THE EFFECTS THAT BEHAVIORAL OBJECTIVES HAVE
ON SHORT TERM LEARNING FOR ELEMENTARY
EDUCATIONAL STUDENTS

by

Glenda A. Begemann

An Abstract
of a thesis submitted in partial fulfillment
of the requirement for the degree of
Master of Science
University of Central Missouri

December, 2014
Accountability demands are placed on public education institutions and public educators by federal and state laws to produce an adequate education for all individual students. Elimination of public school districts and educators’ jobs are at risk when requirements are not met through individual achievement scores. Empirical research on the impact of behavioral objectives on students’ short term learning is rare. In this study we examine how stating behavioral objectives before, during, and after a lesson impacts students’ short term learning by measuring students’ knowledge with both pretest and posttest science exams. A two-way mixed ANOVA was used to compare two different second grade classes assigned to two conditions, the Objectives Group and the Control Group. The teacher stated behavioral objectives for the Objective Group and did not state behavioral objectives for the Control Group. Students exposed to behavioral objectives showed a greater increase in their science posttest scores than did students in the Control Group but it was not significant. The use of behavioral objectives in elementary classrooms may be beneficial to students’ short term learning.
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A Thesis
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Department of Psychological Science
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UNIVERSITY OF CENTRAL MISSOURI
WARRENSBURG, MISSOURI
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Purpose of the Study

The objective of the current study is to examine the use of behavioral objectives in a second grade elementary school lesson. The lesson was delivered by the classroom teachers to measure short term achievement. AIMSweb, a nationally normed test, was used to determine whether all students in both classrooms were achieving academically equally. Precise statements of behavioral objectives were stated before, during, and after a lesson to the students in one classroom by the classroom teacher. In a second classroom the classroom teacher did not state the behavioral objectives at all. The classroom teachers delivered the same science lessons while using the same curriculum guides. There was a pre and post test assessment to measure students’ short term achievement. A two-way ANOVA was used to analyze the results. This research explored the use of behavioral objectives in the regular classroom in the primary grades for the first time.

Objectives and learner outcomes have been investigated at the high school and middle school level and in special education elementary classrooms to measure short term and long term achievement. The information gained from this study can be used to support teachers in improving short term learning, help assure school districts in meeting accreditation standards each year, and help government entities set appropriate standards and goals, while boosting productivity and efficiency.
Rationale

Educational standards and policies are influenced by many government entities and at many different levels. Factors that are incorporated into education start at a national level (No Child Left Behind Law), then funnel down to a state level (an example in Missouri is the Missouri Assessment Program, MAP), then to a district level (maintain accreditation), then to a building level, and finally to a classroom level. All these separate entities affect how the curriculum and the use of assessments are integrated into regular classrooms in the United States of America. When addressing the questions: “What are the best instructional strategies that can be utilized on a regular basis to measure learning outcomes?” and “How do educators ensure a high quality education for every individual student?” many policies and educational theories at all levels have to be considered. Ultimately, the present study focuses on whether stating behavioral objectives that utilize the verbs from Bloom’s taxonomy at all six levels of complexities helps ensure attaining measurable goals that meet grade level expectations thereby helping to assure compliance to No Child Left Behind.

On January 8, 2002 President George W. Bush signed the No Child Left Behind Act, also known as NCLB of 2001, into law (Ritter, 2003). In order for a state to receive federal funding for public schools, the state has to incorporate high standards while establishing measurable goals through assessments (Kysilka, 2003). The NCLB Act requires setting national goals for k-12 education and establishing standards which are developed by a collaboration between federal, state, and local authorities (Ramsay, 2007). In order for public schools in America to receive federal and state funding the schools must meet accreditation through the state standards. In the state of Missouri, the Missouri Assessment Program, abbreviated MAP, is used to measure educational goals to help improve education for all individual students. MAP tests are given
annually to all upper elementary students in the Missouri public school system in all core content areas to measure basic skills. The state of Missouri uses the Missouri School and Improvement Program (MSIP) to help meet the requirements of the NCLB Act of 2003. The state also mandates that public educators teach students a specific curriculum in each grade level. The state mandates grade level expectations (GLE’s) that are to be taught and measured to ensure quality learning for all students. All the government entities policies, laws, and standards have to be considered while making educational decisions on the use of effective teaching strategies that guarantee learning because school districts and communities have a lot to lose if learning is not occurring.

Ravitch (2010) addresses concerns about the five harsh penalties that public school districts and staff members face by being held accountable under the NCLB Law. Ravitch was the assistant secretary of education in charge of educational research during the Bush administration. The accountability plan includes the following for failing public schools. “In the first year of failing to make AYP (Annual Yearly Percentage), the school will be put on notice. In the second year, it would be required to offer all students the right to transfer to a successful school, with transportation paid from the district’s allotment of federal funds. In the third year, the school would be required to offer free tutoring to low-income students, paid by the district’s federal funds. In the fourth year, the school would be required to undertake “corrective actions,” which might mean curriculum changes, staff changes, or a longer school day or year. If a school missed its target for any subgroup for five consecutive years, it would be required to restructure” (Ravitch, 2010, p. 99). When a school restructures there are five options: “convert to a charter school; replace the principal and staff; relinquish control to private management; turn over control of the school to the state; or any other major restructuring of the school’s governance”
(Ravitch, 2010, p.98). When considering job loss, school closure, and community confusion when AYP is not met for all subgroups, effective instructional strategies need to be implemented daily in public educational classrooms, so harsh punitive consequences will not destroy public education.

In order to evaluate learning, effective assessments and instructional strategies need to be implemented. Grade level expectations are broken down into learning domains that can be measured though behavioral, cognitive, and constructivist learning objectives. Behavioral objectives are instructional strategies that are measurable through assessments and evaluate individual students’ learning. Whitmore, who supports behavioral objectives, stated, “The statement of objectives of a training program must denote measurable attributes observable in the graduate in the program, or otherwise it is impossible to determine whether or not the program is meeting the objective” (Hunt, 2002, p. 176). Behavioral objectives are intended to communicate to the students, teachers, planners of the programs, and parents goals or outcomes of the lesson (Gagne, 1972). Behavioral objectives might be a necessity to foster educational achievement for all students. Bloom’s taxonomy is used to help teachers generate measurable behavioral learning objectives by stating a verb to describe a measurable behavior at six levels of complexity, starting from the simplest behavior to the most complex. Bloom’s taxonomy is easily understood and is probably the most widely applied and used teaching tool to help educators state a measurable goal at an acceptable learning level (Clark, 2004).

