Piaget in the Classroom

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ABSTRACT

JEAN PIAGET IS A THEORIST WHO HAS ETERNALLY CHANGED THE WAY IN WHICH ALL PEOPLE PERCEIVE CHILDHOOD DEVELOPMENT. TEACHERS ARE AFFECTED EVERY DAY WITH THE FINDINGS OF PIAGET. IN HIS COGNITIVE DEVELOPMENT THEORY, PIAGET OUTLINES THE FOUR STAGES THAT ALL CHILDREN TRAVEL THROUGH. CHILDREN IN THIRD GRADE, OF AGES EIGHT OR NINE, ARE IN THE CONCRETE OPERATIONAL STAGE. BY USING WHAT HAS BEEN PROVEN OF THE CONCRETE OPERATIONAL STAGE, A THIRD GRADE CLASS AT TANGLEWOOD ELEMENTARY SCHOOL IN LUMBERTON, NORTH CAROLINA WAS TAUGHT NEW MATHEMATICAL CONCEPTS USING CONCRETE EXPERIENCES, AN ABUNDANCE OF MANIPULATIVES, AND COOPERATIVE LEARNING GROUPS WHERE THESE CHILDREN COULD EXPERIMENT WITH THEIR ENVIRONMENTS. THE STUDENTS WERE ASSESSED ON SOLID FIGURES, SYMMETRY, TRANSFORMATIONS (SUCH AS SLIDES, TURNS, AND FLIPS), AND SIMILAR AND CONGRUENT SHAPES. THE GRADES OF THE STUDENTS IN ANOTHER THIRD GRADE CLASS IN THE SAME SCHOOL WHOSE TEACHER CHOSE NOT TO INCORPORATE CONCRETE DEVELOPMENTAL STRATEGIES WERE COMPARED TO THE GRADES OF THOSE STUDENTS IN THE EXPERIMENTAL CLASS. AS PREDICTED THE STUDENTS IN THE CLASS WHO RECEIVED MINIMAL WHOLE CLASS INSTRUCTION BUT WAS PROVIDED WITH AMPLE OPPORTUNITIES TO PERSONALLY EXPERIENCE CONCRETE LEARNING PERFORMED MUCH HIGHER ON THE ASSESSMENT. MOST IMPORTANTLY, EACH CHILD EXCEPT FOR ONE -WHOSE GRADES REMAIN FAR ABOVE AVERAGE- RAISED THEIR MATHEMATICS ASSESSMENT AVERAGES.

Introduction

Jean Piaget, a Swiss cognitive theorist living in the twentieth century, is the creator of one of the most influential theories in education, the cognitive-development theory. Educators rely on Piaget's stages of development daily as they plan their curriculum on a level they feel their students are capable of achieving. Piaget's only oversight is that his stages do not allow for any flexibility. All teachers know that no child is alike in their development. Their uniqueness is what makes a teachers job so complicated. By classifying all children in these stages; not allowing for students to be behind, ahead, or in two stages at once, Piaget has dismissed the individuality of all children (Bybee).

Piaget's cognitive-development theory was based on his years of observing children in educational and non-educational settings. He believed that children actively build upon their own knowledge through experiencing and manipulating their world (Zimmerman). Until then, people had believed that children needed adults to impose knowledge upon them. Piaget was also the first to delineate stages in which children's knowledge progressed. Piaget's four stages are as follows: the Sensorimotor Stage (birth to two years old), the Preoperational Stage (two to seven years old), the Concrete Operational Stage (seven to eleven years old), and the Formal Operational Stage (eleven years old and older) (Berk). Students in the third grade will be around eight and nine years old, although there may be some students who are older for reasons such as being held back or beginning school late. Piaget would classify third graders in the Concrete Operational Stage. Not all eight and nine year olds fit into this category. Some remain heavily dependent on the Preoperational Stage. Some are even beginning to dip their feet

into the Formal Operations Stage. One reason that may contribute to children today not fitting into Piaget's set categories is the level of knowledge and application demanded from them in school. Students in third grade today are being assessed on material that only two years ago was material learned in the fifth grade. Due to the trend in the modern United States to propel our children further and further, faster and faster, students are being rushed through some of Piaget's stages and attaining certain stages earlier. Some of the students are expected to reach a level too high for their current development. These students often perform poorly on state and nation-wide assessments because they are expected to perform tasks and understand concepts beyond them at this point.

