

WILL THE DEER AND THE ANTELOPE CONTINUE TO PLAY?
A CRITICAL EVALUATION OF THE *A HOME ON THE RANGE* CURRICULUM

by

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April 13, 2005

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ABSTRACT

The purpose of this study was to determine the effectiveness of the *A Home on the Range* curriculum in two key areas. These areas included increasing the student's knowledge in basic range science, and changing the student's attitudes and beliefs regarding rangelands. The researcher was also interested in teacher efficacy as it relates to range science.

The *A Home on the Range* curriculum was implemented in two class rooms. Data was gathered using a pre/post-test. The pre/post-test was also administered to two classrooms. The second group was used as a control group.

The data indicated that the *A Home on the Range* curriculum is an effective method of increasing the student's knowledge, as well as changing the student's attitudes and beliefs.

INTRODUCTION

“Conservation must exist in the mind before it exists on the land”

Ollie E. Fink (1938)

Since the time of the industrial revolution, fewer and fewer Americans find themselves living on ranches and farms. According to U.S. Census Bureau estimates, only 1.7% of Montanans are farmers or ranchers (U.S. Census Bureau, 2005). Because there are so few Montanans left who make their living from the land, few people have the kind of intimate knowledge of the environment that was perhaps common in generations past.

While many of us feel nostalgic about the open lands that have sustained our society for generations, providing us with food, fiber, and medicines, many people lack even basic knowledge of the environment. Studies indicate that we have educated a populous that is concerned for the environment, but lacks the ecological background necessary to understand even the most basic concepts of land management (Ewing, Mills, and Terence, 1994).

It was because of these reasons that in November 2003, a group of Extension range specialist and 4-H professionals gathered to begin work on a new curriculum. The hope of all of those gathered was that through their efforts, a new generation would develop an interest and appreciation of rangelands and the role that they play in maintaining our modern lifestyle. Because the members of this group represented

different parts of the western United States and because of their diverse backgrounds, the curriculum that they produced was innovative both in content and in scope. Instead of a typical 4-H project curriculum, this group produced a curriculum more suited to a traditional school setting and appropriate anywhere west of the 100th meridian.

The goals of this group were to develop a curriculum that would lead to an appreciation of rangelands among the general populace, develop support for range agriculture among general populace, develop an appreciation for the role of open lands in supporting a modern lifestyle, and ultimately preserve rangelands throughout the Great Plains and the Intermountain West. Under the direction of the Montana State University 4-H program, this group sought grant funding, hired a professional curriculum writer, and finally produced a curriculum entitled *A Home on the Range*.

The production of such a curriculum is indeed timely. Because rangelands make up approximately 40% of the United States landmass (Society for Range Management, 2005) it is important for all American citizens to possess some basic information regarding how rangelands function and why we need them. This is even more critical in the West where almost 80% of all lands are classified as rangelands (Society for Range Management, 2005).

Even though rangelands are an important part of our everyday lives many people have little or no knowledge of them. In a 1994 study of college students taking a freshman biology course only one third of the students had even a rudimentary knowledge of the water cycle (Ewing and Mills, 1994). In that same year Bixler and Carlisle found that 73% of the urban American elementary school students in their study

were afraid of an attack by non-indigenous animal species such as lions or tigers when they were outside in a natural setting, even if there was an adult present (Bixler and Carlisle, 1994).

Because ultimately our survival depends on the health and productivity of our rangelands, it is critical that we educate the next generation of Americans now. Currently rangeland degradation is having a significant impact on the lives of over a billion people worldwide, and if the current trend continues the next generation is sure to be more adversely impacted (Arnolds and Archer, 2000).

In addition to adding to the knowledge of the students regarding rangelands it is vital that we help them to see the importance of rangelands. Studies have shown that the most effective tool in maintaining or improving the health of an eco-system is the active participation and sense of responsibility of the whole community (Anders, 2000). Further Sanders concluded that people have the ability to change land use patterns for the better, but only if they appreciate the need for change (Sanders, 2000). School programming has been shown to be an effective tool for stimulating appreciation for the environment in a wide range of students (Bixler and Carlisle, 1994). This is often true even if the programming is only in place for a short time (Lisowski and Disinger, 1991). Appreciation of our rangelands is important because we tend to respect the things that we appreciate (Berry, 1987).

Regardless of the curriculum, student learning will be affected by teacher efficacy. Teachers' beliefs and interactions are crucial to the success of students (Ritter, Boone, and Rubba, 2001). Teachers with a strong sense of efficacy achieve more in the

classroom than those with a low sense of efficacy, even if they are using the same tools and have roughly the same abilities (Gist and Mitchell, 1992). Further, studies show that teachers, who are aware of the importance of a subject but are not knowledgeable about that subject, will be unlikely to teach it (Beiswenger, Sturgis, and Jarvis, 1991).

Purpose of this Study

The purpose of this study is to determine the effectiveness of the *A Home on the Range* curriculum in three key areas. These areas include the increase of the students knowledge regarding basic range ecology, the change of students attitudes and beliefs regarding rangelands, and the development of teacher efficacy.

Need for the Study

This study will provide decision makers with the necessary information to further allocate resources to disseminate the *A Home on the Range* curriculum or to address any major weaknesses in the curriculum.

Objectives

The three objectives of this study are as follows:

1. To determine the effectiveness of the *A Home on the Range* curriculum at increasing the students' knowledge of range ecology and range agriculture.
2. To determine the effectiveness of the *A Home on the Range* curriculum at affecting the students' attitudes and beliefs regarding rangelands, and their importance in modern society.
3. To administer a post-post test in an effort to determine the validity of the pre/post-test.

Assumptions

The following assumptions are important to this study:

1. It is assumed that all of the teachers participating in this study are competent professionals and will exert a reasonable effort to assure student success.
2. It is assumed that the students participating in the study are of comparable intellectual capacity, and are representative of their respective communities.
3. It is assumed that the classroom environments will be conducive to learning.
4. It is assumed that both teachers and students will answer questionnaires honestly and to the best of their ability.

Limitations

The following limitations exist for this study:

1. Researcher bias is, as usual, the first limitation of this study. Because the researcher is interested in range science and wanted to see the curriculum be successful it was necessary for him to remain vigilant of the potential to misinterpret the data in this study. Researcher bias was, in part, compensated for by the method of data collection which was done primarily by the teachers.
2. If a student or teacher had a high pre-test score there could have been little room for improvement. This would cause the statistics to be rather unimpressive, but would not be the fault of the curriculum.
3. Because the test population was small, the statistical power is limited. The researcher hoped to compensate for this in part by using a pre-test. The use of a pre-test has been shown to dramatically increase statistical power by providing a baseline (Bacon, 2004).
4. Because the curriculum is designed for multiple grade levels, and because the curriculum was tested in multiple grades, the results represent a wide range of student ages and maturity levels.
5. The wide array of teacher skill levels in public schools could account for some degree of variation in student scores; however, research

methodology could not be modified to account for any differences of this nature.

6. Differing reading levels among age groups could have affected the outcome of curricular materials, but research methodology could not be modified to account for this problem.
7. Due the limits of time and resources, schools participating in this study are limited to those that are in Montana and convenient to the researcher.
8. Because of the timing of this study, none of the classes were able to benefit from the entire curriculum. The researcher did however insist on a minimum of six lessons from participating teachers.

Definition of Terms

The following terms are defined in order to provide clarity as to their meaning as they pertained to this study:

1. Rangelands: Those lands that are more suited to grazing systems than intensive cropping systems, and where the natural vegetation consists primarily of grasses, forbs and shrubs (Society for Range Management, 2005).
2. Range Ecology: The study of how organisms and the environment interact on rangelands.

3. Self-Efficacy: Self-Efficacy has been defined as the beliefs in ones capacity to organize and execute the courses of action required to produce given attainments (Bandura, 1977). For the purposes of this study, self-efficacy will refer to the teacher's beliefs about their knowledge and ability to teach about range ecology.
4. Reflective Pre/post-test: A reflective pre/post-test was given at the end of a study and allows the respondents to rate themselves both before and after instruction based on accurate information. This method reduces the response shift effect (Lamb and Tschillard, 2004).

A REVIEW OF LITERATURE

Range and Environmental Education

Although it is true that Agricultural Education has proven to be an effective means of teaching high school-aged children the basic concepts of range agriculture, many high school students do not take classes in agriculture. Agricultural Education also targets high school children who are already interested in land use and management, but studies have shown that there is a problem of people not having adequate knowledge of land use and land management issues. This problem is clearly illustrated in a 1994 study of college students in a freshman biology class at Oklahoma State University. The study concluded that only about 30% of the students who participated in the study had even a rudimentary idea of what the water cycle is or how it works (Ewing, Mills, and Terence, 1994). Studies of this kind have led to a national effort to develop environmental education curricula for elementary school students. Elementary schools are an excellent place for this type of education to take place because it has been shown that significant changes in attitudes and beliefs can be brought about in as little as seven days of instruction (Lisowski and Disinger, 1991). Similarly Bixler and Carlisle found that the single most effective tool for stimulating appreciation of the environment in a wide range of people is outdoor school programming (Bixler and Carlisle, 1994). It is important for people to develop an appreciation for rangelands based on knowledge of scientific principles because as Bardwell discovered in 1991, people's active participation in

environmental issues depends largely on their attitude toward the environment and their perceived level of competence (Bardwell, 1991). It has been demonstrated throughout the world that among the most effective tools for maintaining or improving ecosystem quality are community participation, and a sense of responsibility that is shared by the entire community (Arnalds, 2000). Currently range degradation affects over a billion people worldwide (Olafur, Arnalds, and Archer, 2000), but the good news is that people have the power to change land use patterns for the better, if they learn to appreciate the importance of those lands and the need for change (Sanders, 2000).