Bloom’s taxonomy is used in educational settings to help teachers set goals and state behavioral objectives for the learning process. Behavioral objectives are stated throughout the lesson to help students acquire new skills, knowledge, and attitudes (Bloom, 1956). Bloom’s Taxonomy is a tool that may help some educators at all levels of education: college, high school,
middle school, and elementary school, measure learning at six cumulative levels. Little research has been done in the primary grades, particularly kindergarten through second grade, to determine if behavioral objectives stated throughout a lesson improve short term learning.

![Figure 1. Diagram of Bloom’s Taxonomy.](image)

Past research has indicated instructional leaders like Gagne and Hunter are credited with developing instructional sequences that include stating learning objectives at the start of all new lessons which have become a practice for children with learning disabilities (Reed, 2012). Reed (2012) has found that stating learning objectives to children in special education has shown significant contributions to special educational students’ outcomes. O’Brien (1985) found significant results in stating objectives for middle school students on student achievement.

Research that investigates the use of behavioral objectives at an elementary level can provide many advantages in elementary education and aid the efficiency and effectiveness of the entire education process. These advantages apply not only to the education of students but to the implementation of effective education programs by those who make the decisions on educational policy. If school districts do not meet state requirements in all content areas, high penalties are inflicted on those public school districts. A school district could face the possibility of losing accreditation along with the corresponding loss of federal and state funding. A school district
cannot afford to implement ineffective teaching strategies that will result in the loss of funding or even worse the closing of the school district. There are many factors that must be taken into consideration when trying to address the issue of what instructional strategies should be used to best educate a student to ensure and improve short term learning in a productive and efficient way.

Schools nationwide are being held accountable to provide their state department (the example for Missouri is Department of Elementary and Secondary Education) with correct documentation that no child is left behind while having to demonstrate to the states annually through the use of standardized assessments (MAP testing in Missouri) that all students are being provided a proficient education. I believe research in the area of implementing behavioral objectives throughout a lesson to measure learning outcomes and ensure that learning is occurring for every student is essential to the welfare of all public schools nationwide.

**Hypotheses**

The purpose of this study was to determine if a relationship existed between short term learning and the use of behavioral objectives. More specifically, does stating behavioral objectives before, during, and after a lesson was taught affect short term learning at a primary elementary level? During this study precise statements of behavioral objectives were stated before, during, and after a lesson to the students in one classroom by the classroom teacher. In a second classroom the classroom teacher did not state the behavioral objectives at all throughout the lesson (Objectives Group and Control Group; teaching methods was a between subjects independent variable). The classroom teachers in both classrooms delivered the same lessons while they used identical Pearson science curriculum guides. There were both pre and post test assessments to measure students’ short term achievement which served as the dependent variable.
Time (pre and post) was the second independent variable. The pre test was given a day prior to the first mini lesson being taught and the post test were given after all mini lessons were completed. Teaching the lessons and collecting all the data took approximately two weeks at an hour per day. A statistical analysis of data was performed to determine if a significant difference existed between the pre and post test scores overall, between the two classrooms’ pre and post test scores combined, and whether there were a significant interaction between the teaching method and time by using the two-way ANOVA. To ensure that all students in both classrooms were achieving academically equally, mean scores from AIMSweb reading and mathematics assessments for second grade students were evaluated before teaching the lessons.

The hypothesis was when the elementary classroom teacher stated learning objectives before, during, and after each lesson (Objective Group) the elementary students would show a greater increase in achievement on the post test over the pretest compared to the Control Group (no learning objectives were stated). If this intervention would have worked it could have been used in the early childhood elementary population to improve short term learning.

Definitions

**Behavioral Objectives**: There are three parts to a behavioral objective: a measurable verb, describes what the student is to learn, and state criteria for success or competency (Gagné, 1972).

Note: Other names used for behavioral objectives include: Learning Objectives, Outcomes, Enabling Objectives, Terminal Objectives, Educational Objectives, Curriculum Objectives, Performance Objectives, Operational Objectives, Instructional Objectives, Student Learner Outcomes, Intents, Aims, and Competencies.
**Maslow Hierarchy of Needs** - Created by Abraham Maslow in 1954, Maslow created a hierarchy of human needs based on two groupings: deficiency needs and growth needs. Maslow noted that each lower need must be met before moving to the next higher level (Huitt, 2007).

**Missouri Department of Elementary and Secondary Education (DESE):** the department audits performance of public schools and makes recommendations to state leaders concerning education spending and policies.

**No Child Left Behind:** NCLB is based on federal legislation that requires educational standards, assessments, and measurable goals to improve individual outcomes in education. The Act requires states to develop assessments in basic skills to be given to all students in certain grades, if those states are to receive federal funding for schools. The Act does not assert a national achievement standard; standards are set by each individual state.

**Missouri Assessment Program (MAP):** MAP is mandated by the Outstanding Schools Act of 1993. The State Board of Education directed the Missouri Department of Elementary and Secondary Education (DESE) to identify the knowledge, skills, and competencies that Missouri students should acquire by the time they complete high school and to assess student progress toward these academic standards. DESE staff worked with educators, parents, and business professionals from throughout the state to develop the Show Me Standards and to create MAP as a tool for evaluating the proficiencies represented by the Standards. The MAP currently includes mathematics assessments for grades 4, 8, and 10; communication arts assessments for grades 3, 7, and 11; science assessments for grades 3, 7, and 10; social studies assessments for grades 4, 8, and 11” (U.S. Department of Education, 2007).

**AIMSweb:** “A benchmark and progress monitoring system based on direct, frequent and continuous student assessment. The results are reported to students, parents, teachers, and
administrators by a web-based data management and reporting system to determine response to intervention” (AIMSweb, 2010, p. 1).

**Missouri School Improvement Program (MSIP):** MSIP arose from state law and by the State Board of Education regulation. Its main purpose is to review and accredit 523 school districts in Missouri. MSIP is required to review 20% of school improvement plans that identify solutions to concerns of failing school districts in order to improve the schools accreditation rating.

**Bloom’s Taxonomy**: Bloom’s taxonomy is an educational tool used by classroom teachers in aiding in the processing of setting goals and behavioral objectives that vary in level of difficulties to help reduce achievement gaps among different subgroups (Guskey, 2007).
CHAPTER 2
REVIEW OF LITERATURE

The Problem

With punishable accountability demands placed on the public education institutions and public educators to produce proficient test results for every individual student (NCLB), the survival of the public education system and the jobs of public educators are at stake (Ravitch, 2010). “The goal from the NCLB Law indicates that all students, 100 percent must be proficient in both reading and mathematics or the failing public schools will be at risk of being privatized, turned into charters, or closed” (Ravitch, 2010, p.104). Studies from the Center on Educational Policy (CEP) have found that “federal restructuring strategies have rarely helped schools improve student achievement enough to make AYP or exit restructuring, no matter which strategy the state or school district applied” (Ravitch, 2010, p. 104). Studies have also indicated that the replacement of public schools by charter or private schools did not improve students’ academic achievement (Ravitch, 2010). The devastation that comes from school closures such as lost jobs and community confusion makes it imperative that potentially more effective instructional strategies such as stating behavioral objectives daily be implemented as this may help to ensure accountability and learning for all students which may help public schools from being closed, privatized, or turned into charter schools.

