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Group work integration for middle school math students

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Richard Cromwell

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Abstract

Raising the test scores in middle school mathematics classes was the intended solution for my project. This required a coordinated effort between me and the teacher to engage students in group work problem solving which combined students together according to their academic grades. By creating this new seating chart, we had an A student with a B student with a C student and a D or F student working together to solve sets of mathematical problems. This grouping created the perfect dynamic for peer interaction while each student was involved in their own learning. The assessment materials created were an average test score printout from the teacher's database which showed the improvement as each week passed. Confidence and less anxiety were the result of this project as well as improved test scores. Students became more interested in their next lesson plan because they were ready.

Backstory

I have always been frustrated by the way math has been taught to students who are bright in other subjects, but just don't seem to get the way the rules are laid out, from the curriculum placed in front of them. For these students, the daily lesson is presented, then students work on problems until they finally get frustrated enough to tune out or give up. Working individually or in groups only seems to frustrate those who desire to learn the difficult material presented to them which is like a foreign language. I was fearful of Math because it seemed to transition too fast without grasping the concepts fully which had stayed with me for many years until I finally reached college. Upon going to college, I found the key to unlocking the door to success in math: a curriculum filled with concentrated efforts by the teacher to engage his/her students. I finally understood math which led me to pursue a B.S. in Mathematics.

When I was in middle school, I achieved high marks in all of my classes except for math which I always worked on but couldn't figure out a way to retain anything I just read. I felt that my low grades in math couldn't just be the teacher's fault because some students received good grades. Unfortunately, when broken into groups, the majority of our class would gossip and pretend to be working on our assignments. To me, this seemed like a huge waste of time and I always felt like someday this was going to affect me somehow. I wanted to have a tutor for this difficult class but my parents couldn't afford one at the time.

During my service learning experiences, I spent time in classrooms tutoring math students. I have seen students become so disengaged in the material that, they start misbehaving to get sent out of the room. When students are placed in groups to complete worksheets or a list of

problems, they often times are texting on their phones, chatting about gossip or staring off into space. These students remind me of myself 30 years ago which is sad to see. It seems that things haven't changed much in all these years. The teachers I have worked with seem to have no choice but to keep raising their voices louder and louder to try and explain things, which really doesn't work at all. Teachers I have witnessed are being overburdened with large class sizes and pupils which seem hard to manage on a daily basis.

This issue creates interest for me in my future goals of becoming a teacher and developing a pedagogical method for helping secondary school students develop a more comprehensive understanding of math. I will be a middle school math teacher, which places me right in the heart of the problem I faced during that time of my life. I don't want my students to be nervous when test time comes because they feel they don't understand the concepts which were presented to them weeks ahead. When my students leave my classroom, I want them to be happy because they have tackled a subject which many students fear.

I would like to continue to work with students in Seaside Middle School and Los Arboles Middle School in Marina. For the past three years, I have been doing service learning in these two sites tutoring math as well as other volunteer work which I have found to be extremely rewarding. In these locations, I have witnessed the same frustrations I went through as a child and feel bad for their situation. I have seen students experiencing a lack of focus, and lack of motivation to succeed, and they are giving up. My goals are to do something to change this situation.

Students I work with in the Monterey Peninsula School District are in need of help right now because they are diverse, face second language issues and have scored poorly in the past on tests.

Group Work Integration

These students are mostly Mexican, - 80%, 10% black and 10% white students. Understanding a white teacher is a challenge for most because many are currently trying to learn the English language. I have seen the scores on their State tests and their class tests which scare me into the feeling that these students need help immediately.

In conclusion, I see a possible remedy for this problem is to create and offer these students more refined group work that, together with homework will engage and challenge them. In my experiences during college, I have found that being partnered with people who know what they are doing is similar to being tutored. Class group-work put together in a creative way can enhance a students' day by making them feel like part of a whole family inside the classroom which makes them more relaxed and susceptible to retain knowledge. This type of interaction would decrease the amount of tension in the room and release the teacher into free-flowing help towards active groups instead of working with individuals, which is too time-consuming. In the end, students find new friends, become more involved in their education and possibly find a new neighbor they can collaborate with over the weekend on special projects or homework.

