

MORRELL CREEK RIPARIAN CLASSROOM
INTRODUCING STUDENTS TO OUTDOOR EDUCATION THROUGH THE
CREATION, USE AND MAINTENANCE OF AN OUTDOOR CLASSROOM

by

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ABSTRACT

Although I teach in a small rural school, my students do not seem to have a strong connection to the land. This project focused on building an Outdoor Classroom and using it to compare traditional classroom learning to that in an outdoor/experiential setting. My hope was to improve comprehension of outdoor education and create better attitudes towards the environment.

I compared traditional (teacher centered) classroom lessons to similar lessons in the Outdoor Classroom, which were by nature, more hands on. My junior high student's comprehension was assessed with pre and posttests, student surveys, journal writing and work samples in both the traditional and Outdoor Classroom lessons.

Student attitudes towards the environment were assessed by specific questions on the assessments, student surveys with short answer sections and their journal and reflective writing. The writing in my journal also assessed my teaching and attitude.

The results of using the Outdoor Classroom were very positive. Although I didn't see as much of an increase in comprehension as I had hoped for, I still saw a six percent increase in Outdoor Classroom lessons compared to traditional lessons. My students felt good about improving the environment through work in the Outdoor Classroom. I believe that educating students about our environment truly helps change attitudes. The Outdoor Classroom also had a positive effect on my teaching, attitude towards students and learning as evidenced by entries in my journal. Overall, I feel that the learning that took place in the Outdoor Classroom had a very positive impact on my students and myself.

INTRODUCTION AND BACKGROUND

For the past four years, I have been teaching seventh and eighth grade science (along with math and electives) at Seeley Lake Elementary School in Seeley Lake, Montana. We are a Title One school where 52% of the students qualify for a free and reduced lunch rate. I have 39 students in the junior high with about 40% female and 60% male students. My students are predominately Caucasian and most come from working class families involved in the timber or agriculture industry.

Although I teach in a small school in a small rural community, I am concerned that my students do not have a connection to the land and a concern for protecting it. Four years ago, I took my junior high students to look at a one year old forest fire burn in our area. While our guest speaker was talking about species that were returning to the fire scarred area, I watched one of my students crush a lodge pole pine seedling with his heel. He came from a family of outdoors people who I assumed would have a great respect for the environment. It was then, that I realized that our students needed to know more about our environment in order to care for and protect it. The last two years I have been working on grants and restoration work, along with my students, building an outdoor classroom. Therefore, my research will focus on building an outdoor classroom and using it to compare traditional classroom learning to that in an outdoor/experiential setting. By sharing and teaching students about their environment, I hope they will develop a connection to it, a sense of ownership and a level of concern to become good stewards of the land. While creating the Morrell Creek Riparian Classroom with my

students, I hope to share the importance of taking care of our environment, increase their knowledge of the outside world and have them think more globally.

I think the data I collected for this project, and continue to gather, will be useful to my colleagues at all grade levels in our pre-school to eighth grade school. As I continue to show an increase in comprehension through outdoor/experiential learning, I hope to share this information, along with grade appropriate lessons with my colleagues.

Focus Questions

My main action research (AR) question is, “What is the impact on student learning when they are introduced to outdoor learning through the creation, use and maintenance of an outdoor classroom?” The sub questions are as follows:

1. Does student comprehension increase in an outdoor/experiential setting compared to a more traditional classroom setting?
2. How does outdoor education affect student attitudes towards the environment?
3. How does this affect me as their teacher?

CONCEPTUAL FRAMEWORK

My desire to develop not only higher student achievement, but also better stewards of the land, led to my AR project addressing the question, “What is the impact on my students when they are introduced to outdoor education through the creation, use and maintenance of an Outdoor Classroom?” The literature examined, revealed that teaching outdoors can be an effective technique to achieve various goals, including an increase in student comprehension and enhanced connection to the environment.

Montana Fish Wildlife and Parks has a program with similar goals to mine – helping students “develop awareness and appreciation for the fish and aquatic resources in Montana, teaching safe and responsible outdoor skills and helping teachers develop skills and interest in teaching natural resource topics” (Flowers, 2010, p. 166). They used a utilization – focused evaluation collecting both quantitative and qualitative data on activities of the Hooked on Fishing program. A web-based survey was created for teachers, using 31 open and closed ended questions. Students were given pre, post and extended post surveys of 46 questions, primarily closed ended questions and instructors were given an interview guide with 23 open and close ended questions. The assessment was given in six different FWP regions at 80 schools in 146. The assessments were given to 2277 Hooked on Fishing students with a control group of 229 who have never had the Hooked on Fishing program. Pre surveys were given in November and December of 2005, post surveys were given in May of 2006 and extended post surveys were given in September of 2006. The article gave many examples of the survey questions and had several tables to show how they analyzed their information. Their data showed significant improvements on questions relating to student’s skills (fishing laws, how to handle a caught fish, etc.) and knowledge between the Hooked on Fishing students and the control group. However there was “little difference found in attitudes and intended behaviors” (Flowers, 2010, p. 169). “Hooked on Fishing did not significantly affect students’ attitudes and intended stewardship behaviors” (Flowers, 2010, p. 169). In contrast, I think my students could have an advantage in this area since they have been involved with the creation, development and maintenance of the Outdoor Classroom from the onset. The student skills have been the easy part to teach and assess (which I did in a

similar fashion). The behavior/attitude is much harder to change. I liked the idea of the pre, post and extended post surveys, and looking at their questions, the data would be easy to assess (primarily closed ended questions on a scale of 1-5). However, that was only one of the assessment pieces that I used.

Young students from England and Iceland were observed and interviewed about the importance of their outdoor spaces (Clark, 2007). Students did some journaling, but photography and drawing were also used as a tool to express the importance of their environment. Students, “made it clear through their photographs, conversation and actions that the outdoors was an important place” (Clark, 2007, p. 354). These studies with young children using a mosaic approach mimic studies from Iceland. The adults involved listened carefully to what the young children had to say during simple interviews and also through their visuals regarding the importance of the outdoors. The studies consisted of inner city and suburban children in three different studies “Listening to Young Children” (2001), “Spaces to Play” (2005) and “Living Spaces” (forthcoming). The data was collected with drawings, interviews – both individual and group and use of cameras – with and without adult supervision.

An idea that I used from the group of studies I reviewed, involved how researchers conducted individual interviews. For example, they did some of their student interviews “on the move” and I think this was a great way to probe for more information from my students. Thus, I gave my students the opportunity to tell and show me more in-depth information. They talked about how their work has affected their attitude –showing me the wetland that we uncovered and how it amazed them that someone would bury it or the frogs that we discovered last spring – living now in that uncovered area. Others

showed me the growth the willows in the wetland exhibited and told about the root to shoot ration, how tall they were when we planted them, etc. Another idea I really liked is the photography aspect. I recently included photography in student's lab reports, after that project. I think this was a great element to enhance their journals. They showed a great deal of change in the Outdoor Classroom, before and after photographs, which could lead to some great conversations and writing. We used this during our weed education unit – a beforehand pulling, after, and extended after, then possibly a compare and contrast writing exercise. I like the idea of having the writing supported by a visual. We will be including photography in their field guides this spring and have used photography and video in their virtual posters with reflections we just completed. It was good to see some photos with my direction of what we needed and then some photos of what was important to them. Even though *Views from Inside the Shed*, (Clark, 2007) was a study for young children, I found many elements that worked for my junior high students with a few adaptations.