Behavioral Objectives

In the 1960’s the concept of behavioral objectives became popular in the education field where they were implemented into instruction to help achieve educational goals while measuring the degree to which the goal had been achieved (Popham & Husek, 1969). James W. Popham,
the guru of behavioral objectives, was the first researcher to identify a connection between behavioral objectives and accountability (Hunt, 2002). He stated that educators must produce results and become accountable for producing evidence that their instruction yields worthwhile results for learners (Hunt, 2002).

In recent research, advocates for behavioral objectives have stated that many defects in education have stemmed from instructional presentations that just state content, such as a film being shown or a talk given by an educator. Past researchers have indicated that critical missing elements in any descriptions of instruction are the related ideas of (a) “what the students have learned from the instruction,” and (b) “what class of performances he or she will then be able to exhibit” (Gagne, 1972, p. 395). These two critical missing elements that researchers indicate are important to learning are commonly known today as behavioral objectives.

Educators would agree that behavioral objectives are statements which describe what a student should have learned and should be able to perform after completing some unit of instruction. The students should have a clear understanding of how he or she will be assessed for learning. Miles and Robinson describe three components of behavioral objectives: “1) a description of a class of stimuli to which the student is to respond (condition); 2) a statement containing an action or behavioral verb which connotes or denotes the behavior the student is to perform; and 3) a description of success criteria by which the student’s behavior is to be judged acceptable or unacceptable” (Hunt, 2002, p. 177).

Bloom’s Taxonomy

Bloom’s taxonomy supports component number two above of behavioral objectives which provides verbs for educators to use which measure learning at six different levels and in three learning domains of cognitive, affective, or psychomotor. Dr. Benjamin Bloom in 1956
created six categories of education which are knowledge, comprehension, application, analysis, synthesis, and evaluation to promote higher forms of thinking rather than just rote learning. Katsberg (2003, p. 402) stated that Bloom’s taxonomy can be an assessment tool for teachers to construct and analyze instruction in three ways: “first, the tool makes the teacher more aware of the content and the process that he or she is teaching or assessing; second, it can point out mismatches between what is taught and what is assessed; and third, the framework can serve as a guideline for developing or revising instruction or assessment.” Bloom’s taxonomy is easily understood and is a teaching tool used to help educators state a measurable goal at an acceptable learning level for the students. The publication *Taxonomy of Educational Objectives: Handbook 1*, the Cognitive Domain (Bloom, 1956) is used worldwide by educators to aid in the process of curriculum preparation and assessment evaluations (Kennedy, 2008).

In a Jordanian tenth grade social studies class, mastery of basic skills was measured in Bloom’s first three categories. The researchers investigated the effects of behavioral objectives on the achievement and retention of high, medium, and low GPA students at the knowledge, comprehension, and application levels. Behavioral objectives were stated at the beginning of each lesson to 472 students in their regular classroom environment in 14 classes and at 14 randomly selected high schools for 11 weeks. The researchers used a pretest and posttest and the data were analyzed by MANCOVA. The results indicated a positive influence of behavioral objectives among groups of students of different levels of previous achievement (Ahlawat, Saadeh, Bader, & Khalifeh, 1988). The researchers found that stating learning objectives for students with a high GPA produced a significant difference between the control group and the treatment group in all six areas (posttest knowledge, comprehension, and application and retention knowledge, comprehension, and application) (Ahlawat et al., 1988). The researchers
also found that the medium GPA group showed a significant difference in two of the six areas (posttest knowledge and retention knowledge) and students with a low GPA showed a significant difference in one area (post application). Overall the resulted indicated that students with a high GPA benefited the most from the statements of behavioral objectives at Bloom’s first three levels whereas students with a medium GPA benefited more than the students with a low GPA who showed a significant difference in one of the six areas.

Controversy About Behavioral Objectives

Throughout the history of education, behavioral objectives have been a controversial subject that has been debated and discussed by both proponents and opponents of behavioral objectives (Kibler, Cegala, Watson, Barker, & Miles, 1981). For example, advocates for behavioral objectives believe that teachers who refused to adopt clearly specified goals (behavioral objectives) are partly responsible for the present failure of American education (Popham & Husek, 1969). On the opposite side critics Schoen and Glass initiated a movement to eliminate behavioral objectives and argued that “behavioral objectives may be useful in planning to teach very basic skills to students but are considered to be useless and damaging to the students” (Hunt, 2002, p. 183). Blair along with other critics to eliminate behavioral objectives argues that implementing behavioral objectives into public education yields superficial learning and test results. Also critics such as Combs, who published a booklet to eliminate the use of behavioral objectives, believed that “behavioral objectives are of limited use and should be confined to the condition of precisely defined skills, that they stifle creativity and cause educators to lose sight of the general goals of education, as well as being undemocratic and demoralizing teachers” (Ware, Newell, & Jester, 1973 p. 667). Research on the use of behavioral objectives in public education today continues to demonstrate mixed results while the
subject continues to be highly controversial and debated amongst professionals (Ahlawat et al., 1988; Hunt, 2002; Kneller, 1972; Ravitch, 2010; Reed, 2012; O’Brien, Meszaros, & Pulliam, 1985).

**Behavioral Objectives: Yes!**

As stated earlier, behavioral objectives were and are a controversial topic with both opponents and proponents for the use of behavioral objectives in the educational environment. Most publications about the use of behavioral objectives lack empirical research and instead value professional opinion. There are several proponents but few empirical studies that advocate for the use and benefits of behavioral objectives through empirical research.

One of the most common arguments for behavioral objectives is that their use contributes to student achievement (O’Brien et al., 1985). Whitmore, who supports behavioral objectives, stated, “The statement of objectives of a training program must denote measurable attributes observable in the graduate of the program, or otherwise it is impossible to determine whether or not the program is meeting the objective.” (Hunt, 2002, p. 176).