In the education system today, we can use what Piaget discovered by realizing that teachers are not the know-all and end-all in the classroom. Students are completely capable making their own discoveries if we allow them. Teachers should be more of a facilitator, providing experiences and materials to lead the students in the right direction, rather than transposing their knowledge to their students.

Although Piaget has been highly disputed and debated, many chose to agree that he was on the right track. Today, teachers learn about Piaget and many other theorists and theories during their studies. Unfortunately, teachers have a tendency to forget about the theories they learn in the past and get caught up in the high-speed motion of practice in the elementary grades. It is important for them to remember to slow down and take the time to put theory into practice.

According to Piaget, that would mean allowing students to progress through the stages and supporting them in whichever stage they may be in. The Cognitive-Development theory would assume that third graders be in the Concrete Operational

Stage. This means that students can visualize changes, solve problems all in their minds, organize objects into hierarchal order, understand classes and subclass, and think logically. Most students from the experimental class will fit nicely into this stage. Some will not yet have fully transgressed through this stage and some will have begun to venture into the Formal Operational Stage.

Educationally, the results to this research will not be a scientific breakthrough and they will not reform the education system. It will allow a beginning teacher to practice a widely known and commonly used educational theory that is undervalued and seldom used in the classroom. Piaget's Cognitive Developmental Theory has been proven to be helpful and yet teachers today are always in a rush, often omitting fundamental steps of learning. This may not be a brand new discovery to the philosophy of education, but it is critically important for any new teachers. It allows them to see teaching from a completely different perspective: from the view of a philosopher and researcher.

Literature Review

Piaget's theories are well known and highly recognized but they were not originally designed to reform the education system, as they did. Piaget's theory of Cognitive Development is very logical and makes much sense. However, many teachers would like for their students to rush through the methodology because of time constraints and automatically grasp abstract concepts without having been taught in a concrete manner. Many other well-recognized theorists and psychologists, such as Lev Vygotsky and John Dewey, have supported and built upon Piaget's work further establishing the constructivist theory. Although some aspects of his theories may be questioned, the

research that Piaget performed was enlightened for his time and is still admired and referred to today (Evans).

Piaget's findings are the basis of many teaching styles today. Truly understanding Piaget's Cognitive Developmental Theory allows for a teacher to teach to her students' abilities. Understanding how children think is useful knowledge to anyone, especially for those who will be shaping and forming future minds. Knowing where each child in a classroom stand can aid them in progressing from one of Piaget's stages to the next. Students can then begin to grasp abstract concepts more successfully and eventually they will progress through the stages quickly, effectively, and efficiently (Bybee).

Piaget's research was not meant for educators; however, he is now one of the most influential psychologists in the discipline. His research on human growth and development have molded the manner in which teachers construct their lessons, they have been incremental to deciding the level at which teachers evaluate their students, and they have shaped the education system in the United States and all over the world (Revenson).

Each one of Piaget's stages is critical to full and well-rounded development. The Sensorimotor Stage, which lasts from birth through to approximately two years old is the stage in which young infants learn everything about their environments through their senses – hence the name. These children learn through touching, seeing, smelling, tasting, and hearing. One of the most important aspects of this phase is the acquiring of object permanence, the notion that something still exists even if it is out of sight (Peterson). The Peoperational Stage still relies heavily on one's senses as well. This

stage lasts from about two to seven years old. At this age children begin to understand their point of view on life; however, they are unable to understand other's points of view and they do not understand any part of life that does not revolve around them (Berk). Bybee and Sund describe the Concrete Operational Stage as the phase in which students are capable of performing mental operations that deal with the past and future, organization, classification, conservation, and the use of imagination for creativity. Wadsworth says it best when he states, "The child evolves logical thought processes (operations) that can be applied to problems that exist (are concrete)" (113). The Concrete Operational Stage is said to take place from ages seven to eleven. However, it is the single stage in which all people tend to spend most of their time (Peterson). Although adults achieve the Formal Operational Stage, most thought is done in the Concrete Operational Stage because abstract thought is not always necessary. The Formal Operational Stage is theorized to begin around the age of seven and it continues throughout adulthood (Singer).