Inviting classes to help my junior high students with restoration has been very exciting. Not only has it increased the amount of work being accomplished, it has also made my junior high students “solid” in what they are doing. Having to teach their peers how to plant a tree, for instance, made them very sure of the directions. According to Julia Cwikla, Mark Lasalle and Sybil Wilner (2009), Project Wetkids outings take sixth grade students through a number of stations to learn about the Mississippi wetlands. Small groups of students rotated through seven stations manned by volunteers and older peers on a variety of subjects about boating, hurricane prediction, bird and plant identification, water testing, use of binoculars for spotting and identifying, throwing a

cast net, etc. Students received folders with information and worksheets to complete at some of the stations. Upon returning to school the next day, students completed a writing piece tied into the standards and a reflection “on their day shared with local naturalists, artisans, story tellers, state and federal scientists, researchers and faculty members” (Cwikla, et al, 2009, p. 278).

I incorporated the peer-teaching piece into my AR research project. My eighth grade students have taught the first graders about the Drummond willows we have planted – they helped them measure and record data on planting day and then again this fall to calculate growth made over the summer. The junior high students worked with the 4th graders last spring making browse protection for those willows and then helped the 4th graders plant larch, dogwood, cottonwood and chokecherry bushes this past fall. They should be able to teach some of the younger students about the life history of macro invertebrates and identification and indication of water quality. Another lesson my older students may be able to do is birding in the riparian areas or something on riparian area mammals – possibly by tracks or bear claw scars on trees. Our 5th grade does a big unit on water – the outdoor classroom would be the perfect place to teach this if their teacher had a few standards based lessons for support. A weed pull would be a great way to introduce or solidify basic plant anatomy, seed dispersal and root structures. Maybe students could help develop lessons for some of the younger grade levels. This was something I hadn’t thought about before reading the article, but it has and will further help develop ownership of the outdoor classroom and area in my junior high students.

Other great ideas for outdoor learning centers and schoolyard ecosystems were discussed by Rob Layton (2001). The article was about planning those outdoor spaces,

therefore making the school grounds more useful. We do spend money and energy on the playground, which is utilized for only a short period of time during the school day. He says, “most schoolyards are not mind-expanding environments...bleak, sterile expanses of asphalt and grass, punctuated with playground equipment” (Layton, 2001, p. 358). Good planning and creativity can turn those neglected areas into great science labs and places for collaboration and activities. They are frequently less expensive than buildings and provide a great addition to the learning environment. He makes mention of looking around at what we have and utilizing it to get out of cramped classrooms. This was interesting because several of my students brought up cramped classrooms when I was interviewing them. I am claustrophobic and apparently am not the only one. A big reason students liked the outdoor classroom was due to the fact that there was fresh air and room to move around. My students have developed a trail and are working on interpretive signs to make the public feel more welcome, so this along with the students’ pride should give them a sense of ownership of the Outdoor Classroom. Climate control was also addressed in this article, so I walked the site for my Outdoor Classroom and found a fairly good area with trees creating a semi- circle. I flattened this area and put in a graveled pad, we are in the process of building permanent tables; these will make the area more user friendly, with the trees providing shelter and shade. These were some of the ideas for enhancing our academics by simply utilizing the outdoors that we currently have available to us.

Field trips and outdoor teaching have been shown to increase learning that is not confined only to students. Dillon, Morris, O’Donnell, Reid, Rickinson, & Scott (2005) shows that teachers had many gains as well. Teachers not only improved relationships

with students, but also improved development in their teaching and curriculum. Outdoor learning allowed teachers to connect subject matter to authentic learning experiences making some abstract ideas much more concrete. This was a major theme in my students' reflections on streamside monitoring. "Instead of just reading about it, we were collecting real science data for Missoula County". This study also showed that these experiences increased "students' awareness and care for their environment and community" (Dillon et al., 2005, p. 247).

An important element that I hadn't thought about was the fact that it is easier to visit a museum or a zoo than to teach in the outdoors. Not only is it a logistic challenge for many teachers, but you also have weather, management and safety issues along with insufficient knowledge preparing teachers to teach outside. Kathleen Manzo (2009) follows five teachers (grades 1, 2, 5 and 8) through a project helping them to become more prepared to teach in the outdoors. Each of the five teachers taught a group of students in the Ecological Garden a variety of subjects ranging from biotic and abiotic variables, identification of plants and mammals to recycling issues and comparing shaded and open areas in the Mediterranean chaparral. Data on the teachers (through the six month project) was collected by interviews, videotaping and a final portfolio. As the teachers became more comfortable with the Ecological Garden, and all the variables that outdoor education involves, their students' learning, attitudes about nature and enjoyment of the lessons also increased. One particular teacher (5th grade) "emphasized the systemic outcome of the project: the cognitive, (the students learned a lot), the social (they had to work with each other, communicate and share) and the experiential (they enjoyed ... they were curious...they had adventures)" (Manzo, 2009, p. 258). Overall,

the five teachers felt that connecting school-based learning with the outdoors was very significant. However teachers were generally insufficiently prepared to teach outdoors. This is information that I hadn't thought about. I had just expected that I would build an outdoor classroom and they would come. I will need to develop some sort of teacher in-service program once the outdoor classroom is done. I may start this with a simple tour of the outdoor classroom followed by simple ideas for students clothing/dressing ideas, locations of the nearest bathrooms, then grade appropriate riparian, weed education and stream ecology lesson plans. Hopefully, I could tie this all into the state standards and create a grade appropriate folder for each teacher. I think that teachers in my school would feel much more comfortable using the outdoor classroom if they started out with a lesson or two created for them. This would set them up for success so they would use the outdoor classroom more frequently.

Tied closely to my thoughts on developing packets for each teacher, I read about a K-8 charter school, Learning Gates Community School (Dillon et al., 2005). The 27-acre campus includes an orange grove, fields, tree house and pond. Their school is set on not being "nature-deficit". Their 520 students are assigned time to spend in the organic garden, take frequent nature walks and receive lessons that connect all their subjects to the world around them. They have an inquiry lesson inside, some direct instruction, and then head outside to test it out. Many agencies and organizations work with the school system to help teachers integrate the outdoors into their curriculum. They have shifted the thought of using the outdoors as something special to using the outdoors as an "instructional tool" for every day. On any given day, you might see students pulling weeds from the garden and discussing root systems, making adobe bricks as an

experiment to see which ingredients are the strongest or sitting on the branches of oak trees writing. Studies from nature based curriculum (Dillon et al., 2005) show that students not only performed better on science tests, but math and had documented improvements in reading. This would be my dream – having those place-based packets for each of the core subjects for every grade level. The more user friendly I can make the outdoor classroom, the more it will get used!

METHODOLOGY

Treatment

My capstone project began the fall of 2009 with grant writing, securing funds and permissions to build an outdoor classroom. With those secured, I began to involve students in the creation of the Morrell Creek Riparian Classroom. I conducted two treatment units on noxious weeds and streamside science, these were paired with non-treatment units also on weeds and riparian areas in order to best assess the changes I implemented.

During the spring of 2010, I began my first unit on weed education. For the classroom (non treatment) weed unit, students learned why some plants are considered weeds, we discussed the meanings of native, invasive and noxious and evaluated why invasive plants cause ecological damage and affected humans. This one week long, classroom unit was started with a pretest, lecture style traditional teacher centered instruction, followed by a posttest.

