USING EXTRINSIC REWARDS TO INCREASE HIGH-SCHOOL SCIENCE STUDENTS' ACADEMIC PERFORMANCE

ABSTRACT OF APPLIED PROJECT

An applied project submitted in partial fulfillment

of the requirements for the degree of

Education Specialist at Morehead State University

by

Angela C. Stephens

Committee Chair: Dr. Beverly M. Klecker

Associate Professor of Education

Morehead, Kentucky

2010

USING EXTRINSIC REWARDS TO INCREASE HIGH-SCHOOL SCIENCE STUDENTS' ACADEMIC PERFORMANCE

Director of Applied Project Beverly M. Sleeker

This was an action research study by the teacher/researcher using a post-test-only experimental design. The purpose of this study was to determine whether or not academic rewards, used day-to-day in the classroom, would increase students' academic performance in ninth-grade integrated science classes in a rural southeastern Kentucky high school. The Hypotheses for the study were:

Research Hypothesis: Ninth-grade science students who are consistently given extrinsic rewards for academic success will perform better academically than ninth-grade science students who are not consistently given extrinsic rewards for good academic success.

Null Hypothesis: There will be no difference in the academic achievement of ninth-grade students who are consistently given extrinsic rewards for academic success and ninth-grade students who are not consistently given extrinsic rewards for academic success.

Informed consent to conduct the study at Betsey Lane High School was obtained from the school principal, the students in the study, and the parents of the students in the study. The participants in this study were randomly selected from the population of ninth-grade science students at Betsy Layne High School in Betsy Layne, Kentucky. After random selection of classes, the treatment (extrinsic rewards) was randomly assigned to two of four sections of ninth-grade Integrated Science

classes. These two classes were the Experimental Group (Group A, N=55). The two classes that received no treatment served as The Control Group (Group B, N=51). The extrinsic rewards used in the experimental group classrooms were identified by the students in the classes. After the four-week period (weeks three through six of fall semester, 2010), all students were given the same teacher/researcher-developed science achievement test. The results were presented as percentage correct in descriptive tables. A *z*-test, with alpha set a priori at .05, was used to test for a statistically significant difference between the sores of the two groups. The null hypothesis was rejected. Ninth-grade science students who were consistently given extrinsic rewards for academic success performed better academically than ninth-grade science students who were not consistently given extrinsic rewards for good academic success, $z = 5.92$, $p. < .05$, two-tailed test.

Accepted by: Beverly M. Klecker, Chair

Wanda L. Staley

Z. W. Uh

APPLIED PROJECT

Angela C. Stephens, M.A. in Counseling

Graduate School

Morehead State University

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Education Specialist Degree in Counseling

Beverly M. Klecker
Director of Applied Project

Applied Project Committee:

Beverly M. Klecker, Chair

Wanda L. Staley

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DATE

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CHAPTER I

INTRODUCTION

Teachers face many problems in today's classroom. One of the most challenging problems is to motivate students to perform well academically. "Students are often not motivated to learn" (Wright, 2001, p.3), many times the same students have excessive absenteeism and tardiness. Often these are the same students that are disruptive to the learning process of other students. Students' academic performance is the focus of this research proposal.

Statement of the Problem

This study investigated whether or not extrinsic rewards motivate freshmen high-school science students to perform better academically. Rewards are often used in the teaching of elementary-school students and with behavior modification in special education classes.

Purpose of the Study

The purpose of this study was to determine whether or not academic rewards, used day-to-day in the classroom, would increase students' academic performance in ninth-grade integrated science classes in a rural southeastern Kentucky high school.

Significance of the Study

Motivating academic effort and achievement in high school students has been the topic of much past research. This study, using an experimental design, will explore the effect that extrinsic rewards have on science achievement of ninth-grade students. If a technique can be implemented in the classroom which promotes

academic success, it is proposed that students would have better attendance, less tardiness, better behavior, and success in the classroom. This would directly benefit the student in his or her current studies as well as his or her future educational endeavors which directly affect success in life.

Statement of Hypotheses

Research Hypothesis: Ninth-grade science students who are consistently given extrinsic rewards for academic success will perform better academically than ninth-grade science students who are not consistently given extrinsic rewards for good academic success.

Null Hypothesis: There will be no difference in the academic achievement of ninth-grade students who are consistently given extrinsic rewards for academic success and ninth-grade students who are not consistently given extrinsic rewards for academic success.

CHAPTER II

REVIEW OF THE LITERATURE

A reward is a method used to support and strengthen desirable behavior. It can be given in return for good behavior or for some service or achievement. A reward in academic settings is frequently used to reinforce good behavior and/or to motivate students. Motivation can either be extrinsic or intrinsic. Definitions for intrinsic and extrinsic motivation according to Woolfolk (2005) are:

> **Intrinsic motivation**: Motivation associated with activities that are their own reward. **Extrinsic motivation:** Motivation created by external factors such as rewards and punishments (p. 341).

External rewards may include pay, promotion, tangible awards, and competition (Lewis, 2000). Recompense, either tangible or intangible, is presented after the performance of a deed, with an intention to cause the behavior to occur again (Williams, 2002). In this case, positive meaning is associated to the behavior. The effect is normally greater if the reward is received immediately. If reward giving becomes repetitive, then the behavior is likely to become a habit. Rewarding behavior or achievement can be difficult at times. Stephen (2000) observed that, when generating a recompense system, it can be simple to reward A, while hoping for B, and in the process-- creating damaging effects.