The problem with most environmental education programs is that they are not designed from the perspective of the agriculturalist. If indeed, by educating the population about rangelands, we foster an actively involved public, it is important that they understand the importance of rangeland agriculture. While many in education appreciate the importance of the environment and agriculture, most curricular materials designed for elementary school children do not address the importance of range agriculture. In fact, many environmental education curricula do not consider that man is part of the eco-system at all, unless it is to portray human activity a negative and destructive force, but this does not have to be the case. Water resource education in Wyoming has proven to be effective in developing attitudes and knowledge in children of all ages, even though it was primarily focused on resource management and given a very low priority at the time of the study (Beiswenger, Sturgis, and James, 1991).

Teacher Efficacy

Teacher self-efficacy is defined as the beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments (Bandura, 1977).

Teacher self-efficacy is important because studies have shown that teachers who are highly efficacious achieve more than their counterparts with low self-efficacy (Gist and Mitchell, 1992). Teacher self-efficacy is of great importance to this study because few elementary school teachers have received training in range science, range agriculture, or ecology in general. Several studies have shown that it is difficult for teachers to teach about environmental issues, because they have received little or no training in environmental studies (Smith-Sebasto and Smith, 1997).

High teacher self-efficacy leads to more than confident teachers. Highly efficacious teachers are more likely to use inquiry and student centered teaching strategies, while teachers with a low sense of efficacy are more likely to use teacher directed strategies such a lecture and reading from text (Czerniak, 1990). While teaching straight from a book can be successful with some students, there are volumes of research that clearly show the value of using alternative strategies to address each students learning style (Kagan, Rosmann, Day, Albert, and Phillips, 1964; Bjorklund, 1989; Witkin, Moores, Goodenough and Cox, 1997).

The use of a variety of teaching strategies is clearly valuable, but no strategies are effective if the student is not motivated to learn. The attitudes and beliefs of teachers are critical to student success because teacher attitudes and beliefs can be directly correlated

to student attitudes and beliefs (Ritter, Boone, and Rubba, 2001). Therefore, it follows that if a teacher sees a particular subject as less important or less valuable, students will be less successful in that particular field of study. But, because teacher self-efficacy is related to more than the teacher's belief a subject is important, it is critical that teachers have the opportunity to learn about what they are asked to teach.

Typically teacher self-efficacy is studied in conjunction with a summer workshop designed to educate teachers about specific subject matter. The workshop's effectiveness is then evaluated with a pre/post-test. Occasionally teacher self-efficacy is studied as part of a descriptive study and is measured with no interest in changing the degree of efficaciousness as was the case in the Beiswenger, Sturgis, and James study (1991) designed to describe the state of water resource education in Wyoming.

METHODOLOGY

Curriculum Evaluation

While there are a number of possible reasons to evaluate curriculum (Bonnet, 1981), the purpose of this study was to ascertain whether or not the *A Home on the Range* curriculum is effective as a tool to increase knowledge and change attitudes regarding rangelands, in a typical Montana elementary school classroom. Because this study's objectives involved evaluating the curriculum in a classroom and because classrooms were not easily reassembled to accommodate the researchers need for random assignment, any scientific inquiry necessitated the use of a quasi-experimental design (Campbell and Stanley, 1963). It was for this reason that the focus of this literature review was directed at this type of evaluation.

Any type of a curriculum evaluation that is supposed measure the students increase in knowledge requires a measurement instrument. The intuitive way to measure a student's knowledge is to administer a test; however, there is more than one way to find out what a child has learned. Evaluators of curriculum use interviews with students in an effort to ascertain the effect of the treatment on students; others read students' journal entries, and some attempt to observe behavioral changes. Just as surely as the aforementioned methods of measurement are legitimate, they are also less well suited to quantitative study than to qualitative study (Campbell and Stanley, 1963).

Population and Selection

The study population (n= 34) consisted of fourth, fifth, and sixth grade elementary school students from three Montana towns; Livingston, Denton, and Grass Range.

Livingston, Montana is located in southwestern Montana approximately twenty-eight miles east of Bozeman, Montana along Interstate 90. Livingston's population in 2003 was estimated to be 7,073 (U.S. Census Bureau, 2005), making Livingston one of only ten Montana cities with a population of more than 7,000. Livingston is the county seat of Park County. Agriculture remains the most economically important industry in Park County, followed closely by tourism. Agriculture in Park County consists primarily of range agriculture and hay production. Small grain production is also important to Park County.

Grass Range, Montana is located in Fergus County, in Central Montana, approximately thirty miles east of Lewistown, Montana and one hundred miles north of Billings, Montana. According the U.S. Census Bureau (2005), Grass Range had an estimated population of 148 people in 2003. Fergus County is dominated by agriculture. Grass Range is on the east side of the Judith Mountains, in an area referred to locally as the "Big Dry". The area is dominated by short grass prairie and low mountains with timbered ridges. Agriculture in the "Big Dry" is almost exclusively range agriculture, with cattle being the most important crop.

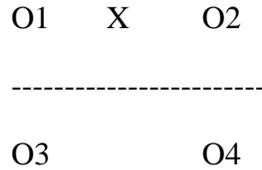
Denton, Montana is also in Fergus County, but it is in the northwest part of the county. Denton is approximately forty-five miles northwest of Lewistown and about fifty miles north of Stanford, Montana. Denton's estimated population for 2003 was 293 (U.S. Census Bureau, 2005). The Denton area is known for its rich soils that produce excellent crops of wheat, barley and some oats. Although small grains dominate the landscape in the immediate vicinity, range agriculture is more prominent ten or more miles in any direction from town. Rangelands in the Denton area are typical short grass prairie, with the breaks of the Judith River to the east and south of town.

Communities were selected for this study based primarily on the willingness of teachers to participate. They were also selected based on their relative proximity to the researcher's home and to Montana State University. It would be impossible to travel in any direction from any of these towns without traversing native short grass prairie.

Design

Due to the fact that this study utilized school classrooms and because it is not possible to rearrange classrooms in order to ensure random assignment, it was necessary to use a quasi-experimental design (Campbell and Stanley, 1963). This study utilized the nonequivalent control group design. The nonequivalent control group design is the design most widely used in schools, because the use of entire classrooms is a convenient way to group children because they are in an already existing unit. The nonequivalent control group design utilized a control group, but the control group did not have pre-experimental sampling equivalence (Campbell and Stanley, 1963).

In the diagram below O1 and O3 represent the pre-test, X represents instruction from the *A Home on the Range* curriculum, and O2 and O4 represent the post-test.



In order to conduct this study, classes from the treatment group received instruction from the *A Home on the Range* curriculum after a pre-test and before a post-test. Classes from the control group also took the pre and post-tests but did not receive instruction from the *A Home on the Range* curriculum. The fact that both sets of students were administered the pre and post-tests is a key feature of this design and it is useful because it controls for the “test effect” that can be problematic when a pre and post-test design is used. While it is true that the use of a pre-test can create the risk of a “test effect” it is useful because the use of a pre-test can dramatically increase statistical power when a small test population is used because it provides a base-line (Bacon, 2004). In this study the dependent variable is the change in test scores from pre to post test and the independent variable is whether the students received instruction from the *A Home on the Range* curriculum.

Campbell and Stanley (1963) identify the major threats to validity for this design as maturation, experimental mortality, history, selection maturation and statistical regression.

1. Maturation refers to the natural, physical and psychological changes that occur in people over time. Maturation in children as young as the ones in this study was inevitable. The use of a control group should have compensated for this problem.
2. Experimental mortality refers to participants not being able to complete the study. Because this was a relatively short study conducted in public schools, experimental mortality was not a major problem.
3. History refers to factors outside of the realm of the study that might have affected the student's performance on the pre or post-test. It is impossible to compensate for these factors.
4. Statistical regression refers to a tendency for students whose scores fall at either extreme on a variable to score near the mean when the variable is measured a second time.
5. Selection maturation interaction refers to the problem of differing levels of maturity between groups that may skew results. Perhaps this is the greatest threat to this study, because of the range of ages and maturity levels that occur in children from fourth to sixth grade. There was nothing the researcher could do to compensate for this.

Instrumentation

The instrument used to collect data was a pre/post-test that was designed by the researcher and implemented by the teachers. The pre/post-test was designed to determine the student's knowledge, attitudes and beliefs regarding the subjects covered in the *A Home on the Range* curriculum. The pre/post-test consisted of twenty true or false questions pertaining to the key concepts of the *A Home on the Range* curriculum; fifteen of the questions were designed to measure knowledge and five to measure attitudes and beliefs. A copy of the pre/post-test can be found in Appendix A. The Pre/post-test was tested for reading level using the Flesch-Kincaid Grade Level test. The pre/post-test proved to be written at the 4.2 grade level, because it included words like eco-system, rangelands, and ecology. The Flesch-Kincaid Grade Level test uses the average number of syllables per word to determine the grade equivalent reading level, and it is for this reason that it was impossible for the researcher to write the pre/post-test at a lower reading level and still ask questions about range ecology. Additionally a post-post test was given approximately one month after the post-test to measure both the student's retention and to resolve questions of validity regarding the pre/post-test. A copy of the post-post test can be found in Appendix E.