Our (treatment) weed unit began with a pretest on a variety of methods used for weed control, including the Bradley method, using information from the Missoula Weed

District “KNOWEEDS” curriculum. During a field trip, we identified noxious weeds in the Morrell Creek Riparian Classroom and discussed different removal methods on the site. The students determined the best method and decided why a manual (Bradley) method made the most sense in our Outdoor Classroom area (proximity to the creek, good native vegetation and the primary noxious weed being spotted knapweed - which responds well to manual removal). Students then mapped the area, discussed proper pulling – not leaving roots, etc and why weeds are put in bags (seed dispersal, etc.). Then we put our learning into use with a manual weed pull, along with invited members of the community and Missoula County Weed District. This was followed up by a posttest that involved all my junior high students (approximately 39) on methods, importance of mapping the area and proper weed pulling. We took some photos to see long-range improvement and also to incorporate them into our journals. Through this ten-day unit, students learned the importance of land management and becoming good stewards of the land.

In the fall of 2010, my eighth grade (last year’s seventh grade) and seventh grade (new students) began a unit on riparian areas and streamside science. The students examined the importance of riparian areas, their uses and what they are. This week long, non-treatment riparian unit was a classroom-based unit involving lecture, activities, art and demonstrations. Assessments were primarily pre and posttests. Afterwards, we moved to a one-week streamside science unit. After learning the basics of chemical testing in the classroom with different temperature waters (for Dissolved Oxygen testing) and different stream and pond waters, students chose groups in which to become “experts” at one chemical test. After the classroom practice session, they performed this

test at the Outdoor Classroom site and presented the results of their test to the rest of the class. Students were then given a tub of creek water to collect macro invertebrates from. They had to sort, identify and count the macros to determine their value as a water quality indicator. With all the data collected from the Outdoor Classroom, we completed a water quality index to determine the health of Morrell Creek. This information was then submitted to Montana Watercourse, which is a statewide water education program.

Through this unit, students learned the value of healthy riparian and stream systems. Hopefully this information will help them make informed decisions concerning our area, as we see changes in our valley. “I wonder if the golf course knows how mowing to the creek affects the bull trout” was a comment from one of my seventh grade students.

In both treatment units, students were given a task directly related to the maintenance/care of the Outdoor Classroom. Through “hands on/experiential” methods and work in the Outdoor Classroom, students completed that task. Due to their positive responses to the weed and streamside science unit, more “hands on/experiential” units will be added to my science curriculum.

Treatment Schedule

My treatment schedule began in early fall of 2009, to see if my plan would even be possible.

September 2009 – March 2010 – Secure grants and permissions to build an outdoor classroom on Morrell Creek.

Table 1
Treatment Schedule

Lesson	Treatment	Data Collection Method	Dates
How do you feel about learning – outdoors/experiential compared to traditional, attitude towards the environment, etc	Yes	Interviews	April 2010
Weeds – identification; meaning of invasive, native, noxious; how they affect our state	No	Pre and post test	May 1-5, 2010
Weed Removal Methods and reasons for choosing compared to land and location	Yes	Pre and post test, journaling	May 10-14, 2010
Riparian Areas – what they are, their uses and importance	No	Pre and post test, student work	September 27-October 1, 2010
Streamside Monitoring – learning to perform the chemical tests, macros and their value also a water quality indicators, water quality index	Yes	Pre and post test, journaling	October 4-8, 2010
Attitude towards the environment	Yes	Likert survey and open ended questions	October 10, 2010

Research Methods

This study took place during the spring of the 2009-2010 school year and the fall of the 2010-2011 school year at Seeley Lake Elementary. We are a small school,

preschool to eighth grade, with about 200 students. I included all my seventh and eighth grade science students in order to assess their baseline knowledge and their “acquired” knowledge. My current seventh graders consist of six girls, 14 boys, five free and reduced lunch rate and two special education students (reading at about a 2nd grade level). My eighth graders have six girls, 12 boys, 14 free and reduced lunch rate and two special education students. The research methodology for this project received an exemption by Montana State University’s Institutional Review Board and compliance for working with human subjects was maintained.

To see if there is any impact on my students when they are introduced to outdoor education through the creation, use and maintenance of an outdoor classroom, I chose a variety of data collection methods. I will be using interviews, surveys, pretests and posttests, journaling and student work samples.

For my first sub question, “How does student comprehension in an outdoor/experiential setting compare to their comprehension in a more traditional classroom setting?” I used pre and posttests and student work samples. I feel these methods complemented each other very well. I easily gave these to my whole group and saw not only how their “outdoor/experiential” (treatment) scores compared to their “indoor” (non-treatment) scores on a similar subject, but also how their baseline knowledge compared to their acquired knowledge. This question gave me quantitative data and was by far, the easiest to analyze. I got the quantitative data I needed to compare outdoor/experiential learning to a more traditional classroom approach. I implemented a non-treatment (indoor) and a treatment (outdoor) unit in two areas – weed education and streamside science.

My question of how outdoor education affects student's attitudes towards the environment was more difficult to analyze. I used interviews of smaller samples of students along with whole group Likert surveys. Journaling and reflections helped me collect this qualitative data. I think this combination of data provided me with a good mix of my students. I used small group interviews combined with whole group Likert surveys to give me good baseline data on student attitudes towards the environment. I interviewed a portion of both the seventh and eighth grade class on how they felt about learning outdoors compared to a traditional classroom, how it affected their attitudes about the environment and if the outdoor/experiential education improved their comprehension. I chose a mix of abilities and a random mix of girls and boys to interview. I used six students for those interviews (Appendix F). Whole group surveys were also used (Appendix E). During and after treatments we journaled – this gave me information as to the progress and value of the treatment.

As far as the impact on me as their teacher, I used my own journal filled with reflections and field notes to see changes in attitudes, progress and worthiness of the treatment. I think the students' interviews along with their reflective writings have been very insightful. Students' work and grades have always had an impact on me – I always feel that I am part of the problem when students don't do well or fail. Knowing this, their work samples and assessments also affected me. I looked at their Measure of Academic Progress testing and their Montana Comprehensive Assessment System testing to see how we are doing not just individually, but as a whole group and also compared to the rest of the country. Using the above tools, I determined how the Outdoor Classroom use impacted me.

When creating my research assessment tools, I consulted many sources. After disturbing the ground (during chip removal) in the Outdoor Classroom, we noticed many more weeds. I consulted the Missoula County Weed District for some help. They had just finished writing the Knoweeds Curriculum (Caton and Mills, 2010). It was perfect timing – they looked over my pre and post tests and lessons, I looked over their new curriculum. I adjusted the language in my assessment tools and lessons to match theirs, for consistency. I will also include the Knoweeds Curriculum in my teacher packets that I am creating for each grade level. During my riparian area unit, I consulted the Missoula County Conservation District for help with my lessons and assessments. I had also found a source, “Holding onto the Green Zone Action Guide, A youth program for the study and stewardship of community riparian areas,” put out by the Bureau of Land Management and the University of Wisconsin. Together with these two guides, I felt like my lessons and assessments would be reliable and valid. For help with my Streamside Science unit, I used the expertise of my friends from Trout Unlimited and many sources from Montana Watercourse – the *Volunteer Water Monitoring Guidebook*, *Healthy Water Healthy People* (2002), and *Project WET* (2002). These sources also provided me with that common language that I think is so important and also information that I can use in my future teacher packets.

In order to determine if the Morrell Creek Riparian Classroom made an impact on my junior high students, I used the data collection items listed in the Research Matrix Chart listed on the following page.