Extrinsic rewards in an academic setting bring extrinsic motivation that occurs when a student is obliged to undertake something, or act in a particular way because of external factors like cash and good grades. According to Bentham (2008), the only

cure for the problem of procrastination and low grades is to offer rewards to the best performing scholars. This results in tremendous improvement even among students performing at the lowest levels. Extrinsic rewards can also include praise, recognition, public appreciation, and telephone calls home from the teacher. Telephone calls from the teacher to students at home were strongly encouraged by the school in which this study was conducted.

Lepper, Green, and Nisbett (2003), used an experimental design in their study of drawings by kindergarten children. The researchers randomly selected two groups of seven children each. Each group was given instructions to draw images of human beings and flowers. The experimental group was assured a 'good player medal' for their task; the control group was not promised anything. On a return visit, an analysis of co-variance was used to measure academic achievement and to test the null hypothesis. The experimental group did their work in much less time compared to the control group.

Researchers at the *Centre for Educational Research and Innovation* (2000) used an experimental design to study students who were poor in math. Fourteen students were randomly selected from the population and were randomly assigned to one of two groups of seven each. A pre-test of academic achievement was given to all students before the experiment. Students in the experimental group were promised a trip outside school if they scored a mark of 70% and above. The control group was not promised a reward. All students were given the same test and the results were

marked and recorded. All seven students in the experimental group scored 70% and above. The control group scored 45% and below.

Felissa and Turban (2010) conducted a research study with undergraduate students in three large universities in the USA. The participants were randomly selected and randomly assigned to one of two groups. Each undergraduate of the experimental group was given a chance to select their rewards from a list produced by the researcher. Students from each university were given a project, which involved coming up with a unique work that would later be presented in a science congress outside the school. Students in control group were not promised any reward. All students were given a period of one month to work on their projects during which time observations were being made on the amount of time and seriousness they put into their projects. An analysis of co-variance was used to measure their achievement. It was found that the experimental group had the best projects.

In a study by Abbott (2001), five students from Highleys College were randomly selected and randomly assigned the treatment of a consistent extrinsic behavior reward. Structured interviews were administered to each of the students and the results analyzed. Students who emphasized only mastery goals showed better achievement and more desire on rewards, than students who mentioned both mastery goals and social goals. More rewarding and motivation did not necessarily translate into better motivation especially if it led to the use of effort-minimizing approaches as an alternative to more active learning approaches.

Ann and Phyllis (2010) used a multi-method approach in their study of 30 kindergarten children in Wales. Two teachers randomly selected 30 children to explore completion and quality of homework. Parents of 15 of the children were asked to use extrinsic reward like candy and ice cream as motivation. The use of consistent external rewards was tracked throughout the term of study. The control group received no extrinsic rewards throughout the period. At the end of the term, an analysis of their performance and consistency of doing their homework was done. Use of extrinsic motivational methods demonstrated increase in academic achievement, persistence and greater inclination to challenge.

Brophy (2004) used a single-case study design in his research with a primary school student of St. Anthony Preparatory. The student was asked to undertake an academic task at that time (homework), and he would later be given an opportunity to do something he really liked to do later, in this case, playing football. Another student of the same class was asked to do the same homework but was not promised any reward. The use of these rewards was tracked consistently for three months. The control sample did his assignments though inconsistently. The experimental sample then began to demand for a chance to play, if he was to do his homework. Thus, this strategy though attractive, depicted academics as something bad that should be done quickly and put aside, other than something enjoyable.

Ginsburg and Bronstein (2008) used a random sample of 170 talented high school students (68 males and 102 females). The students were given structured questionnaires to complete. They were asked questions about the effects of extrinsic

rewards on their performances in class. According to the analysis, 159 students reported their performance improved when extrinsic rewards like trips, books and school uniforms were given.

Sheri and Garrison (2009) used an experimental design in their study of first grade and third grade children from a mid-sized city in the south of United States. They randomly selected 10 students from each level and randomly assigned them to one of two groups. A math test was given to all the students before the study. The experimental group was promised a reward of free math revision books and a chance to attend math symposiums every once a month if they performed well. The control group was not promised any reward. The use of consistent external rewards was followed the whole semester. Academic achievement was then measured at the end of the semester through marking the test. In the experimental group, third grade students who used to score 40% and below scored 70% and above while first grade students who used to score 50% and below could score 70% and above. The results for the control group, however, remained constant.

Erchul and Martens (2010) called the attention of sixth-grade students to the instrumental value of learning by putting two teachers side by side. One of the teachers used negative words and personal embarrassment, thus, making them fearful if they did not perform well in class. Teacher B however, used words of praise and encouraged the students to work hard in class, assuring them of a bright future if they did so. The performance of both the teacher's students was observed by comparing the results. Students of teacher B, performed better than those of teacher A. Thus, use

of positive words helped the students to recognize the connection between classroom learning and life after school. They were able to appreciate that schools are established by society for their benefit. This gave them enthusiasm to even work harder in class.

Smelser and Content (2000) conducted a research on the impact of negative rewards--rewards used with negative consequences--on academic achievement. A teacher conducted an experimental-design research study using his sixth- through eighth-grade communications art class in London, UK.. The teacher introduced a program called S.T.A.R.S (Students That Aren't Really Serious). In this program, when a student was caught doing something negative like not giving their homework in time, chatting in class and not fully participating in class or failing to attend school, they were given a star. When a student earned 50 stars, they were punished by either being sent home, being denied candy while others are given candy, or left out when others went for a trip. According to the teacher, this program had worked well thus resulting to better grades for his students.

Although negative reinforcement (e.g., discipline referrals, being sent to the principal's office, removing breaks) has been proven to work, positive reinforcement--using rewards--has been found to work much better. Positive rewards encouraged students to work more, giving them purpose and reason for their work. Over time, positive rewards resulted in better results. Most teachers, according to Aronson (2002), have been observed to prefer positive rewards to negative ones.