Data Analysis

Data retrieved from non-equivalent control group quasi-experimental design studies are more suited for simple gain statistics than analysis of variance because analysis of variance assumes homogeneity of regression that may or may not exist (Campbell and Stanley, 1963). The researcher used simple gain statistics in an effort to insure that all data was understood and interpreted accurately.

Post-post test data was collected and reported. This data was not compared to pre/post-test data because it was collected using a very different instrument over a month later.

Teacher Self-Efficacy Study

Because of the small number of teachers who participated in this study and taught the curriculum (n=2), the researcher gathered data using a reflective pre/post-test but did not attempt to apply any statistical analysis to the data. The researcher anticipates that this data may be useful for a future pilot study. A copy of this test can be found in Appendix B.

Pilot Study

A pilot study was conducted to determine the appropriateness of the pre/post- test questions regarding reading level and content. The same study also evaluated the teacher self-efficacy test. Both tests were sent to four professional educators, two school administrators and two elementary school teachers, who were familiar with the curriculum. Educators were asked to comment on individual questions and the test as a whole. All of the survey respondents believed that the tests were appropriate with regard to reading level and content.

FINDINGS

The student population (n=34) consisted of fourth, fifth, and sixth grade children enrolled in the public school system in Grass Range, Denton, and Livingston, Montana. Of this sample, only 29.41% (n=10) were males. Table 1 represents the gender distribution after the group was divided into treatment and control groups.

Table 1. Gender Distribution of Students

Gender	Control	Treatment	Total
Male	37.5% (n = 6)	33.3% (n = 6)	35.3% (n = 12)
Female	62.5% (n = 10)	66.6% (n = 12)	64.7% (n = 22)

The majority of the students (70.6%) in the study were from rural, small towns; there were twelve (35.3%) from Denton and twelve (35.3%) from Grass Range, Montana. Both Denton and Grass Range are in Central Montana and are about 100 miles from the nearest large city. The remaining ten (29.4%) of the students were from Livingston, Montana located in Southwestern Montana about 28 miles from Bozeman.

The students ranged in age from 9 years old (4th graders) to 13 years old (6th graders). While this represented a wide range of physical and emotional maturity levels, it was appropriate to a study of a curriculum for fourth, fifth and sixth graders. Of the

group, 17.6% (n=6) were fourth graders, 41.2% (n=14) were fifth graders, and 41.2% (n=14) were sixth graders. This information is illustrated in Table 2.

Table 2. Grade Level Distribution

Grade Level	Grass Range	Denton	Livingston	Percentage
6 th	2	12	0	41.2
5 th	4	0	10	41.2
4 th	6	0	0	17.6

Achievement Analysis Pre/Post-Test

Fourth grade students in Grass Range (n=6) completed six activities from the *A Home on the Range* curriculum during science class. Prior to receiving instruction from the curriculum, the students were given a pre-test to determine their knowledge, attitudes and beliefs regarding basic concepts of range science. The mean pre-test scores for the fourth graders from Grass Range were 11.5 correct answers out of 15 questions for knowledge. The mean pre-test scores for the Grass Range group were 4 correct answers out of 5 possible questions for attitudes and beliefs. Two days after their last activity the students were given the same test as a post-test. The mean post-test scores for the Grass Range students were 12.17 out of 15 possible for knowledge, and 5 out of 5 possible for attitudes and beliefs. This represents an average gain in knowledge of 4.5 percentage points and 20 percentage points for attitudes and beliefs. A one tailed, paired sample *t*-

test for means showed that the knowledge results were significant ($P = .0125$) at the .025 alpha level and the results for attitudes and beliefs were significant ($P = .03$) at the .05 alpha level. The pre and post-test knowledge data are illustrated in figure 1, and the pre and post-test attitudes and beliefs data for the Grass Range treatment group are illustrated in figure 2.

Figure 1. Grass Range Treatment Group Knowledge pre/post Data

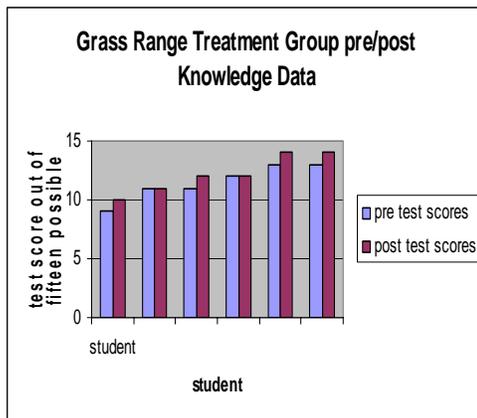
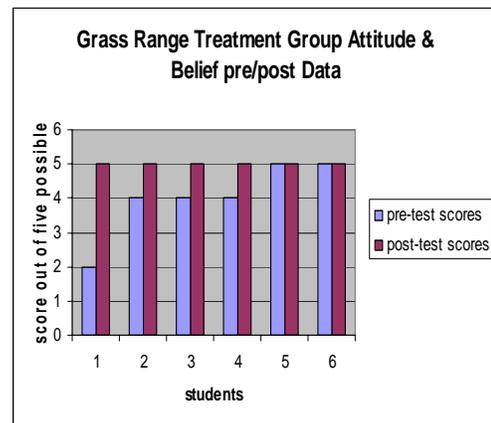


Figure 2. Grass Range Treatment Group Attitude & Belief pre/post Data



A similar test was conducted in the Denton sixth grade classroom. Students ($n=12$) were given the same pre-test followed by six activities from the *A Home on the Range* curriculum and then given the post-test. Mean pre-test results for the Denton group were 11.08 out of 15 possible for knowledge, and 4.25 out of 5 possible for attitudes and beliefs. Mean post-test data were 13.08 out of 15 possible for knowledge, and 4.58 out of 5 possible for attitudes and beliefs. Expressed as a percentage, the mean pre-test scores for this group are 73.9% for knowledge and 85% for attitudes and beliefs, compared to the post-test mean scores of 87.2% for knowledge and 91.6% for attitudes

and beliefs. These scores indicated an increase of 13.3% for knowledge and 6.6% for attitudes and beliefs. A one tailed, paired two sample *t-test* for means showed that results for the knowledge portion of the test were significant ($P = 9.08452E-8$) at the .01 alpha level and the results for the attitudes and beliefs portion of the test were significant ($P = .0194$) at the .025 alpha level. The pre and post-test knowledge data for the Denton treatment group is illustrated in figure 3, and the attitudes and beliefs pre and post-test data for the same group are illustrated in figure 4.

Figure 3. Denton pre/post Knowledge Data

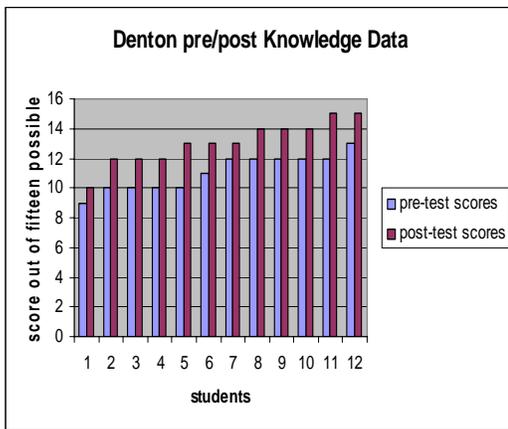
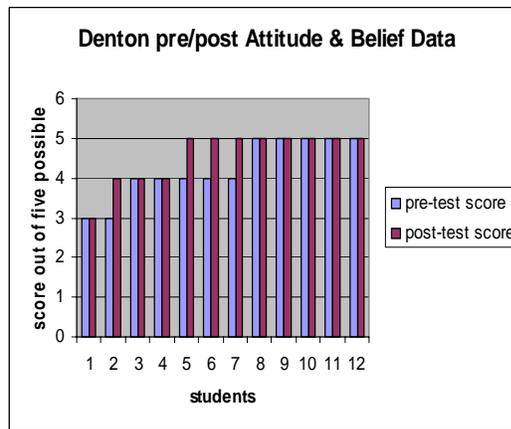


Figure 4. Denton pre/post Attitude & Belief Data



The composite results of both treatment groups were more impressive. The mean pre-test score for knowledge for both groups was 11.22 out of 15 possible with a standard deviation of 1.308. The mean pre-test score for attitudes and beliefs was 4.166 out of 5 possible, with a standard deviation of .8575. Expressed as a percentage, the mean pre-test score for knowledge was 74.8% and the mean score for attitudes and beliefs was 83.3%. Again, using a one tailed, paired two samples *t-test* for means, the knowledge

results were highly significant ($P = 1.63679E-10$) at the .01 alpha level and the attitudes and beliefs scores were also significant ($P = .000125$) at the .01 alpha level. The composite of the treatment group knowledge pre and post-test data is presented in figure 5, and the attitudes and beliefs data for the same group is illustrated in figure 6.