Table 2
Research Matrix Chart

Question	Interview	Surveys	Pre Test	Post Test	Journaling Reflections	Student Work Samples
What is the impact on student learning when they are introduced to outdoor education through the creation, use and maintenance of an outdoor classroom?	1, 2,4	1,2	1	3,4	1,2,4	3,4
Does student comprehension increase in an outdoor/experiential setting compared to a more traditional classroom setting?			1	3,4		3,4
How does outdoor education affect student attitudes towards the environment?	1,2,4	1,2			1,2,3,4	
How does it affect me, as their teacher?	1,3,4	1,3,4			1,3,4	

Key:

- 1 - Will show baseline information
- 2 - Will show students' opinions

- 3 - Will show progress during treatment
- 4 - Will show the value of the treatment

Using a variety of data collection methods, I was able to determine if the Morrell Creek Riparian Classroom indeed had an impact on my junior high students. Collecting data from both treatment and non-treatment sources allowed me to compare not only comprehension but also attitude change in my students. This would help me to determine the effect of the Outdoor Classroom on my students.

DATA AND ANALYSIS

The intention of my Action Research project was to examine the impact on students when they are introduced to outdoor learning through the creation, use and maintenance of an outdoor classroom. During the course of this project, data was collected to examine the three research sub questions:

- Does student comprehension increase in an outdoor/experiential setting compared to a more traditional classroom setting?
- How does outdoor education affect student attitudes towards the environment?
- How does this affect me as their teacher?

I have used several data collection methods in my Action Research project to examine the impact on my students when they are introduced to outdoor education. I have used the pre and posttests for Weed Identification (Appendix A), Weeds Part Two (Appendix B), Riparian Areas (Appendix C), Streamside Science (Appendix D), a Likert survey (Appendix E) on attitudes towards the environment and interviews (Appendix F).

I used this data to help answer my questions on their comprehension and attitudes towards the environment.

To address comprehension increase in an outdoor/experiential setting compared to a traditional classroom setting, I taught a unit on weed education in the spring of 2010. On the non- treatment weed identification unit pre and post- tests, four short answer questions were asked on attitude and comprehension of what weeds are and why we should care about them. The table below shows the overall average scores for both the seventh and eighth grade. I broke the questions down individually to determine both comprehension and attitude changes.

Table 3
Non-Treatment Unit
Weed Identification, N=39

Weed Identification	Pretest Average	Post test Average	Percent of Increase
seventh grade	30%	56%	26%
eighth grade	39%	70%	31%
Overall Average			29%

Individual Question	Pretest Average	Post test Average	Percent of Increase
1. Define Weed. Why is it a subjective term?	11%	72%	61%
2. What is an invasive species?	55%	74%	19%
3. Why should we care about invasive species?	60%	84%	24%
4. What are noxious weeds? Give some examples.	19%	59%	40%

The weed identification unit (non- treatment) was taught with a variety of lecture and PowerPoint presentations. Most (75%) questions were comprehension questions about what weeds are. Both seventh and eighth grade students showed a good improvement in these areas (40% increase). I felt like my students needed to know what weeds were, why they were invasive or noxious before they could/would care about the impact they have on our lives. Both groups of students showed gains in question three,

“why should we care about invasive plants?” seventh grade made a good improvement from their pretest to their posttest (30% increase), while eighth grade made smaller gains (17% increase). I feel that eighth grade had smaller gains due to higher pretest scores – we had talked about the impacts of weeds on the Game Preserve south of town the previous fall (during hunting season) as we talked about limiting factors for the elk populations. This may be part of the reason there was not as much increase in the eighth grade testing. Question four had the largest percentage of increase on the test. I think this was simply due to terminology. Neither seventh nor eighth grade knew what a noxious weed was, as defined by the state. They had all heard the term, but to know the definition and then the weeds that belonged to that category was something new to all of my students. Although the weed identification unit was a non-treatment unit, it definitely made students more aware of what they are and how they affect our environment.

Following the weed identification unit, students were given a pretest on a variety of methods used for weed control (treatment). The table below shows overall average scores for both seventh and eighth grade along with individual scores regarding comprehension and attitude about the outdoors.

Table 4
Treatment Unit
Weeds Part 2, (N=39)

Weeds 2	Pretest Average	Post test Average	Percent of Increase
seventh grade	41%	85%	44%
eighth grade	30%	79%	49%
Overall Average			47%

Individual Question	Pretest	Post test	Percent of Increase
1. List and give examples of five methods for halting the spread of invasive species.	27%	77%	50%
2. Which method should we choose for the Outdoor Classroom and why?	52%	84%	32%
3. Why should we keep a map of where we have removed invasive species?	89%	90%	1%

Question one is primarily a comprehension question concerning the different methods of removing invasive species. Although we did show a good increase in comprehension (50%), the majority of student's errors were not due to incorrect answers – just incomplete. Students were able to list removal methods; several students ($N=9$) however, did not give examples of those methods, making their responses worth only half the points.

The second question showed both comprehension and also attitude towards the environment. We did show an increase in comprehension (32% increase), but more importantly, students were able to elaborate and develop decisions about the Outdoor Classroom and the environment in general. “We pulled dead and new “baby” spotted knapweed. We didn’t spray because we were so near to the creek we didn’t want to pollute it, so we pulled manually. It felt good to know something as simple as that can help dramatically in our environment.” As I read through all of the students’ comments, there was a general trend to choose manual removal in the Outdoor Classroom so we would not put chemical sprays into the area close to the creek – “so we could protect the water fish and macro invertebrates.”

Weed education is a very good thing to know, so we know how to get rid of them. I know that I learned what spotted knapweed looks like when it is just a little plant. Spotted knapweed tends to take over and kill all of our native plants that are important to our lands growth and everything around it. I also know that I learn better when I am outside actually learning and doing it. So I thought the day was very important not just for my education on weed education, but also for the Outdoor Classroom and restoring the land. (eighth grade male)

Several students also wrote that we would have to use some type of chemical, though, for the Canadian thistle – hand pulling actually stimulates root growth and increases the spread of this weed. This was information that the students gathered while listening to the Missoula Weed District guests speaking. I was very impressed that so many ($N = 9$) caught that bit of information during the lecture, as it was almost an out loud note to themselves, rather than information for us. Overall, I was very happy with the results of

question two. Students seemed to think that weed control was good not only for the Outdoor Classroom, but for our environment in general. They also thought it was something fairly simple that almost anyone could accomplish with a little work.

“Yesterday we went to the Outdoor Classroom to pull weeds. Getting rid of them made me happy because weeds are harmful to the environment and can displace native vegetation. We primarily pulled knapweed but I pulled enough to fill up a garbage bag.”

As I looked at individual results, I went over one of my special education students in last year’s eighth grade class. He scored an 11% on his treatment pretest and 35% on his posttest. He answered question one and listed four methods of halting the spread of invasives without using examples. Later, I showed him the error – he gave me great examples, so, if he would have read the directions he had the potential to get a 95%. He gave a great answer for question two that showed not only his comprehension of the material but a great attitude towards the environment. He wrote that we should use a manual weed pull because of the creek and “especially because of the new pond we found, where we have found frogs. We don’t want the chemicals to get into the water and hurt the natural habitat.” He also added that we could do something different on the top (we have an upper bench in the Outdoor Classroom) because there isn’t any water near that area. I feel like the second part of his statement required deeper thought, which showed his comprehension of the material and concern towards the environment. This student comes from a family that doesn’t do a lot of outdoor activities, so I feel that he gained this information from the unit on weeds and time in the Outdoor Classroom.

