

Prairie Science Class Evaluation Report

2003-2004

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Program Summary

The Prairie Science Class (PSC) is a formal partnership between the U.S. Fish and Wildlife Service's (USFWS) Prairie Wetlands Learning Center (PWLC) and the Fergus Falls Independent School District 544. Its mission is to use the local prairie wetlands ecosystem as an integrating and motivating context to engage 5th students in science, math, and writing through real world, field-based learning experiences. Program goals include developing knowledge and skills in math, writing, and science; increasing motivation toward learning; developing technology, problem solving, and communication skills; and fostering character skills and a stewardship ethic. The educational philosophy guiding the PSC is interdisciplinary, experiential learning through authentic, field-based experiences and constructivist approaches.

During the 2003-2004 school year, 50 5th graders (a morning class and an afternoon class) were involved in the PSC, spending two hours each day at the PWLC. While at the PWLC, the PSC teacher (an ISD 544 employee) and PWLC environmental education specialists provided field-based instruction in the curricular areas of science, math, and writing through a series of seasonal, integrated units based on the prairie wetlands ecosystem. Students spent the remainder of the school day at the Fergus Falls Middle School, where they received their reading, social studies, physical education, and health instruction.

(Visit http://midwest.fws.gov/pwlc/prairie_school.html for more information)



Students banded mallards during the fall migration unit, building math skills through weighing and measuring the ducks; students also learned wildlife management techniques and the importance of prairie wetlands to sustaining waterfowl populations.



Students worked in small groups to assist the USFWS with prairie restoration efforts. Students studied ecological concepts, such as biodiversity and native and nonnative species, and practiced observation and classification skills.



Students conducted winter ecology research projects, presenting their results at a family night held at the PWLC.



Evaluation Methodology

The purpose of this formative evaluation was to document program outcomes for stakeholder justification and to support decisions regarding program continuation and expansion. This evaluation was also used to identify areas where program improvement is needed and to assess the progress made toward program goals. There were four questions guiding this program evaluation:

1. Have the students attained grade-level proficiency in science, math, and writing?
2. Have the students' science process, problem solving, and technology skills and their skills in working cooperatively and communicating with others increased?
3. Do the students have a more positive attitude toward learning, a more positive attitude toward the prairie wetlands environment, a stronger stewardship ethic, and a stronger sense of civic responsibility than their peers in traditional classrooms?
4. Did the Prairie Science Class meet the needs of the students and parents, the Fergus Falls School District, and the U.S. Fish and Wildlife Service?

To answer these questions, a variety of data collection instruments was used (see table below). The fifty students in the Prairie Science Class were the primary source of information for this evaluation. Parents of the Prairie Science Class students, the Fergus Falls Middle School Principal, the ISD 544 Superintendent, the PWLC Supervisory Park Ranger, the USFWS Project Leader of the Fergus Falls Wetland Management District, and the Region 3 Chief of the National Wildlife Refuge System also provided information for this evaluation. In addition, fifty students in the Fergus Falls School District receiving traditional instruction participated in the evaluation as the control group. All data collection took place over the 2003-2004 school year. The evaluation was implemented by ISD 544, with assistance from the USFWS in data analysis and report preparation.

