LEADERSHIP AND SCIENCE ACHIEVEMENT

OF AFTERSCHOOL STUDENTS

by

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ABSTRACT

Adolescents are driven by interactions with their peers. Social pressures can have heavy impacts on a student's academic motivation and achievement, and social development. In order to provide a space to work on having productive peer interactions, I designed a classroom research project that incorporated leadership initiatives into the enrichment activities at Teton Afterschool. Leadership initiatives used were teambuilding activities and group discussions and debriefs. Students participated in one science unit without leadership initiatives, followed by a unit where each lesson began with a teambuilder.

The focus question for this project was: What are the effects of introduction leadership initiatives into enrichment time of Teton Afterschool? Data collected showed statistically significant improvements in science content quizzes and self-reported leadership confidence surveys between units. There was also a decrease in the number of disciplinary actions that had to be taken by staff during the leadership unit. Student interviews described a range of attitudes about leadership, and mainly positive attitudes about science lessons and Teton Afterschool in general. These results show that the inclusion of teambuilding in programs for upper elementary and middle school students has potentially very positive effects.

INTRODUCTION AND BACKGROUND

For many children across America, school is not enough. Students lack supervision, homework help, and the structures to have positive, productive experiences once the afternoon bell has rung. Since 2002, the 21st Century Community Learning Centers (CCLC) program, funded by the 2001 No Child Left Behind Act, has been the only federal government-funding program focusing solely on afterschool programs. These programs have the power to supplement in school academics, provide enrichment activities, and create community and a sense of belonging for students who may not have people to watch them after school is over. Over the past 14 years, there has been much discussion and research about the effectiveness of afterschool programs, their focuses, and how they ought to be managed. Research suggests that it is not the academics in these programs that most benefit students, but a focus on personal and social development (Durlak, Weissberg, & Pachan, 2010).

I coordinate a 21st CCLC afterschool program for the community of Teton Valley, Idaho. Teton Afterschool (TAS) serves 25 to 35 students from two different schools in the district – Rendezvous Upper Elementary School (fourth and fifth grades) and Teton Middle School (sixth through eighth grade). There is a separate branch of TAS that serves pre-kindergarten through third grades. Students accepted into the TAS program either qualify for free or reduced lunch or are recommended into the program by teachers based on behavioral or academic needs. Students are required to sign up for TAS a minimum of three days a week, meaning the exact same mix of students does not attend each day. Some students attend every day, whereas others only attend for three or four.

Teton Valley is a community of about 6,000 people, comprised of the towns Victor, Driggs, and Tetonia. The majority of valley residents are white and middle class, but there is also a sizeable and growing Hispanic population. The economy is based on both agriculture and the tourist service industry. About 75% of students in TAS are Hispanic. Many of these students' parents work in Jackson Hole, across the Teton Pass in Wyoming, and do not have anyone to supervise them in the afternoon or evening. Some parents also do not speak English well, have not graduated high school, or both, making it difficult for them to assist their children with homework as they get further into middle school.

Aside from being part of a high-need population, these students are regular middle school-aged kids. I have observed they are very peer-driven, and need the approval of their friends to feel belonging and success. Despite this dependency they can also be very unkind to peers, and are missing some positive social skills. During unstructured time, there is occasional bullying and relentless, though good-natured teasing. Their peer communication consists of a lot of put-downs, and I observe very little positive or constructive language being used. Students also have trouble voicing problems or talking about issues they have with their peers, which has on occasion led to physical altercations.

These peer relationships also affect how much students participate during enrichment activities, and how much fun they have. Academically we do not push much content in TAS, but we do teach short educational lessons daily. During this time many

students participate in activities, but others engage in attention-seeking behavior that disrupts and detracts from the whole group experience.

Based on these observations, I wanted to create a unit that challenged TAS students personally, socially, and academically. While teaching field-science groups for years in the past, I witnessed a lot of positive reactions to group leadership tasks, teambuilding activities, and frequent reflection on cohesion and social interactions within field teams. For this project, I expanded on field education leadership principles to design a unit of lessons that incorporated activities promoting both social and personal development (Teton Science Schools, 2015). These activities would help students interact in positive ways, grow as individuals, and learn the science lesson. Therefore, the focus question for this project is, "What are the effects of including leadership initiatives into the science enrichment time of Teton Afterschool?" The subquestions for this project were as follows: Does leadership practice change students' perceptions of themselves as leaders? Does starting lessons with leadership activities help students retain more science content? And how does leadership practice affect the amount and type of disciplinary action that has to be taken?

CONCEPTUAL FRAMEWORK

The social environment of a school or classroom – including peer relationships, fear of judgment, and distraction – contribute heavily to students' achievement, engagement, and attitudes about their learning (Bishop & Pflaum, 2005; Wentzel, 1998). Social aspects are so influential that afterschool programs with missions focusing on student social and personal gains also show higher academic achievement gains than

those that do not have this focus (Durlak et al., 2010). Studies also show that an increase in connection to community, service learning, and leadership skills are beneficial for student social relationships and overall academic performance (Bishop & Pflaum, 2005; Carlisle, 2011; Warren, 2012). There are a wide variety of strategies to engage students in leadership activities, including teambuilding activities and individual reflection. Both have the capacity to increase students' personal growth as leaders (Allen & Hartman, 2009). Individual reflection has been found to increase students' abilities to self-assess and self-manage (Liuoliene & Metiuniene, 2009). Teambuilding activities, when combined with service learning, have the power to improve students' connection to community, social responsibility, and abilities to build and maintain healthy relationships with peers (Carlisle, 2011; Slavkin, 2007).