The third question on mapping showed very little growth, however we did start (pretest) with 89% comprehension. This may show that students are carrying over the

mapping skills from tree and grass seed planting that I had done a few weeks prior to the weed unit. I should have come up with a better question, as this one may have skewed the data by showing less growth.

Again, I was pleased with the results of the weed education unit. Students made gains in both the non-treatment and treatment units. However, the treatment unit showed much more growth (47% increase compared to 29% increase.) Very similar results were found in their daily work as they completed a plant safari and the great race for survival. “I feel that pulling the weeds along Morrell Creek was a good thing to do. Teaching students about invasive species control will help us better understand and manage the land that we live on.” This student’s statement pretty much sums up my goal for the entire project.

To further address my sub question regarding a comprehension increase in an outdoor/experiential setting compared to a traditional classroom setting, I taught a “non-treatment” unit on riparian areas. A pre and post- test were given on comprehension based questions of why riparian areas are so important to wildlife, stream life and to humans and also how humans affect the health of a riparian area. I feel like the question of how we affect the health of riparian areas might also shed some light on student attitudes towards the environment.

Table 5
*Non-Treatment Unit
Riparian Areas, (N=39)*

Grade	Pretest Average	Post test Average	Percentage of Increase
seventh	19.5%	84%	63.5%
eighth	63.7%	94.2%	30.5%
Overall Average			47%

Table 6
Eighth Grade Individual Results, (N=18)

Individual Question	Pretest	Post test	Percentage of Increase
1. In complete sentences, explain what a riparian area is.	47 %	78%	31%
2. In complete sentences, write three reasons why riparian areas are so important for: Wildlife and humans			
1.	67%	100%	33%
2.	60%	83%	23%
3.	13%	78%	65%
Stream Habitat			
1.	67%	96%	29%
2.	34%	87%	53%
3.	13%	78%	65%
3. What can we do to change unhealthy riparian areas?	73%	100%	27%
4. In nature, what slows down the water in a stream? Think of as many ideas as you can and list them.	67%	100%	33%
5. What attracts birds to riparian areas?	53%	100%	47%
6. How does canopy cover affect the physical properties of the stream itself?	60%	87%	27%
7. How do humans affect the health of a riparian area?	73%	96%	23%

This non-treatment riparian unit was taught with a variety of lecture, PowerPoint presentations, artwork and hands on elements. The first question is a simple comprehension question about what a riparian area is. Questions 2-1 to 2-3 are about the importance of riparian areas for humans, wildlife and stream life. The variety of results on these six questions had to do with students only being able to come up with a couple of answers on the pretest. Questions three and seven showed not only comprehension of what we can do to improve the health of riparian areas, but also showed me a change in their attitude on the environment (25% increase). Several students wrote about the work they had done in the Outdoor Classroom to improve it. Even though this was a “non-treatment” lesson, students were still affected by the work they had done in the Outdoor Classroom.

Humans can affect the health of a riparian area in different ways, some good and some bad. A bad way is pollution. Some people that live near water have septic systems right in the riparian areas. This pollutes both the body of water and the riparian area. A good way is that we can help restore it. We can plant trees, remove invasive species and clear out garbage. (seventh grade female)

My seventh grade class showed the greatest improvement from the pretest to the posttest (63.5% improvement), while my eighth grade class showed an average amount of growth (30.5%). I attribute this big difference due to the eighth grade being involved in the Outdoor Classroom their entire seventh grade year, plus this entire eighth grade year.

Riparian areas are important to our environment because they help keep the rivers and streams clean, help keep the habitats for fish and other aquatic life healthy, provide a habitat for birds and an area for native plants. I feel that the Outdoor

Classroom opened a door for me to learn this and gave me an opportunity to help take a small step to keeping our environment healthy. (eighth grade female)

After the non-treatment riparian area unit, a treatment streamside science unit was taught. On the streamside science pre and posttest, seven questions were asked on attitude and comprehension of the basic elements of streamside monitoring. The table below shows the overall average scores for both the eighth grade and the seventh grade. I broke the eighth grade questions down individually (the first question dealt with both appraising their attitude and comprehension, while the other six questions were primarily comprehension and application questions).

Table 7
Treatment Unit
Streamside Science, (N=40)

Streamside Science	Pretest Average	Posttest Average	Percentage of Increase
seventh grade ** flu week	18%	55%	37%
eighth grade	53%	94%	41%
Overall Average			39%

Table 8
Eighth grade Individual Results, (N=18)

Individual Questions	Pretest	Posttest	Percent of Increase
1. In complete sentences, explain why we should care about clean water.	97%	100%	3%
2. As part of their habitat, what do fish and macro invertebrates need?	86%	100%	14%
3. What are the four C's of water?	89%	94%	5%
4. How does the temperature of the water affect the dissolved oxygen content?	28%	100%	72%
5. How does ph affect living things?	11%	86%	71%
6. What could a high nitrate concentration indicate?	0%	89%	89%
7. What is turbidity and how would that affect our fish and macro invertebrates?	64%	89%	25%

The first question not only deals with comprehension of why we need clean water, but also attitude towards the environment about why we should care for it. There was very little change in my eighth graders from pretest to post- test (3% increase). This may be due to this class being involved in the Outdoor Classroom for the past two years (which was further supported by their interviews showing that 100% ($N=9$) of the students felt they learned better outside). They are exposed to lots of information on the importance of taking care of our water. The next two questions on fish and macro invertebrates and the 4 C's of water also showed only average growth due to the fact that their pretest scores were fairly high (14% and 15% increases). I again attribute this to being in the Outdoor Classroom for two years and working on streamside monitoring with the Watershed Education Network folks. Kids, fish and macros are a great combination for learning!

The Outdoor Classroom is important to me, our school and our community. It is great fun for me to be outdoors enjoying myself while learning. I got to check for water quality and teach my class to find the turbidity of the water. Looking for macros in the microscope is a lot of fun. (seventh grade male)

Although we have done streamside monitoring for several years, this past fall I purchased equipment of our own and we became experts in the chemical testing end of things. Groups of students learned how to do the tests, and taught the others how to perform chemical testing. I feel like this is the reason for such high increases in the last four test questions (64% average increase). "When I taught my class about Dissolved Oxygen, I learned that the temperature of the water affects the dissolved oxygen content because the cooler the water is the more oxygen it can hold." Although they had done the

testing before, an adult had also been there in charge. When they had to become the expert and teach others, a lot more learning happened. Three different work samples (virtual posters) also brought up the fact that they were chemical testing experts. Overall, I was very pleased with the increase in comprehension on this treatment unit and also the results of question one, showing that outdoor education not only improves comprehension, but also improves their attitude towards the environment.

Some interesting results that I had were with three low scoring eighth grade students (including one special education student). They are all C and D grade science students. One of those students improved his score by 31 points, another by 18 points and the other (special education student) improved by 36 points. All three of these students seem to learn much better when the material is “hands on”. When looking over their tests, I was amazed to see all three got the question about how temperature affects dissolved oxygen content and the question regarding turbidity both correct. This had to do with the testing in the lab with different temperatures and types of water and then going into the field with the test kits. I do not feel that they would have gotten these correct with just a lecture style class (They had an average baseline grade of 65%). Overall my eighth grade students had a 41-point improvement in this outdoor/experiential treatment unit. I did see better gains in the riparian unit for the seventh grade class, but my seventh graders (about 35%) had the flu during the streamside-monitoring unit. This is the reason for only using individual results of the eighth grade. My eighth grade made better gains in the outdoor/experiential unit on streamside monitoring (41% compared to 30.5%). My three C and D science students from the eighth grade also scored better in

the streamside-monitoring unit compared to the more traditional riparian unit (28% improvement compared to 16%).