Pajeres (2002) stated that although extrinsic rewards increase academic achievement, they may not be as effective when heavily relied upon. Students may become too focused on rewards or competition to the extent of not paying attention to what is being taught. Pajeres further suggested that task management and success tends to be higher when students perceive themselves to be engaged in an activity for their own reasons. Also, students should be allowed to select their own rewards.

Summary of Review of Literature

Research findings from the studies in the literature reviewed for this study supported the use of extrinsic rewards to motivate academic achievement. Extrinsic rewards were found to be most suitable to motivating stable performance on tasks requiring following a clear plan to reach an apparent goal, than more open, divergent and complex tasks. Giving scholars extrinsic rewards for employing knowledge tasks makes the inherent account that the action is not worth doing in its own values. Extrinsic motivation also suppresses intrinsic motivation, especially if the reward is expected. Tangible rewards as well, have a small positive effect on attitude, although they have been found to increase academic achievement, in the long run (Broussard & Garrison, 2009). Finally, Kohn (1994) stated that extrinsic rewards are temporary and in fact that people who are rewarded actually do not perform as well as people who do not expect any reward.

Definition of Terms

Motivation. The internal processes that gives behavior its energy and direction; it is derived from a variety of sources such as needs, emotions, and cognitions to satisfy a desire (Wright, 2002).

Extrinsic Rewards. The extrinsic rewards used in this study were selected by the ninth-grade students in the experimental group (see Method section for a full description of the process and the rewards selected.).

Academic Performance. Academic performance is defined in this study as a students' scores on the science classroom assessment instruments designed by the teacher/researcher for this study.

CHAPTER III

METHODOLOGY

This action research study used a post-test-only experimental design with randomly selected and randomly assigned ninth-grade science students. The students who were randomly assigned to the experimental group received extrinsic rewards. The students who were randomly assigned to the control group received no rewards.

Statement of Hypotheses

Research Hypothesis: Ninth-grade science students who are consistently given extrinsic rewards for academic success will perform better academically than ninth-grade science students who are not consistently given extrinsic rewards for good academic success.

Null Hypothesis: There will be no difference in the academic achievement of ninth-grade students who are consistently given extrinsic rewards for academic success and ninth-grade students who are not consistently given extrinsic rewards for academic success.

Informed Consent for the Study

Permission to conduct this study at Betsey Lane High School was obtained from the school principal. The study was described to the students by the teacher/researcher and they were verbally informed of their right to participate or not participate in the study. Students were assured that there would be no repercussion resulting from opting out of the study. Students who wished to participate signed a consent form. The parents of the participating students were informed of the study

and gave their consent by signing the consent form. (Appendix A, Parental Consent Form).

Population and Sampling

The participants in this study were all enrolled in ninth-grade science classes at Betsy Layne High School in Betsy Layne, Kentucky. The student body is composed of 458 students of which 430 or 94% are Caucasian students and the other 28 or 6%, are African American students. The student population is predominantly Caucasian, which reflects the percentage of ethnicity in Floyd County. The required Science classes contained approximately 150-180 students.

Students were enrolled in four ninth-grade science classes by the school counselor in a non-systematic manner. The treatment (extrinsic rewards) was then randomly assigned to two of four sections of ninth-grade Integrated Science classes. These two classes were the Experimental Group (Group A, N=55). The two classes that received no treatment served as The Control Group (Group B, N=51).

Group A classes: Experimental Group (Received Extrinsic Rewards)

1. Integrated Science I (1st period): 5 males and 22 females
2. Integrated Science I (5th period): 12 males and 16 females

Group B classes: Control Group (Received No Extrinsic Rewards)

1. Integrated Science I: (2nd period): 16 males and 5 females
2. Integrated Science I: (3rd period): 15 males 15 females

The overall sample was representative of the racial, gender, and socio-economic composition of Floyd County, Kentucky.

Instrumentation

The instrument (see Appendix) used in this research was designed by the teacher/researcher to measure the effectiveness of extrinsic rewards on motivationally challenged students and to measure an increase in the academic performance of students on individual and group levels. The instrument consisted of 15 multiple-choice, one open-response question, and five chart/graph questions that measured content of previous lessons.

Validity and reliability. The main concern for teacher-constructed classroom assessment is content validity. The teacher/researcher assured content validity of the instrument for this study by constructing the questions, with different levels of difficulty by making sure that the students all had opportunity to learn the material being measured. Reliability in classroom assessment is less important as the instruments are non-standardized. (Linn & Miller, 2005).

Procedure

The study began the third week of school fall of 2010. The teacher/researcher had the students set up a point system that established rewards to be earned. Then the teacher/researcher asked for recommendations from the students as to what type of rewards they should receive for academic performance and at what level these rewards should be placed (Woolfolk, 2005).

The teacher/researcher tallied the suggestions and allowed the students to vote on the top 10 rewards they should receive for meeting set specific criteria.

The students selected the following.

1. **Incentative points**

    a. 90% or better on a test [50 points per test]

    b. Class average for a test 80% or better [50 points per test for all]

    c. Obtaining the highest average on a test [50 points]

2. **Reward System**

    a. 1 Homework pass [5 points]

    b. 20 extra points added to a test below 70% [10 points]

    c. Food and drink brought into class [15 points]

    d. Notes for a whole chapter [20 points]

    e. Free notebook grade [full credit] [30 points]

    f. 100 extra incentive points [40 points]

    g. Video Day (entire class) includes drinks and food to be brought into class [750 points]

A secondary reward was also established: if the points earned are not used then the student will carry that amount of extra incentive points to the end of the nine weeks of school.