The Social Environment

Adolescent students are at a crux between childhood and adulthood. Because of this distinctive time period, their relationships with parents, teachers, and peers are evaluated and appraised in unique ways (Wentzel, 1998). In a study of 167 sixth grade students from a suburban middle-class community, Wentzel (1998) found that good relationships with teachers were linked to interest in classes and adherence to class norms; however, peer relationships were the only motivating factor on students setting goals for exhibiting positive social behaviors. Furthermore, "parents, peers, and teachers seem to play relatively independent roles in your adolescents' lives, and the effects of having multiple sources of support on motivational and academic outcomes are primarily additive rather than compensatory" (Wentzel, 1998, p. 207). In other words, a teacher or

parent relationship cannot substitute for the influence and role of a peer relationship. These findings reaffirm my observations that peers have a uniquely influential role in a middle school students' life.

Aside from social behavior, peer relationships also affect students' academic engagement and achievement. In a study concerning classroom engagement, Bishop and Pflaum (2005) found that the two factors most deleterious from student engagement were distraction from others and fear of peer judgment. Through paired interviews and student drawings they also found that positive engagement experiences contained elements of community belonging and leadership (Bishop & Pflaum, 2005). They found that:

> [Students] perceive [peers] as influencing their engagement and their ability to learn. Grouping students onto teams, attending to school size, ensuring all students are well known, and engaging in meaningful work… are indeed a good beginning to fostering the type of belonging the students in this study say they require for academic achievement (Bishop & Pflaum, 2005, p. 10).

When these studies are looked at together, it can be concluded that healthy peer relationships not only support positive social behaviors, but also support student engagement in classroom activities.

Peer relationships appeared crucial to social and academic achievement in the aforementioned studies, and teachers are working to address those relationships in positive ways. In a classroom research project involving 60 eighth grade students in two different classes, Carlisle (2011) sought to help students develop and maintain healthy relationships with peers and teachers by using teambuilding activities, journaling, and a community service project. After the intervention, 68% of students reported that the

community service project helped them build and maintain relationships with peers, as well as 32% reporting the same effects from teambuilding activities (Carlisle, 2011).

Outside of traditional classroom settings, the social environment of afterschool programs also appears to have a bearing on student motivation and achievement (Durlak et al., 2010). In a meta-analysis of 75 reports concerning 69 different afterschool programs with missions promoting student personal and social development, participation in these programs was significantly correlated with increased positive student feelings and attitudes about school, as well as positive social behaviors (Durlak et al., 2010). In quantifiable terms, "the average member of the control group would demonstrate a 12 percentile increase in achievement if they had participated in an after-school program" (Durlak et al., 2010, p. 299).

Leadership

Leadership activities such as teambuilding, reflection, and community service were used together successfully in the intervention by Carlisle (2011), and all three are supported throughout the literature. Standard teambuilding activities, individual and group reflections, and service learning all fall under the source of leadership learning that leads to personal growth (Allen & Hartman, 2009). These activities can be combined with simulations, games, role-playing, and job rotations to teach and practice specific leadership skills with students (Allen & Hartman, 2009).

Reflection and journaling allow time, space, and structure for students to think back over and make meaning out of learning that has just happened (Liuoliene & Metiuniene, 2009). Pairing teambuilding activities with reflective practice would ensure

that students think critically about their experiences in the group challenge. Liuoliene and Metiuniene (2009) categorized six types of journaling used in modern education practices: reflective, speculative, double entry, metacognitive, synthesis, and free journaling. Incorporating regular reflection into teaching practices can help students develop metacognitive, deep learning, self-assessment, and self-management skills (Liuoliene & Metiuniene, 2009). An increase in self-management skills for disruptive and attention-seeking students could decrease the amount of peer distraction experienced in a learning environment.

Service learning also can be used to foster student connection to community, leadership skills, and positive social interactions. Authentic service learning should include student voice in planning and procedures, academic connections, meaningful service, reflection, collaboration, result evaluations, and recognition (Slavkin, 2007). It is important that the service project holds meaning for students, is cooperative in nature, and makes students engage in problem solving for authentic community needs (Slavkin, 2007). In a meta-analysis of 14 studies involving a cumulative 2,129 students, service learning showed a positive effect on student learning and academic achievement when compared to control groups (Warren, 2012). This conclusion was based on both student self-reports and exam scores (Warren, 2012).