One of the opposing views of Piaget is that he set age restraints on his stages, which all teachers know is inconceivable. Each child that come and go through a classroom is unique and learns using their individual mannerisms. Considering that Piaget was an advocate of nurture shaping a child's knowledge, it seems odd that he would put such restricting age limitations on his theory. Rosemary Peterson and Victoria Felton-Collins agree that some children take longer than seven years to reach the Concrete Operational Stage and, on the contrary, others are capable of reaching this stage early. There is also the possibility that a child may experience transition and be in two stages at once (Peterson).

One acquires their knowledge of the world through their interactions with the environment and by forming relationships with the unknown. According to Piaget, people do this through assimilation and accommodation (Silverman). How do teachers learn about their students, for example? They learn through observation, they learn through evaluating their work, they learn through noticing their actions, and they learn through experience. This is the same manner in which students learn. They make observations as a result of their experiences with the environments. The most important task of a teacher is not to be the ultimate source of information for their students but to allow students to have the opportunities to experiment in their world. Children are inquisitive and curious by nature and if schools allow them the chance, they will make their own discoveries that will be meaningful to them (Bybee).

Children learn through doing. "Learning is an active process" (Peterson 59). Math cannot be taught as other subjects traditionally are, Math has to be lived and experienced. Underlying mathematical concepts that adults take for granted are learned in the Concrete Operational Stage such as number concepts. This is the stage that is all too often undervalued (Peterson). In mathematics, critical concepts such as classifying, grouping, sorting, counting, and relationships are dealt with. This would be impossible without a child's firm grasp of the Concrete Operational Stage. In order to fully respect this, teachers must teach math concepts in a concrete manner using a multitude of manipulatives.

"Learning occurs at the optimum level when children are allowed to explore their environment" (Bybee 32). As a teacher, understanding Piaget's stages is critical to understanding where your students are on a developmental level. The Concrete

Operational Stage is an important stage where students need a lot of concrete experiences. The use of manipulatives and concrete instruction is imperative for the majority of students to reach high academic success. Piaget studied child development and tried to understand how a child's brain worked. He inadvertedly shed light on the pedagogy of teaching (Zimmerman). Teachers can now understand their students, those students' developmental levels, and each student's individual needs. Not only does this make for a well-rounded teacher, these effective teachers can now teach more efficiently teach their students but simultaneously allow their students to make discoveries about their world for themselves.

Methodology

A class of 16 third graders were taught the mathematical concept of Similar and Congruent Shapes, Symmetry, Solid Figures, and Transformations using Piaget's Cognitive Developmental Theory. This theory states that eight and nine year-old children are in the Preoperational and/or Concrete Operational stage of Cognitive Development and that these children still need new concepts introduced to them in a very concrete manner. In order to teach this successfully the grade-level text book, worksheets, whole-group instruction, cooperative groups, and hands-on manipulatives will be used.

Initially, the new topic will be introduced to the students using a very concrete approach. Then the concrete objects will be combined with symbols. For example, a worksheet that has pictures of the manipulatives that have been used in the class would be useful so that the students can still make connections to the concrete. Finally the class will progress to the use of symbols only, having transgressed fully from the absolute

concrete to the completely abstract. According to Piaget, this is the best and most efficient way for children to learn new information, retain it, and be able to utilize it effectively. After the new concepts have been taught according to Piaget, the students will take an assessment in the form of a unit test to measure their knowledge and the results will be compared with an unmentioned third grade class also at the same school. The ultimate goal is that this class, as a whole, performs better than the other third grade class. Additionally, a sub goal is for each child to generally do better than their own personal averages meaning that the students have sufficiently grasped this new mathematical concept. The process of comparing the experimental class' results to those of a different third grade class is an additional assessment tool that will be used to evaluate the success of the institution Piaget's theory.