Another interesting detail I found was several students commenting on the idea that simple changes could lead to big results. Students felt that pulling weeds made a big difference to the native vegetation in the Outdoor Classroom. Another place I saw this same type of moments were during our tree planting performance assessments (student work samples). Students commented that the “simple” act of planting trees could affect our environment very positively, not only providing more oxygen, but also improving the riparian area by reducing erosion and improving habitat for birds and mammals. Students also wrote about providing a canopy for the creek to lower the temperature of the water and improve stream health for fish and macro invertebrates. I was happy to see the students realize that individuals can make a difference.

In order to answer sub question two, "How does outdoor education affect student attitudes towards the environment?" I used interviews, surveys, checklists and journaling. The Likert survey and open-ended questions (Appendix E) was a data collection method I used to assess student's attitudes towards the environment. I gave the students seven questions in which they chose SA (strongly agree), A (agree), D (disagree) or SD (strongly disagree). The statements were given a point value of four for strongly agree, three for agree, two for disagree and one for strongly disagree, with the exception of question six in which the point value is reversed. Along with each statement there were open-ended questions similar to the survey statement. Figure 1 summarizes the average score for the seventh grade, eighth grade and a combined score.

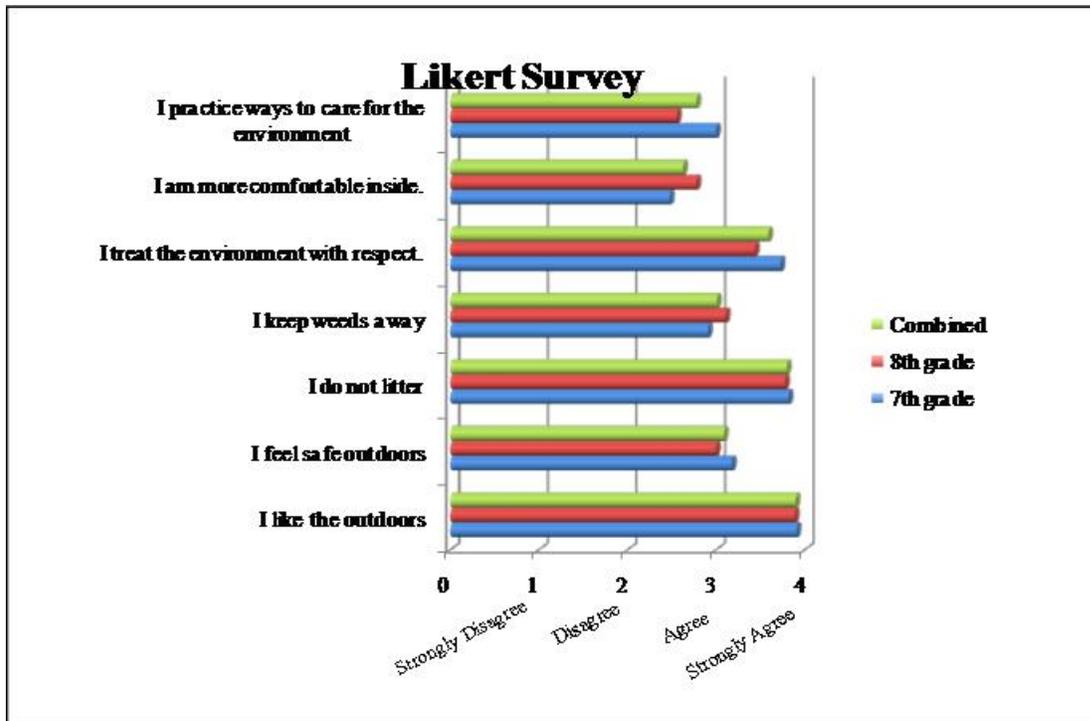


Figure 1. Likert Survey and Open-Ended questions, ($N=40$).

I feel like the data gathered from the above figure reinforced my thoughts about students being educated about the outdoors and then having a better, more protective, attitude about our environment.

When I asked students if they liked the outdoors, 96% ($N=40$) responded positively. I did find a direct correlation between those students who liked the outdoors and those who scored high on both the streamside science and riparian areas post- tests. I looked at seven students in the eighth grade that chose Strongly Agree for question one on the Likert Survey. Those seven students had a pretest average of 62% on streamside science and 72% on riparian areas and ended up with a 100% and 99% average on the respective posttests. Those pretest and posttest scores are both above the class average and also five to ten points above their own average; so, I wonder if this is because of their enthusiasm and enjoyment of the outdoors. They also had several comments in common on the

open-ended questions (Appendix E). Four of the students wrote about the fresh air, feeling the wind on their face and the way the air smelled. Three students wrote about liking to work outside in the Outdoor Classroom, hands on activities and learning new things. Beauty of the forest, trees and stream was another common factor in this area. Again, this was further evidenced by the interview where students thought outdoor learning “helps me respect it more, seeing how beautiful it is helps me want to keep it that way.” I think that their enjoyment of and attitude towards the outdoors helped them to be more attentive to the materials presented in both streamside science and riparian area studies as we spent time in the Outdoor Classroom over the last two years. Seventy-five percent of my junior high students felt safe outdoors, and littering was something that 94% of my students were greatly opposed to. When they were asked about preventing the spread of weeds, only 73% of my students responded positively. “To tell the truth, I just don’t do it because I don’t always have the time and am not sure what to do.” After analyzing this information, I realized that my current seventh grade students had not received any weed education, so they didn’t know what to do to prevent the spread of weeds. Treating the environment with respect was also confusing to some of my students. They really didn’t know what to do to treat it with respect. 81% of the students did, however, feel like they were respectful to the environment. I made the sixth questions confusing by changing the scale around for a positive answer. If I would have changed at least two of the questions, it would have been fine, but I only changed one. Some students marked strongly agree and then in the open ended questions responded the opposite way. Therefore, only 63% responded positively. When asked if they practiced ways to take care of the environment, 69% of the students said strongly agree. Many of

the seventh graders responded very similar to the weed question – they really didn't know what to do to care for the environment. Overall, I think the results of this survey were very positive. I found several trends on many of the open-ended questions. The first question about what students liked or didn't like about the outdoors was interesting. I expected something to the effect of riding dirt bikes, snowmobiles, etc. The overall trend was peace and quiet. "I like the outdoors and the way I can hear the birds and other creatures", "I like the outdoors because it is quiet, beautiful and enjoyable"; and "I like many things about the outdoors. I like the smell of the pine trees; I like the ponds and streams. I like the mysteries the outdoors hold and I like to explore the places around me." These student comments make me think that we are putting way too many things in our children's lives – too many activities and not enough quiet time, time to sit, listen and reflect. I realize there is a fine line between enough structured time and too much free time, but looking at this makes me wonder if we haven't found that balance. Another trend I saw was in feeling safe. Kids generally felt safe if they weren't alone, but about 35% mentioned bears and mountain lions. (We have had a particularly "busy" bear fall – little natural food, lots of bears). Overall, students did not litter and felt they were respectful of our environment. I was happy with the results on the Likert survey and open-ended questions not only about student attitudes towards the environment, but also knowledge of their ability to care for the environment.