In a study on teaching social studies in Jordan the researchers stated behavioral objectives prior to each lesson and found empirical evidence that statements of behavioral objectives were useful in improving the achievement of many students, mostly students with high GPAs (Ahlawat et al., 1988). In another social studies study the researchers showed statistically significant results with the use of behavioral objectives (O’Brien et al., 1985). Behavioral objectives were one of the five variables tested in a regular classroom setting to determine academic achievement in sixth, seventh, and eighth grade classrooms with a sample of 168 students and 8 teachers. The researchers used hierarchical multiple regression analysis to study the contribution of each variable to explain the variance in student achievement for the
posttest scores. Both of these studies indicated a positive relationship between teachers’ use of behavioral objectives and student achievement as well as with a couple of other studies that have found the use of behavioral objectives generally improve student learning (Duchastel & Merrill, 1973).

Another study found that communicating learning objectives supported both learning and positive behavior in special education. Englert (1984) found several factors that contributed to student achievement and positive behavior in special education while dividing 28 intern student teachers into a treatment and control group to analyze their instructional practices. In the treatment group Englert found several effective strategies that may have improved student achievement compared to the control group. Englert noted that the teachers’ intentional behaviors to teach at a faster pace, state behavioral objectives clearly, and prompt children to correct their errors instead of telling them the correct answers improved learning and behavior in special education classrooms (Englert, 1984).

Other researchers that are against the use of behavioral objectives have stated their opinions rather than using empirical research to debate the use of behavioral objectives scientifically. Ware et al. (1973) found that Comb’s booklet that was published to eliminate the use of behavioral objectives proved to have little accountability because Combs simply stated his opinion about the use of behavioral objectives and failed to use empirical research to back up his position. Blair (2007) stated that objective-led lessons cause students to be passive and result in superficial learning where Reed (2012) has found no empirical evidence to support this finding.

**Behavioral Objectives: No!**

There are several reasons professionals believe stating behavioral objectives are counterproductive to achievement. Many critics simply believe that the implementation of
behavioral objectives would cause a stale learning environment that controls and demoralizes educators’ creativity and flexibility to vary from the curriculum guide to ensure perceived reliable students achievement through the use of strict evaluations or test. Blair (2007) has argued that objective led lessons result in passive and superficial learning. Similarly Combs argued “that the use of behavioral objectives are of limited use, stifle creativity, cause teachers to lose sight of the general goals of education, are undemocratic, and demoralize teachers” (Ware et al., 1973, p. 667). These arguments are valuable but debated based on the lack of empirical evidence (Reed 2012; Ware et al., 1973).

Other professionals argue that behavioral objectives should not be implemented into daily public education for numerous reasons. Critics believe that educators would lose sight of broader goals of education because implementation of behavioral objectives can make a program appear successful when in reality it is yielding superficial results. Glass believed behavioral objectives were susceptible to superficial results and that schools would choose to implement them because of the easily attainable goals that would make a program appear to be a success when they were met (Hunt, 2002). Blair and Glass both believe that the use of behavioral objectives yields superficial test scores and learning and the program is not really a success it just appears to be. Critics also believe that the use of behavioral objectives are turning education into a methodical and procedural ritual instead of just allowing learning to occur naturally. Kneller believes behavioral objectives should not be used in instruction because it would cause a culture to set high value on the productivity and efficiency through the use of behavioral objectives (Kneller, 1972). Kneller also believes that education will decline into an inauthentic and spiritless condition if teachers adopt the behavioral objectivist approach. He states “that the process of education should not be tightly controlled by holding teachers more strictly
accountable for the evaluation of reliable learning and the reporting of the perceived accuracy of student’s achievement through the use of behavioral objectives” (Kneller, 1972, p. 398).

**State and Federal Policies Controlling Public Education or Failing Public Education**

Federal and state laws dictate that learning must be assessed through nationally normed tests. Standards must also be met for all students under the NCLB Law and goals must be attained by all schools (MSIP) or punishable consequences will be placed on the public institutions, public educators, and the community (Ravitch, 2010).

Public School Districts are mandated by the state and federal government to provide evidence that measurable goals are being met by all students through valid and reliable standardized tests. Ravitch (2010, p. 109) stated that “children are being trained and not educated due to mandate testing while teachers and administrators are doing their best to meet requirements of state and federal law.” She believed everyone’s energy is being used up all year to pass the mandated test while students are lacking the basic skills to move on to the next grade level.

In the state of Missouri, the Missouri Assessment Program, abbreviated MAP, is used to measure educational goals to help improve education for all individual students. MAP tests are given annually to all upper elementary students in the Missouri public school system in all core content areas to measure basic skills. Missouri Department of Elementary and Secondary Education use Missouri School Improvement Program (MSIP) which holds public schools accountable for all Missouri public school students (Missouri Department of Elementary and Secondary Education, 2009). With punishable consequences like closing public schools and following restructuring guidelines from the NCLB Law, Ravitch, the secretary of education in 2006, became a non-supporter of the NCLB Law. Her lack of support for NCLB Law was due to
the inadequate restructuring solutions that fail under the NCLB Law for failing schools. The restructuring solutions provided under the NCLB Law yielded little effect on student achievement.

The state also mandates that public educators teach students a specific curriculum in each grade level. The state mandates grade level expectations (GLE’s) that are to be taught and measured to ensure quality learning for all students (Appendix C). Grade level expectations (which are behavioral objectives) are measured quarterly and recorded on progress reports that are given to parents quarterly and kept on file throughout the student’s entire education process.

Review of Relevant Research

Behavioral objectives and effective teaching strategies are a topic of consideration because of state and federal policies that place negative consequences on failing public education districts. Many proponents tried to advocate for the implementation of behavioral objectives through the use of empirical research which was very limited whereas opponents against implementing behavioral objectives debated against the use of behavioral objectives based on logical concerns.

Research on student improvement with the use of implementing behavioral objectives throughout a lesson for regular education students in elementary schools has not been tested. Research on implementing behavioral objectives throughout a lesson at the high school and middle school level for either regular educational students or students in special educational classrooms has shown significant outcomes as stated previously. Past researchers have indicated that including statements of learning objectives at the start of all new lessons or after an anticipatory set has become a common practice for children with learning disabilities (Reed, 2012). Also Englert (1984) has found that stating learning objectives and other instructional
techniques to children in special education has shown significant contributions to the students’ learning and behavior. Further, O’Brien (1985) has also found significant results in stating behavioral objectives for middle school students based on their achievement.