Figure 5. Composite Treatment Group pre/post Knowledge Data

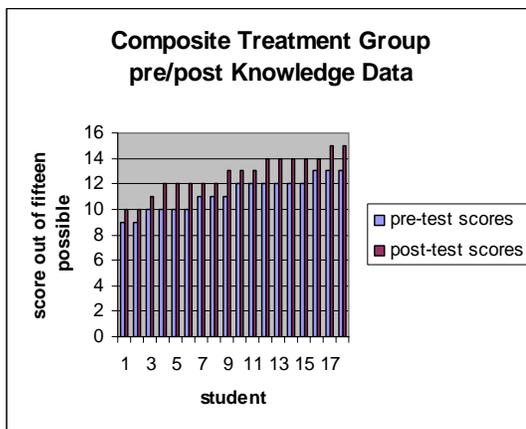
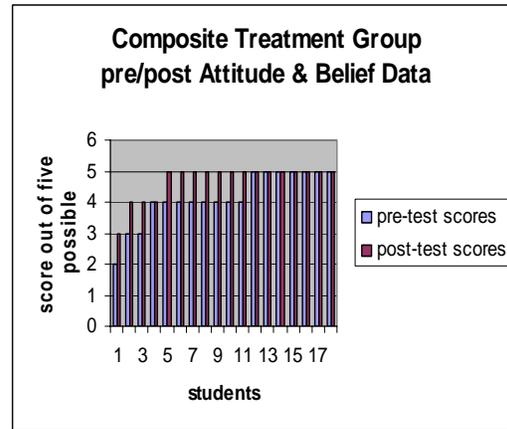


Figure 6. Composite Treatment Group pre/post pre/post Attitude & Belief Data



The Grass Range control group ($n = 6$) consisted of fifth and sixth graders in a combined fourth, fifth, and sixth grade classroom that went outside of their home classroom for science class. These students were given the pre-test on the same day as the treatment group. The mean pre-test scores for the Grass Range control group were 9.66 for knowledge and 3.83 for attitudes and beliefs. Expressed as a percentage, those scores were 64.4% for knowledge and 76.6% for attitudes and beliefs. They were also given the post-test on the same day as the treatment group. The mean post-test scores were 9.16 for knowledge and 4.5 for attitudes and beliefs. Expressed as a percentage, these scores were 61% for knowledge and 90% for attitudes and beliefs. The results for a

one tailed, paired two samples *t-test* for means showed that there is no significant ($P = .207$) increase in knowledge for this group, but there was a significant ($P = .0125$) increase in the attitudes and beliefs score for this group. The knowledge pre and post data for this group is presented in figure 7, and the attitudes and beliefs data for this group are presented in figure 8.

Figure 7. Grass Range Control Group pre/post Knowledge Data

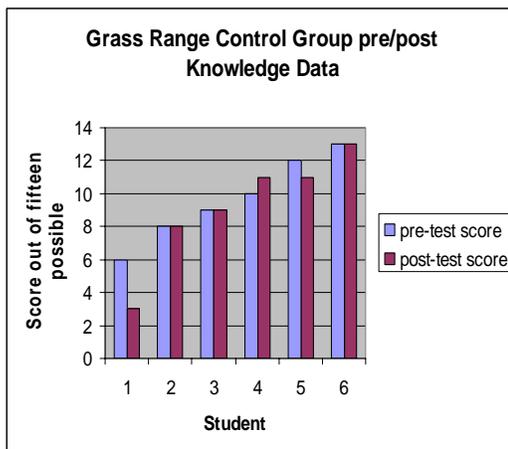
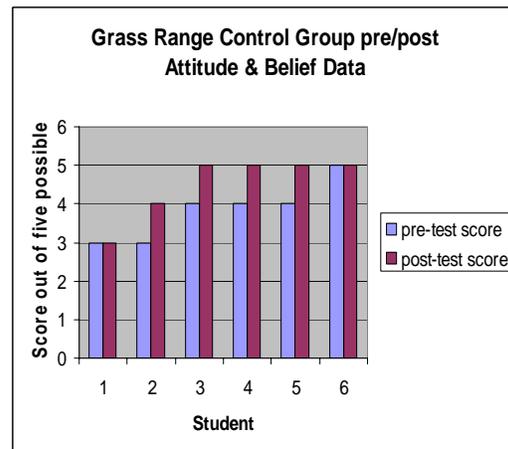


Figure 8. Grass Range Control Group pre/post Attitude & Belief Data



The control group from Livingston ($n = 10$) was given the pre-test on March 3, 2005. Their pre-test mean score for the knowledge portion of the test was 10.3 correct out of a possible 15, and for the attitudes and beliefs portion of the test their mean pre-test score was 3.7. Expressed as a percentage, those scores were 66.67% for the knowledge portion of the test, and 74% for the attitudes and beliefs portion of the test. The post-test was given on Thursday, March 31, 2005. The mean post-test score for the knowledge portion of the post-test was 10.1, slightly lower than the pre-test and the mean post-test score for the attitudes and beliefs portion of the post-test was 3.8. The post-test scores

expressed as a percentage were 67.3 for the knowledge portion and 76% for the attitudes and beliefs portion of the test. Using a one tailed, paired two samples *t-test* the results for the knowledge portion of the test did not indicate a significant ($P = .33089$) change, nor did the same test show a significant ($P = .3988$) increase in attitudes and beliefs. The knowledge data for the Livingston control group are illustrated in figure 9, and the attitudes and beliefs data for this group are illustrated in figure 10.

Figure 9. Livingston Control Group pre/post Knowledge Data

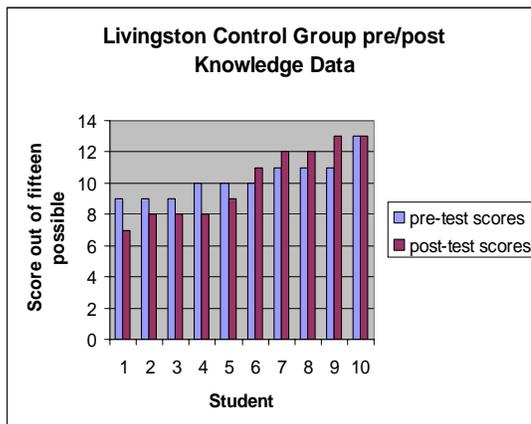
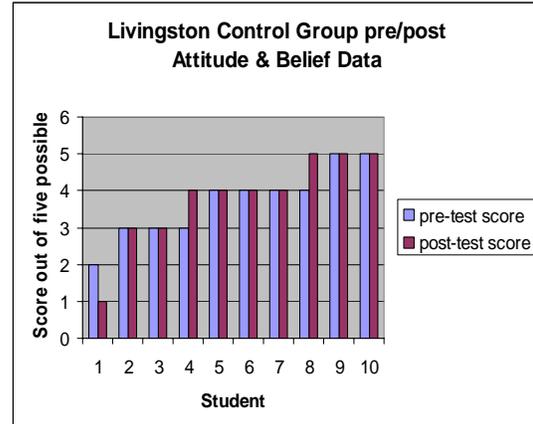


Figure 10. Livingston Control Group pre/post Attitude & Belief Data



The composite of the two control groups ($n = 16$) showed a mean pre-test knowledge score of 10 correct out of 15 possible, or 66.67%, with a standard deviation of 1.8. The mean score for this group on the attitudes and beliefs portion of the pre-test was 3.75 out of 5 possible, or 75%, with a standard deviation of .856. The post-test mean scores for the control group were, 9.56 right out of 15 possible with a standard deviation of 2.608 for the knowledge portion, and 4.06 correct out of 5 possible for attitudes and

beliefs with a standard deviation of 1.13. Expressed as a percentage, these scores were 63.7% for knowledge and 81.2% for attitudes and beliefs. Using the one tailed, paired two sample *t-test* for means there was not a significant ($P = .075$) change in knowledge, nor was there a significant ($P = .06$) change in attitudes and beliefs. The pre and post-test knowledge data for the control group are illustrated in figure 11, and the attitudes and beliefs pre and post-test data are illustrated in figure 12.

Figure 11. Composite Control Group pre/post Knowledge Data

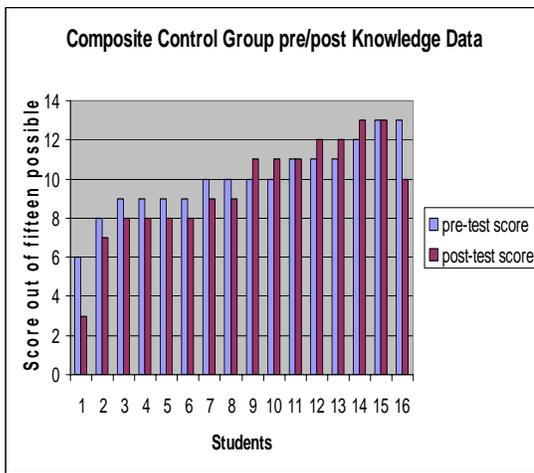
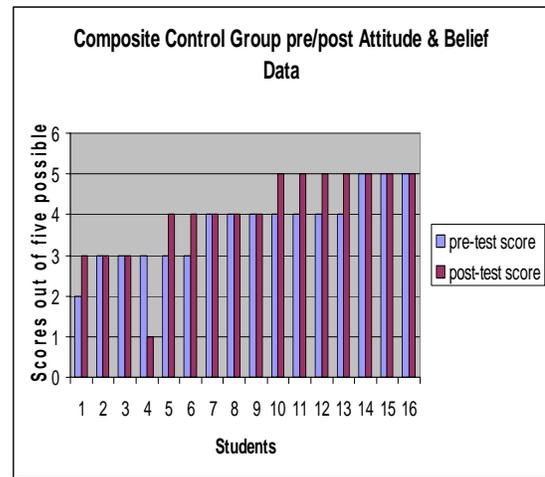


Figure 12. Composite Control Group pre/post Attitude & Belief Data



Because the one tailed, paired two sample *t-test* for means compares means of attitudes and beliefs and knowledge as a composite, the graphs below are provided. The data represented in figure 13 represents the mean pre and post-test knowledge scores for the treatment group with error bars. The effort bars indicate the standard deviation, the numbers indicate the mean scores. The data in figure 14 represents the mean pre and post test scores for the control group.