Several crucial elements for leadership curriculum implementation were seen across studies. The most prominent of these is that leadership and social goals must be explicitly defined and clear to all students (Allen & Hartman, 2009; Durlak et al., 2010; Hine, 2014). Durlak et al. (2010) also maintain that programs should be implemented

with a sequenced approach to learning, emphasis on skill training, and focus on active learning. In a three-year longitudinal study of leadership structures at a Catholic school in Perth, Australia, Hine (2014) found that the greatest benefits were that the system was stable, consistent, and well known to all students. A high student and staff value of student leadership, servant leadership in particular, led to student appreciation for both elected and unofficial peer leaders (Hine, 2014). Allen and Hartman (2009) maintain that clear purposes must be stated before all leadership activities, and all organizational structures and systems need to support student and member development.

Conclusion

Young adolescent students are social creatures. Social factors such as fear of judgment, distraction, unhealthy relationships, and bullying have been shown to be serious detractors from student perceptions and esteem surrounding school and academic achievement (Bishop & Pflaum, 2005; Carlisle, 2011; Wentzel, 1998). On the other hand, programs and classrooms that focus on community, teambuilding, and supporting healthy social relationships have had a positive effect on student perceptions and gains (Bishop & Pflaum, 2005; Carlisle, 2011; Durlak et al., 2010). One proven method of helping build these crucial social skills, maintain positive relationships with peers, and experience personal growth is through incorporating leadership practices such as teambuilding, reflection, and service-learning (Allen & Hartman, 2009; Carlisle, 2011; Liuoliene & Metiuniene, 2009; Slavkin, 2007; Warren, 2012).

METHODOLOGY

The purpose of this study was to answer the focus question: What are the effects of including leadership initiatives in the science enrichment time of Teton Afterschool? Based on research findings that leadership practice within student groups can increase group cohesion, confidence in social settings, and academic achievement, I implemented teaching practices that would help students move towards these goals. Participants for this study consisted of students already in the TAS program. The classroom research project consisted of two similarly taught science units: one without leadership activities and one beginning each science lesson with a teambuilder. Data collected included content quizzes, pre and post leadership surveys, personal observations, student interviews, and records of disciplinary actions taken by staff members.

Participants

This study included students enrolled in TAS. These students ranged from 4th to 8th grade. Groups were divided into three groups based on ages: 4th grade, 5th grade, and 6th grade through and 8th grades. There were 9, 12, and 8 students in each group respectively, for a total of 29 students actively involved with the program during the intervention. Because of extremely low and inconsistent attendance, the middle school group was not included in data for content, leadership, or interviews. Middle school data was included for disciplinary action. Even though attendance was problematic, those middle school individuals who did attend TAS during the classroom research project participated in the same lessons as the two other groups on their assigned science day.

During the intervention, TAS had a majority of Hispanic students in the program totaling 76%. The remaining 24% of students were white. Male students made up 59% of the program and female students were 41%. Students accepted into Teton Afterschool Program qualify for free-and-reduced lunch or are recommended to the program based on grades or behavior.

Intervention

The intervention consisted of teaching two science units: one without and one with leadership initiatives. Unit 1, the comparison unit, included four lessons on avalanches and the tools of snow scientists (Appendix A). Unit 2, the experimental unit, was focused on animal biology and building naturalist skills (Appendix B). Although these units cover different content, they were both taught using place-based education principles, and cover natural science that students do not have a lot of previous experience with. Each unit also included a "research" day, a game day, and an experiment day.

Each age group participated in one science lesson per week, as per their typical rotation. During the experimental unit, each activity time opened with a leadership initiative, and science content followed. Often the teambuilder could be used as a metaphor for the science being covered. Students were encouraged in reflective debriefs to make connections between leadership skills and the natural world.

Leadership initiative teambuilders included a balance of group challenges and reflections. Challenges focused on getting students to engage in problem solving, communication, inclusion, self-understanding, and teamwork. These initiatives were

designed to create spaces for students to work with each other towards a common goal. Competitive scenarios were not included. Debriefs and reflections were short group discussions, where everyone was expected to participate. Although the literature gives more weight to written, personal reflections than group discussions, the nature of afterschool made written reflection very difficult. Questions focused on students' strength and weaknesses as a group and as individuals. Most leadership initiatives took 10 to 15 minutes to complete.

Data Collection

Data was collected to address each of the questions listed in the introduction. The Data Triangulation Matrix for this study is presented in Table 1. First, a Leadership Confidence Likert Survey (Appendix C) was given to all students before and after the intervention. Students were asked to rate their personal confidence with different leadership situations and their views on leadership in general. Statements for the Leadership Confidence Likert Survey were adapted from the Teton Science Schools' guiding Leadership Principles (Teton Science Schools, 2015). Changes in these answers over the two quizzes showed if students changed attitudes or aptitudes about themselves as leaders.

In order to evaluate the effect on science learning, each unit ended with a short content quiz (Appendices D and E). Students do not take quizzes or get grades in TAS, so they were not expected to prepare for these in any way. Quizzes were each 5 questions long and focused on practical skills, tools, and vocabulary learned in each unit.