Although effective, this project will require considerably few resources and supplies. An elementary school with an experimental third grade class to implement this instructional strategy with another class to compare results will be necessary. The school used for this thesis is Tanglewood Elementary School in Lumberton, North Carolina. The manipulatives needed will include paper, pens, three-dimensional figures of solid shapes, and small tangible shapes including triangles, quadrilaterals, pentagons, hexagons, and octagons. The use of a camera to document the students' learning will also be necessary as well as the use of a power point program to present the findings.

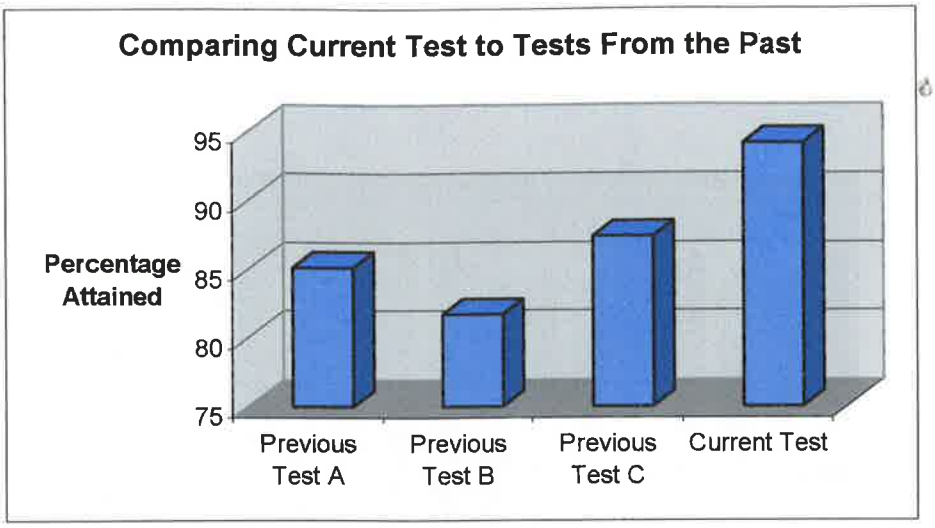
Results

The results of my experiment were exactly as predicted. The students in the controlled class performed much better than the other class in the same school. Each child excelled and performed above their usual expectations, except for one child whose average remained the same. The results could not really have been more favorable. Using manipulatives to introduce the topic to the students was very useful for their understanding. The students were physically able to pick up, touch, manipulate, fold and unfold, categorize, count, and move around tangible items, which is one of many educational gifts that a teacher can give her students.

Although Piaget's stages were used to determine where the students in this age group should be developmentally, this experiment shows that there is flexibility between the stages and that it is possible to be in two stages at once. Third graders have theoretically moved into the concrete operational stage. Too many teachers do not fully understand this stage and unfortunately they do not allow students to spend the amount of time needed in this stage, while simultaneously helping to bring up students who have not reached this stage.

The results to teaching mathematical concepts using concrete objects that the students could manipulate were outstanding. The students performed better on this test, as a whole class, than they have on any other test in the past. Three previous class tests averages were compared to the class average for this test in the graph below.

