Environmental Field Days: Recommendations for Best Practices

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Stephan Carlson
University of Minnesota Twin Cities

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By: Stephan Carlson Ph.D.

Abstract

In Minnesota, supplemental K-12 programs like Environmental Field Days require significant investment and educate over 10,000 4-6th graders about issues related to our natural resources, environment, and conservation. The key to success is collaboration between outside organizations like state and federal agencies, and nonprofits along with the school teachers attending the all day programs. To assist collaborations, a compilation of best practices is presented for improving the educational value and impacts these programs have on young people. Results are shared from a state-wide study of 32 counties in Minnesota of Environmental Field Day programs along with seven practical recommendations to improve their educational outcomes.

Key Words:

Environmental Field Day, conservation, non-formal, science education, environmental education, field trips, hands-on activities, experiential education, hands-on learning

Introduction

Environmental Field Days require investment of money, staff, time and energy in program planning and presenting. Field Day programs often involve a variety of agencies and organizations to both organize and teach the sessions. Field Days are a specific type of field trip where students visit six to eight learning stations, for 30 minutes each, learning by engaging in hands-on activities and discussion (Poudel et al., 2005). Station are often taught by volunteers who are frequently professional scientists working for county, state or federal agencies such as the Department of Natural Resources (DNR) or the Soil and Water Conservation District (SWCD) or nongovernmental organizations (NGO's). Non-formal science educators often see field trips as a starting point for young people to gain first-hand knowledge and experience about science as it relates to the environment (Athman & Monroe, 2002; Poudel et al., 2005; Steven & Andrews, 2006).

A variety of researchers have addressed "best practices" for environmental / stewardship education in extended classroom experiences (NAAEE, 1996; Siemer, 2001; McDonnell, 2001; Fortner, 2001; Stevens & Andrews, 2006). Stevens and Andrews (2006) attempted to define what may constitute "good", "better" or best" when it comes to educational practices, with best being "a program or practice that has been clearly defined, refined through repeated delivery, and supported by a substantial body of research" (Fedler, 2001, 7). Applying best practices across Field Day settings increases the likelihood that these programs meet their intended outcomes in science and environmental education.

It is clear from teachers and parents that students enjoy out-of-classroom experiences. However, some research shows that out-of-school science experiences can have a small impact on students learning (Gottfried, 1980). How students gain new insights and understanding cannot be left to chance. A body of literature has evolved over the last two decades supporting the notion that considerable learning occurs in the informal/non-formal science education arena with students on museum field trips (Falk & Dierking, 1997; Hofstein & Rosenfeld, 1996; Rennie, 1999; Flexer & Borun, 1984;

Griffin, 2004; Orion & Hofstein, 1994; Piscitelli & Anderson, 2001; Storksdieck, 2006; Stronck, 1983) and during family visits (Falks & Dierking, 2000; 2002; Falk & Storksdieck, 2005). Field Days are a popular type of informal science education field trip with distinctive features not found in the museum "free-choice" setting. This type of science education merits research specific to its characteristics and outcomes.

Although field trips are a primary method for non-formal educators to reach students, some classroom teachers and students may see field trips as an excuse to have some fun and get out of school rather than as a concrete learning opportunity (Brigham & Robinson, 1992; Gottfried, 1980; Griffin & Symington, 1997). This paper address the following questions related to Environmental Field Days: How much do students learn? Do these programs make a difference? How widespread are they? How can they be improved to have greater impact? It will review studies in science field trips and the fields of environmental education, cognitive psychology and museum studies, along with data collected from programs found in Minnesota. From this research, seven practical recommendations are developed to guide planners of field trip programs to improve their educational impact.

Do Students *LEARN* Anything on Field Trips?

While learning may not be easily observed, it is obvious to teachers, parents and field trip leaders that kids enjoy field trips. Researchers have identified positive impacts on student attitudes and learning resulting from field trips (Ignatiuk, 1978; Koran, Koran & Ellis, 1989; Lisowski & Disinger, 1988; Ramey, Walberg & Walberg, 1994; Stronck, 1983; Hofstein & Rosenfeld, 1996; Rennie, 1999; Finson & Enochs, 1987; Flexer &

Borun, 1984; Griffin, 2004; Orion & Hofstein, 1994; Piscitelli & Anderson, 2001; Storksdieck, 2006; Stronck, 1983). Smith (1979) found that sixth graders participating in community outdoor education had improved attitudes towards school and learning in general. Gross and Pizzini (1979) and Knapp (2000) surveyed students a year or more after field experiences and found increased and sustained improvement in attitudes and enthusiasm towards the sites they had visited and the topics studied. In their study of fifth and sixth graders' visits to a science museum, Flexer and Borun (1984) found the field trip improved students' attitudes towards science.