Literature Review

In middle school mathematics classes across the nation, students continue to struggle when it comes to assessments for the state standards. Math is a challenging area of study for many students whose academic performance seems to be worsening instead of improving. Learning math through traditional pedagogical approaches does not seem to be effective for these students, even when students learn math, in group-work activities. By describing the way middle school students use their classroom time in studies of alternative approaches to coursework, students may have a new way to improve their self-confidence, learning ability, and camaraderie in the classroom.

Group-work, when done in innovative and strategic ways, can be an effective way to impact middle school student math learning. Methods including the mixing up of students according to their last test scores and interacting with their classmates in a small group forum have given him a great challenge to test, (Bianchini, 1995). He has shown that by using a program for complex instruction which blends together all grade levels of students, which included special conditions for learning by solving one problem between the whole group, together with continuing the normal tradition of test construction, the students in all observed classrooms improved. They have come to a consensus in this study about middle school, for the percentage of students talking and working together, including significant gains found on all five pre-, post-tests. The basis for comparison in the before and after effect of the research is reflected in grades attained. This research dealt with a model of group-work which addressed teaching math at a high intellectual level to students with diverse academic skills.

With proper group intervention techniques, like facing each other directly and having each person participate in place the students see things differently during class-time which includes academic, social and self-management skills, according to Campbell and Brigman (2005). The test resulted in gains in math achievement scores from middle school students which previously did not have this type of interaction and have now seen their progress go up each week.

Students who face new concepts in math, coupled with a sense of alienation from their peers, have been receptive to the idea of group-work becoming a fresh innovative way to explore a difficult subject like math. The core of the issue for math learning is the transition from elementary school to middle school, because the curriculum becomes a lot harder and students are segregated into certain sections of learning according to their learning abilities. According to Brannigan (2007) during the transition to a new school, new students need to be taught communication skills and how to build relationships with teachers and peers in order to fully engage themselves in math. Akos and colleagues (2007) have demonstrated that acceptance into peer groups relieves stress, and group work in early adolescence is an effective way to help students succeed in math. Through group-work, adolescents can not only express creativity, but also attain achievement on tests. Results have shown that by having successful relations between peers during group-work, achievement levels were higher in group-work assessments than in individual-work assessments, (Sung, Chang, Chang and Yu, 2010). These findings also show an increase in popularity during the students interactions with their classmates and confidence build up from better achievement on test scores.

Although research has shown an increase in test scores as a result from group-work, teachers have to be creative about how they design group-work with lesson plans. Letting friends hang out together does not seem to work as well using group assignments because they are

concentrating on other issues besides math, and may perpetuate poor attitudes toward school and low aspirations (Farivar, 1992). In order to achieve math score improvement, Farivar (1993) suggests that there are, -three important factors in pedagogical design: seating arrangement, teacher style and instruction. The seating needs to be organized so each student faces one another, the teacher needs to float around the classroom in order to manage the discipline at hand and the instruction needs to be thorough with examples on the board for reference points. The data collected by the National Center for Research on Evaluation, Standards and Student Testing has shown that group processes provide important insights into students' mathematical skills and their behavior in collaborative groups (Webb, 1992). In this study students broke into groups of four to work on decimal numbers. They were then tested on a similar problem without peer collaboration. The results after testing indicated lower average scores by individual learning versus collaborative work. In addition, Duren (1992) found that students who practiced in cooperative groups demonstrated greater long-term memory of problem-solving strategies. Duren's (1992) results suggest that the more you work with problems the better test results you'll achieve. When students were working together, they attempted many more problems which provided them more exposure to possible test questions. With different management techniques like interaction in the classroom, students will feel as if they have really applied themselves and brought themselves out of the usual lonely feeling of learn by yourself methods they grew up with.