One aspect of the project I was very eager to study was the effect of leadership practice on discipline issues. I kept records during the two intervention units of the times verbal corrections, sitting out from activities, calls home, behavioral plans, or removal from the program occurred, as well as which students were involved in these incidents (Appendix F). I also kept a personal teaching journal to record student interactions, reactions to lessons and teambuilders, and other thoughts about the units. Because student groups rotate throughout the week I also included other staff members' notable daily experiences in the journal.

The final source of data I used to address the overall effects of leadership initiatives, content retention, and leadership confidence was scripted student interviews (Appendix G). These focused on how students perceive peers as effecting their learning and community, and how they thought the leadership initiatives effected enrichment activities. Two students from each age group volunteered for the interview process.

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.

Table 1
Data Triangulation Matrix

Focus Questions	Data Source 1	Data Source 2	Data Source 3
Primary Question: 1. What are the effects of including leadership initiatives in science enrichment time of Teton Afterschool?	Leadership Confidence Likert Survey	Content Quizzes	Student Interviews
Secondary Questions: 2. Does leadership practice change student perceptions of themselves as leaders?	Leadership Confidence Likert Survey	Student Interviews	Personal Observations
3. Does starting lessons with leadership activities help students retain more science content?	Content Quizzes	Student Interviews	Personal Observations
4. How does leadership practice affect the amount and type of disciplinary action that has to be taken?	Disciplinary Records	Student Interviews	Personal Observations

DATA AND ANALYSIS

Students improved markedly between Unit 1 and Unit 2. Across data sources, it seems as though the inclusion of leadership initiatives in lessons increased student engagement, academic success, and leadership confidence.

Students as Leaders

Students took the Leadership Confidence Likert Survey in January before the beginning of Unit 1, and again in April after the end of Unit 2. A total of 14 students were present to take the survey on both occasions; those numbers are reviewed here. In order to assess changes in student answers numerically, I assigned each response possible on the survey a number value: a “Strongly Agree” response was given a 5, “Agree” a 4,

"Neutral" a 3, "Disagree" a 2, and "Strongly Disagree" a 1. The total possible points on the survey were 70. The mean Pre-test score was 49.9. On the Post-test score, students rated their leadership confidence an average of 5.3 points higher for an average of 55.2 (Table 2) (Figure 1).

Table 2
Leadership Confidence Likert Survey Results

	Mean	Median	Standard Deviation
Pre-Test	49.9	51.5	±6.1
Post-Test	55.2	56.0	±6.7

Because of the small sample size data were not parametric, or they did not follow a "normal" bell curve distribution. In order to assess the significance of these findings I ran a Wilcoxon signed-rank test. This would allow me to used paired data from Pre and Post tests to see if the rise in scores was due to chance or not. The Wilcoxon signed-rank test returned a p-value of 0.001021 at a 95% confidence interval. This result means that there is a 95% probability that the positive shift in scores was not due to chance.

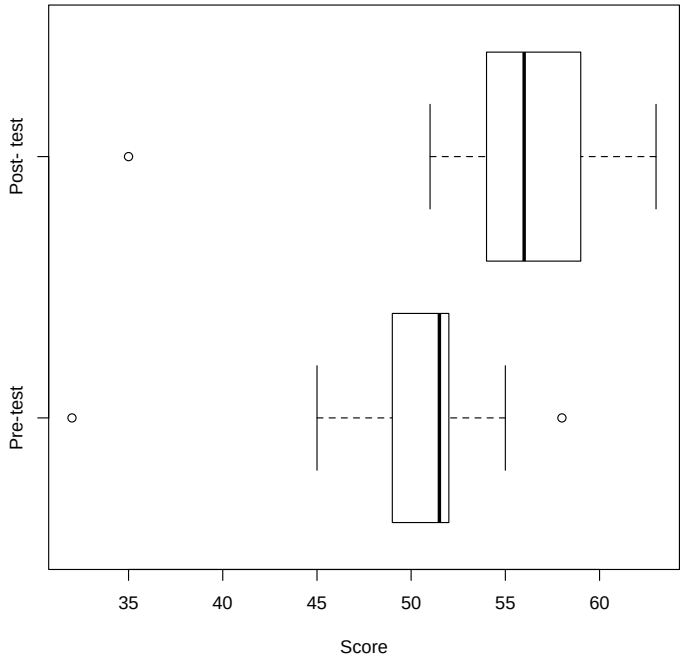

Figure 1: Leadership Confidence Likert Survey pre and post test comparison.

Looked at as individual Likert items, students scored an average of 0.4 points higher on each question during the Post-test. There were only two items that averaged negative change: “Anyone can be a leader” and “I prefer group activities and assignments to working alone.” The largest positive changes of responses were for the last three items of the survey: “I am a leader in my friend group,” “I am a leader in my classroom,” and “Afterschool gives me opportunities to practice leading.” The average changes for these questions were 0.71, 0.79, and 0.86 points respectively.

Student responses about teambuilding initiatives and personal leadership skills were less clear in the interviews. One student commented: “I like being a leader. I like to take control and say ‘hey, let’s listen.’ I think that I have a loud voice and I like to talk during activities and get people to listen to me.” Another student, who I observe as a strong leader in his group stated: “That I remember, I never had (been a leader).