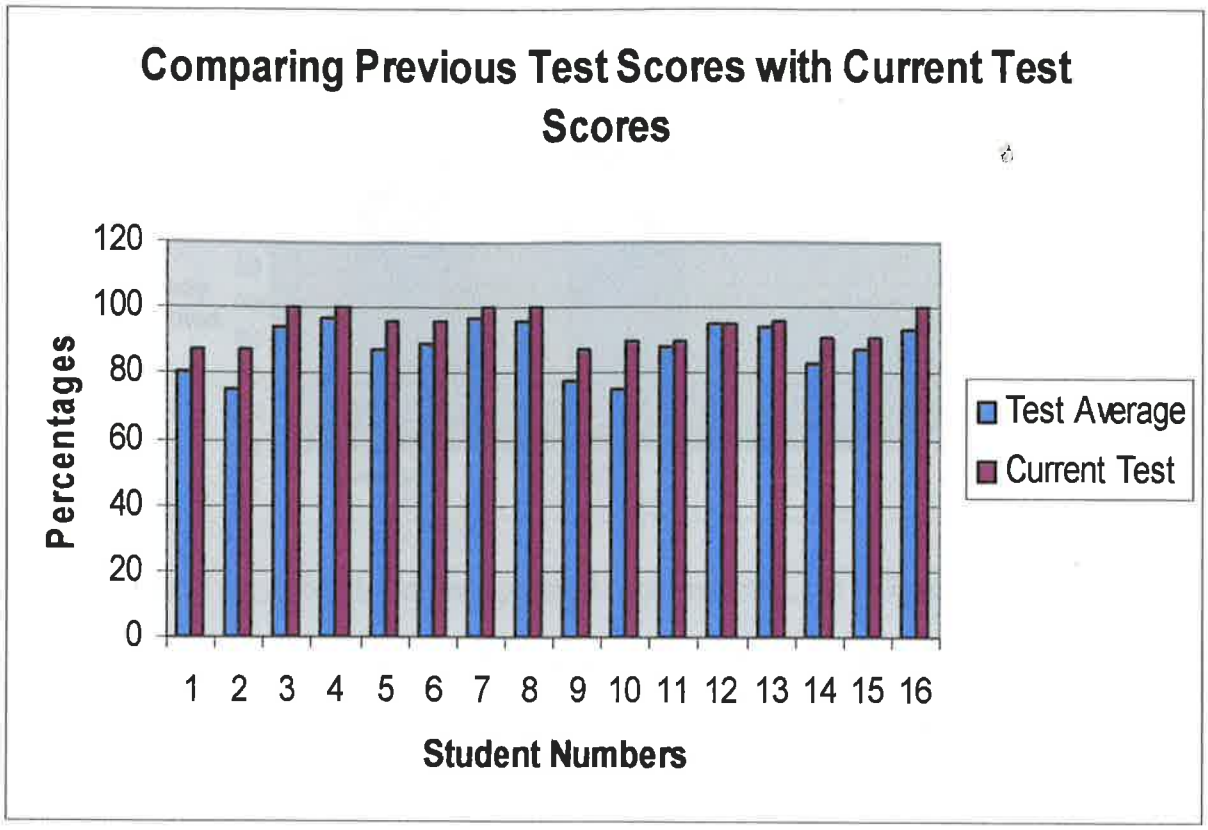
Graph 1



The class' average for math tests in the past ranged from 81% to 87%. For exact figures see Table A1 in the Appendix. The class average for the test in question where each student had the opportunity to experience manipulatives and to experiment making discoveries on their own was significantly higher: 94%. Any teacher would be extremely proud of his/her students for an improvement such as this one. Hopefully, teachers who see this may also begin to see the advantages of taking the extra time and effort to allow the students to use manipulatives.

One of the main goals of any teacher is to help each one of his/her students improve. The students made tremendous improvements on this test, in general. Each and every child performed higher test scores on this test than their average for the other tests taken this grade period except for one child.