In order to create the dynamic of group-work successfully, the teacher must lead by example to show how this activity will play out each day. The composition of groups of students placed together to do math work is an important component of group-work design. Hawley and De Jong (1995) have shown that separation of children according to achievement divisions can be another

way to correct this problem. This type of activity is interesting, because it separates students into groups by grades, so you have an A student with a B student with a C student and finally a D or F student. The process helps the teacher, because these students are helping each other like a tutor would, and they are all be held accountable for their work at the end of each session.

Farivar (1992) agrees with these results, and also added that their findings have shown this type of cooperative learning is an instructional methodology that helps break down interpersonal barriers between high, middle and low achieving students. In addition, his study shows that even high achieving students perceive the benefits of working in heterogeneous groups, which may allay the fears of those who think that the only role for high achieving students in cooperative learning groups is that of a helper. Perhaps this model of success should be spread throughout the school to stimulate other subjects as well.

These findings have demonstrated how during the beginning of difficult material being presented to adolescent minds, success can be greatly achieved by creative interaction. By changing the traditional seat arrangements from everyone looking forward while trying to sweat through tough problem-solving techniques, to intelligent management skills with new seating charts in groups, peer interaction can improve our children's test scores. Within a few weeks, everyone knows each other by name, they feel more comfortable when the next lesson is being presented and possibly have found a new neighbor they can console with during homework time at their houses. Anxiety levels will decrease as the feeling of togetherness has been ingrained in the classroom, which will eventually lead to class being fun again (Farivar, 1992).

The solution to refining student skills in the math class does not seem out of reach; preventing shortfalls in math scores that we have seen recently and locally within the Monterey County School District seems possible. The effects of these shortfalls in education, when they are not

practiced, are loss of revenue to a school by not attaining certain levels of results when the state tests are given. Principals can lose their jobs if they do not improve test scores. Implementing some of these group-work techniques in middle school math classes nationwide, with support from the Department of Education, may bring about new hope for the “No Child Left Behind” dream. We will then address the situation as, “it takes a nation to raise children,” demonstrating how all children need to be taught the same way.

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Community Partnership

As a way to increase mathematics test scores in middle school, I decided to assign students to specific groups during group work activity during the day by achievement levels. The partner I have chosen will be Seaside Middle School which is located in the Monterey Unified School District close to the CSUMB campus. They are currently trying to strategize ways of increasing their test scores by gaining connections in order to engage their students into trying harder. Teachers are currently using technology as a way to help make understanding easier. Connecting with the parents is also one of their strategies in order for homework to become more of a priority which makes the kids better prepared for the next lesson.

With the help of grant money recently acquired, the school has purchased smart boards which are in most classes now. These are chalkboard size computers which can be written on with a special pen and can easily access the vast array of information located on the internet to aid in instruction during the class period. Teachers are currently learning strategies by way of professional development techniques offered by coaches, which frequently come to the campus when needed. My coordinator will be the principal Mrs. Nugent, who sees improvement now as a direct result of their efforts toward the goal of attaining higher benchmark scores and State level testing.

Another issue facing this school has been the integration of English as a second language students, who are trying to catch up with the rest of their classmates figuring out the difficult mathematical languages being used. These translations can be hard even for English speaking students to master so further help is needed on a day-to-day basis. Research has shown that kids

working together in groups has been very successful because they like to help each other out and if divided up according to different achievement levels, the smart kids will help those who are struggling.

This school and others I have talked to have also expressed the need for better teachers who will go the extra mile to explain problems more and to create a better management system in their classroom, which will help engage these students who want to succeed and not just goof around all day. Management of the classroom seems to be a big issue in this district, which as this school is situated in a lower income part of town, the problem seems to be even harder to tackle and teachers more difficult to retain.

We have decided that I will have access to the grade sheet along with the names attached, then figure out a proper seating arrangement by giving the A students the #1, B students the #2, C students the #3 and D's and F's will get the #4. I then create a seating chart accordingly, by having one table with 1,2,3,4 and another the same and so on. The grade for the last test will be the control grade, and then as each week is tested, results will ensue. I will attend the school as I usually have been for the last 3 years as a volunteer, since the kids already know me which will not make them seem like they are being evaluated, which might skew the results. Together with the changing of partners each week, working with new technology and giving students new ways of understanding the math language will inspire them to be prepared for their big tests when they arrive.

