session was to allow students the opportunity to practice their new role, and so that the educator could give advice.

In the teacher led group, students would come into the classroom and complete the warm up for four minutes. After the four minutes the teacher would lead the class through direct step by step instructions on how to complete the warm up. The teacher would complete the warm up without the assistance of students in the class.

CHAPTER IV

RESULTS

The purpose of this study was to compare direct teacher instruction versus student led instruction on completing the beginning of class warm up. Is it more beneficial for students to collaboratively check their warm ups relying on peers to walk them through how to correctly answer the question; or is it more effective to have the educator review step by step instructions on how to correctly answer the warm up? The gains from the pretest to each of the four weekly math tests for seventh graders taught using the two strategies, student or teacher led, were analyzed using a t test for independent groups. A separate analysis was used for both the standard and advanced classes. The results are reported in Table 1.

Table 1: Math Assessment Gains for Teacher vs. Student-led Warm Ups

Group	Test	Instruction	Mean Gain	n	Standard Deviation	t	Significance
Standard Level	Week 1	Student Led	62.5%	28	20.25%	0.85	0.4
		Teacher Led	58.0%	32	20.79%		
	Week 2	Student Led	38.2%	28	23.04%	0.43	0.67
		Teacher Led	35.6%	32	23.22%		
	Week 3	Student Led	9.6%	28	31.46%	2.92	0.005 *
		Teacher Led	31.3%	32	26.09%		
	Week 4	Student Led	52.3%	28	16.24%	0.18	0.86
		Teacher Led	51.6%	32	16.58%		
Advanced Level	Week 1	Student Led	36.9%	31	22.94%	0.54	0.59
		Teacher Led	33.8%	33	23.59%		
	Week 2	Student Led	33.8%	31	25.88%	1.07	0.29
		Teacher Led	27.2%	33	22.81%		
	Week 3	Student Led	30.7%	31	21.61%	1.49	0.14
		Teacher Led	22.5%	33	22.51%		
	Week 4	Student Led	38.1%	31	22.04%	0.64	0.52
		Teacher Led	34.4%	33	23.51%		

* p = 0.005

The null hypothesis that there would be no significant differences in academic growth between the standard and advanced selected student groups receiving student led instruction on how to solve the beginning of class warm up, versus the standard and advanced selected student groups receiving teacher led instructing on how to solve the beginning of class warm up is rejected for standard students on the week three assessment, and is supported for all other assessments.

CHAPTER V

DISCUSSION

Study Analysis

Based on the results of the study there are no significant academic achievement differences between the two instructional strategies on the four assessments, except for week three. In this week, the standard level teacher led group scored significantly higher (having a 0.005 significance) than the standard level student led group. With the exception of that week, each group performed relatively equivalent as its counterpart and either strategy could produce similar results.

A reason why there was such a discrepancy with week three was due to three students receiving zeros in the standard level student led group. The assessment required students to support their answers with explanations. If a student had a wrong answer they could have still received partial credit if they explained their work. Each of these students gave incorrect answers and two of them did not explain their work, so they were not able to receive partial credit. The third gave incorrect answers and work. There were other students who did not get the answers correct, but showed work that was relatively accurate, so they received partial credit. These three zeros pulled the groups' mean significantly down and caused the standard deviation to be much larger. No other group, including the advanced student led and teacher led had such a big discrepancy.

Implications

Although there were no major academic differences, other than week three standard, between the two strategies, each one has a purpose and should be used when appropriate. The benefit of students leading the class through the warm up is that it allows the instructor time to

take attendance, help individual students, and assess the class. This method also allows students the opportunity to see how a problem would be solved through different perspectives. The classes that participated in student led instruction seemed to work more collaboratively as a group. Students working with each other helped foster peer relationships and built the community in the classroom, which led to more inclusion of students. There are other benefits to having a teacher direct the class on how to complete the warm up. A teacher can identify and go over specific problems that he or she noticed from the previous lesson. A teacher may also be able to give a clearer answer than a student. Each strategy has benefits that maximize the effectiveness of the instruction. An educator should utilize the most appropriate strategy for that specific warm up.

Threats to Validity

- The educator must offer outside class help to any struggling student after school, or in advisory. All students have the option to come in for extra help during these times and some students utilized this opportunity to improve their content knowledge.
- Students have tutors outside of school that could improve their content knowledge.
- The school has a redo policy; which allows students to redo assessments. The assessment data recorded for this study only used the original scores and not the redo assessments. Students still have the option, and they may use that as a crutch in taking the original assessment, knowing that there is a second opportunity to do better.
- The assessments were created independently, so they have not been extensively vetted to show their reliability and validity.
- The teaching ability of each student varies: some were more effective than others.

Relationship between Literature Review and the Study

The results of the study showed that there was little difference between the teaching strategies. Conderman, et al. (2012) believed in varied instruction and that each type of instruction has its benefits. Traditional lecture style and student led instruction each have their own benefits and can be utilized effectively in the correct context. How an instructor begins his or her class varies depending on the type of lesson that is being introduced. Throughout the unit there may have been warm ups that were more tailored toward teacher-led instruction over student-led instruction and vice versa. Either method can be effective in completing the warm up but the warm up is essential to the lesson and provides a learning activity for the beginning of class (“Warm Ups”, 2007).

Future Suggestions and Additional Research

Using the warm up for a single mathematics unit may have been too short of a time frame to measure which instruction type has a greater increase in academic achievement. A more effective study may require the use of an entire semester or year. This would allow for more opportunities to show the difference between student led and teacher led warm ups. Observing the social aspect from this study, one could make the argument that the student led group developed a stronger community due to an increase in student involvement in the classroom, but cannot be conclusive without supporting data. Social development is equally as important to academic achievement and should be measured accordingly. The use of student led instruction allowed the teacher time to do other educational things for the class. An educator could use this time to pull students, take attendance, or check homework, all of which are things that would positively impact student achievement. A future study should include a social

measure of the classroom community, a longer timeline and a record of the supports that an educator can implement with the class while having a student go over the warm up.

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