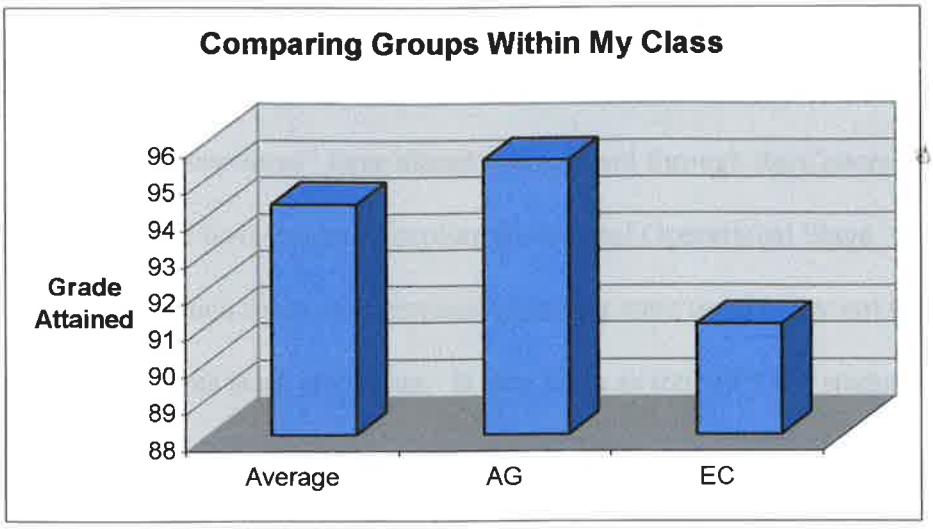
Graph 2



For each child's percentages see Table A2 in the Appendix. The only student who did not improve their test average was Bryce, whose average is already in the mid 90's; therefore, this test was an absolute success.

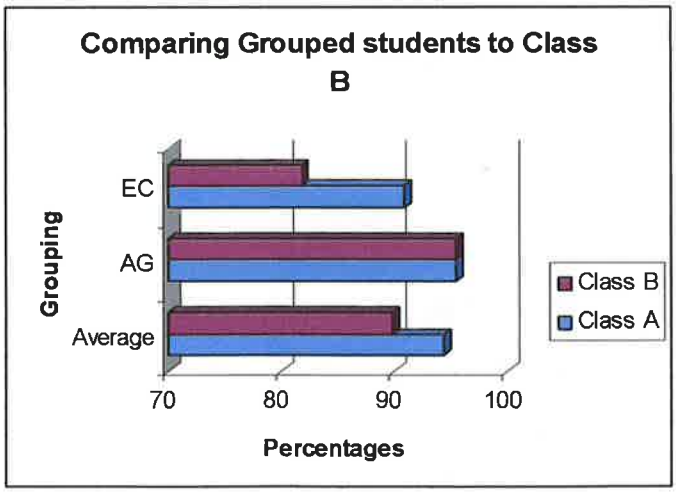
Although this test did allow most children to perform above their previous averages, it did not break through the restraints of school classification. Comparing the grades from the AG students (students who have been identified to be gifted), the EC students (students who have been identified to require supplements to the classroom), and the remaining students, or the "Average" students, the grades reflected the students' general level of achievement.

Graph 3



For exact figures see Table A3 in the Appendix. As predicted, the AG students averaged the best results on their tests and the EC students averaged the worst results. However, for the worst results to average in the high 90s is a feat in itself. To see the demographics of the groups in my class see Graph A1 in the Appendix. When comparing the groups in this class to the groups in Class B, the results were astounding.

Graph 4

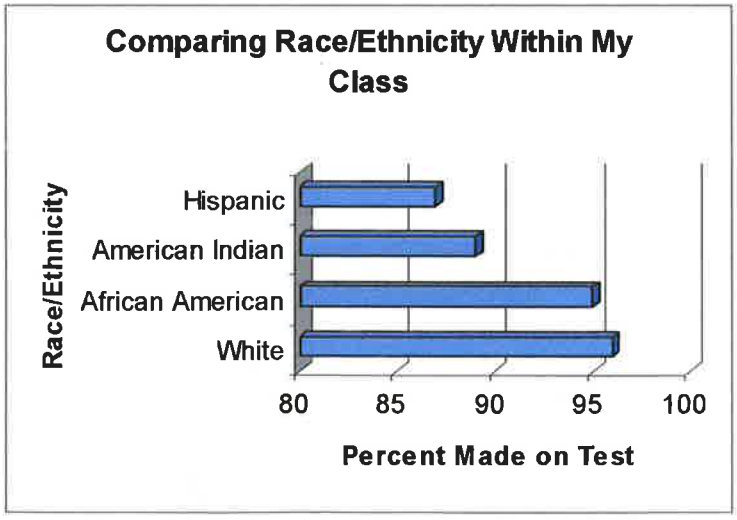


EC students in Class A, the experimental class, performed significantly better than Class B. The "Average" students also performed better when being taught in a concrete manner with the use of manipulatives. The AG student grouping is the only group who

achieved the same results. Using Piaget's Cognitive- Development Theory, this can be explained although one must be able to remain open-minded. These students who have been identified as "exceptional" have already progressed through the Concrete Operational Stage and have begun to explore the Formal Operational Stage. Because of this, the manner in which these mathematical concepts were taught may not have helped these particular students learn any better. It may seem as though these students would have learned this material, despite the method with which it was taught due to their progression through Piaget's Stages.