Summary of Data Collection and Analysis

| Instrument | Instrument Description | Constructs Assessed | Information Source | Time of Implementation | Data Analysis |
|-------------------------------------|--|--|--|--|------------------------------|
| Minnesota Comprehensive Assessments | Part of the educational accountability system in MN | Math, writing, reading achievement | PSC students (n=50); ISD 544 5 th grade students in traditional classrooms (n=186); 5 th grade students in MN | March 2004 | Independent-samples t test |
| Affective Self-Report | 20-item survey; likert items on 5-point scale (strongly agree to strongly disagree) | Attitudes toward learning, attitudes toward the prairie wetlands environment, stewardship ethic, sense of civic responsibility | PSC students (n=45); ISD 544 5 th grade students in traditional classrooms (n=40) | September 2003 (pretest) and May 2004 (posttest) | Multiple linear regression |
| Skill Self-Report | 14-item survey; likert items of 4-point scale (not at all to very well); item format "How well could you do each of the following at the beginning of the school year? Now?" | Science process skills, problem solving skills, technology skills, and skills in working and communicating with others | PSC students (n=42) | May 2004 | Dependent-samples t test |
| Student Interviews | 15 minute interviews using a question guide | Cognitive and affective program outcomes; program satisfaction; areas for program improvement | PSC students representing range of achievement levels (n=10) | April 2004 | Analytic induction |
| Parent Survey | 13-item survey; likert items on 4-point scale (strongly agree to strongly disagree) | Cognitive and affective program outcomes; program satisfaction; areas for program improvement | Parents of PSC students (n=39) | March 2004 | Descriptive statistics |
| Parent Focus Group | 1-hour focus group using a question guide | Cognitive and affective program outcomes; program satisfaction; areas for program improvement | Parents of PSC students (n=4) | April 2004 | Analytic induction |
| Stakeholder Interviews | Formal and informal interviews | Program outcomes and impact; degree program supported agency/organization goals; areas for program improvement | Middle School Principal; ISD 544 Superintendent; Regional Chief of National Wildlife Refuges; USFWS Project Leader of the Fergus Falls Wetland Management District; PWLC Supervisory Park Ranger (n=5) | April - June 2004 | Analytic induction |



Evaluation Results

1. Have the students attained grade-level proficiency in science, math, and writing?

- 🌍 PSC students' scores on the Minnesota Comprehensive Assessments in reading and writing were significantly higher than their peers in traditional ISD 544 classrooms ($p = .03$); PSC students' math scores were equal to their peers in traditional ISD 544 classrooms.*
- 🌍 PSC students scored above the state average on the Minnesota Comprehensive Assessments in reading and math (state averages in writing were not provided).*
- 🌍 According to the results of the student interviews, PSC students felt they have learned science, math, and writing concepts and skills and described this learning as stronger than in previous school years; they attributed this to the real-world applications of science, math and writing using the prairie wetlands environment.
- 🌍 Of the PSC parents who completed the survey, 98% felt their children learned science, math, and writing concepts and skills better than they would have in a traditional classroom. Results of the focus group support this finding, as parents attributed stronger learning in the content areas to the PSC's hands-on instructional strategy, the interdisciplinary nature, and the real-world applications using the prairie wetlands environment. Parents also felt the PSC worked well for students with a variety of learning preferences and needs.

*An initial concern raised by the ISD 544 community was the possibility that this nontraditional learning environment would negatively affect student learning; while students' environmental interest and skills might grow, students would not master the content in the traditional subject areas. The evaluation results suggest otherwise. Lack of an assessment at the beginning of the year prevents us from knowing if PSC students began with higher achievement levels than their peers in traditional classrooms. However, by scoring at levels at or above their peers, we do know that despite participation in the PSC and its nontraditional learning environment, students' academic performance in traditional subject areas was at levels that are acceptable to the state. Further, parents and students felt participation in the PSC led to growth and mastery in the traditional subject areas. This sense of academic self-efficacy is also an indicator of positive impact on learning and achievement, as academic self-efficacy has research-based links to academic achievement.

Student Voices

"Things you read in a science book you just go, 'What? I don't get it.' And from the little pictures, it's hard to understand. But on the prairie, you can see it up close and feel it. It's easier to understand when I get to see it."

"When we compare math problems to the outside, like making estimates outside, it's easier - like what percentage of Mallard Marsh is covered in ice. It's actually easier to learn outside."

"We write a lot, and my spelling really improved. You can write about observations, and that helps because you write down what you saw. At first, you'd just write about one thing, but now you have a lot more to write about because we've been observing better."

Parent Voices

"It has made science and math practical. These kids are able to see and experience how and why they would apply the concepts they are learning to real life."

"My son wasn't a big math guy last year, and all of a sudden this year, he seemed to enjoy it and doesn't seem to be as challenged by it. He explained some of the things he does out here - like measuring the duck's bill or 100 meters on the prairie; it's a neat way of learning!"