All of these activities were assessed over the four weeks [August 23, 2010-September 20, 2010]. Additionally, the student had the option of giving extra incentive points to other students if he or she chose to.

A board of current information for each student (using identification numbers as opposed to the names of students in order to keep confidentiality) was posted. The

information on the board reported the points that had been collected and a cumulative amount of all the points that has been earned, as well as a cumulative amount for the class. Each student had the option of sharing their scores with fellow students. Additionally, each individual student received his or her own scorecard to keep up with his or her cumulative score.

Each student was given a pre-copied set of created checks which the student used to purchase one of the rewards. They were given only one copy. Each student understood the reward system and it was his or her individual decision whether or not to use their points for themselves or combine and use them as a group. Group B (control group) did not receive the additional reward system.

The teacher/researcher then created and monitored the checking system through which the students earned a check to receive a specific reward. Finally, the teacher/researcher developed an updated total board to display the progress of each student. The student board was posted with identification numbers substituted for names. Thus, each student was able to monitor his or her progress in the class. Any student could have chosen to have shared his or her progress.

This study ran for 20 school days --from August 13, 2010-September 20, 2010. Then a comparison was made between test scores of Groups A and Group B on the teacher/researcher designed instrument measuring academic achievement to see if external rewards had impacted their learning.

Assumptions

This research study was based on the following assumptions: (1) all of the students were at the same developmental level, (2) all were from the same socio-economic status in the community, (3) all of the students had the capacity to learn science, (4) all students had the proper discipline to behave and learn in class, (5) all were focused on school activities, (6) all students had courtesy and kindness to others around them, and that all (7) students were motivated to learn.

Limitations of the Study

The limitations of this research study are as follows: (1) the time factor, which is the amount of time needed to accurately create a thorough design to test the particular indicated study, (2) the general monetary resources needed to fund the research (money designated by the school board for the research), (3) the school schedule of activities during class time, etc., (4) limiting the amount of points that a student could earn in a single week, (5) the continuous interruptions that occur on a daily level in all schools, and (6) the amount of time that it would take the teacher to complete the daily documentation (an aide could be used to monitor and record the academic data). Further, the findings of this action-research study, limited to a single science department in a single school, may not be generalizable to other populations.

Data Analysis

Data for the study were the number of rewards received by the ninth-grade science students in Group A (Experimental Group) and the achievement scores on the teacher/researcher-created achievement test on the science material covered for the

four-week period for both Group A (Experimental Group) and Group B (Control Group). Data were reported as percentage-correct on the achievement test. Descriptive tables were created to present graphic depictions of the results. Each student's performance on test was recorded in the following areas: obtaining 90% or better on a test, the class average collectively for the test 80% or better, and earning the highest score on the test.

Timeline

June – July, 2010: Wrote Proposal

August 19-16, 2010: Obtained consent for the study from Principal, students, and parents.

August 23-September 20, 2010: Conducted the study.

September 20-Octoberr 20, 2010: Analyzed the data and wrote report.

October 20, 2010: Submitted first draft of Applied Project to Chair.

CHAPTER IV

RESULTS

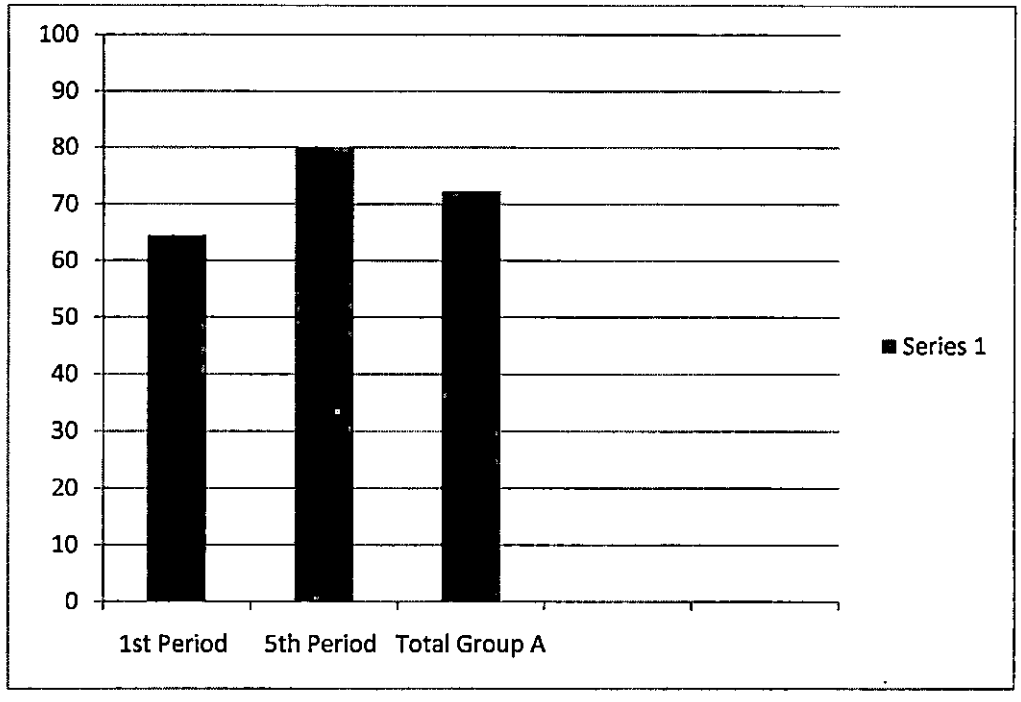
Null Hypothesis: There will be no difference in the academic achievement of ninth-grade students who are consistently given extrinsic rewards for academic success and ninth-grade students who are not consistently given extrinsic rewards for academic success.