This collaboration into proven success by my research will benefit them by having higher test scores much needed as the schools are evaluated each year as to their performance. This will benefit me by having the satisfaction of knowing I can help these kids enter high school with a

better understanding of Algebra, which is why I am trying to become a teacher. They will have happier students right away at a critical time period as summer is quickly approaching and the school year will end soon. I will also have shown that by being there as a tutor to facilitate this effort, my desire to teach in this school might be easier to acquire by showing effort towards my future students.

Project Plan

The specific goal I have now will be to engage my students to work in groups effectively in order to help them learn about each week's lesson plans. Effective learning in the classroom will be done by assigning strategic groups to work together in a collaborative effort to show strength in working with different peers. These groups will be able to sustain themselves during difficult problem sets by joining together in an effort to show the correct procedures and final answers while working in unison. The increase in over-all class test scores whether they are small or big will be the focus here, as even the smallest percentage of increase like 1% will mean in a class of 30, that the class has correctly answered an additional 30 questions.

The context in which I will be focusing my efforts will be at Seaside Middle School. The location I intend on being will be at two different mathematics classrooms located right across from each other. The chairs inside these classrooms will be pre-arranged in order to help facilitate the group setting which will be seat assigned according to plan. For the seating chart I will use see Appendix 1.

The participants will be 6th, 7th, and 8th graders during their regular scheduled day. This will include between 25-30 students for each grade level in two different classes. The total number of students involved for this project will include an average of 165 students. The girls and boys at this school are evenly distributed but the race mixture is 70% Latino, 10% Black, 10% White and the other 10% are mixed between Asian and Philippine.

The first day students come back from their spring break I will receive all test scores from the previous Friday. Then, I work out a seating chart according to their test scores with the focus being on splitting the children up according to their grades. In a class of 28, I will need 7 groups with four members in each which will have me placing an A student with a B student with a C student and finally a D or F student. If I don't have enough A students, which I have already seen might be an issue, then I simply place a high B student in that slot accordingly. Likewise, if I don't have enough lower achievers than the opposite will occur, I'll place a lower grade child in the position needed. This rearranging of groups will take place on a Monday, as soon as school starts and will take approximately 15 minutes for each grade level. The first thing I do is go to the first class, take care of their seating arrangement and then go across the hall to the next class. By the time I have this done, the class will have received their lesson plan for the week and will be working in groups to engage in their new learning environment.

My specific role will be to continue my efforts as tutor in these classrooms which I have been doing for three years now. I will be floating around all the groups in both classrooms trying to help with difficulties in language identification, formula implementation and group-work collaboration. Managing these new groups to ensure they have a chance at working will be another focus throughout my day, which will include making sure everyone participates, everyone respects their peers and engaging in one-on-one help as may be needed. Another focus

I will have to ensure at the end of the day and at the beginning, that each student is responsible for his or her chair being put back in line. At the conclusion of the first week, the test will ensue covering the lesson learned and then on Monday I return once again, to receive all the test scores and to switch all groups. The specific test questions given are seen here in appendix 6. By the end of this four week study, each student will have the opportunity of having worked with partners they've never been with before.

The community partner role will be to furnish me with the test results each week so I may arrange group settings for the week. They will also inform me of any difficulties presented which I may adjust accordingly. In addition, the teachers at Seaside Middle School who will be working with me will present any additional feedback I may consider to enhance the children's learning, like using my ability to speak Spanish in order for clarification purposes during class-work or trying to group people by gender if need be.

I will be delivering all of the roll sheets with test grades attached, the percentage details whether up or down in graph form and the lesson plan for the weeks being tested. The roll sheets will have names omitted to provide anonymity while the graphs I will present in two different forms to show clarity. The graphs will be in stacked form as well as line markers which will highlight the class differentiation and the weekly progress.