"My daughter has ADHD, but you wouldn't know it this year. You mix the indoor and outdoor learning, and it's extremely helpful for her concentration. So it's good for kids with special needs. We had her on Ritalin and that didn't work for her, but this program has."

2. Have the students' science process, problem solving, and technology skills and their skills in working cooperatively and communicating with others increased?

-  On all 14 items on the student skill self-report, data showed a positive, statistically significant increase ($p < .001$) in students' assessments of their science process, problem solving, and technology skills and their skills in working cooperatively and communicating with others (see table below).*
-  According to the results of the student interviews, PSC students felt their observation skills improved, attributing this improvement to the opportunity to practice these skills in an outdoor setting.
-  According to the results of the student interviews, PSC students felt they had become better thinkers and problem solvers, attributing this improvement to the opportunity to think about what they saw on the prairie, their practice in "reading the land," their field-based projects, and the time spent in "circle" (reflection).

Summary of Average Responses on the Skill Self-Report

| How well could you do each of the following? | Beginning of School Year | End of the School Year |
|---|--------------------------|------------------------|
| 1. Make observations about the environment around me. | A Little | Very Well |
| 2. Read the landscape. | Not At All | Pretty Well |
| 3. Make a reasonable guess about why something in nature happens. | A Little | Pretty Well |
| 4. Collect data to answer a research question. | A Little | Pretty Well |
| 5. Find information from more than one place when working on a project or a report. | A Little | Pretty Well |
| 6. Ask questions to find out more information. | A Little | Pretty Well |
| 7. Think about what I've done to help me learn. | A Little | Pretty Well |
| 8. Use the internet (at school or home) to find information. | A Little | Pretty Well |
| 9. Use a handheld to collect or record data. | A Little | Pretty Well |
| 10. Work with others as a team or in small groups. | Pretty Well | Very Well |
| 11. Use field equipment to gather information or data. | A Little | Pretty Well |
| 12. Identify the plants and animals that live in the prairie wetlands. | A Little | Pretty Well |
| 13. Share my ideas with others through speaking. | A Little | Pretty Well |
| 14. Share my ideas with others through writing. | A Little | Pretty Well |

*Because this skill self-report was not given to the control class, it is difficult to know if this growth in skills was due to the PSC or to cognitive maturation over the school year. The results of students' interviews suggest that skill growth was due to the PSC, as students' attributed skill growth to instructional strategies – the field-based setting, for example – that are not a part of the traditional classroom experience. Further, perceived growth in these skill areas is important, as it indicates academic self-efficacy, which does have research-based links to academic performance.

Student Voices

"I've learned how to observe better. At the beginning of the year, we'd just look around and say, 'Oh, there's nothing over here so I'll look someplace else.' And now you'll look at one place for awhile, and you'll see everything changing."

"I've learned to observe. When you go outside, usually if you see a butterfly or frog you'll be like, 'Oh, that's just a butterfly.' Maybe you'll try and catch it, but you won't actually look at it that closely. But when you learn to observe, you can see what it's like or how it's different from something else, and you can compare it to other things."

"I like hearing everybody else's opinions about things during circle. It makes me consider other things."

"I think about things longer to make sure that what I say is really what I think. I make sure I've seen everything about it before I say something. We have to think more here than at school."

"It's made me a better thinker because it helps you take the time to think. Like if you are outside and looking at tracks, you think about what the animal was doing and why it was there. In the weather, you think about how the temperatures have changed. Yesterday the humidity was 88% and today it was 100%. And you think about the difference and what effect that will have."

3. Do the students have a more positive attitude toward learning, a more positive attitude toward the prairie wetlands environment, a stronger stewardship ethic, and a stronger sense of civic responsibility than their peers in traditional classrooms?