The Null Hypothesis was tested by comparing the difference between the total percent correct on the science achievement test by Group A (experimental group receiving awards) and the total percent correct on the science achievement test by Group B (control group receiving no rewards).

Tables 1 and 2 below presents a graphic depiction of the average exam score (percentage correct) by gender for Group A, the Experimental Group who received Extrinsic Awards throughout the study.

Table 1.

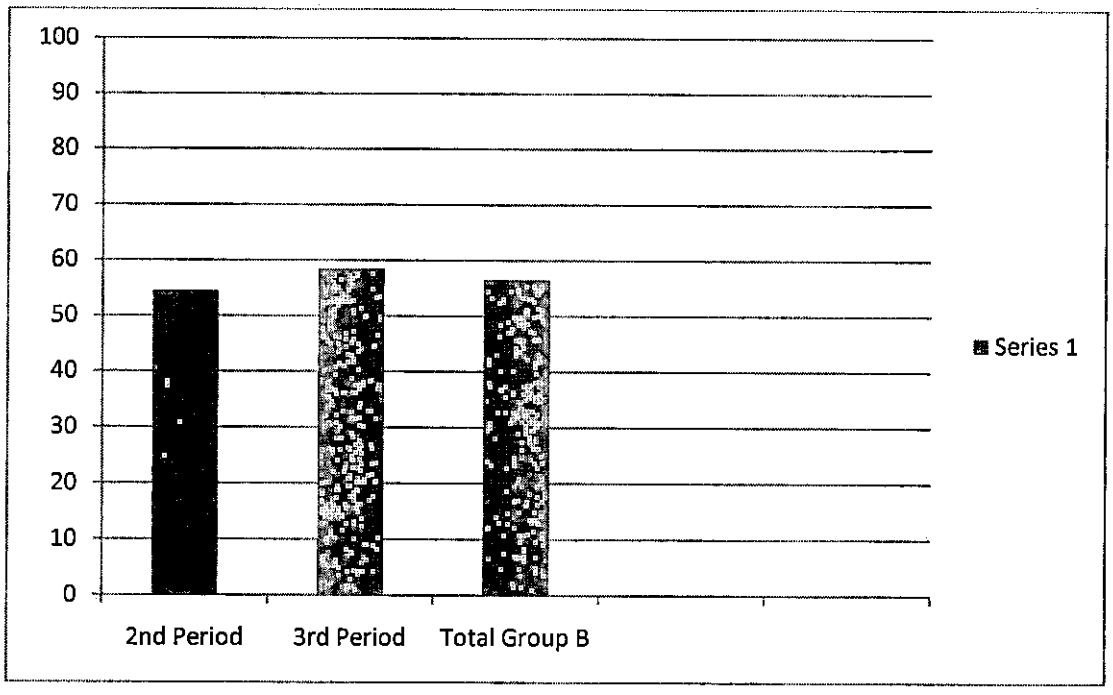
Group A (Experimental Group): Exam Scores by Percentage Correct



The results presented in Table 1 for Group A (Experimental Group) (N=55) average exam scores indicate that the class with the highest average percent correct was Integrated Science I Fifth Period (80%). The group average for the students in Integrated Science I First Period had lower scores with a group average of 64.5%. There was a difference of 15.5% between the scores of the two classes in Group A (Experimental Group). The overall average percentage correct for Group A (Experimental Group) was 72.25%.

Table 2.

Group B (Control Group) Exam Scores by Percentage Correct



The results presented in Table 2 for Group B (Control Group) (N=51) average exam scores indicate that the group with the higher average percent correct were the students in Integrated Science I Third Period (58.5%). The students in Integrated Science I (2nd period) had an average percent correct on the exam of 54.5%. However, there was only a slight (4.0%) difference between the scores of the two classes in Group B (Control Group). The overall average percentage correct for Group B (Control Group) was 56.5%.

Descriptive Comparison Group A and Group B Scores

There was an observed difference in the exam average percent correct when comparing Group A (Extrinsic Reward Applied) (N=55) and Group B (No Extrinsic Reward Applied) (N=51); 72.25 % - 56.5% = 15.75%. Group A's average percentage correct on the exam was 15.75% higher than Group B.

Test of the Null Hypothesis

The difference observed in the descriptive statistics between the two groups was tested for statistically significance with alpha set *a priori* at .05, using a z-test (Gravetter & Wallnau, 2005). The null hypothesis was rejected and it was concluded that ninth-grade science students who were consistently given extrinsic rewards for academic success performed better academically than ninth-grade science students who were not consistently given extrinsic rewards for good academic success, $z = 5.92$, $p. < .05$, two-tailed test.

CHAPTER V

CONCLUSIONS

Discussion

The results of this action research using a post-test-only experimental design, found that the use of rewards in the experimental group caused an increase in science achievement as measured by the classroom assessment.

There is a difference in the exam averages when comparing Group A (Extrinsic Reward Applied) and Group B (No Extrinsic Reward Applied) Group A -72.25 % - Group B - 56.5% = 15.75%. Nevertheless, the differences between the two sections of Group A need to be further examined. Clearly, the difference in the average percent correct in first and fifth period class scores in Group A are markedly different. In contrast, no marked difference was observed between scores of the second and third period classes in Group B.

The differences between the two classes making up Group A (it should be noted that both classes had higher scores than either class in Group B) cannot be examined with the study design. There are no apparent differences in the proportion of gender in the two classes. Maybe the assumption that the students were equal in ability and motivation was false. The use of a post-test-only design did not allow for equating these differences in students in the statistical analysis.