Sometimes I'm a leader, but usually I don't think I am." There was also evidence of different leadership styles in the sample of students I interviewed; one student stated: "I like other people being happy over my own happiness, so I'm okay with not being in charge all the time."

Science Content

There was a very wide range of scores for content quizzes (Figure 2). The Unit 1 quiz (Quiz 1) average was 54.1% with a standard deviation of 26.4% (*N*=14). The Unit 2 quiz (Quiz 2) average was 72.6% with a standard deviation of 21.5% (*N*=21). Even though the range is rather wide, students' scores did improve between quizzes an average of 18.1%.

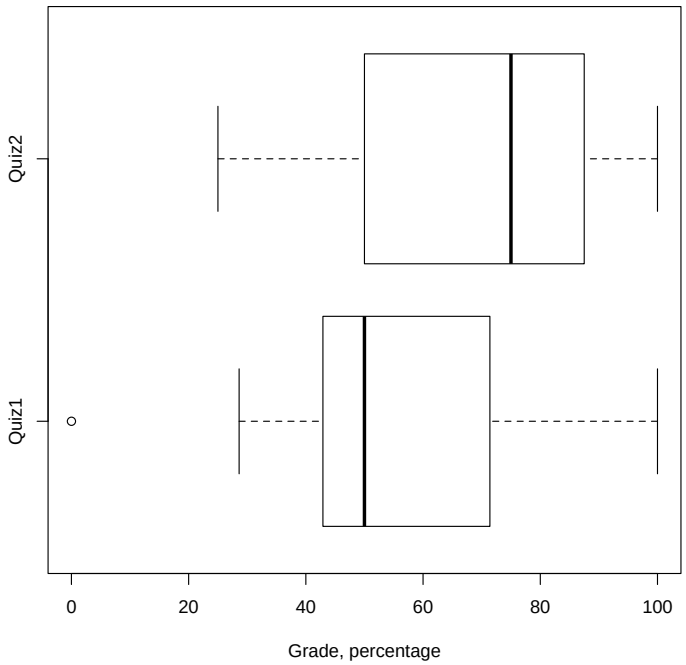

Figure 2: Quiz 1 and Quiz 2 comparison.

Taking the scores of students who were present for both Quiz 1 and Quiz 2, the averages are 54.9% for Quiz 1 and 73.1% for Quiz 2 (*N*=13). Using these paired data in a

Wilcoxon signed-rank test, a p-value of 0.01732 was returned. Although this value is not as strong as the p-value for the Likert surveys, it is still a small enough number to say that there is a 95% chance that the positive change in quiz results was not due to chance.

When asked about how the science content of these two units compared to past science lessons in TAS, students responded positively. One student said: "I think this year was funner because last year we did what we already knew – like the mentos in the soda. I liked learning about the types of avalanches." Another responded: "It was a lot different especially because we were with you this year…you want to focus on things around this valley instead of the whole world. I like them both, but I think I like to have a better understanding of where I live. I think it was also a lot harder stuff and trying to understand science than last year [when] we were just playing games." A third student did not see as much of a difference, stating: "Every science experiment we do we learn things, so I think it was about the same."

Disciplinary Action

Throughout both units of the classroom research project, I kept records of disciplinary actions that had to be made during the entire program, not just my activity time. If leadership initiatives were truly successful, the effects should be seen cross-programmatically and not only during my activities. End of day discussions with other TAS staff members were used to record disciplinary actions that were taken in my absence. Student behaviors were categorized by the type of action staff members used to correct them. These range from a verbal correction to being asked to leave the program (Table 3).

Table 3
Possible Behavior Types by Staff Response

Level 1	Level 2	Level 3	Level 4	Level 5
Verbal Correction	R-Form/ Sat Out	Parents Called	Behavior Contract	Asked to Leave Program

By far the most common student behavior requiring disciplinary action was a Level 1 behavior, with 20 incidents out of 30 total for both units. Repeat Level 1 behaviors call for upgrade to Level 2 and then Level 3. There were no Level 4 or 5 behaviors during the intervention. There were a total of 17 disciplinary incidents in Unit 1, and 13 incidents in Unit 2 (Figure 3). Although there were fewer total incidents in Unit 2, it appears that the intensity of incidents increased: with 70% of Level 2 and 3 behaviors occurring during Unit 2.