Some of the critics, such as Combs and Blair, believe that the implementation of behavioral objectives would cause a stale learning environment that controls and demoralizes educators’ creativity and flexibility to vary from the curriculum guide to ensure perceived reliable student achievement through the use of strict evaluations or tests (Blair, 2007). Also Class and Kneller believed that educators would lose sight of broader goals of education because implementation of behavioral objectives can make a program appear successful when in reality it is yielding superficial results as well as turning education into a methodical and procedural ritual instead of just allowing learning to occur naturally (Kneller, 1972).

The ongoing debate over whether or not behavioral objectives should be implemented daily into public education today may be justified by the mandate to meet government performance standards, state standards, and by empirical results on effects of behavioral objectives.

The government entities are demanding that public school districts set high values on productivity and efficiency, while demonstrating measurable results through standardized tests, which is why effective instructional strategies that have empirical relevance should be implemented into learning environments.

As stated earlier, behavioral objectives are implemented into public education already by state standards and are reported on quarterly for all individual students through the use of reliable and valid assessments. There may be benefits to implementing behavioral objectives in the classroom daily to help foster educational achievement for all students at the federal, state, and
district level. Some benefits of implementing behavioral objectives in the classroom daily may include meeting federal, state, and district standards which can help eliminate school closures, job loss, and community confusion.
CHAPTER 3  
METHODOLOGY

Participants

The sample consisted of 22 second grade students from an urban Midwestern Elementary School for whom the researcher obtained consent and assent forms. There were a total of 39 students in the classes. The participants were selected out of convenience based on having two teachers that taught the same grade who agreed to allow the researcher to use their classrooms and students to research. Participants included 11 males and 11 females, and all participants were in the range of seven to eight years of age. Two female educators with 15 combined years of experience in teaching had agreed to participate in the study teaching the lessons.

Materials

The researcher used several materials for the proposed research. First, AIMSweb was used to test for academic equality amongst the two classrooms of students before the lessons were presented. AIMSweb has a reported internal reliability, test and retest reliability across four months for grades 1 to 8 (reading Comprehensive tests of basic skills) of .90 (AIMSweb, 2010). Pearson’s AIMSweb monitors early literacy, reading, and math and received the highest possible rating for predictive validity and reliability from the National Review Committee. Also, the Pearson Science Test that contains nine multiple choice test questions worth one point each and one short answer question worth two points for a total of 11 points total was given to the students twice (pretest and post test). Other materials that were used include an assent form and a consent form (see Appendix B).
Procedure

Two weeks before any testing began a brief meeting was held for all parents and second grade students who were potential participants in the research. The second grade classroom teachers and the researcher held the meeting to discuss and answer all questions and concerns relevant to the research being conducted. After all consent forms and assent forms were understood, signed, and collected, the research began. Formal permission along with a signed form was given by the school administrator. The classroom teacher and researcher retrieved the students’ reading and math grades from AIMSweb to ensure academic equality before the experiment research started. The classroom teachers and the researcher gave the Pearson pretest a day prior to teaching the same formal lessons. The pretest took approximately 30 minutes for each student to complete. The researcher collected the pretests for the students that had both assent forms and consent forms signed. A day after the pretest the classroom teachers delivered the same science lessons for the remainder of the two weeks with one exception. One classroom teacher stated the behavioral objectives before, during, and after the lesson (Objectives Group) while the other classroom teacher did not state the behavioral objectives (Control Group) at all throughout the lesson. The researcher was present during the lessons to ensure the same lessons were taught and that the interventions (stating behavioral objectives) were being implemented properly. After the lesson was taught the Pearson Science post test was given to all the students. The researcher collected all the test forms without any names written on them for the students that who had provided signed assent forms and consent forms. There was not any way to link the tests back to any of the participants. The participants were debriefed and then given the opportunity to ask questions. The delivery of the lessons, completion of the tests, and collection of the data took approximately two weeks at approximately one hour per day.
AIMSweb was used to determine academic equality amongst the two classrooms before the experimental research started. When given the AIMSweb second grade reading and mathematics assessment, the two classes’ mean scores for reading were 73.00 ($SD=45.66$) for the Objectives Group and 63.00 ($SD=33.93$) for the Control Group. The math mean for the Objectives Group was 6.00 ($SD=5.93$) and for the Control Group was 7.00 ($SD=3.36$). Based on the comparison of the two classes’ mean scores, it is an assumption that the children in each class have similar academic abilities. Also, an independent t-test was used to compare the two classes on math and reading scores and the results determined that there was not a significant difference between the two groups on either test score (math $p = .075$ and reading $p = .330$).

The two-way ANOVA was used to analyze the scores on the Pearsons Science pre and post tests. The Pearsons pre and post tests were scored on how many questions were answered correctly. The total points ranged from zero to eleven and the data were entered into SPSS. The researcher used a two-way mixed ANOVA to test the main effects of teaching method, time (pre-post), and the interaction. The main effect of time was within subjects and determined if a significant difference existed between the pre test scores and the post test scores across both groups. The second main effect was teaching methods, and it compared the two classrooms on pre and post test scores combined. The interaction effect determined whether there was a significant difference in the changes between the two classrooms’ pre to post test across the different teaching methods.
The two-way mixed ANOVA showed a significant main effect for time (pre test scores to post test scores), $F(1,20) = 19.42, p = <.001, \eta^2 = .493$, a non-significant main effect of teaching methods, $F(1,20) = 3.93, p = .061, \eta^2 = .164$, and a non-significant interaction, $F(1,20) = 2.21, p = .152, \eta^2 = .10$.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pretest Mean</th>
<th>Pretest SD</th>
<th>Post test Mean</th>
<th>Post test SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group</td>
<td>6.78</td>
<td>2.11</td>
<td>8.11</td>
<td>1.54</td>
</tr>
<tr>
<td>Objectives Group</td>
<td>4.77</td>
<td>1.88</td>
<td>7.46</td>
<td>1.90</td>
</tr>
<tr>
<td>Total</td>
<td>5.59</td>
<td>2.18</td>
<td>7.73</td>
<td>1.75</td>
</tr>
</tbody>
</table>

*Table 1:* Descriptive Statistics on Pearson's Science Pre-Test and Post-Test Scores for the Control Group and Objectives group.

The significant main effect of pre to post test scores within the same classes was expected by the researcher. The researcher expected the test scores to increase in both classes using either teaching method A or B from the pre test to the post test. These results suggest that the teaching methods produced basically the same results, but when examining Figure 1, we can clearly observe a steeper line for the Objectives Group compared to the Control Group, although this interaction trend was not statistically significant.

Figure 1 indicated that there was a greater increase or improvement for the Objectives Group compared to the Control Group. The graph showed that the Objectives Group (stating learning objectives throughout the lesson) had an increase of two points compared to the Control Group (not stating learning objectives) that only had an increase of one point.
Figure 2. Mean difference values representing improvements from pre to post science test scores comparing both teaching method of stating learning objectives and not stating learning objectives.