Some students may respond better to an external stimulus to get them to work and others will still work at their same pace. The use of extrinsic rewards motivates some students to do the work in order form them to get what they want, this in return

will aid in the progress of their academic status. Based on the research evidence in the literature reviewed for this study and the findings of the study, I would recommend the use of extrinsic rewards in high-school classrooms. From observations during this study, I have found that students who received student-selected extrinsic rewards were more motivated, persistent, and enjoyed class more than did students who did not receive extrinsic rewards.

Recommendations

If I were to repeat this study, the things that I would do differently would be to give the experiment more time. I think a nine-week grading period would be a more sufficient amount of time to see if the results would be consistent.

In future studies, I would use a pre-test, post-test, experimental design. I could then use the pre-test to equate the groups by using an Analysis of Covariance (ANCOVA) when I analyzed the data. This analysis would equate the students by using the pre-test scores and test for differences in the post-test scores.

I ran into the problem of the lack of funds to buy food and drinks with when the students votes to combine their points to watch a movie and to have snacks and soft drinks. I ended up paying for all of it.

I also had to design a lesson plan for watching a PG movie with applicable Core Content for Integrated Science I. Luckily it wasn't too difficult, and I was able to write a good one. I also had them do an exit slip at the end of the class. They had to write three scientific things that they had learned from watching the movie and turn it in to me and I assigned a point value for it.

Based on these issues, I would probably let the class select three to five movies and then let them tell me what was scientific about each one. If they couldn't find anything scientific about the movie then I would remove that particular movie from the list.

If using extrinsic rewards were to be an ongoing part of my class, helping students to identify rewards that required no funding to purchase items needed and that were compatible with the curriculum would be challenging.

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APPENDIX

CONSENT FORM

Dear Parent/Guardian:

The Science class in which your child is enrolled will be participating in a research study. The study will be used to test the effects of an applied reward system on the academic performance of each student. The study will be given to four Science classes, which contains approximately 120-155 students. The proposed results of this study should show that by introducing a proper reward system that benefits and acknowledges the improvement of academic performance will greatly improve the student's participation in class work, increase the accuracy, promptness to class, and improve the attitude shown in class. This knowledge obtained from the research study will provide valuable information to all teachers on how they could improve classroom academic progress of the students.

The study will take place during August 13, 2010-September 20, 2010. I, Angela Stephens, will be conducting the research; I am one of three current Science teachers at Betsy Layne High School. I am on my tenth year of teaching at Betsy Layne High School and I teach 1 Anatomy & Physiology and 5 Integrated Science I classes.

I have developed a hypothesis that if extrinsic rewards are given to the students; then they will improve academically. The research study will be able to support the theory or disprove it.

The study will also be based upon the opinions and ideas of students on how they can improve in both areas along with my own suggestions. I believe that if the students develop their own rewards and how to achieve them, they would be more likely to follow them than if I dictated what they should do.

There will be a posted board of current information of each student, a cumulative amount of all the points they have earned; as well as a cumulative amount for the class. I will be using identification numbers instead of student names to protect confidentiality.

Opinions and choices will play an important role for each student in this research study.

I have conducted several collaboration sessions with other teachers and have gathered their individual suggestions on how they have developed appropriate measures and procedures to be used in class. I will combine these ideas and theories to the suggested ones from the students to create a usable and effective means of increasing their academic output.

I have reviewed the research that has been done on the idea study of reward systems and academic/behavior improvement. There are many that disagree with the idea of "bribing" students in order to get what the teacher wants from them, and there are others that do believe that providing an external stimulus gives students more motivation to perform at their maximum potential.

This study will also allow students to compete against their fellow classmates on collecting as many possible points and deciding upon which type of reward they

will collect. I do believe that this research study will be greatly beneficial to the students as well as other teachers in the improvement and the advancement of behavior and academic performance.

This research study is part of a required graduate course at Morehead State University (EDGC 699A, Applied Project) and this research study will be optional for your child, please review the detailed information on the following parental consent form. The participation of your child in this study is desired and necessary, if you do decide to allow your child to participate please sign and date the following consent form. If you do not wish for your child to participate in this study then I will respect your decision and not allow your child to participate.

Sincerely,

Angela C. Stephens

Instructor of: Anatomy & Physiology and Integrated Science I

Consent Form (Continued)

The information provided on this form and on the accompanying cover letter is presented to you in order to fulfill all legal and ethical requirements for Morehead State University (the institution sponsoring this graduate study) and the Department of Health and Human Services (HHS) regulations for the Protection of Human Research Subjects as amended on March 26, 1989. The terminology that will be used during this study is the same as utilized as in all studies, therefore the information pertained in this study should not be misinterpreted.

The administration of Betsy Layne High School has given approval to conduct this specific study, "*Using Extrinsic Rewards To Increase High-School Science Students' Academic Progress*" on my Science classes. The main purpose of this study is to determine if the effect of a reward stimulus will increase academic performance of students on written activities. A secondary and unrelated topic of this research study is to view the social development between students in creative and efficient decision making on personal and a community level. The research study will be based upon the following procedures:

1. Improvement on academic performance. Possible points possible to earn.
    a. 90% or better on a test [50 points per test]
    b. Class average for a test 80% or better [50 points per test for all]
    c. Obtaining the highest average on a test [50 points]
2. Reward System
    a. 1 Homework pass [5 points]

b. 20 extra points added to a test below 70% [10 points]

c. Food and drink brought into class [15 points]

d. Notes for a whole chapter [20 points]

e. Free notebook grade [full credit] [30 points]

f. 100 extra incentive points [40 points]

g. Video Day (entire class) includes drinks and food to be brought into class [750 points]

3. Secondary reward: if the points earned are not used then at student will earn that amount of extra bonus points at the end of the nine weeks of school.