"How does outdoor education affect student attitudes towards the environment?" is what I hoped to answer by my Likert survey and the open-ended questions. I got good quantitative data from the survey showing that most of my students had a positive attitude towards the environment. This was also confirmed by question one on my streamside

science pre and posttest. I feel like the qualitative data from the open-ended questions also support this. I asked students what they did to take care of the environment. One student's response was, "In class I am helping restore a riparian area because it used to be covered with wood chips." Another student also mentioned the Outdoor Classroom, "you get to learn more hand on, it's real and I think I learn more that way."

Looking at student journals, interviews and reflections reinforced the Likert survey and questions in three main directions. Those trends were both attitudes towards our environment and comprehension of the subject matter, as well as longevity. As far as attitude towards the environment, I was thrilled to read many of the comments students made, such as,

Being able to help the Earth and keep the water and riparian area healthy is a great feeling and is very important. That's what the students at Seeley Lake Elementary are doing in the Outdoor Classroom at Morrell Creek. We get to help the world and learn at the same time. I have learned an enormous amount of things in the Outdoor Classroom that I would have never learned before in my life. I actually learned how to plant a tree. 20 years from now I plan on coming to visit the Outdoor Classroom and identify all the trees that we planted. (eighth grade female)

Another student wrote about work they had done in the Outdoor Classroom, "I would love to be able to look back and say, I did that. That is what I feel like the Morrell Creek Riparian Classroom's purpose is; to educate people of this time and the next generation as well." There were many comments in this qualitative data that reinforced the comprehension piece as well. Students talked about the importance of the riparian areas

for wildlife, stream health and fish. Chemical testing and macro invertebrates also came up as indicators of stream health. The final trend I saw was one of longevity – wanting to see what their trees looked like in 20 years, wanting to show their children what they had done. I guess one student’s comments sums it all up rather well, “My experience in the Outdoor Classroom has changed my thoughts on the outdoors and taught all of us that no matter what it takes, we need to take care of our environment, by going outside, I now appreciate it more, notice things more.”

As I analyze the impact Morrell Creek Riparian Classroom has on my students, I come to the last sub question about how it will impact me as their teacher. I look back through my journal over the past year and read some of the comments; I come up with three common themes – hard work, knowledge of the subject matter and attitude. On October 21, 2011, I wrote about the work ethic of eight of my eighth grade students,

___ are always A students. They work so hard at everything they do. I watched them plant their trees – hauling mulch, scooping rocks out of the holes and making sure everything was perfect for their seedlings, then helping others. Truly a pleasure for me to be able to work with them.

At a grant meeting later in the year, a Fish Wildlife and Parks biologist said, “these students could learn to do anything, and would do an excellent job.” As I think about their hard work, I realize it goes hand in hand with their knowledge of the subject matter and attitudes on their environment.

Once students had a basic knowledge they were able to perform the task at hand – whether it was a weed pull, monitoring water quality or planting trees. The same FWP biologist was at one of our tree planting sessions and commented that, “they (the

eighth grade) would definitely be an asset to any landscaping company with their work habits and knowledge.” As I think about knowledge, I am immediately drawn to streamside monitoring. My journal entries included, “they loved being experts at chemical tests, sharing their knowledge and macros were such fun for them. It was important to them, also, that their results were part of a bigger picture – sharing real data with Missoula County!”

I feel that attitude towards the environment definitely makes a difference in both the student’s work ethic and comprehension of material presented in the Outdoor Classroom. Those students who had a positive attitude towards the environment based on my Likert survey (93%) also performed better on assessments (10-12 points higher) and worked (based on observation) than those who did not. As we measured Drummond Willows with the first graders this past fall, I wrote about pride and excitement that my junior high students took in showing the younger ones how tall the trees had been in the spring and how much growth they had done over the summer. One of my seventh grade students Facebooked that night, “Junior high is the best. We got to go to the Outdoor Classroom and are making a difference in the world” – that pretty much sums up my idea of a great attitude.

I had only two negative comments in my journal – one during streamside monitoring (September 2010) and another one during tree planting (October 2010). Both comments were written about students who were not doing the task at hand. “MR” had to redo her tree because she didn’t have enough soil to cover roots and just piled rocks in instead. She commented, “This is stupid, anyway.” Fortunately, “MF” (another student) stepped in to help her.” (“MF” has very high assessment scores and works very hard to

obtain those scores.) During streamside monitoring, I wrote that “FB just wanted to throw rocks in the creek I instead of working on the ph testing.” Out of curiosity, I looked back at their Likert surveys – neither of those students ranked enjoying the outdoors very highly – both were twos (disagree). However 83% ($N=36$) of my comments were positive.

The Outdoor Classroom has made such a positive impact on my students and, in turn, has made a positive impact on me as their teacher. I wonder if it is my ability to communicate about something I am passionate about and or whether it is because the lessons are not so “teacher centered” as we work in the Outdoor Classroom? I look forward to developing lessons for my students and in the future will develop lessons for other age groups and their teachers. I am sure I can help my colleagues and their students get many years of use and enjoyment while learning in the Outdoor Classroom.

INTERPRETATION AND CONCLUSION

To answer my focus question on the impact of student learning through the use of the Outdoor Classroom, a variety of data was analyzed. The data provides evidence that student comprehension not only increases, but also their attitude towards the environment improves. In addition to the student benefits, it has also made a positive impact on me.

In my first question about comprehension comparing traditional classroom to outdoor/experiential methods, student comprehension of the outdoor education materials using a hands on/experiential method showed only a slight increase over traditional classroom methods (6%). Weed education showed an encouraging increase of 19% for the treatment unit over the non-treatment unit. This increase may be due to the fact that I

taught it out of the curriculum guide without much tweaking of delivery. Streamside science (treatment), although very enthusiastically received, did not show an increase over the non-treatment riparian area unit. I have two different thoughts on this – one, we have done streamside monitoring before, so we started with higher pretest scores (eighth grade 53%) and also the riparian (non-treatment) unit incorporated art and building of a meandering stream to slow down water. The unit was taught in a much more hands on method rather than traditional manner. Although I was disappointed to not see an incredible increase in the overall comprehension, I did see my lower end students were able to retain more information as evidenced by their individual test scores and journaling.

I am not very good at learning things out of the book. I really like to explore plants when looking at real plants that have just been pulled from the ground. I also like going outside and making the outdoor classroom a better riparian area. I have never planted a tree before and now I have and it was very fun. I learned a lot. (seventh grade male)

I do feel that student learning was definitely enhanced by the Outdoor Classroom and although the increase in comprehension was not as high as I would have liked, their comprehension was still higher than a traditional classroom setting, especially for my lower end students (on average, a ten point gain).

Students seem to have gained more concern for our environment over the course of the last two years of working in the Outdoor Classroom, which was the gist of my second question. This qualitative data has been gathered through many of their reflections. I have also observed this by seeing their baseline data with very low scores

(especially in weed education) and then those Ah ha moments as we were working outside.

The Morrell Creek Riparian Classroom is something that I am very thankful to be able to learn in. Since we began working hard to make the Outdoor Classroom a better place, I have learned a lot about our environment. Just by planting a baby tree and giving it a place to grow taught me about the importance of trees in a riparian zone. I am grateful that I am not tied to learning in a regular, everyday classroom (seventh grade female).