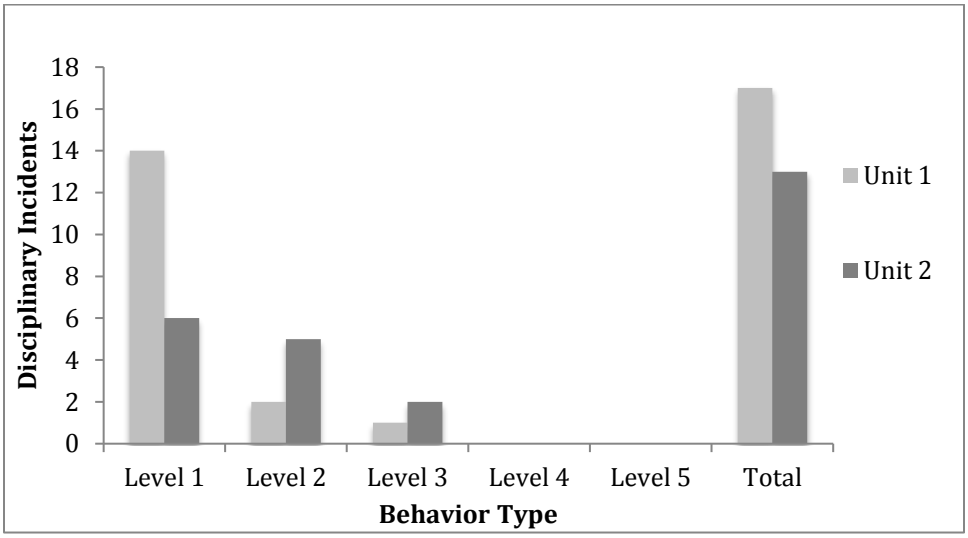

Figure 3: Disciplinary action comparison for Unit 1 and Unit 2.

Another interesting breakdown of disciplinary data is by the students who were involved. Twenty-nine incidents involved male students, while only one incident involved a female student. A total of 10 students total were involved in these incidents; 7 of these 10 were cited in multiple incidents. Broken down by grade, five out of eight

incidents in Unit 1 involved sixth or eighth graders, and four out of six incidents in Unit 2 involved sixth or eighth graders (Figure 4).

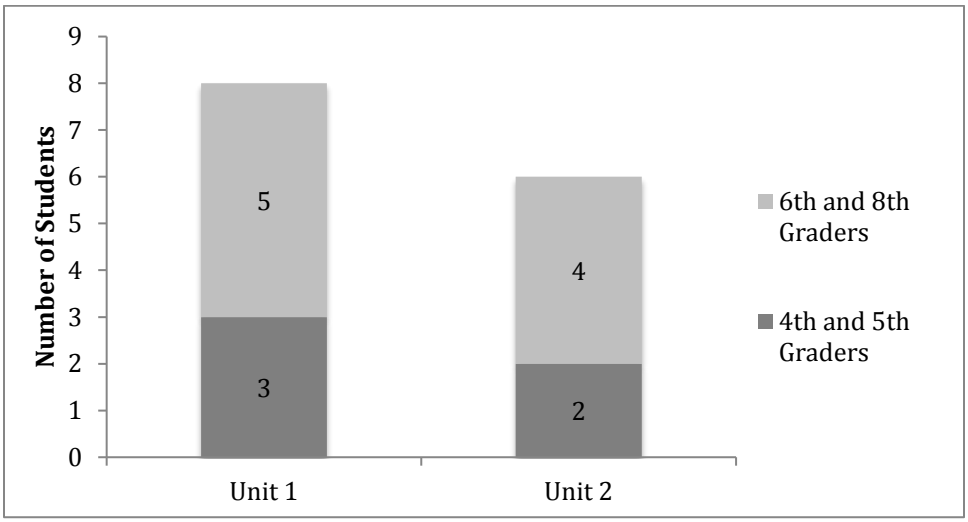

Figure 4: Students involved in disciplinary action by Unit and grade.

When commenting on group engagement and behavior during teambuilders, one fourth grade student remarked: “I think we laugh a lot and it’s fun to play around, but I feel when we get a group of all people who do that the thing goes wrong and we have to take time to go over it again.” This student also said: “I think we got better as we went on and were quicker getting back on track.” The other fourth grader I interviewed stated: “I feel like we didn’t work as well as a team because we kept telling each other what to do and bossing each other around.” These observations show that students not only can tell when they are off track, but also know why they are not working together as well as they could.

The fifth grade group was more practiced and effective at working together. One student commented: “In the beginning of the year everyone was not really listening and just talking with their friends, but now that we know you more we can listen and do the

exercises a lot easier." The other fifth grade interviewee stated: "We did really well and you had to keep making it harder for us." As a side note, one out of four student volunteers interviewed were listed in the disciplinary incidents above.

INTERPRETATION AND CONCLUSION

We now return to the focus question: What are the effects of including leadership initiatives into the science enrichment time of Teton Afterschool? According to the data presented above, adding leadership practice to enrichment time significantly increased students' science learning and self-reported leadership confidence, as well as decreased the number of disruptive behaviors seen across program. As seen in other studies, participation in an afterschool program focusing on social and interpersonal aspects showed an increase in students positive feelings about themselves, in our case as leaders in the Leadership Confidence Likert Survey (Durlak et. al 2010).

Student interviews indicated a spread of opinions about personal leadership, but were very positive about the science content and how it was covered and showed a good awareness of group problems during team activities. Despite the silliness and unfocused nature of some group activities, students did improve at paying attention and focusing on completing team initiatives later in the experimental unit. Students showed increased engagement as also occurred in Bishop and Pflaum's 2005 study about the social environment, student engagement, and achievement. Greater engagement could have led to the increased science achievement and decreased distracting behaviors seen in this study. Because Wentzel (2008) found that peer relationships are the only influencing

relationship on “prosocial” behavior, it is logical that focusing on creating positive and productive relationships would lead to a decrease in disruptive behavior.