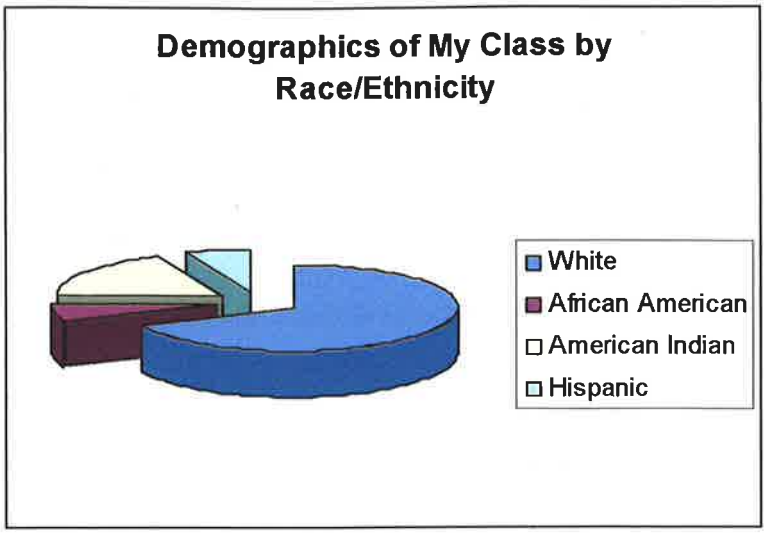
It is a possibility that different types of students will progress through the stages at their own, unique pace. Race and Ethnicity may also influence the speed and agility in which students are capable of moving through Piaget's Stages. Comparing Race and Ethnicity in the experimental class is as follows:

Graph 5



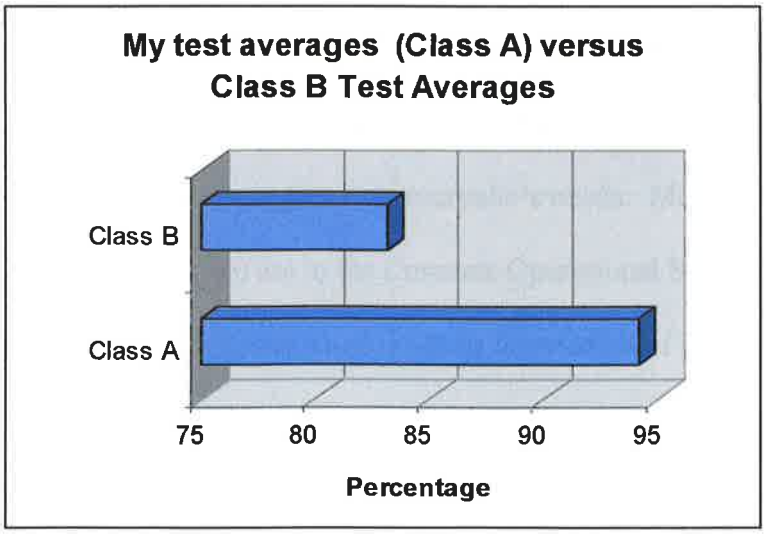
This class is not ideal to compare race and ethnicities as the class demographics are not varied enough due to the small numbers (see below). For exact figures see Table A4 in the Appendix.

Graph 6



Finally, the ultimate test of whether or not the students in the experimental class learned better than other students their age is to compare their grades to those of another class. In Class B the teacher changed nothing in the way she taught. She taught the exact same mathematical concepts as was taught to Class A but in a much less concrete manner using little to no manipulatives. The results are astounding. To see the exact scores for each of Class A and Class B's students see Table A5 in the Appendix.

Graph 7



The students in Class B acquired an acceptable test average; however, Class A learned the material better and showed a greater understanding of the new mathematical concepts learned. The two class averages differ by over 10%, which is truly significant.