- While there was not a statistically significant difference between PSC students' attitudes toward learning and their peers', interviews indicate students felt the PSC helped them become more interested in school and learning. Students also felt the PSC improved their classroom behavior and promoted a sense of belonging or community.
- Of the PSC parents who completed the survey, 98% felt their children were more excited about school because of the PSC. All of the PSC parents who completed the survey felt their children expressed a positive attitude toward the PSC and were interested in discussing what they were learning in the PSC at home. The results of the focus group support these findings, as parents described the PSC as motivating their children toward learning.
- When controlling for initial attitudes toward the prairie wetlands environment (as measured by the pretest), PSC students had a more positive attitude toward the prairie wetlands environment than their 5th grade peers in traditional classrooms. This difference was statistically significant ($p = .019$). This finding is supported by the results of the student interviews and parent focus group, as students and parents felt the PSC helped develop an awareness of and appreciation for the prairie wetlands environment.
- While there was not a statistically significant difference between PSC students' stewardship ethic and their peers (as measured by the attitude self-report), interviews indicate students felt the PSC had a positive influence on their actions in the environment.

Student Voices

"Last year I would wake up and think, 'Oh no, another school day.' Now I like to get up in the morning, and I love to come to the PSC; I just can't wait to get here. That's seriously how I feel."

"It changes your attitude. Fourth grade didn't go too well; I got detention all the time. This year I haven't had any detention. I stay out of trouble because I have more to do and because I don't want to get kicked out of it because it's really good here. I like coming to school this year. Last year I played sick 6 times. This year, none. But I was sick once for real with strep throat."

"It's changed the way I feel about nature. I think about what I've seen, and I read the land a lot."

"I used to not really like nature too much, but now I have an interest in it because we learned about all the different things that are in the environment."

"I definitely care more about wildlife and the environment now that I'm in the PSC. When I'm walking, last year if I'd see an ant, I'd step on it because my friends would. But this year, I never would. We should take care of the environment - even ants."

"Last year I liked wildlife just because you can hunt it. But this year, I also like it because it's interesting."

Parent Voices

"It used to be, 'What did you do in school today?' and they'd say, 'Nothing.' Now we don't get that. Now they tell us what they did on the prairie."

"With the kind of resources we have in Minnesota, we need some kind of stewardship experience in school to make them better stewards later on. So in that sense, the PSC isn't just great for the kids, but we are building really good citizens who are going to think about the things that they do when they become adults."

"An appreciation and respect for nature is a huge lesson they have learned, and that doesn't come from a textbook."

4. Did the Prairie Science Class meet the needs of the students and parents, the Fergus Falls ISD 544, and the U.S. Fish and Wildlife Service?

- According to the results of the interviews, students described their PSC experience as positive and as something they'd recommend to others. Students also expressed the desire to participate in the PSC as 6th graders and recommended that it should be expanded so that more students could participate.
- According to results of the parent survey, parents were overwhelmingly positive about their children's experiences with the PSC. All of the respondents had a positive impression of the effects of the PSC on their children, felt their children benefited in ways that could not be achieved through a traditional program, and would recommend the program to others. All of the respondents also felt the PSC should be continued.
- According to the results of stakeholder interviews, the PSC met the needs of ISD 544. The PSC was described as a positive cooperative effort to implement an innovative program with strong educational results. ISD 544 felt the program built a learning community atmosphere, that students with previously low attendance had higher attendance due to the PSC, and that the program retained at least 3 students who otherwise would have attended school in other districts. Throughout the school year, calls were received from parents of 1st and 2nd graders, asking for their children to be placed on a PSC waiting list. Parents of 148 of the 200 4th grade students have requested that their children participate in the PSC for the 2004-2005 school year.
- According to the results of the USFWS stakeholder interviews, the PSC met the needs of the USFWS. The daily exposure to the prairie wetlands environment and the time spent in field-based learning experiences was vital to meeting the needs of the USFWS. The Service felt the PSC was a cost-effective way to gain maximum environmental education outcomes. The mission of the USFWS was supported by the PSC as it fostered an awareness of the USFWS mission and an environmental ethic. The PSC also supported outreach into the local and regional community through PSC families visiting the PWLC, communication with and support from community members, and positive media coverage. The PSC highlights what can be gained through meaningful partnerships and has the potential to serve as a model for environmental education reform within the USFWS.