One problem with this classroom research experiment was consistency. Because of the scheduling of TAS, I only had time to work with students on leadership and science once a week. If students missed my day of programming they may go several weeks without being involved with their group in a teambuilding initiative. Our population sees a good amount of turnover – with students leaving TAS and others joining up pretty consistently. That means that, functionally, there is always a new mix of students involved in activities. This aspect of the project can be compared to Hine’s 2014 classroom research project on student leadership. Hine found that his school’s stable and consistent approach to student leadership positions greatly benefitted the population because students understood the system and knew what was expected by and from leaders (Hine 2014).

Another problem was the middle school population. Low enrollment coupled with low attendance affected the first unit of the project, with about 2 students present for my enrichment activity every week (and often different students than the previous week). During the second unit of the project we saw an increase in enrollment and attendance for middle school students. However, I think that the growing pains from new students learning the standard operating procedures and rules of the program led to the increase of Level 2 and Level 3 behaviors we saw during that time. I started this school year really wanting to focus on the adolescents in our program, and I have been disappointed to see attendance fluctuate so heavily. I believe that if I had been working with a good core

group of five or six middle school students all year before this project, results would have been different.

I think that the project on the whole was a success. I saw a positive difference in student engagement and leadership confidence during our progressive activities. Students also responded very positively to the place-based science curriculum that was different than the ‘mad science’ type lessons other instructors have used with them in the past. As is important with an afterschool program, we ended up having a lot of fun along the way!

VALUE

I was able to see a difference in group cohesion, science retention, and leadership confidence from doing 10 minutes of teambuilding once a week. Even more astounding, we were able to improve science learning with 10 minutes of our very short 40-minute enrichment time taken up with teambuilding. I think that the potential of this realization is very powerful. If educators spend time on creating a positive social environment, content teaching can become more efficient.

The inclusion of leadership initiatives has the potential to impact and improve many different learning environments. Classroom teachers with more students, consistent attendance, and multiple days a week to work could potentially see vast improvements. By creating a team culture and safe space to work together, students should display less disruptive behaviors even on days when a teambuilder is not done.

Beyond classroom goals, I feel passionately about developing students as social individuals. Because they are at an age when peers can determine much of what students want to get involved in, educators owe it to students to build a space where they can

practice vital 21st vital century skills like leadership, communication, idea processing, trial and error, and conflict resolution. By making students work through challenging and creative problems together, we can build a future where students not only learn facts and behave during class, but also problem solve, think creatively, and step up to face the challenges ahead of them.

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APPENDICES

APPENDIX A

UNIT ONE LESSON PLAN SUMMARY

UNIT ONE LESSON PLAN SUMMARY	
Topic	Lesson & Objectives
Week 1: Intro to Avalanches	Students were asked pre-assessment questions about what they knew about avalanches and created a mind map. Afterwards, students were split into groups and directed to find videos of and research a type of avalanche: slab, slough, or cornice. Students then made very short presentations about what their avalanches were. Lastly we watched a video of each type together. (Students also completed Leadership Confidence Surveys.)
	1. Students will be able to name 2 types of avalanches. 2. Students will be able to describe the differences between avalanche types. 3. Students will work successfully in groups.
Week 2: Snowpack	After recapping what happened the week before, students got up close and personal to the slab in their home snowpack! Using shovels to dig a snowpit big enough to fit the whole group, students investigated the different layers that have formed in the field. (1 heavy, wet storm layer on top of a weak, faceted old layer.) Students practiced using shovels, probes, and private eyes.
	1. Students will understand that a snowpack consists of layers. 2. Students will find and identify the differences between layers in a snowpack. 3. Students will evaluate the relative strength and density of different snow layers.
Week 3: Avalanche Experiment	Using a slopemeter, piece of corkboard, sugar, and flour, students experimented with creating the necessary angle for avalanche conditions. They looked at the "red zones" on the slopemeter and made predictions about whether they thought sugar or flour would slide easier. Sugar slid at about 43 degrees, while flour hung on until 90! Students shared out hypotheses and observations before and after each trial.
	1. Students will actively experiment with slope angles and snow textures. 2. Students will demonstrate that every slope does not have the potential to slide. 3. Students will identify slope angles that may be able to experience avalanches.
Week 4: Celebration of Learning	Students completed the Unit 1 Celebration of Learning (Quiz 1)! Afterwards, students participated in the rope-shape teambuilding exercise.
	1. Students will reengage with material covered. 2. Students will make connections between lessons. 3. Students will feel ownership and pride over their learning.