Figure 13. Composite Treatment Group Mean pre/post Knowledge Scores

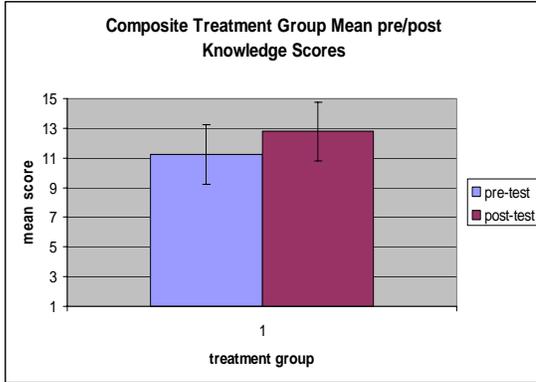
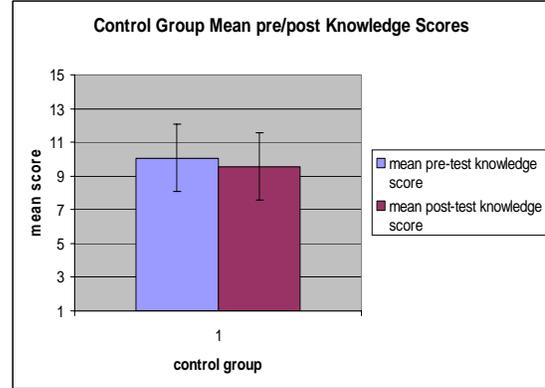


Figure 14. Composite Control Group Mean pre/post Knowledge Scores



Similarly the data in figure 15 represents the mean pre and post-test attitudes and beliefs scores for the treatment group, and figure 16 represents the mean pre and post-test attitudes and beliefs scores for the control group. Please note that the error bars represent the standard deviation.

Figure 15. Composite Treatment Group Mean pre/post Attitude & Belief Data

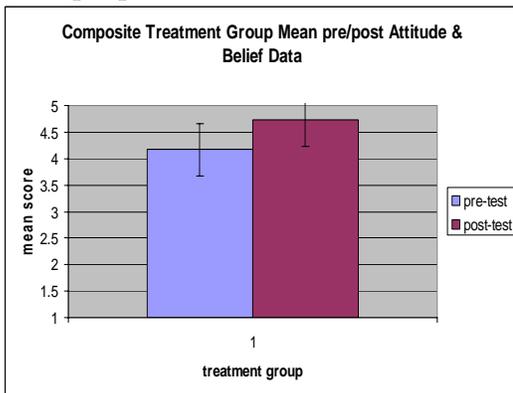
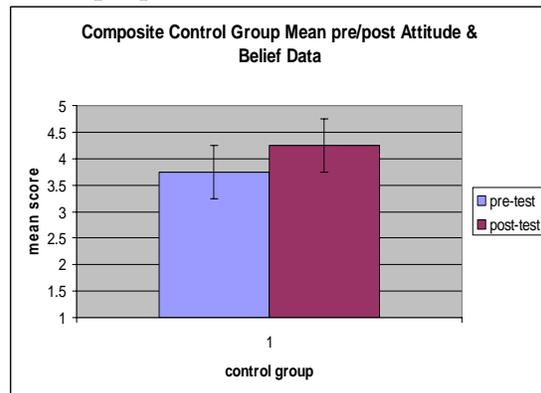


Figure 16. Composite Control Group Mean pre/post Attitude & Belief Data



A Survey of Test Responses

By reviewing the data item by item, the researcher was able to ascertain what material, if any, was difficult. To that end, an item by item analysis of the twenty true or false pre/post-test survey items can be found in Appendix C. Items seven, eleven, thirteen, sixteen, and nineteen were designed to address attitudes and beliefs. The remaining items were designed to measure the student's knowledge.

Teacher Self –Efficacy

Because the group of teachers who taught the curriculum was so small ($n = 2$), the researcher collected the data and reported it, but did not conduct a statistical analysis of the data. Both of the teachers who taught the curriculum were women who possessed Master's degrees and have more than 10 years of teaching experience. Both teachers taught school in small rural communities in Central Montana. Both teachers completed a reflective pre/post-test upon completion of the *A Home on the Range* curriculum. Their responses to the questions were rated on a scale from 1 to 5, with 5 indicating that the respondent agreed strongly with the statement, and 1 indicating that the respondent disagreed strongly. Respondents rated their responses before and after taking part in the study. An item by item analysis of their responses can be found in Appendix D.

Post-Post Test Results

Post-post test data was collected approximately one month after the post-test. After the post-test there was no further instruction in range science. The same students who took the pre/post-test were given the post-post test, with the exception of one student from Denton who was absent. The post-post test consisted of eighteen multiple choice questions that were designed to measure the students' knowledge of range science, and twenty likert-scale questions designed to determine the students' attitudes and beliefs regarding range science.

Post-post test results from the Livingston control group yielded a mean score of 51.15% correct for the knowledge portion of the test. The same group had a mean score 62.15% of the total points possible for the attitudes and beliefs portion of the test. Figures 17 and 18 graphically display the results of the post-post test by student. The control group from Grass Range had a mean score of 59.17% on the knowledge portion of the post-post test, and 72.5% on the attitudes and beliefs portion of the post-post test. The composite of the control group had a mean score of 53.7% on the knowledge portion of the test, and 65.4% on the attitudes and beliefs portion of the test. These data show a different and varied outcome from that of the previous survey instrument, which only provided respondents with the possibility of a true-false response.

Figure 17. Livingston Control Group Post-Post Test Data

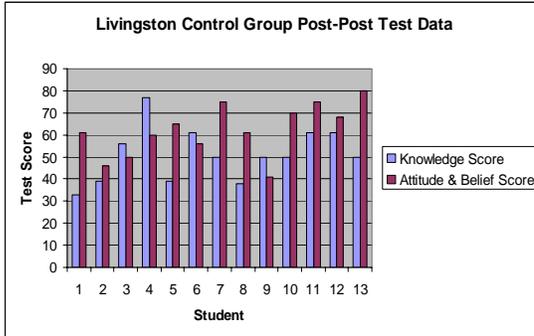
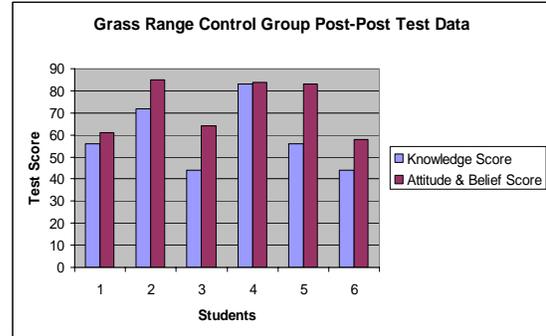


Figure 18. Grass Range Control Group Post-Post Test Data



Post-post test results for the Denton treatment group yielded a mean score of 67.64% for the knowledge portion of the test. The Denton group also had a mean score of 74.36% for the attitudes and beliefs portion of the post-post test. The Grass Range treatment group had a mean score of 56.5% on the knowledge portion of the test, and 78.83% on the attitudes and beliefs portion of the post-post test. Figures 19 and 20 graphically display the results of the post-post test by student. The mean post-post test scores for the treatment group taken as a composite was 63.7% for the knowledge portion of the test and 75.9% for the attitudes and beliefs portion of the test.

Figure 19. Denton Treatment Group Post-Post Test Data

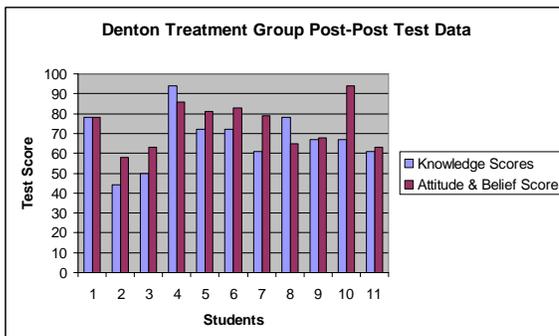
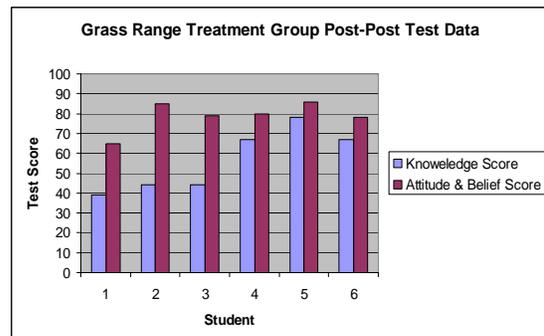


Figure 20. Grass Range Treatment Group Post-Post Test Data



Again these data show a different and varied outcome from that of the previous survey instrument, which only provided the respondents with the possibility of a true-false response. The first survey only allowed the analysis of nominal data where the post-post test instrument responses were in ordinal data form.

A detailed item by item analysis of the post-post test results can be found in Appendix F.

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Summary

Even as society places more demands on America's rangelands, the general population has become less aware of both the limitations and potential for rangeland production. If future generations of Americans are to enjoy the continued benefits of healthy and productive rangelands, it is important that we act now to educate our populace. Today's students are tomorrow's policy makers, and as such they need accurate information regarding our abundant natural resources. The purpose of this study was to determine if the *A Home on the Range* curriculum is an effective means of educating fourth, fifth, and sixth grade students from Montana about rangelands.