Student Voices

"It's better than I thought it would be. I like that we wonder about things and discuss things more. I like getting to go outside every day and not spend so much time in the classroom."

"Some people might wonder that it's a 5 minute bus ride to PWLC, and that's 10 minutes of no learning. But it's like you make up hours for it in the field; like for every minute, you get an hour of learning. It's not like the bus ride will kill you because you learn even more here."

"I think you should expand the program so that a lot more kids can do it, because all my friends from my old school are asking what it's like on the prairie, and then maybe they could have the chance next year to try it for themselves."

"We are learning things in school, but we are learning a lot more here. Learning is easier when you actually see what you are learning about. It's a fun way to learn."

Parent Voices

"We have been extremely pleased with the PSC. In addition to providing a very unique, hands-on learning environment, the class has given my child knowledge about the natural world that will last a lifetime."

"The involvement of the PWLC staff has been an important component. These people made a huge positive impression on the students! Please keep it going and dream up more innovative programs for other grade levels!"

"I think it's a wonderful opportunity for kids to experience all they have with the hands-on opportunities, rather than trying to imagine these experiences through a textbook."



Students watch in wonder as they release a mallard after measuring and banding it.



Students practice observation and data collection skills as they track the spring migration of waterfowl.



Students greet Governor Pawlenty during his visit to the area to learn about successful community partnerships.

School District Voices

*"The PSC demonstrates what is right in education. This is what makes public education stronger."
- ISD 544 Superintendent*

*"It's been a great cooperative effort. It's shown that the District is willing to take a chance and look at something a bit innovative and give our kids a chance to learn in a different setting. It opens up all kinds of possibilities for helping students become productive learners. ... We are trying to create life long learners and good citizens; we are trying to create people that respect their environment; that's why we are excited about the possibilities to expand this program. We were able to directly impact 50 students this year, but if we could provide that kind of a concentrated experience for every student, imagine the impact we could have."
- Middle School Principal*

USFWS Voices

*"The PSC is a model for changing the way we educate children in the environmental sciences. I've been in the Service for 28 years and in all those years, and I've never seen a program like this. I'd like to use this program as an example of a partnership and a model for environmental education and expand it throughout the nation's refuge system. That would be my honest hope."
-Region 3 Chief of the National Wildlife Refuge System*

*"The program's emphasis on bringing students daily into the field instills an environmental ethic that can't be built through one-time experiences. This will result ultimately in adults that are more aware of the impact of their daily decisions and actions in the environment."
-Fergus Falls Wetland Management District Project Leader*

*"We are reaching students on a repeated and long term basis. This is critical in building a land ethic within students and giving them the tools to become informed decision makers in the future. By educating students within the prairie wetlands environment, we are able to fulfill both national missions (providing environmental education) and local missions (education about the prairie pothole region). The PSC demonstrates quality, meaningful environmental education. We've had inquiries about replicating this program from refuges throughout the system and from other school districts in Minnesota."
- Prairie Wetlands Learning Center Supervisory Park Ranger*

Conclusion

The results of this evaluation suggest positive cognitive and affective outcomes, including concept attainment and skill development in science, math, and writing; growth in problem solving and technology skills and skills in working and communicating with others; and positive influences on students' motivation toward learning, attitudes toward the prairie wetlands environment, and stewardship ethic. Further, both ISD 544 and USFWS believe the PSC is accomplishing their respective missions and goals in a meaningful, quality way. Given these findings, continuation of this program is appropriate.

These findings are also consistent with research on other educational programs that use the environment as an integrating and motivating context. Research by Lieberman and Hoody (1998), the State Education and Environment Roundtable (2000), the National Environmental Education and Training Foundation (2000), and Athman (2003) support using environment-based education programs to improve academic performance, attendance, classroom behavior, motivation, and critical thinking skills. This previous research and the findings from the PSC evaluation demonstrate that integrated learning using authentic, field-based experiences makes sense, with positive outcomes for students and the partnering organizations.