The results clearly show that by introducing the new material in a very concrete manner and by allowing students to use manipulatives the students generally performed much better than they are used to and much better than other classes on the same playing field. Although the experiment evidently shows that the students in Class A learned the material more effectively using this method than the students in Class B who did not use this method, more importantly is the result that students commonly improved their own test scores and learned this particular material better than other material introduced in the past.

Summary

The research performed could be very helpful to any beginning teacher and could even be useful for more experienced teachers. This method of teaching, using Piaget's Cognitive-Development Stages, is grounded in its research and has been proven to work. All students, despite their age, learn better using a more concrete approach. Some students are capable of learning abstractly from the beginning, even children as young as third graders, but it does not hurt to appease to everyone's needs. Most of the students in the third grade (age eight and nine) are in the Concrete Operational Stage of development; therefore, using concrete manipulatives allowed all of the students to be very successful in completing the assessment.

Teachers today would love it if all of their students could be in the Formal Operations Stage so that teaching and learning would take place more quickly. Unfortunately, as Piaget discovered, each child has to go through all of the stages; and as was later discovered, each child has to do this at his or her own pace. It is much more beneficial to any teacher to introduce a subject in a concrete manner in order to teach to the level of a child in the Concrete Operational Stage, even though it may be more time consuming. What teachers often don't realize is that although teaching concretely seems to take longer to begin with, it may save time in the long run as each child will be where they need to be and re-teaching will not be necessary. Also, each child will truly have accomplished to the best of their ability.

As is shown in the research and in the results, this method was extremely successful in rendering high scores on the mathematics test taken by the class. Each student despite grouping, age, race/ethnicity, and previous scores achieved high results and most students achieved higher results than their average math grades. Not only were the students extremely proud of their accomplishments, they learned a concept so concretely that they truly understood it and they were able to master it without too many problems. If teachers only took the time to allow each child to achieve to the highest of their abilities, students would perform as they did for this experiment on a much more regular basis.

REFERNCES

Atkinson, Christine. Making Sense of Piaget. Boston: Massachusetts, 1983.

Berk, Laura E. Child Development. 6th ed. New York: New York, 2003.

Bybee, Rodger W., and Robert B. Sund. Piaget for Educators. 2nd ed. Prospect Heights, Illinois, 1982.

Evans, Richard I. Dialogue with Jean Piaget. New York: New York, 1981.

Peterson, Rosemary, and Victoria Felton-Collins. The Piaget Handbook for Teachers and Parents: Children in the Age of Discovery, Preschool-Third Grade. New York: New York, 1986.

Revenson, Singer. A Piaget Primer: How a Child Thinks. Madison: Connecticut, 1996.

Silverman, Hugh J., ed. Piaget Philosophy and the Human Sciences. Atlantic Highlands: New Jersey, 1980.

Wadsworth, Barry J. Piaget's Theory of Cognitive and Affective Development. New York: New York, 1984.

Zimmerman, Barry J., and Dale H. Schunk, ed. Educational Psychology: A Century of Contributions. Mahwah: New Jersey, 2003.

APPENDICES

- Chart A1

Comparing Current Test to Tests From the Past

Previous Test A	Previous Test B	Previous Test C	Current Test
85.114	81.698	87.356	94.125

- Chart A2

Comparing Individual Student Test Score to Current Test Scores

	Test A	Test B	Test C	Current Test
Kelly	76	85	79	87
Sidney	69	75	81	87
Lane	98	95	90	100
Haylea	100	95	95	100
Brooke	87	90	85	96
Summer	84	90	92	96
Lexi	100	97	93	100
Tori	95	94	98	100
Marshall	79	82	74	87
Alston	72	75	79	90
Abigail	88	90	85	90
Bryce	90	100	95	95
Mack	95	87	100	96
Helena	87	78	85	91
Addison	86	90	85	91
Kendall	90	100	89	100

- Chart A3

Comparing Groups Within My Class

Average	AG	EC
100	100	87
100	100	90
100	96	96
95	96	
91	91	
87	90	
87		

- Chart A4

Comparing Race/Ethnicity Within My Class

White	African American	American Indian	Hispanic
100	95	87	87
100		90	
100		91	
100			
100			
96			
96			
96			
91			
90			
87			

- Graph A1