There were several statistical assumptions that had to be met to ensure the data and analysis were valid. The data did not violate the assumption that requires the use of interval and ratio data as the test scores are ratio data. The researcher ensured that each student had their own separate materials including pre test and post test forms and all the work was done independently so that the assumption for independent observations was met. The assumption of sphericity was not violated; the Mauchly’s Tests of Sphericity were not significant because there were only two levels of each independent variable. The assumption of a normal distribution or N larger than 30 was met. The frequency distributions on the dependent variable were approximately symmetrical and bell shaped (see Figures 2 and 3). The assumption of proportional or equal cell sizes was met because the 2 x 2 ANOVA cell sizes had a similar number of subjects, 9 and 13 subjects, although the cell sizes were not equal. A final assumption for ANOVA was
homogeneity of variance. The researcher examined the Levene’s Test of Equality, which indicated that all $F$ tests were not significant with $p$-values greater than .05 (.058 and .673) which indicated that the assumptions were not violated. The pretest scores for both classes had an $F$ value of .058 which was close to violating the assumption but not significant. Therefore, all the statistical assumptions for the two-way ANOVA were met.

*Figure 3.* Post test scores for both teaching methods form a fairly symmetrical curve to meet the statistical assumption of a normal distribution.
Figure 4. Pretest scores before any teaching methods occur forms a fairly symmetrical curve to meet the statistical assumption of a normal distribution.
CHAPTER 5
DISCUSSION

Statistical Results Compared to Research Results

The significant main effect of time, or the difference from pre to post test scores within the same classes, was expected by the researcher. The researcher expected the test scores to increase in both classes using any teaching method. The main effect of teaching method was non-significant but approached significance with a \( p \)-value of .061 which was greater than the standard alpha level of .05. The effect size indicated that the difference in teaching methods could explain about 16% of the variances in science test scores.

The interaction effect was non-significant. The results therefore did not support the hypothesis because stating learning objectives before, during, and after a lesson would result in a significantly greater difference in improving overall learning. However the interaction of time with teaching method accounted for 10% of the variances in science test scores.

This finding above did not support the earlier findings of the positive use of the implementation of behavioral objectives in a classroom. As stated earlier the previous studies were conducted at both a high school and middle school level for students in both regular education classrooms or special education classrooms (Ahlawa et al., 1988; O’Brien et al., 1985). Ahlawat et al. (1985), Englert (1984), and O’Brien et al. (1985) found through the use of implementing behavioral objectives a significant improvement in student’s achievement, learning, and/or behavior.

Those against the use of behavioral objectives may interrupt the results of the present study to support some of their logical concerns but professionals have to consider all findings.
Opponents argued that behavioral objectives are counterproductive to achievement, cause stale learning environments that control and demoralize educators’ creativity and flexibility, produce superficial test results and learning, and causes educators to lose sight of larger goals for education (Blair, 2007; Hunt, 2002; Kneller, 1972; Ware et al., 1973). However, because previous studies have found significant improvement based on the use of behavioral learning objectives and the fact of the results of the present study was fairly close to showing a significant improvement, we should be cautious about reaching any strong conclusions (Ahlawat, et al., 1988; Englert, 1984; O’Brien et al., 1985). Also in this present study the Objective Group did outperform the Control Group which indicated that learning was not superficial when behavioral objectives where implemented throughout the lesson.

Because the results of the present study were not conclusive, educators, law makers, and community members might need to reconsider revamping federal and state policies to ensure quality learning is occurring for all children under different criteria than just state assessments which can yield harsh consequences for public schools, administrators, and educators when scores are too low to meet the standard. Kneller (1972), a critic of behavioral objectives, believed that education would decline into an inauthentic and spiritless condition if teachers adopt the behavioral objectivist approach. Ravitch (2010, p. 109) stated that “children are being trained and not educated due to mandate testing while teachers and administrators are doing their best to meet requirements of state and federal law”. She believed everyone’s energy is being used up all year to pass the mandated test while students are lacking the basic skills to move on to the next grade level. With this information one might think about whether or not public education has declined into an inauthentic and spiritless condition not because of the use of
behavioral objectives but because of state and federal policies that require teachers to teach and prepare for yearly state assessment.

Kneller (1972) also believes that education should be a dialogue between the school and persons in the community, while the teacher encourages the students to enter into acts of learning that are meaningful to the student. Kneller’s statement leads me to my next question which needs to be researched; “Why are American Schools really failing?” Educators, policy makers, and community members may need to look at outside influences that impact learning such as degradation of the family and how that affects students learning instead of instilling harsh consequences on the public school district and educators when AYP is not met.

Also it is notable to point out that in 2006 Ravitch (2010), who was the secretary of education and a supporter of the NCLB Law, came to the conclusion that the NCLB Law was a failure because the solutions to failing schools had little effect on student achievement. For example, less than one percent of eligible students in failing schools sought to transfer to another school (Ravitch, 2010, p.99). While keeping the big picture in mind, which is educating all students at an acceptable level, many variables and obstacles must be considered and overcome to achieve the results required by NCLB. It is likely there is not just a single solution like stating or not stating learning objectives to overcome this educational dilemma.

**Improvement of the Study**

This study could be improved by repeating the same experiment with a larger sample size of at least 30 or more participants and with classes of gifted or high achieving elementary students, medium-achievers, and low-achieving students. The assumption of homogeneity of variance was met, as the Levene’s tests indicated, ensuring equal variances of the two populations. However, the $p$-value for the Levene’s test was .058 which was close to violating
the assumption of homogeneity of variance. If the research was duplicated using at least 30 participants the ANOVA would be more robust. Also, with an equal number of participants in the two conditions it would ensure that the assumption of proportional or equal cell sizes was met. Also, the same experiment may be conducted using at-risk students as participants.

Since this was the first study to be conducted at the elementary level as compared to the empirical data available regarding behavioral objectives for middle school and high school students, in future studies the researcher might want to consider the cognitive developmental stages of children according to Piaget’s Theory of Cognitive Development. Since elementary children are in a different cognitive developmental stage (preoperational stage) than most middle school and high school students (concrete and formal operational stages) the researcher might want to conduct an assessment or evaluation over the elementary student’s understanding of specific behavioral objectives for the academic area of study (Cherry, 2014).

A Difference in Teaching Methods

The graph that compared the two teaching methods, Objectives Group and Control Group also revealed a greater improvement in learning for the Objectives Group compared to the Control Group which suggests there is a difference in the two teaching methods. If the research could be replicated with a larger sample size, tested at multiple schools and grade levels and in several subject areas with multiple tests it would have greater statistical power, which make it more likely to detect any effect of teaching method.