Studies also show field trip experiences result in knowledge gain (Bitgood, 1989; Bogner, 1998; Evans, 1958; Falk & Balling, 1982; Stronck, 1983; Wendling & Wuensch, 1985; Wright, 1980). In Mississippi, the 4-H Pizza Farm Field Days demonstrated sizable knowledge gains through pre and post tests conducted with a random sample of participants (National 4-H Council, 1999). In Minnesota, an internal comparison of pre and post tests for metro-area students involved in the 2001 Children's Water Festival revealed an average 25% improvement in test scores (Bilotta, 2001). While many studies measure knowledge gain in post tests directly following the field trip experience, Falk and Balling (1982) and Bogner (1998) measured knowledge retention after one to six months, suggesting field trips can have relatively long-term impacts on knowledge.

In the context of environmental education, impacting attitudes and knowledge may not be enough. Many key definitions of environmental education include teaching skills and motivating citizens to take action, in their own lives and on a broader scale, to address complex environmental issues (Barry, 1976; Childress & Wert, 1976; Culen, 1998; Hungerford & Volk, 1990; Rubba & Weisenmayer, 1988; Stapp et al., 1969;

UNESCO, 1977). Bogner (1998) measured knowledge and behavior change variables in middle school students participating in a one- or five-day outdoor ecology program and found increased knowledge in both but only behavioral change in the five-day program. The Nebraska's Groundwater Foundation (1994) conducted a behavioral impact study of teachers and students and found a link to conservation behavior, based on the level over which the individuals had complete control such as turning off the faucet while they brushed their teeth. They concluded that while the Festival did not have a direct impact on behavior, it did serve as a catalyst for behavior change (Groundwater Foundation, 1994).

One variable that predicts environmentally responsible behavior is "locus of control," and is a student's perception of his or her own ability to make a difference (Hines, et al., 1986/87; Hungerford & Volk, 1990, O'Brien & Carlson, 1995). It is a construct that has been utilized to explore environmental issues using Case Studies and Issue Investigation pedagogy. Students gain insights into citizenship and realize that they can influence change as they participate in authentic environmental issues (Ramsey & Hungerford, 1989; Ramsey, Hungerford & Volk, 1992).

While many environmental education and nature centers endorse the broad goal of encouraging environmentally responsible behavior, Simmons (1991) found that few make clear attempts to reach this goal. Although some educators assume that improvements in attitudes and knowledge will naturally lead to behavior change, the connection between these variables is complex and poorly understood (Culen, 1998; Fishbein & Ajzen, 1975; Leeming, Dwyer, Porter & Colbern, 1993; Ramsey, Hungerford & Tomera, 1981). Upper elementary students are more likely to make changes to simple behaviors such as recycling or turning off a faucet while brushing their teeth (Groundwater Foundation, 1994; Regnier, Gross & Zimmerman, 1992). They are less likely to affiliate with behaviors that require real sacrifice, like not using a car (Rickinson, 2001). Researchers suggest that targeting upper elementary student behavior can extend beyond the child and impact the family as well. This impact may increase through family discussion in informal science museums and working together on homework assignments (Ballantyne, Connell & Fien, 1998 & Uzzell et al., 1994; both cited in Rickinson, 2001; Falk & Dierking, 2000; 2002; Falk & Storksdieck, 2005). The fourth-sixth grade level is an ideal age to influence environmental behavior.

Factors That Improve Learning

The field of visitor studies has identified a number of factors that impact learning in a free-choice recreational setting such as museums (Falk & Dierking, 1992; Falk & Dierking, 2000; 2002). One such example is when students arrive on site for a field trip site, adults often observe them “running wild” or becoming overly hyperactive and social. This phenomenon may not have so much to do with misbehavior as acclimation to a novel environment (Falk, 1983; Martin, Falk & Balling, 1981). Studies have shown that children in novel environments are distracted and must expend energy learning about their surroundings before they are ready to attend to tasks and learn cognitive material (Falk, Martin & Balling, 1978; Kubota & Olstad, 1991; Orion & Holfstein, 1994). Martin, Falk and Balling (1981) determined that novel environments are generally not appropriate for assigned-task learning.