Comments like the above make me realize that educating students about the outdoors does make a difference in their attitude. Being outdoors seems to heighten their level of awareness. Many students felt good about doing “something as simple as” a weed pull could have a great impact on their environment and were proud to have helped and participated. I believe that educating students about our environment truly helps change attitudes.

In my third question about how the Outdoor Classroom affects me, remarks in my journal were very positive. It also enabled me to see my students in a slightly different light as we were working side by side digging in the soil or looking at macros through the microscope. Students who might not “shine” academically might be perfect at knowing tree species, identifying macro invertebrates or planting trees. While we worked very hard in the Outdoor Classroom, we all seemed to have fun, too.

Overall, I would liked to have seen a better increase in comprehension when comparing outdoor learning to traditional. However, I do think that students have good attitudes regarding the outdoor classroom. They are always interested in when we are

going back. They do have the ownership that I was hoping for as well as the makings of good stewards of the land.

There were changes I would make to improve my data collection. First, there would be corrections in a couple of the data collection instruments. I would change the form of question two on the riparian areas test, I would reword question six on the Likert survey to be a positive question, (possibly – I am more comfortable outside than inside.) and finally I would eliminate the mapping question on the Weeds II test and replace it with something else. Another thing I might think about changing is the way I taught Riparian areas. I feel that I had too many hands on activities for a non-treatment unit. I am not a “lecture type” teacher, but should have been for the sake of data collection (However, if my overall goal is having students learn about the outdoors, I did accomplish that.) Finally, I would try to schedule the flu for a different week than my seventh grade treatment week! Those changes would have helped my data collection.

VALUE

This capstone project has provided me the opportunity to not only create an Outdoor Classroom, but to right a wrong that was made over 30 years ago and educate students along the way. This is something I have wanted to do for a long time, but needed that extra push to accomplish it. I feel that this project made an impact on my teaching and me in three ways.

One major change in my teaching is the amount of hands on/experiential lessons I provide for my students. As I make my lesson plans each week, I see if there is any way I can make them more hands on/ experiential, no matter what the subject is. I feel like these lessons also bring more relevance to the subject matter. In math class, we may be

working on circumference and I need browse protection for the willows we planted. This situation provides a great opportunity for the students to use the information from math class, figure out how much wire fencing we need for the browse protection and then build it for the Outdoor Classroom. Students were very engaged in the project to make sure things were built correctly and the project was much more relevant than the pencil paper projects in the math book. Not one student asked, “Why do we have to learn this?” Another perk to this particular project was incorporating measurement, finding total cost, and then a writing assignment about where I should buy the materials – local or Missoula and why. This was a wonderful lesson for my students.

For my second change, I now try to incorporate something about our environment in the lessons I teach. I truly believe that the more we educate students about our environment, the more interest they will have in it and the more they will take care of it. Each year as I get grant money, we are able to restore another part of the Morrell Creek Riparian Classroom. My students learn about the importance of riparian areas, water quality, and weeds in the area along with why we should care about our environment. We then invite a younger group to come with us to help with re-vegetation projects. My students teach their younger partner about planting or pulling weeds, etc. It not only imbeds their learning, but also gives the younger students a good role model to look up to and creates “buy in” to the Outdoor Classroom and our environment.

Finally, an impact that the Morrell Creek Riparian Classroom has had on me is a desire to create a few lessons for each grade level. I truly thought teachers would use the Outdoor Classroom if it was built, but have realized through observation and research that this is not the case. I have begun to find grade level appropriate lessons that match

our science standards for teachers in our building, which I will model during our PIR days in August. I feel that I can show how using the Morrell Creek Riparian Classroom can enhance their sense of place, history, science, math and reading as well as their comprehension in those subjects. Although I don't have a traditional style of teaching, I definitely think my outdoor/experiential lessons have more impact on my students than those I teach more traditionally in the classroom. I intend to develop more lessons that are relevant to my students, match state standards, are hands on and can be incorporated in the Outdoor Classroom.

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APPENDICES

APPENDIX A

WEED IDENTIFICATION PRE AND POSTTEST

Weed Identification Pre and Posttest

Name _____

Please answer the following in complete sentences.

1. Define Weed. Why is it a subjective term?
2. What is an invasive species?
3. Why should we care about invasive species?
4. What are noxious weeds? Give some examples.

APPENDIX B

WEEDS PART TWO PRE AND POSTTEST

Weeds Part Two Pre and Posttest

Name _____

Please answer the following questions in complete sentences.

1. List and give examples of five methods for halting the spread of invasive species.
2. Which method should we choose for the outdoor classroom and why?
3. Why should we keep a map of where we have removed invasive species?

APPENDIX C

RIPARIAN AREAS PRE AND POSTTEST

Riparian Areas Pre and Posttest

Name _____

1. In complete sentences, explain what a riparian area is?
2. In complete sentences, list three reasons why riparian areas are important for:
Wildlife and humans
 - 1.
 - 2.
 - 3.

Stream Habitat

- 1.
 - 2.
 - 3.
3. What can we do to change unhealthy riparian areas?
 4. In nature, what slows down the water in a stream? Think of as many ideas as you can and list them.
 5. What attracts birds to riparian areas?
 6. How does canopy cover affect the physical properties of the stream itself?
 7. How do humans affect the health of a riparian area?

APPENDIX D

STREAMSIDE SCIENCE PRE AND POSTTEST

1. In complete sentences explain why we should care about clean water.

2. As part of their habitat, what do fish and macro invertebrates need?

3. What are the four C's of water?

4. How does the temperature of the water affect the dissolved oxygen content?

5. How does ph affect living things?

6. What could a high nitrate concentration indicate?

7. What is turbidity and how would that affect our fish and macro invertebrates?

APPENDIX E

LIKERT SURVEY AND OPEN ENDED QUESTIONS

Survey

Name _____

I'm interested in your attitude towards the environment. Your comments will not affect your grade; they will simply be used for my data collection. Please circle how much you agree with each statement.

SA – Strongly Agree, A – Agree, D – Disagree, SD – Strongly Disagree

1. I enjoy the outdoors. SA A D SD

What do you like about the outdoors?

2. I feel safe outdoors. SA A D SD

Why did you answer the question in this way?

3. I do not litter. SA A D SD

Why?

4. I try to keep weeds from our area. SA A D SD

How do you do that?

5. I treat the environment with respect. SA A D SD

Why did you answer this question the way you did?

6. I am more comfortable inside than outside. SA A D SD

In what ways?

7. I practice ways to take care of the environment.

SA A D SD

What do you do?

APPENDIX F

INTERVIEW QUESTIONS

Name_____

Interview Questions:

Warm up questions – What are your favorite things to do, how do you feel you do in school, what types of outdoor activities do you like, does your family do quite a few things outdoors, examples?

1. Do you learn better in an outdoor/experiential setting compared to the classroom? How so? Any examples? What outdoor lesson do you remember most?
2. How do you feel about field trips and guest speakers as far as increasing your comprehension on a subject? Any examples? What did you like about recent field trips or speakers that were particularly wonderful? Why? Does it help when the teacher presents lessons prior to or after the field trip? Can you think of an experience you've had like this?
3. How do you see the relationship between studying outdoors and your attitude about the environment? Have you had any changes in attitude about the outdoors, what do you think made that change? What do you feel controls people's attitudes about the environment?
4. What type of science information in these outdoor experiences would you see as a benefit to you as an adult?
5. If you were giving advice to a teacher, when having lessons outdoors, what do you think is most important?