Also, the table that compared the pre-test and post-test means for the two teaching methods, Objectives Group and Control Group also revealed a greater improvement for the Objectives Group compared to the Control Group which suggests there is a difference in the two teaching methods too. The pre-test mean for the Objective Group was 4.77 and for the Control
Group was 6.78, the post mean for the Objectives Group was 7.46 and for the Control Group 8.11, and the difference between the pre and post-tests means would indicate an increase in the scores for the Objectives Group which was 2.69 compared to the Control Group which was 1.33. Also, the Objectives Group performed lower on the pre-test before any teaching interventions were given compared to the Control Group but after stating behavioral objectives to the students before, during, and after each lesson the Objectives Group outperformed the Control Group. This indicates as stated earlier if the research could be replicated with a larger sample size, tested at multiple school, and tested based on student’s academic ability (high, medium, and low) it could have a greater statistical power, which makes it more likely to detect any effect of teaching method.

*Extraneous Variables*

Several factors could have acted as extraneous variables, increasing the nonsystematic variance and making it more difficult to measure differences between teaching methods. First, different teachers have different teaching styles. Some of the differences may have come from the teacher’s ability or inability to deliver a lesson while relating to the students. Past studies have found that teachers’ behaviors largely influence student learning (O’Brien, Meszaros, & Pulliam, 1985). Also, having all children actively involved comes with experience of the teacher, so years of experience are another factor that could account for some of the differences in test scores. Students’ academic abilities based on their GPAs also have to be considered as stated from past studies (Ahlawat et al., 1988). Ahlawat et al. (1988) found stating learning objectives to students’ with high GPAs improved students’ test scores in six areas (posttest knowledge, comprehension, and application and retention knowledge, comprehension, and application). Their results indicated that students with high GPAs benefited the most from stating learning
objectives (improvement in all six areas), whereas students with medium GPAs benefited more than students with low GPAs (improvements in one of six areas). Also test scores may not be entirely accurate measures of student ability, as students may fail to follow directions, skip a question or two on the exam, or improperly misread a question resulting in lower test scores. Another extraneous variable that could affect learning is natural outside influences, such as lack of food, poor living conditions, emotional, physical, and sexual abuse, a lack of social support, and a dysfunctional home environment. School schedules changing throughout the school year to accommodate assemblies and uncontrollable disruptions in the regular school day such as public address system announcements and fire drills could also affect performance on exams. All of these extraneous variables can contribute to lower achievement.

**Strengths**

Even though the results did not yield significant outcomes there were several strengths to this study. This study was conducted in a naturalistic environment of regular classrooms with actual teachers and students. The teachers also had several years teaching experience in that school and at that grade level. This research was conducted for two weeks for an hour a day instead of ten minute lessons for only a couple days.

**Conclusion**

These results are important because harsh penalties are being placed on school districts and staff members when schools nationwide fail to make annual yearly percentage (AYP) by mandatory improvements under the NCLB Law. When considering job loss, school closure, and community confusion when AYP is not met for all subgroups, revamping federal and state policy so harsh punitive consequences can be decreased to those involved in public education may be one of the best solutions. Also it would be best to implement many solutions to this problem.
instead of just looking for one solution such as whether or not to use behavioral objectives to fix a broken system. Stating learning objectives before, during, and after a lesson is just one simple intervention that could be used in the early childhood elementary population although the present study suggest that this intervention may not improve short term learning. Federal and state policy may need to be revamped and further research may need to be done to understand what circumstances are important for teachers to use behavioral objectives in classroom teaching.
References


Yes!&c=1


APPENDIX A
SCIENCE TEST SAMPLE

Read each question and circle the best answer. Then fill in the circle next to the correct answer.

1. Susan is pushing Carlos on a swing. First she pushes lightly and then she pushes harder. What will happen to the swing?
   A. It will stop.
   B. It will not change.
   C. It will move faster.
   D. It will move slower.

2. What is friction?
   A. A force that causes heat.
   B. A force that can stop a moving object.
   C. A force that can slow down a moving object.
   D. All of the above.

3. When does work happen?
   A. When you sweat.
   B. When a force moves an object.
   C. When you cannot move an object.
   D. When you push hard against the wall.

4. Angela has to work harder to pull a wagon filled with toys than an empty wagon. Why?
   A. It takes less force to move heavier objects.
   B. It takes more force to move lighter objects.
   C. It takes more force to move heavier objects.
   D. It takes more friction to move heavier objects.

5. What objects will magnets attract?
   A. Some objects made of glass.
   B. Some objects made of metal.
   C. Some objects made of wood.
   D. Some objects made of plastic.
APPENDIX B
ASSENT FORM, CONSENT FORM, AND PERMISSION NOTE

Assent Form

(Does stating learning objectives before, during, and after a lesson improve short term student achievement?)

**Researcher and Researcher Topic:** My name is Glenda Begemann. I am trying to learn about using learning objectives before, during, and after a lesson is taught to see if it helps students learn better. If you would like, you can be in my study.

**What will happen in this Research?** If you decide you want to be in my study, you will be taught a lesson by your classroom teacher and take a short test after the lesson is taught. Your name will not be recorded on the test form. You will write boy or girl on the test form.

**What are the good and bad things that come from you being in the research study?**
The risks associated with participating in this study are similar to the risks of everyday life. You will be in the same classroom and with the same teacher that you have now. The good thing about being in my study is you get to take a test that your teacher does not give you a grade on. Another good thing is your teachers will get to find out if stating learning objectives helps you learn better and faster.

**We will not share your personal information:** Other people will not know if you are in my study. I will put things I learn about you together with things I learn about other children, so no one can tell what things came from you. When I tell other people about my research, I will not use your name, so no one can tell who I am talking about.

**Parent/Guardian Approval:** Your parents or guardian have to say it’s OK for you to be in the study. After they decide, you get to choose if you want to do it too. If you don’t want to be in the study, no one will be mad or upset with you. If you want to be in the study now and change your mind later, that’s OK. You can stop at any time.

**Researcher Contact Information:** My telephone number is 1-816-786-9912. You can call me if you have questions about the study or if you decide you don’t want to be in the study anymore.

**Agreement:** I have decided to be in the study even though I know I don’t have to do it. Glenda Begemann has answered all my questions and I know that I can stop being in the study at any time.

_________________________________  ____________________________
Signature of Study Participant       Date

_________________________________  ____________________________
Signature of Researcher              Date
Consent Form

Identification of Researchers: This research is being done by Glenda Begemann a former John W. Luff teacher and a graduate student with the Psychology department at University of Central Missouri.