This poses a challenge for Field Day organizers who intend to use assigned- task learning in outdoor/recreational settings. They can overcome this potential obstacle by using an appropriate level of novelty, one that can actually improve learning (Falk, 1983; Falk & Balling, 1980). Falk and Balling (1982) compared learning in third and fifth graders taught a lesson on trees in different settings. While the third graders learned best in the schoolyard and poorest at the nature center, the fifth graders performed best at the nature center and poorest in the schoolyard. This phenomenon illustrates an optimum level of novelty that can actually improve learning. For the third graders, the nature center was too new and distracting for them to learn well, but not so for the fifth graders. Researchers conclude that "Fifth-and sixth-graders may not only be ready for day-long field trips to novel settings. . . but may thrive on them" (Falk & Balling, 1980, p.8).

Optimizing the novel setting and achieving learning objectives can be done by first desensitizing students to the novel environment (Kubota & Olstad, 1991; Rudman, 1994). Research by Balling, Aronson and Falk found that novelty-reducing treatment (information on restroom location, agenda, types of food at concession, etc.) helped fourth graders at a zoo learn better (Falk,1983).

Teaching methods used in the field setting can also work to improve learning. A field setting is more likely to improve student learning if it directly relates to the topics being studied and the outdoor location (Falk & Balling, 1979; Knapp, 1996). Active learning strategies, such as hands-on activities, inquiry exercises and experiential learning help engage students (Carlson & Maxa, 1998; Poudel et al., 2005). Traditional classroom teaching may be less effective than non-formal science methods (Colburn, 2000; Griffin & Symington, 1997; Price & Hein; 1991; Wendling & Wuensch, 1985). Games, simulations, role plays, choice mapping and other creative methods can activate/capture student interest and even encourage critical thinking (Downing, 1997; Paul et al., 1990; Regnier et al., 1992). Active learning teaching methods are recognized as enjoyable and developmentally appropriate approaches for upper elementary students (Andrews, 1992; Martinez & Hartel, 1991; Poudel et al., 2005; Spector & Gibson, 1991). For practical guides to creative teaching strategies, see Downing (1997), Ham (1991) and Regnier et al. (1992). Lazear (1991) offers a toolbox for educators, providing practical teaching approaches targeting multiple intelligences (Gardner, 1983), learning styles, and addressing differences in the way individuals and members of different cultural groups learn (Roberts & Rodriguez, 1999).

The use of themes can also improve learning by helping to organize information and connect ideas (Ausubel, 1960; Ham, 1991; Regnier et al., 1992). Unlike general topics like “natural resources” or “water quality”, themes are complete sentences that tell a story: “The actions of our community impact the Mississippi River.” Students are likely to remember the theme more than individual facts. Supporting ideas should be limited to seven, plus or minus two (Miller, 1956). By recognizing that the human brain has a limited capacity to process new ideas and limiting main points, the overall theme will have a greater impact on what students retain (Ham, 1991).

Students learn more on field trips supplemented with preliminary or follow-up activities in the classroom (Farmer & Wott, 1995; Gennaro, 1981; Orion & Holfstein, 1991). Pre-visit instruction prepares students for the field trip experience and sensitizes them to the new concepts and issues. Short educational treatments, out of context and without reinforcement, are unlikely to have much educational impact (Culen, 1998; Volk & McBeth, 1997).

Various forms of pre-visit instruction have been tested. Hartly and Davies (1976) suggest that pre-tests alone can have positive impacts on learning by alerting students to ideas that will be studied. Lockett (1982) suggests that this finding illustrates a lag in children's understanding and application of the concept. He suggests that field settings offer an opportunity for students to "extend emerging cognitive abilities to new situations" (p. 3). Learning theorists have supported the idea that curricular materials and concept introductions are useful instructional strategies when presenting learners with new information (Ausubel, 1960; Koran & Baker, 1979). Pre-course training of teachers may also improve student learning and attitude and encourage teachers to more effectively prepare their students (Gutierrez de White & Jacobson, 1994, as cited in Rickinson, 2001).

Follow-up activities, even without pre-instruction, can also increase student learning (Farmer & Wott, 1995; Flexer & Borun, 1984; Rudman, 1994). Knapp (2000) found that students taking part in a field trip without follow-up instruction retained positive attitudes over time, but could not remember the content specifics of the trip. Knapp concludes that students need follow-up and repetition in the classroom to transfer short-term learning from a field trip into long-term memory. Follow-up activities reinforce key concepts and give students a chance to process the field day experience. Summary activities like creating visual Venn diagrams, concept maps or diagramming can help students reflect on what they learned and make connections between different concepts covered during the field trip (Oldfather et al., 1999; Hyerle, 1996). For optimal experiential learning, students need to have opportunities to reflect, generalize what they have learned, and apply key concepts to new situations (Kolb, 1984).