All of these activities will be assessed over the next four weeks [August 13, 2007-September 20, 2010]. There are no foreseeable risks that will pertain to the students; however, this study may produce competition among the students to outperform others in the class.

There will be a posted board of current information of each student, a cumulative amount of all the points they have earned; as well as a cumulative amount for the class [maybe this will create a class against class rival to see who can excel the most]. Each student will be identified by identification number to protect confidentiality; also each individual student will receive his or her own score card to keep up with their cumulative score.

Each student will be given a pre-copied set of created checks, in which the student will use to purchase the above rewards. They will be given only one copy and are expected to keep up with it and not to lose it. If they do lose it then they will not

receive another copy of checks. Each student will know the reward system and it will be their individual decision whether to use their points for themselves or combine and use them as a group.

The purpose of this form is to allow your child to participate in this research study and will allow the researcher to use the information collected to develop additional techniques with fellow faculty and staff in the creation of a new discipline for behavior and academic problems. The parental consent for this research study is strictly on a volunteer basis, without undue influence or any sort of penalty in which the student may face. The parent/guardian signature below states that the parent has read and understands the above description of the research study, as well does the student signature. Both signatures agree that the intended subject agrees to participate in the research study cooperatively.

If you have any additional questions pertaining to this research study, the rights of the subjects, or if you have any information to inform the researcher about your child, please call the researcher, Angela Stephens, at (606) 478-9138. I would also like to thank you for taking the time to read the detailed information that was provided to you and I am looking forward to working with your child.

Please sign the next page for consent to participate in the experiment.

Consent Form Signature Page

Consent to participate in the experiment, "*Using Extrinsic Rewards To Increase High-School Science Students' Academic Progress*"

Please detach this page and return to Ms. Angela C. Stephens.

Keep the other pages for you records.

_____ _____

Student's Signature Date

_____ _____

Signature of Parent/Guardian Date

SCIENCE ACHIEVEMENT TEST

Our Planet Earth

Name_____ **Period**_____

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1 The study of Earth's composition, structure, and history is called

A seismology.
B physics.
C chemistry.
D geology.

2 Forces that shape Earth's surface can be divided into

A constructive and physical.
B constructive and destructive.
C chemical and destructive.
D chemical and physical.

3 The two layers that make up the lithosphere are the

A upper mantle and lower mantle.
B oceanic crust and continental crust.
C inner core and outer core.
D crust and upper mantle.

4 The three main layers of Earth's interior are the

A crust, core, and lithosphere.
B crust, mantle, and core.
C mantle, inner core, and outer core.
D crust, mantle, and asthenosphere.

5 A naturally occurring, inorganic solid with a crystal structure and a characteristic chemical composition is a

A rock.
B fossil.
C mineral.
D piece of granite.

6. What is a mineral's hardness?

A a type of fracture in which a mineral breaks along regular, well-defined planes
B the resistance of a mineral to scratching
C the color of a mineral's powder
D a type of fracture in which a mineral breaks along a curved surface

7 Rocks are classified as

A sandstone, limestone, or granite.
B organic, intrusive, or clastic.
C igneous, metamorphic, or sedimentary.
D sedimentary, intrusive, or metamorphic.

8 Intense heat, intense pressure, or reactions with hot water can modify a pre-existing rock to form a(an)

A metamorphic rock.
B sedimentary rock.
C igneous rock.
D organic rock.

9 A series of processes in which rocks are continuously changed from one type to another is called

A a volcanic eruption.
B the rock cycle.
C geology.
D melting.

10 What changes are involved when mud from a lake bottom turns into a sedimentary rock and then into a metamorphic rock?

A compaction and cementation, and then melting
B heat and pressure, and then weathering
C compaction and cementation, and then heat and pressure
D melting, and then compaction and cementation

11 The hypothesis that the continents move slowly over Earth's surface and once were joined into one supercontinent is called

A plate tectonics.
B continental drift.
C sea-floor spreading.
D subduction.

12 Why was Wegener's hypothesis of continental drift originally rejected by geologists?

A Wegener did not have any data to support his hypothesis.
B The continents of South America and Africa do not fit well together.
C Wegener could not explain how the continents could move through the ocean Floor.
D Wegener's data were incorrect.

13 New ocean crust is formed along

A mid-ocean ridges.
B subduction zones.
C mountain belts.
D trenches.

14 A subducting oceanic plate

A is less dense than the plate it moves under.
B is pushed up and over the continental crust.
C sinks into the mantle, forming a trench.
D moves horizontally in the opposite direction past the other plate.

15 The heat that drives mantle convection comes from the gradual cooling of Earth's interior and

A the sun.
B the decay of radioactive isotopes.
C sea-floor spreading.
D trenches.

Open Response---Please choose one of the following.

16 How does the subduction of an oceanic plate result in the formation of a volcano?

17 Describe the rock cycle.

Graphs and Charts---Please answer ALL of the following.