Purpose of the Study: The purpose of this study is to find out if stating learning objectives before, during, and after a lesson is taught improves short term student achievement.

Request for Participation: I am inviting your child to participate in a study on student achievement at John W. Luff Elementary School. It is up to you and your child if you would like to participate. If your child decides not to participate, he or she will not be penalized in any way. If your child decides not to participate his or her data will not be used in this study. Your child can also decide to stop at any time without penalty. If your child does not wish to answer any of the test questions at the end of the lesson, he or she may simply skip them. Your child may withdraw his or her data at the end of this study. If your child wishes to do this, please tell me before he or she turns in their materials. Once your child turns in his or her test I will not know which test was theirs.

Exclusions: Parents or guardians you must sign consent form for your child to participate in this study. Students who do not normally take written tests in class are excluded from this study.

Description of Research Method: This study involves a series of short mini lessons that will be taught by their classroom teacher. The lessons are pertain grade level expectations (Gle’s) that will be taught to your child this school year regardless of this research project. Also a pre and post test will be given. This study will take about two weeks at approximately one hour a day to complete. Please note that I cannot give your child individual results because the data is confidential.

Privacy: All of the information I collect will be anonymous. I will not record your child’s name or any information that could be used to identify your child.

Explanation of Risks: The risks associated with participating in this study are similar to the risks of everyday school life.

Explanation of Benefits: The results will help determine if learning objectives should be used more frequently throughout the school day to improve student achievement.

Questions: If you have any questions about this study, please contact Glenda Begemann. She can be reached at (816)786-9912. If you have any questions about your rights as a research participant, please contact the Human Subjects Protection Program at (660) 543-4621.

If you would like for your child to participate, please sign a copy of this letter and return it to your child’s classroom teacher. The other copy is for you to keep.

I have read this letter and agree to let my child participate.

Parents Signature: _______________________________________________________________

Name of Child: _________________________________________________________________

Date: _________________________________________________________________________
Permission Note

I, Toni Kilgore, the administrator of John W. Luff Elementary School, give Glenda Begemann permission to come into the school and test her thesis topic.

Thesis topic: Does stating learning objectives before, during, and after a lesson improve short term student achievement.

I understand that Glenda Begemann will follow all ethical guidelines in the process of this research. Glenda Begemann will communicate all information needed to complete this research to me prior to doing any research.

Signature:___________________
Name:______________________
Date:_______________________

Signature:___________________
Name:______________________
Date:_______________________
APPENDIX C
LEARNING OBJECTIVES

Learning Objectives

The classroom teachers’ will use their Scott Foresman science curriculum that has been adopted by the school district to teach the unit on “Force and Motion”. The classroom teachers’ will teach the same lesson by following the same teacher guide with one exception. Only one classroom teacher will state grade level expectations (Gle’s)/behavioral objectives before, during, and after each lesson is taught.

Behavioral Objectives that will be stated:

The students will be able to (TSWBAT):

**Build Background (pp.297-301):** (This section is divided into 3 mini lessons that will take approximately 20 minutes per lesson plus additional time for the teacher to assess what they have learned).

1. TSWBAT explain if heavy objects fall faster than lighter objects. ***
2. TSWBAT describe earth’s gravity as a force that pulls objects on or near the earth and towards the earth without touching the object (FM.2.B2a).
3. TSWBAT describe how objects move on different surfaces.***
4. TSWBAT measure (using non-standard units) and compare the force (i.e., push or pull) required to overcome friction and move an object over different surfaces (i.e., rough, smooth) (FM.2.A2c).
5. TSWBAT describe the direction and amount of force (i.e., direction of push or pull, strong/weak push or pull) needed to change an object’s motion (i.e., faster/slower, slower in direction) (FM.2.D2a).
6. TSWBAT describe and compare the distance traveled by heavier/lighter objects after applying the same amount of force (i.e., push or pull) in the same direction (FM.2.D2b).
7. TSWBAT measure force. ***
8. TSWBAT compare and describe the amount of force (i.e., more, less. Or same push or pull) needed to raise an object to a given height, with or without using inclined planes of different slopes FM.2.F2a).
9. TSWBAT compare and describe the amount of force (i.e., more, less, or same/ push or pull) needed to raise an object to a given height, with or without using levers (FM.2.F2b).

Note: The students will illustrate and write about what they have learned in their journals. The students will use their words to explain and describe their comprehension over the objects. The teacher will use the assessments in the book to check comprehension.
*** These are the behavioral objects the teacher will state the other objects are Gle’s that tie into the lesson.

**Lesson 1 (pp. 302-307):** (This lesson will take approximately 40 minutes).

1. TSWBAT describe how objects move differently (for example, straight, circular, back and forth).***

**Lesson 2 (PP. 310-313):** (This lesson will take approximately 20 minutes).

1. TSWBAT explain why work is done when a force moves an object.***

**Lesson 3 (PP. 310-313):** (This lesson will take approximately 30 minutes).

1. TSWBAT name different heat sources (for example, friction, solar, nuclear, and electric).***
2. TSWBAT explain the amount and direction of the force exerted on an object (for example, push, pull, friction, and gravity) and describe how much the object will move.***

**Lesson 4 (PP. 314-317):** (This lesson will take approximately 30 minutes).

1. TSWBAT name examples of simple machines and describe how they change effort.***
2. TSWBAT explain ways that simple machines make work easier.***
3. TSWBAT apply the use of an inclined plane (ramp) and/or lever to different real life situations in which objects are raised (FM.2.F2c).

**Lesson 5 (PP. 318-321):** (This lesson will take approximately 30 minutes).

1. TSWBAT identify that magnets attract to and repel from each other and certain materials.***
2. TSWBAT describe magnetism as a force that can push or pull other objects without touching them (FM.2.A2b).

**Guide Inquire (PP. 322-323):** (This lesson will take approximately 30 minutes).

1. TSWBAT identify that magnets attract to and repel from each other and certain materials (FM.2.A2a).
2. TSWBAT describe how objects may be moved with magnets (push/attract or pull/repel).***

**Wrap-Up Chapter 10 (PP. 324-328):** (The students will measure motion (20 minutes), review chapter 10 (20 minutes), NASA biography (20 minutes), and take a test (20 minutes).

1. TSWBAT demonstrate an understanding of customary and metric measurement of length and distance, selecting appropriate units of measurement (for example, inches, feet, yards, centimeters, and meters).***
2. TSWBAT explain how men and women of all ethnic and social backgrounds make contributions to science and technology.***