The project timeline will be four weeks long starting on March 28 when the children return from their spring break and conclude April 25. The first week, I will have results on Monday, April 4, the second week I will have results on Monday, April 11, the third week I will have results on Monday, April 18 and my final results will be on Monday, April 25. Each Monday I

will have performed the new seating arrangements and every day I will be able to attend Seaside Middle School to help facilitate my project to its conclusion.

Assessment

The Capstone Project results will show a percentage of average test results for the whole class being studied. The initial data will show how the students stand as a whole group with their previous test results before engaging in group interplay. This initial data can be found by looking at appendix 4. The impacts of the data will reflect higher confidence levels for the students involved. They will improve their understanding of mathematical concepts by working with their peers to see other ways of solving difficult problems. This can open their eyes to alternative solutions not given by the teacher who might not teach different methods.

The impact for these improvements will be shown from higher graduation rates, to students entering high school looking for advanced placement courses and for relief from stress which comes from the unknown feeling of anxiety every time the students enter the classroom. Bringing home better grades to the children's parents will also enable a sense of pride in each student who in turn can focus on other activities of their interests like sports, music and art.

By creating this type of study into alternative forms of teaching, I hope to give other teachers and principals hope that their overall assessment scores can be improved with no cost to them except a little rearranging of the furniture. Creating a sense of community in the classroom with all students working with each other keeps them awake and interested in a subject that is quickly

lost to confusion and boredom. When students have a feeling of knowing the subject they are dealing with, they can connect with the teacher better by answering questions and providing more thought provoking interests in further enrichment about the lesson. As a student and a future teacher, I will be interested in knowing about any classroom activities which this study will help to portray in order for improvement in testing scores to be achieved.

I would also like to ask questions anonymously from any students involved with this study to see if they feel I could improve anything or if they felt it wasn't worth trying. I would like to know if they felt closer to their peers by working in different groups and whether they have gained any new friends by collaborating with their classmates. I would also like to know if they felt like they learned more by getting hands-on with their learning as group work demands or if they wanted a more teacher based learning experience. These questions will be included in my final summation as confident and voluntary. The last question I would like to ask would be if they felt like working with people who had different grade levels, like A, B, C, D or F made them feel better about themselves by helping each other out like being a part of a team or do they prefer to be alone in their learning like the normal routine.

My tool for the specific outcomes will be the grade sheets printed out from the teacher. First I will use the grade sheets as a starting point in order to use them as a tool for shifting the seating positions around the classroom. I am looking for grade averages for my outcomes for the entire class as a whole which I hypothesize will increase as the weeks progress. To see the results for the entire class average on test scores, go to: Appendix 7 (see figure. 1).

Results

The results of my four week study on group work integration showed some very interesting results which were better than I could have ever imagined. Students showed significant improvement on their test scores along with their confidence levels as well. The resulting chart from the class can be seen in appendix 5. The class average test score before this experiment was a dismal 45.37%. The first week of integration techniques and togetherness as a collective unit showed an average of 73.13% for their test scores. The second week boasted another increase to an average of 77.33% with students getting excited about their new environment. The third week I was shocked to see even more improvement to an average of 82.5% on their weekly test scores. Then finally, the class average for the fourth week became incredible with an average of 90.33% for their test results. These results describe a 100% improvement in average test scores from being virtually alone in their class, to hanging out together in a collaborative effort for success.

The bottom tier of students, who fell into the D or F category, had improved their overall class grades from 60.89% to 68.57% which is the core reason for trying out this experiment. Given the fact that these quantitative results show an 8% gain in the hardest to reach students in just 4 weeks, I feel that by the end of the semester these 8th graders will be ready to move on to high school and not be left behind.