This study was conducted using the nonequivalent control group quasi-experimental design. The participants in this study were fourth, fifth, and sixth grade students from Grass Range, Denton, and Livingston, Montana. The treatment group in this study received instruction from the *A Home on the Range* curriculum and data was gathered using a pre/post-test, to determine the effect of instruction. The control group was given the same pre/post-test without the benefit of instruction. The use of a control group allowed the researcher to determine if any gains were the results of instruction or simply the result of maturation, the test effect, or some other random occurrences. The objectives of the study were:

1. To determine the effectiveness of the *A Home on the Range* curriculum at increasing the students' knowledge of range ecology and range agriculture.
2. To determine the effectiveness of the *A Home on the Range* curriculum at affecting the students' attitudes and beliefs regarding rangelands, and their importance in modern society.
3. To administer a post-post test in an effort to determine the validity of the pre/post-test.

The researcher also gathered data regarding teacher self-efficacy from teachers who participated in the study, in an effort to learn if teaching the curriculum would increase teacher self-efficacy.

The findings can be summarized in the following statements.

1. The student population was primarily female, with only 29.4% (n = 10) of the population being male.
2. The majority of the population, 70.6%, was from small towns.
3. The age of the students in the study ranged from 9 year old fourth graders, to 13 year old sixth graders. 35.3% of the population was sixth graders, 41.1% was fifth graders, and 17.6% was fourth graders.
4. The pre and post-test data was analyzed using descriptive statistics and paired two samples *t-tests* for means.
5. The teacher self efficacy data were not analyzed using statistics, because the test population consisted of only 2 teachers.

6. Post-post test data was collected and reported, but was not compared statistically to pre/post-test data because it was in ordinal form, whereas the pre/post-test data was in nominative form.

Conclusions

The study determined the effectiveness of the *A Home on the Range* curriculum in Montana classrooms, regarding the increase of knowledge of range science. It also determined the shift in attitudes and beliefs of students regarding rangelands and their management. Based on the findings of this study, the following statements are presented as conclusions:

1. The effectiveness of the *A Home on the Range* curriculum at increasing the knowledge of Montana students ranging in age from fourth through sixth grade, regarding basic range science concepts, proved to be statistically significant using a true or false survey instrument.
2. The effectiveness of the *A Home on the Range* curriculum at changing the attitudes and beliefs of Montana students ranging in age from fourth through sixth grade proved to be statistically significant using a true or false survey instrument.
3. The control, as a whole, group did not exhibit a statistically significant increase in knowledge and beliefs, or in knowledge. The control group from Grass Range did exhibit a statistically significant increase in attitudes

and beliefs. One possible explanation for this could be prolonged and close contact with the treatment group.

4. Some of the students gave incorrect responses to items on the post-test that they responded to correctly on the pre-test. This is in part due to the fact that students had a 50% chance of selecting the incorrect response if they were guessing.
5. The mean post-post test scores of the treatment group were ten percent higher than the control group for both knowledge and attitudes and beliefs.

Implications

The data and test results provided by this study allowed the researcher to make the following statements:

1. The use of the *A Home on the Range* curriculum can be an effective way to teach the basic concepts of range science to rural Montana students ranging from fourth through sixth grade.
2. The use of the *A Home on the Range* curriculum can be an effective way to teach grade favorable beliefs and attitudes regarding rangelands to rural Montana students ranging from fourth through sixth.
3. The use of the *A Home on the Range* curriculum can be an appropriate tool for use in rural Montana elementary schools.

Recommendations

The findings of this study revealed the *A Home on the Range* curriculum to be an effective means of teaching range science to fourth, fifth, and sixth grade students in Montana. Based on these findings the following recommendations were made.

1. The *A Home on the Range* curriculum should be made available to schools throughout Montana.
2. Future studies should be done to investigate methods of improving teacher self-efficacy regarding range science. These studies should be designed around a summer teacher workshop, because this is the method of investigation most used in teacher efficacy studies.
3. Future studies should be done in other Montana schools to determine the effectiveness of the *A Home on the Range* curriculum in those schools.
4. The *A Home on the Range* curriculum should be introduced to teachers through the Agriculture in Montana Schools program.

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APPENDICES

APPENDIX A

STUDENT PRE/POST-TEST

Pre/post-test
A Home on the Range

Name_____

School_____

Teacher_____

Please circle the T if you think the statement is true or circle the F if you think the statement is false.

- 1 T F Rangelands produce many products that I use every day.
- 2 T F Water is an important part of all rangelands.
- 3 T F Most of the land in Montana is rangeland.
- 4 T F Types of soils affect which animals can live on rangelands.
- 5 T F Groundwater is part of the water cycle.
- 6 T F Range plants can grow anywhere.
- 7 T F People are not part of the range ecosystem.
- 8 T F Before cattle came to the West, grazing was not an important part
of range ecology.
- 9 T F Range health can have a great on affect people in cities.
- 10 T F People who live far from rangelands can have an important affect
on range health.
- 11 T F Rangelands are important to me.
- 12 T F Rangelands are important to America's economy.
- 13 T F Rangelands are less important than farm lands.

- 14** **T** **F** There are not many jobs that deal with rangelands.
- 15** **T** **F** All living things on rangelands affect each other.
- 16** **T** **F** Rangelands are only important to ranchers.
- 17** **T** **F** Fire is always bad for rangelands.
- 18** **T** **F** Range fires are always started by people.
- 19** **T** **F** Rangelands are important places for recreation.
- 20** **T** **F** Ancient people did nothing to change rangelands.

APPENDIX-B

TEACHER EFFICACY SURVEY

Teacher Self-Efficacy Survey

Name _____

Date _____

Please rate your responses to each statement below on a scale of one to five, with five being agree strongly and one being disagree strongly. Please rate your responses for both before you took part in the study and after you took part in the study.

1. I am confident that I understand the basic concepts of range ecology

Before

After

2. My understanding of range ecology does not affect how well my students learn about rangelands

Before

After

3. I can draw the “water cycle”.

Before

After

4. Range science is an interesting and important subject for Montana kids

Before

After

5. The study of rangelands is a good way to address the study of many science disciplines.

Before

After

6. Rangelands are important to all Montanans for a variety of reasons

Before

After

7. I enjoy teaching and learning about rangelands

Before

After

8. I would consider adding range science to my curriculum in the future.

Before

After

9. I am confident in my ability to teach range science to my students.

Before

After

10. It is not important for children to learn about rangelands in school.

Before

After

APPENDIX C

PRE/POST-TEST RESULTS ITEM BY ITEM

PRE/POST-TEST RESULTS ITEM BY ITEM

Because the researcher used a true or false survey instrument, students had an equal chance of getting a correct response to each item if they guessed. For this reason the data presented here may not accurately reflect the students' knowledge of range science.

Item 1: Rangelands produce many products that I use every day.

This item was designed to elicit the students most basic understanding of range agriculture and the products it supplies that are a part of everyday life. The control group (n= 16) gave 14 correct pre-test responses, and 14 correct post-test responses. The treatment group (n = 18) gave 16 correct pre-test responses, and 17 correct post-test responses. For both groups, this data indicated a basic understanding of the things produced through range agriculture.

Item 2: Water is an important part of all rangelands.

This item was designed to ascertain the students understanding of the importance of water in range agriculture. The control group (n = 16) gave 16 correct pre-test responses, but only 14 correct post-test responses. The treatment group (n = 18) gave 18 correct responses both on the pre-test and on the post-test.

Item 3: Most of the land in Montana is rangeland.

This item was designed to ascertain the students understanding both of what rangelands are and why they are so important to Montanans. The control group gave only 8 correct responses to this item on the pre-test, but later gave 13 correct responses

on the post test. The treatment group gave 13 correct responses on the pre-test, and 15 correct responses on the post-test.

Item 4: Types of soils affect which animals can live on rangelands.

This item required a deeper understanding of range ecology than the previous questions, but was directly addressed in the curriculum. The control group gave only 4 correct pre-test responses, and 6 correct post-test responses. The treatment group gave 12 correct responses on both pre-test and post-test. The responses to this item might, in part, have reflected differences in the maturity of the students.

Item 5: Groundwater is part of the water cycle.

This item directly addresses the student's understanding of the water cycle. The control group gave 15 correct pre-test responses, which indicated some familiarity with the water cycle, and 11 correct post-test responses. The treatment group gave 11 correct responses on the pre-test and 15 correct responses on the post-test, which indicated that students may have learned about the water cycle as a result of the curriculum.

Item 6: Range plants can grow anywhere.

This item was designed to find out if children understand that plants have unique and individual habitat needs. The control group gave 10 correct responses on the pre-test, and 13 correct responses on the post-test. The treatment group gave 16 correct responses on the pre-test, and 17 correct responses on the post-test.

Item 7: People are not part of the range ecosystem.

This item was designed to learn about students' attitudes and beliefs regarding range agriculture. Because this item related to attitudes and beliefs, the researcher found

it difficult to apply the terms right or wrong. Therefore, the researcher rated the responses as either favorable or unfavorable. The control group gave 7 favorable responses on the pre-test, and 10 favorable responses on the post-test. The treatment group gave 11 favorable responses on the pre-test and 15 favorable responses on the post-test.

Item 8: Before cattle came to the West, grazing was not an important part of range ecology.