Students identify prairie plants, recording their data on handheld computers.



Students conduct inventories of the aquatic invertebrates in the different wetland areas.



Recommendations

The data collection tools collectively generated several areas for potential program improvement. Students suggested spending more time in the field and traveling to less-visited places on the prairie. Students also suggested spending more of their school day at the Prairie Science Class. Parent suggestions included increased parent communication on learning activities through weekly rather than monthly updates and increased storage area at the PWLC for winter clothes and school supplies.

Findings from this program evaluation also provided recommendations for future implementation:

- *Program expansion* - Students, parents, ISD 544, and the USFWS collectively agreed that the PSC should be expanded to provide more 5th grade students with the opportunity to participate and to accommodate growing parent and student interest in the program. While many students and parents expressed interest in extending the program into the next grade level, so that a student's PSC experience would be longer than one year, ISD 544 felt it was more important to provide this unique learning opportunity to other students.
- *Retain program length and grade level* - Stakeholders felt the length of program (daily participation over the course of a school year) was important, as program outcomes would likely decrease if the amount of time spent in the program decreased. Stakeholders agreed that 5th grade was a good fit for the PSC, given the 5th grade science standards' emphasis on life science and environmental science. In addition, the cognitive level of 5th graders allows for relatively in-depth field study, yet 5th grade students appear to be young enough to interact with the environment in a playful, wonder-filled manner.
- *Continued evaluation and monitoring of student progress* - Given the emphasis on educational accountability and limited financial and staff resources, evaluation plays a key role in justifying the effort and resources that are being expended. Documentation of program outcomes also is integral in achieving program support locally, regionally, and nationally.
- *Professional development of teachers* - Along with the administrative support of ISD 544 and the USFWS, the PSC teacher played a key role in the success of the program. There is a need to train formal educators and environmental educators in integrated, field-based teaching methods if the PSC is to be replicated or adapted in other school districts and at other natural areas.

In addition, this evaluation suggests areas for further exploration:

- *Characteristics of successful partnerships* - Stakeholders collectively agree the PSC is an example of a successful partnership. However, what specifically made this partnership between the USFWS and ISD 544 work? While this was not a question posed as part of

the evaluation, stakeholders suggested the following items as being integral to making the partnership work:

- Strong cooperation and solid commitment to the program by the Superintendent, Principal, and School Board of the partnering school and by the Refuge Manager and Regional Office of the USFWS;
- Teachers who are dedicated to the program and have the skills and motivation to implement non-traditional teaching methods and a strong science background;
- Agency personnel with strong backgrounds in education, environmental education, and the biological sciences who can commit four to eight hours of instructional time per week per class;
- Adequate on-site facilities to accommodate daily attendance by a class or classes of students (classroom or lab space, rest rooms, storage, etc.); classroom space is needed that can be devoted to the program;
- Field sites that can accommodate a class or classes of students on a daily basis with minimal or acceptable levels of impact to the environment; and
- Minimal distance between the school and refuge so that traveling time is minimized.

Future evaluation of the PSC could incorporate a more systematic look into what makes this partnership work. This would be a key piece for program replication.

- *Teacher Qualifications* - As indicated earlier, stakeholders agreed some of the program success can be attributed to the PSC teacher. It would be useful to know what teacher characteristics contributed to this success. For example, the PSC teacher had 30 years of teaching experience (including science teaching), had visited the PWLC with his students for traditional environmental education programs during previous years, and was passionate about and committed to the PSC idea. Does successful teaching in PSC-like programs require training in the environmental sciences and an environmental education or science education background? Does it require training in integrated, field-based and project-based methods? Does it require a certain comfort-level in the outdoors? What motivates a teacher to put in the extra time and effort required for implementation of a non-traditional instructional program: Ownership in the idea or program? A strong environmental ethic? A passion for teaching? Insight into these questions would help prepare teachers to instruct in these non-traditional settings, which is another key piece for program replication.