After the results came in, I decided to ask one child from each academic level from the beginning test results in order to get a fair representation across the board for their answers. See appendix 2: (figure 1) for the list of questions. 100% of the students asked could not find any room for improvement on this idea of group work integration. 100% of the students felt like they would like to engage in group work every day. 100% of the students have made new friends as a result of this experience which they never would have talked to before. 100% of the students felt like this interaction between themselves actually helps each other understand clearly. 100% of the students said they would rather not learn from the teacher sitting in straight rows because it seems boring. 100% of the students felt better about themselves because they had helped a fellow student understand these difficult concepts. 100% of the students said they would not like to learn by themselves as they have been accustomed to as a normal routine.

The teacher I worked with indicated they felt like the extra management effort put out was well worth the effort given the results we obtained. For the questions I asked the teacher please see appendix 3. The teacher also liked the fact that the students were engaging with one another in a positive manner instead of gossiping all day about boys or girls. The teacher didn't mind rearranging the desks every day because we engaged the students to help us put them all back in a straight row. The teacher felt as if this project should be used in all middle school math classes because the results speak for themselves and the students had a great time as well instead of

sleeping through class. The teacher couldn't think of any other ways for improvement other than contests between the groups with prizes given out at the end of the day. I asked the students and the teacher these questions in between classes while they could be anonymously answered.

For the chart on the low achievers rise in overall grades go to: Appendix 7 (see figure 2.)

The results indicated to me that we have a lot to learn about the way we teach our children. Traditional ways of lining children up like little soldiers doesn't work well and keeps them in the dark as to the conceptual learning that goes along with group work activity. Even further examination indicates the need for higher achievers to help their peers; through tough material presented to them and to no surprise, they actually like helping each other out. I learned how to really focus on what school is about during the last 4 weeks which is to learn about concepts needed in high school and have fun doing it. Taking a lesson from other countries as I have done here during this experiment gave me the confidence I need to become the teacher I want to be. I want to be known as the teacher who cared about the students' ability to succeed whether or not the material was a challenge or not. I want to show students how they can pass these ideas on to their next school in order for them to spread the good word about togetherness in the classroom. In addition, I would like these students to remember each other as friends and keep those memories alive forever, even when they leave school for work one day.

Appendix

Appendix 1.....pg. 24

Appendix 2.....pg. 25

Appendix 3.....pg. 26

Appendix 4.....pg. 27

Appendix 5.....pg. 30

Appendix 6.....pg.31

Description

Appendix 1: Layout of the room with grades for each students' seat.

Appendix 2: Types of student questions I asked.

Appendix 3: Types of questions I asked the teacher.

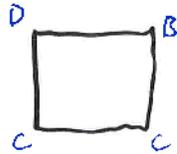
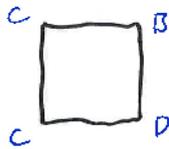
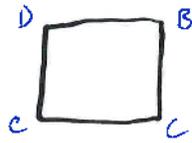
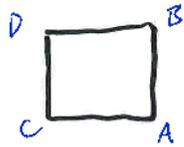
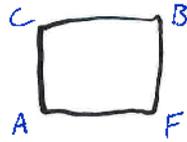
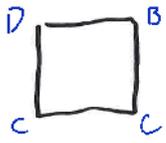
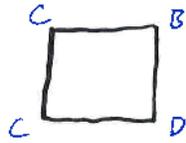
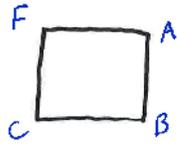
Appendix 4: Beginning grading chart before experiment.

Appendix 5: Results grading chart showing improvement.

Appendix 6: Test questions given to students.

Appendix 1.

seating chart



Group Work Integration

Appendix 2.

The Questions I would like to ask the students are as follows:

- 1) Do you feel there is room for improvement for this group-work activity?
- 2) Do you feel the grouping of students isn't worth trying on a daily basis?
- 3) Do you feel like new friends have come about from this experience?
- 4) Do you feel like doing this project where people interact with one another helps?
- 5) Would you rather learn from the teacher sitting in straight rows?
- 6) Did you feel better about yourself trying to help individuals who are struggling?
- 7) Do you prefer learning by yourself and staying with the normal routine?

Group Work Integration

Appendix 3.