This item was designed to determine if the students understood that cattle are not the only grazing herbivores on rangelands, and if the student realized that many wild animals are also grazers. The control group gave 9 correct responses on the pre-test, and 15 correct responses on the post-test. The treatment group gave 15 correct responses on the pre-test, and 16 correct responses on the post-test.

Item 9: Range health can have a great on affect people in cities.

Like item 1, this item was designed to ascertain the student's comprehension of the importance of range agriculture in supporting a modern life style. The control group gave 12 correct responses on the pre-test and 7 correct responses on the post-test. The treatment group gave 15 correct responses on the pre-test, and 18 correct responses on the post-test.

Item 10: People who live far from rangelands can have an important affect on range health.

This item required more sophisticated thought than most of the others. It was designed to determine if the students understood that through economy and politics,

people do not have to live near rangelands to affect rangeland-use decisions. The control group gave 6 correct responses on the pre-test, and 11 correct responses on the post-test. The treatment group gave 7 correct responses on the pre-test, and 10 correct responses on the post-test.

Item 11: Rangelands are important to me.

Like item 7, this item related directly to attitudes and beliefs. The control group gave 15 favorable responses on the pre-test, and 14 favorable responses on the post-test. The treatment group gave 18 favorable responses on the pre-test, and 18 favorable responses on the post-test.

Item 12: Rangelands are important to America's economy.

This item was designed to ascertain the same information as item 9. By restating the item, the researcher was able to ascertain a student's true understanding of the issue. The control group gave 15 correct responses on the pre-test, and 15 correct responses on the post-test. The treatment group gave 18 correct responses on both the pre-test and the post-test.

Item 13: Rangelands are less important than farmlands.

This item addressed students' attitudes and beliefs toward rangelands. The control group gave 14 favorable responses on the pre-test and 16 favorable responses on the post-test. The treatment group gave 15 favorable responses on the pre-test, and 18 favorable responses on the post-test.

Item 14: There are not many jobs that deal with rangelands.

This item was designed to determine if students' were aware that there are career opportunities in range management and range science. This subject is addressed in the curriculum. The control group gave 5 correct responses on the pre-test, and 4 correct responses on the post-test. The treatment group gave 12 correct responses on the pre-test, and 16 correct responses on the post-test. The fact that this question elicited such a one sided response on the pre-test might be explained by the demographic factors of the treatment group, the overwhelming majority of whom have one or more parents employed in agriculture.

Item 15: All living things on rangelands affect each other.

This item was designed to ascertain if the students had a rudimentary understanding of range ecology. The control group gave 12 correct responses on the pre-test, and 11 correct responses on the post-test. The treatment group gave 15 correct responses on both the pre-test and the post-test.

Item 16: Rangelands are only important to ranchers.

This is basically the same as item 11, only it has been restated. By restating the item, the researcher was able to ascertain if the student comprehended the topic. The control group gave 12 favorable responses on the pre-test, and 14 favorable responses on the post test. The treatment group gave 16 favorable responses on the pre-test, and 17 favorable responses on the post-test.

Item 17: Fire is always bad for rangelands.

This item was designed to determine if students understand that fire can be a good thing for rangelands under the right circumstances. The control group gave 12 correct

responses on the pre-test and 4 correct responses on the post-test. The treatment group gave 8 correct responses on the pre-test, and 14 correct responses on the post-test.

Item 18: Range fires are always started by people.

This item was designed to ascertain whether the students understood that there are many reasons for range fires. The control group gave 15 correct responses on the pre-test, and 14 correct responses on the post-test. The treatment group gave 15 correct responses on the pre-test, and 16 correct responses on the post-test.

Item 19: Rangelands are important places for recreation.

This item was designed to measure students' attitudes and beliefs about rangelands. The control group gave 12 favorable responses on the pre-test, and 14 favorable responses on the post-test. The treatment group gave 15 favorable responses on the pre-test, and 18 favorable responses on the post-test.

Item 20: Ancient people did nothing to change rangelands.

This item was designed to ascertain students' knowledge of historical range management. The control group gave 12 correct responses on the pre-test, and 11 correct responses on the post-test. The treatment group gave 13 correct responses on the pre-test, and 12 correct responses on the post-test.

APPENDIX D

TEACHER EFFICACY SURVEY RESULTS

ITEM BY ITEM

TEACHER EFFICACY SURVEY RESULTS

ITEM BY ITEM

Teachers were asked to rate their responses to each item on a scale of one to five. For this survey five represents strongly agree and 1 represents strongly disagree.

Teachers were asked to rate their responses for both before the study and after the study.

Item 1: I am confident that I understand the basic concepts of range ecology.

This item was designed to ascertain the teacher's confidence in their subject knowledge of range ecology. Both teachers' response for before the study was 2 and after the study their responses were 5.

Item 2: My understanding of range ecology does not affect how well my students learn about rangelands.

This item was designed to determine how the teacher valued efficacy. Both teachers reported their response before and after the study at 1, indicating that they strongly disagreed with the statement.

Item 3: I can draw the "water cycle".

This item was designed to ascertain the teachers understanding of the water cycle. One of the teachers reported her response for before the study as a 4, and the other reported her response for before the study as a 5. Both teachers reported their responses for after the study as 5.

Item 4: Range science is an interesting and important subject for Montana kids.

This item was designed to determine whether or not the teachers believe that range education is important. Both teachers reported their response for before the study at 4. One of the teachers reported her response for after the study as a 5, while the other reported a 4 for after the study.

Item 5: The study of rangelands is a good way to address the study of many science disciplines.

This item was designed to ascertain whether the teachers understood the interdisciplinary nature of range science. One of the teachers reported her response before the study as a 2, while the other reported a 3. Both teachers reported their response after the study as a 5.

Item 6: Rangelands are important to all Montanans for a variety of reasons.

This question was designed to ascertain whether the teachers appreciated the importance of rangelands. Both teachers gave a response of 5 both before and after the study.

Item 7: I enjoy teaching and learning about rangelands.

This item was designed to determine the teacher's enjoyment of range science. One of the teachers gave her response before the study as a 3, while the other teacher's response before the study was 4. The teacher's responses for after the study were 4 and 5 respectively.

Item 8: I would consider adding range science to my curriculum in the future.

This item was designed to determine if the teachers would be interested in adding

range science to their curriculum as a result of participating in this study. One teacher's response before the study was 1, while the other teacher's response before the study was 4. One of the teacher's response after the study was 5, while the other teacher's response was 4.

Item 9: I am confident in my ability to teach range science to my students.

This item was designed to ascertain the teacher's level of confidence in their ability to teach range science. Both of the teachers rated their response before the study at 2. One of the teachers reported her response after the study at 5, while the other reported a response of 3.5.

Item 10: It is not important for children to learn about rangelands in school.

This item was designed to determine if the teacher values range science. One of the teacher's response before the study was 3, while the other teacher's response was 1. Both teachers' response for after the study was 1, indicating that they strongly disagreed with the statement.

APPENDIX E
POST-POST TEST

13. One part of a typical range eco-system is:

- A) animals
- B) houses
- C) roads
- D) tractors

14. Herbivores are animals that:

- A) eat meat
- B) eat plants
- C) eat fish
- D) eat both plants and animals

15. A type of surface water is:

- A) a lake
- B) a well
- C) rain
- D) a cloud

16. When plants use water it is:

- A) lost to the water cycle
- B) wasted
- C) returned to the water cycle
- D) used to hold the plant up straight

17. One herbivore **NOT** usually found on rangelands is:

- A) deer
- B) grasshoppers
- C) cattle
- D) mountain goats

18. Which is **NOT** a tool to help keep rangeland healthy?

- A) fire
- B) extreme recreational use
- C) fences
- D) grazing

+++++

In this section please circle the response that most closely describes your beliefs

Example

E. Swimming in the creek is fun.

- strongly agree
- agree
- don't know
- disagree
- strongly disagree

You would circle "strongly agree" if you believe that swimming in the creek is fun.

+++++

1. Rangelands are important to Montana.

- strongly agree
- agree
- don't know
- disagree
- strongly disagree

2. The water cycle affects me.

strongly agree agree don't know disagree strongly disagree

3. Rangelands and farmlands are the same thing.

strongly agree agree don't know disagree strongly disagree

4. Cattle grazing on public lands can be good for wildlife.

strongly agree agree don't know disagree strongly disagree

5. Ranchers, bird watchers, hikers, and hunters, should be educated about ways to keep rangelands healthy.

strongly agree agree don't know disagree strongly disagree

6. Wildfires can sometimes be good for the land.

strongly agree agree don't know disagree strongly disagree

7. Rangelands are lands that only cattle use.

strongly agree agree don't know disagree strongly disagree

8. Range agriculture only produces things that are shipped to other countries.

strongly agree agree don't know disagree strongly disagree

9. Rangelands only affect ranchers.

strongly agree agree don't know disagree strongly disagree

10. Learning about rangelands is interesting.

strongly agree agree don't know disagree strongly disagree

11. Ranchers have done a good job taking care of rangelands.

strongly agree agree don't know disagree strongly disagree

12. Rangelands would be more useful as housing sites.

strongly agree agree don't know disagree strongly disagree

13. Rangelands have been affected by people for a long time.

strongly agree agree don't know disagree strongly disagree

14. Wild animals that use rangelands are not very important to Montana.

strongly agree agree don't know disagree strongly disagree

15. Rangelands can benefit from cattle grazing.

strongly agree agree don't know disagree strongly disagree

16. There are many jobs available for people who are interested in rangelands.

strongly agree agree don't know disagree strongly disagree

17. It is important to care about rangelands.

strongly agree agree don't know disagree strongly disagree

18. Protecting range from overuse by recreation is important.

strongly agree agree don't know disagree strongly disagree

19. Rangeland health does not affect me.

strongly agree agree don't know disagree strongly disagree

20. Range plants aren't much different than weeds.

strongly agree agree don't know disagree strongly disagree

APPENDIX F

POST-POST TEST RESULTS

ITEM BY ITEM

POST-POST TEST RESULTS

ITEM BY ITEM

What follows is an item by item discussion of the post-post test knowledge items.