APPENDIX B

UNIT TWO LESSON PLAN SUMMARY

UNIT TWO LESSON PLAN SUMMARY	
Topic	Lesson & Objectives
Week 1: Ecosystem Matching	**Teambuilder:** Yarn Toss. In a circle, students thought about how different members of an ecosystem relate to each other. Students passed a ball of yarn between them to illustrate connections and made a web. We discussed food webs and how non-living things are also involved. **Lesson:** Ecosystem Matching. Students were given mixed up sheets of animals' picture, tracks, and skull and had to work with other groups to compile a matching set. Students shared why they thought the tracks and skull matched their animal.
	1. Students will work together as a complete group to complete a task. 2. Students will describe how different members of an ecosystem rely on each other. 3. Students will defend their thinking and choices to their peers.
Week 2: Predator & Prey	**Teambuilder:** All Aboard. Students had to fit all members of the group onto a towel. When they succeeded, the towel was folded in half and they had to do it again. Students discussed how communication was used well and poorly. **Lesson:** Predator & Prey. Students listed predators and prey animals that they already knew, and explained how they rely on each other. Then students were split into a "predator" group and a "prey" group. Prey students had two popsicle sticks that represented their lives, and had to keep at least one and collect at least two "food" stickers from me during the round to survive. Predator students had to tag prey students for popsicle sticks and get at least two to survive. During one round there were no predators and food ran out.
	1. Students will use communication skills to complete a group task. 2. Students will explain what predators and prey need to survive. 3. Students will recognize the importance of predators in prey population dynamics.
Week 3: Tools of a Naturalist	**Teambuilder:** Helium Hoop. Students started in a tight circle around a large hula-hoop, and are told that it is filled with helium. Students were only aloud to use one finger on each hand on the bottom of the hoop, and could never lose contact with the hoop. Students had to work together to put the hoop on the ground. **Lesson**: Field Guides. Students were introduced to several plant, bird, geology, butterfly, and general naturalist field guides. After an opportunity to look through them freely, students discussed how a naturalist might use them in the field. We then had field guide races. At the end of the day, students chose one field guide they were particularly interested in and made a drawing of something in it.
	1. Students will assess what leadership skills made this task successful. 2. Students will explore and discuss the value of field guides. 3. Students will make detailed observations about a subject in a field guide.
Week 4: Celebration of Learning	Students completed the Naturalist Celebration of Learning (Quiz 2)! Afterwards we had a silent conversation on the white board about what service means and then compiled a list of possible service projects we might be able to do in afterschool.
	1. Students will feel ownership and pride over their learning. 2. Students will engage with what service is. 3. Students will compile ideas of ways to help their community.

APPENDIX C

LEADERSHIP CONFIDENCE LIKERT SURVEY

This survey contains a number of statements about leadership. You will be asked what you think about these statements. There are no "right" or "wrong" answers; your opinion is what's important! Circle the following options for how you feel about each statement:

SA	Strongly Agree
A	Agree
N	Not Sure
D	Disagree
SD	Strongly Disagree

1. There are many different types of leaders.

   SA A N D SD

2. A leader should take everyone's wants and needs into consideration before making decisions.

   SA A N D SD

3. Leadership is a behavior, not a role.

   SA A N D SD

4. Anyone can choose to be a leader.

   SA A N D SD

5. I feel comfortable raising my hand to ask questions in class.

   SA A N D SD

6. I think about the short-term *and* long-term consequences of my actions.

   SA A N D SD

7. I like to make my own decisions.

   SA A N D SD

8. I prefer group activities and assignments to working alone.

   SA A N D SD

9. I am honest with myself and with others.

   SA A N D SD

10. I know that there are some things in the world I cannot control.

    SA A N D SD

11. I feel in control of my language and actions all the time.

    SA A N D SD

12. I feel like a leader in my friend group.

SA A N D SD

13. I feel like a leader in my classroom.

SA A N D SD

14. Afterschool gives me opportunities to practice leading.

SA A N D SD

15. Is there anything else you want to say about leadership in general or about yourself as a leader?

APPENDIX D

AVALANCHE QUIZ

1. What are two types of avalanche?

2. What are two tools that people can use to study a snowpack?

3. What is one thing that needs to be present for an avalanche to happen?

4. What is a name for the weak, crystalline, crumbly snow that slides easily?

5. At what slope angles are avalanches and slides most likely? (How many degrees?)

APPENDIX E

NATURALIST QUIZ

1. What is a naturalist?

2. Draw a food web with at least 3 parts!

3. What animal made these tracks?

4. Name two tools a naturalist can use to help them.

5. Why is it important to have predators?

APPENDIX F

DISCIPLINARY RECORD DATA SHEET

DISCIPLINARY RECORD						
Behavior type:	*Level 1*	*Level 2*	*Level 3*	*Level 4*	*Level 5*	
Day	Verbal Corrections Needed	R-Form Given, Sat Out From Activity	Parents Called	Behavior Contract Made	Asked to Leave Program	Notes:

APPENDIX G

STUDENT INTERVIEW

1. Describe your experiences with the teambuilding exercises.
    a. What effects do you think they might have had on your group?
    b. Do you think that you stepped into a leadership role during these? How?
2. What was your favorite activity that we did?
    a. What positive memories do you have from that experience?
3. How do you think the science lessons from this unit compared to past units?
    a. Content, group engagement, behavior, etc.
4. What do you see as the role of Afterschool in your life?
    a. Why do you come? What do you get the most out of your time here?
    b. Is it important that Afterschool continues in years to come?