The questions I would like to ask the teacher would be:

- 1) Are the improvements attained worth the extra effort involved in management?
- 2) Do you like the fact that the students are engaging themselves with one another?
- 3) Would you prefer to not have the desks rearranged everyday causing more chatter?
- 4) Do you feel like this project should be used by all middle school math students?
- 5) How can ideas like this be improved in your view of what has happened?

Group Work Integration

Appendix 4.

3/30/2011

black 1 Illuminate Student Information

Block 1

Viewing 12 of 24 Assignments

Name	Parcels	Grade	3/7	3/14	3/21	3/28	3/31	3/22	3/29	3/14	3/21	3/28	3/28
[REDACTED]	77.90	C	2	1	1	1	1	1	1	1	1	1	1
[REDACTED]	78.90	C	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	79.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	80.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	81.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	82.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	83.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	84.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	85.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	86.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	87.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	88.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	89.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	90.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	91.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	92.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	93.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	94.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	95.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	96.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	97.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	98.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	99.90	B	1	1	1	1	1	1	1	1	1	1	1
[REDACTED]	100.90	B	1	1	1	1	1	1	1	1	1	1	1

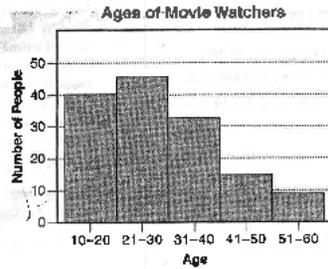
Appendix 6.

Buckle Down Mathematics Practice Test, Form A

Part I

- 1 Shawna, Hank, Charlotte, and Terry went out to eat and shared 2 orders of mozzarella sticks with 10 mozzarella sticks in each order. Shawna ate $\frac{1}{4}$ of the mozzarella sticks, Hank ate 5 mozzarella sticks, Charlotte ate 20% of the mozzarella sticks, and Terry ate $\frac{3}{10}$ of the mozzarella sticks. Who ate the *greatest* number of mozzarella sticks?
- A. Shawna
 - B. Hank
 - C. Charlotte
 - D. Terry

- 2 The following histogram shows the number of people in certain age groups who went to a newly released movie one night at the local theater.

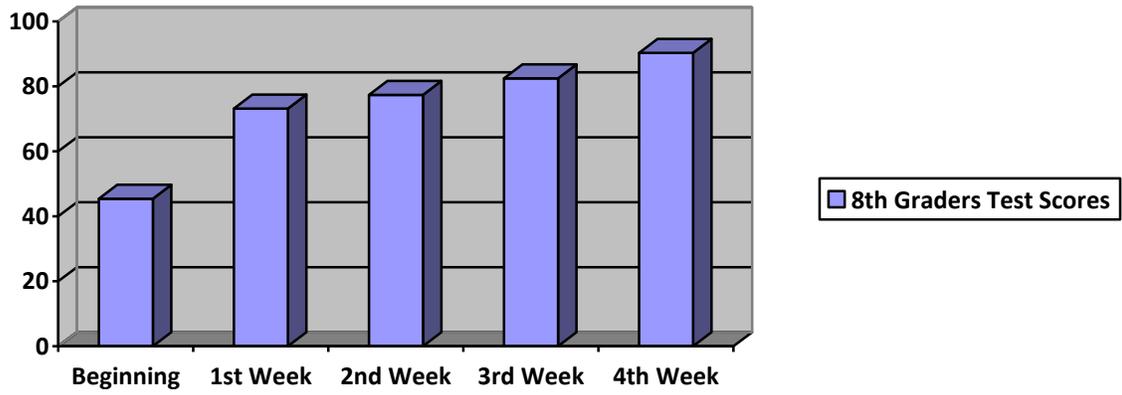


What conclusion can be drawn from the histogram?

- A The 21-30 age group consists of about twice as many people as the 41-50 age group.
- B The median age falls within the 31-40 age group.
- C The movie is more popular with older people.
- D More than half of the audience members were between the ages of 21 and 40.

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Appendix 7. Figure 1. (n=32)



Appendix 7. Figure 2. (n=7)