The correct answer to each item is printed in red and underlined.

1. Water is important to rangelands because:

- A) it sustains plant life. B) it provides places to swim.
C) it holds soil in place. D) it evaporates to make clouds.

This item was designed to ascertain the students' understanding of importance water to rangelands. The correct answer to this item is A. Fifteen of the students in the control group (n=19) answered this item correctly, compared with thirteen of the students from the treatment group (n=17).

2. A job that has to do with rangelands is:

- A) crop farmer B) fisheries specialist
C) wildlife biologist D) feed salesman

This item was designed to ascertain the students' understanding of careers in range agriculture. The correct answer to this item is C. Only six students in the control group answered this item correctly, compared with ten students in the treatment group.

3. Range agriculture supplies us with:

- A) nothing that I use daily B) only beef
C) milk D) medicines, and food

This item was designed to ascertain the students' understanding of what range agriculture provides us with. Fourteen of the students from the control group answered this item correctly, compared with seventeen of the students from the treatment group (n=17).

4. About how much of Montana's land is range?

- A) 50% B) 67% C) 5% D) 30%

14. Herbivores are animals that:

- A) eat meat B) eat plants C) eat fish D) eat both plants and animals

This item was designed to ascertain the students' understanding of what a herbivore is. Twelve of the students from the control group answered this item correctly compared to thirteen from the treatment group.

15. A type of surface water is:

- A) a lake B) a well C) rain D) a cloud

This item was designed to ascertain the students' understanding of what surface water is. Fifteen students from the control group answered this item correctly compared to only twelve from the treatment group.

16. When plants use water it is:

- A) lost to the water cycle B) wasted
C) returned to the water cycle D) used to hold the plant up straight

This item was designed to ascertain the students' understanding of the water cycle. Twelve students from the control group answered this item correctly, compared to only ten from the treatment group.

17. One herbivore **NOT** usually found on rangelands is:

- A) deer B) grasshoppers C) cattle D) mountain goats

This item was designed to ascertain the students' understanding of what animals are normally found on rangelands. Fifteen of the students in the control group answered this item correctly, compared to all seventeen from the treatment group.

18. Which is **NOT** a tool to help keep rangeland healthy?

- A) fire B) extreme recreational use C) fences D) grazing

This item was designed to ascertain the students' understanding of tools available to range managers. Eleven students from the control group answered this item correctly, compared to only five from the treatment group.

What follows is a detailed description of the items from the attitudes and beliefs portion of the post-post test. Students were asked to circle the response to each item that most closely matches their attitudes and beliefs. To facilitate evaluation of this section of

the test, the researcher assigned a point value to each possible response, however for the sake of expedience and to spare the reader, only the most favorable and favorable responses to each item are reported in this narrative. In the following narrative the most favorable response is printed in red and underlined the response that would be considered favorable is the one next to it.

1. Rangelands are important to Montana.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding rangelands and their importance. Ten students from the control group gave the most favorable response to this item, and six gave a favorable response, compared with eleven most favorable responses and six favorable responses from the treatment group.

2. The water cycle affects me.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the water cycle. Only five students from control group gave the most favorable response and seven gave the favorable response of agree, compared to eight most favorable and six favorable responses from the treatment group.

3. Rangelands and farmlands are the same thing.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding rangelands and their unique place in American agriculture. Only four students from the control group gave the most favorable response and six gave a favorable response, compared to five most favorable responses and seven favorable responses from the treatment group.

4. Cattle grazing on public lands can be good for wildlife.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding private grazing on public land. Only one student from the control group gave the most favorable response, five gave a favorable response and five gave a least favorable

response. From the treatment group, five students gave the most favorable response and eleven gave a favorable response.

5. Ranchers, bird watchers, hikers, and hunters, should be educated about ways to keep rangelands healthy.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the responsibility of users for keeping rangelands healthy. Nine students from the control group gave the most favorable response to this item and six gave a favorable response, compared to five most favorable and eleven favorable responses from the treatment group.

6. Wildfires can sometimes be good for the land.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the value of wild fires as a range management tool. Six students from the control group gave the most favorable response and eight gave a favorable response, compared to only three most favorable and twelve favorable responses from the treatment group.

7. Rangelands are lands that only cattle use.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the many uses of rangelands. Only four students from the control group gave the most favorable response to this item and six more gave a favorable response, compared to nine most favorable and eight favorable responses from the treatment group.

8. Range agriculture only produces things that are shipped to other countries.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding products of range agriculture. Six students from the control group gave the most favorable response to this item and five gave a favorable response, compared to only three most favorable and ten favorable responses from the treatment group.

9. Rangelands only affect ranchers.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the importance of rangelands to all Montanans. Four students from the control group gave the most favorable response for this item and nine gave a favorable response, compared to nine most favorable and four favorable responses from the treatment group.

10. Learning about rangelands is interesting.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding their interest in rangelands. Four students from the control group gave the most favorable response and seven gave a favorable response, compared to five most favorable and six favorable responses from the treatment group.

11. Ranchers have done a good job taking care of rangelands.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the role ranchers have played in preserving America's rangelands. Five of the students from the control group gave the most favorable response to this item and seven gave a favorable response, compared to only four most favorable and five favorable responses from the treatment group.

12. Rangelands would be more useful as housing sites.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the importance and usefulness of rangelands. Eight students from the control group gave the most favorable response to this item and five gave the favorable response, compared to ten most favorable responses and four favorable responses from the treatment group.

13. Rangelands have been affected by people for a long time.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the historical use of rangelands in America. Four students from the control group gave

the most favorable response to this item and ten gave the favorable response, compared to four most favorable and eight favorable responses from the treatment group.

14. Wild animals that use rangelands are not very important to Montana.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding importance of wildlife living on rangelands to Montana. Ten students from the control group gave the most favorable response to this item and six gave the favorable response, compared to only seven most favorable responses and seven favorable responses from the treatment group.

15. Rangelands can benefit from cattle grazing.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the importance of grazing animals to rangeland health. Only two students from the control group gave the most favorable response to this item and nine gave the favorable response, compared to only one most favorable response from the treatment group and eight favorable responses from the treatment group.

16. There are many jobs available for people who are interested in rangelands.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding careers in range science and management. Three students from the control group gave the most favorable response to this item and four gave the favorable response, compared to only two most favorable responses and six favorable responses from the treatment group.

17. It is important to care about rangelands.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding importance of rangelands. Ten students from the control group gave the most favorable response to this item and seven gave the favorable response, compared to eleven most favorable responses and four favorable responses from the treatment group.

18. Protecting range from overuse by recreation is important.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the importance of protecting rangelands from overuse. Nine students from the control group gave the most favorable response to this item and three gave the favorable response, compared to six most favorable and six favorable responses from the treatment group.

19. Rangeland health does not affect me.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding the role of rangelands in our modern society. Six students from the control group gave the most favorable response and four gave a favorable response, compared to eleven most favorable responses and five favorable responses from the treatment group.

20. Range plants aren't much different than weeds.

strongly agree agree don't know disagree strongly disagree

This item was designed to ascertain the students' attitudes and beliefs regarding range plants. Only three students from the control group gave the most favorable response to this item and eight gave the favorable response, compared to seven most favorable and seven favorable responses from the treatment group.

APPENDIX G

IRB CERTIFICATE

IRB CERTIFICATE

Human Participant Protections Education for Research Teams Page 1 of 1



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Human Participant Protections Education for Research

Completion Certificate

This is to certify that

Keith Duren

has completed the **Human Participants Protection Education for Research Teams** online course, sponsored by the National Institutes of Health (NIH), on 05/16/2005.

This course included the following:

- key historical events and current issues that impact guidelines and legislation on human participant protection in research.
- ethical principles and guidelines that should assist in resolving the ethical issues inherent in the conduct of research with human participants.
- the use of key ethical principles and federal regulations to protect human participants at various stages in the research process.
- a description of guidelines for the protection of special populations in research.
- a definition of informed consent and components necessary for a valid consent.
- a description of the role of the IRB in the research process.
- the roles, responsibilities, and interactions of federal agencies, institutions, and researchers in conducting research with human participants.

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APPENDIX H
IRB EXEMPTION

IRB EXEMPTION

**INSTITUTIONAL REVIEW BOARD**

For the Protection of Human Subjects

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TO: Keith Duren

FROM: Mark Quinn, Ph.D. Chair *Mark Quinn Ch*
 Institutional Review Board for the Protection of Human Subjects

DATE: May 12, 2005

SUBJECT: *Will the Deer and Antelope Continue to Play: A Critical Evaluation of the 'A Home On The Range Curriculum'*

The above research, described in your submission of April 15, 2005, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal Regulations, Part 46, section 101. The specific paragraph which applies to your research is:

- (b)(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- (b)(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.
- (b)(3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
- (b)(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.
- (b)(5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.
- (b)(6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.