USING SCIENCE SKILLS

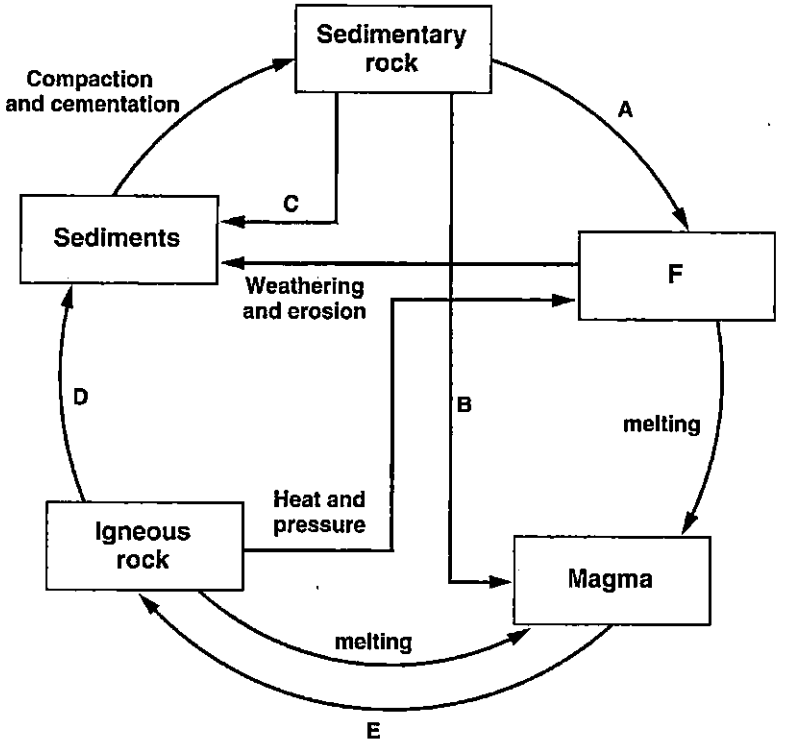

Figure 22-2

18 **Classifying** What type of rock would fit into Figure 22-2 at the location shown by the letter F?

19 **Interpreting Graphics** In Figure 22-2, what processes are represented by the arrow labeled A?

20 **Interpreting Graphics** In Figure 22-2, what process is represented by the arrow labeled D?

21 **Drawing Conclusions** Use Figure 22-2 to describe how an igneous rock could turn into a sedimentary rock and then into a metamorphic rock.

22 **Using Models** Use Figure 22-2 to describe the process involved in the formation of a sedimentary rock

THE EARTH EXAM: ANSWERS
MULTIPLE CHOICE

1.	D	DIF:L1	OBJ: 22.1.1 Describe the science of geology.
2.	D	DIF: L2	OBJ: 22.1.1 Describe the science of geology.
3.	D	DIF:L2	OBJ:22.1.2 Describe the main layers of Earth's interior.
4.	B	DIF:L1	OBJ:22.1.2 Describe the main layers of Earth's interior.
5.	C	DIF:L1	OBJ:22.2.1 Distinguish between rocks and minerals and explain several properties used to identify minerals.
6.	B	DIF:L2	OBJ:22.2.1 Distinguish between rocks and minerals and explain several properties used to identify minerals.
7.	C	DIF:L1	OBJ:22.3.1 Classify rocks as igneous, sedimentary, or metamorphic and explain how different types of rocks form.
8.	A	DIF:L2	OBJ:22.3.1 Classify rocks as igneous, sedimentary, or metamorphic and explain how different types of rocks form.
9.	B	DIF:L1	OBJ:22.3.2 Describe the processes by which rocks continually change from one type to another in the rock cycle.
10.	C	DIF:L2	OBJ:22.3.2 Describe the processes by which rocks continually change from one type to another in the rock cycle.
11.	B	DIF:L1	OBJ:22.4.1 Explain the hypothesis of continental drift. STA:SC-HS-4.6.4.B
12.	C	DIF:L2	OBJ:22.4.1 Explain the hypothesis of continental drift. STA:SC-HS-4.6.4.B
13.	A	DIF:L1	OBJ:22.4.2 Relate how the theory of plate tectonics explains sea-floor spreading, subduction, and the formation of mountains.
14.	C	DIF:L2	OBJ:22.4.2 Relate how the theory of plate tectonics explains sea-floor spreading, subduction, and the formation of mountains.
15.	B	DIF:L2	OBJ:22.4.3 Explain the mechanisms of plate movement. STA:SC-HS-2.3.8

ANSWERS

16. As the oceanic plate sinks into the mantle in the subduction zone, the plate causes melting. Magma forms and rises to the surface, where it erupts and forms volcanoes.
DIF:L2 OBJ: 22.6.1 Describe the internal structure of a volcano and how volcanoes form.
STA: SC-HS-2.3.8

17. The rock cycle is a series of processes in which rocks continuously change from one type to another. These processes include erosion, weathering, melting, cooling, heat and pressure, and compaction and cementation.
DIF:L2 OBJ: 22.3.2 Describe the processes by which rocks continually change from one type to another in the rock cycle.

18. Metamorphic rock
DIF:L1 OBJ: 22.3.1 Classify rocks as igneous, sedimentary, or metamorphic and explain how different types of rocks form.

19. Heat and pressure
DIF:L1 OBJ: 22.3.2 Describe the processes by which rocks continually change from one type to another in the rock cycle.

20. Weathering and erosion
DIF:L1 OBJ: 22.3.2 Describe the processes by which rocks continually change from one type to another in the rock cycle.

21 An igneous rock would undergo weathering and erosion to form sediment. The sediment would undergo compaction and cementation to form a sedimentary rock. Heat and pressure would change the sedimentary rock to a metamorphic rock.
DIF:L2 OBJ: 22.3.1 Classify rocks as igneous, sedimentary, or metamorphic and explain how different types of rocks form.

22. Weathering and erosion form sediment, which piles up. Over time, this sediment is squeezed and cemented together to form sedimentary rock.
DIF:L1 OBJ: 22.3.1 Classify rocks as igneous, sedimentary, or metamorphic and explain how different types of rocks form.