Although pre and follow-up activities can increase student learning on field trips, some researchers argue that the best way to have an educational impact is to integrate the field program into a well-constructed classroom curriculum (Culen, 1998; Gross & Pizzini, 1979; Mason, 1980; Volk & McBeth, 1997; Storksdieck, 2006). Upon completion of a study on variables impacting high school students' learning on field trips, Orion and Holstein (1994) concluded that field experiences are best situated early in a given curriculum.

Measuring Program Impact

Program evaluation and assessment is an important step in improving the effectiveness of environmental education and field study programs (Disinger, 1981; Marcinkowski, 1993; Simmons, 1991). Although evaluation is the key to measuring success, these programs rarely use it, emphasizing participant satisfaction rather than learning outcomes (Chenery & Hammerman, 1984/85; Disinger, 1981).

To be effective, programs must produce and share clear learning goals and objectives. Goals and objectives effectively guide educators, prepare learners, and offer a baseline for measuring learning outcomes (Hungerford, 1998; Marcinkowski, 1993; Simmons, 1991; NAAEE, 1996). Goals and objectives should relate directly to learner outcomes in terms of attitude, knowledge or behavior. *A GreenPrint for Minnesota* (MOEA, 2000), the National Science Standards and local education standards are sources of learning goals and objectives.

A survey was conducted to provide a snapshot of environmental field day programs in Minnesota. Environmental field day programs were identified in 66 of Minnesota's 87 counties (76%). A total of 32 programs were identified, 21 (76%) coordinated by the University of Minnesota Extension and 11 others coordinated by other agencies but involving Extension Educators as presenters (Table 1).

Phone surveys were conducted with representatives from 15 of the 21 (71%) programs coordinated by the University of Minnesota Extension. Respondents self selected for the 45-minute phone interview. Survey participants answered questions about program logistics, planning, format and partner involvement. Since the interview sample was small, the results cannot be seen as statistically valid.

Over 11,000 youth were involved in the 15 surveyed programs. Program profiles reveal that partnerships are key to the success and continuation of Environmental Field Days programs in Minnesota. 67% of surveyed programs relied heavily on in-kind donations, usually presenters' time and field site access, made by planning partners (Figure 1). Soil and Water Conservation Districts were common partners (for 80% of programs), and were responsible for most of the programs in Minnesota not coordinated by the Minnesota Extension Service. The Department of Natural Resources was another key partner, involved with 73% of surveyed programs. 25 other partners were identified, including commodity groups, nature centers, museums, zoos, county and state agencies.

Environmental field days themselves build a fun and enjoyable environment by using hands-on activities and outdoor settings (Figure 2). Hands-on activities were mentioned as highlights for youth in 73% of surveyed programs. 88% were in an outdoor setting for half or more of the day. The greatest challenges facing planners are securing presenters, weather issues, and coordinating a variety of partners and schools (Figure 3). Classroom teachers were given the responsibility of arranging transportation and supervising students in all 15 programs (Figure 4). When it came to integrating the Field Day program into classroom curriculum, 40% of program representatives placed this responsibility on classroom teachers. Most of the surveyed programs provided learning goals and objectives, though fewer provided preliminary and/or follow-up activities. Only three surveyed programs were designed to accompany a complete classroom curriculum (Figure 5).

Although 40% of surveyed Extension Educators said they participate in these programs because they are good learning opportunities for youth, the actual efficacy of programs in relation to student learning has not been well documented. Figure 6 reveals the types of program evaluation conducted. While 14 of the 15 programs have a formal evaluation process in place, written evaluations from classroom teachers are the most common form of evaluation and, for many programs, may be the only source of evaluation information. Other types of evaluation currently in use include student feedback from evaluation sheets, feedback during group assemblies, informal verbal quizzes and written tests (Figure 6).

Creative ways to approach the educational challenges include providing presenters with training or materials on age-appropriate education, involving classroom teachers in an in-service curriculum training, developing a curriculum to accompany the Field Day, and taking advantage of the outdoor setting to transform a series of stationary presentations into an illustrative guided hike.

Best Practices for Environmental Field Days

The following best practices are based on a review of literature, program surveys and feedback from Extension Educators. These recommendations were developed and proposed as guidelines for planning and delivering effective Environmental Field Day programs. Taking time to create a vision of a program as a whole means seeing an entire program with coordinated goals. Involve program partners for valuable information, planning support, financial resources and in-kind donations. Research suggests that Extension Educators and other Natural Resources professionals can benefit from training on environmental education methods and opportunities to practice these methods (Bainer, Cartel & Barron, 2000; Smith-Sebasto, 1998). In addition, the application of educational theory can enhance natural resources field trips (Athman & Monroe, 2002).

Recommendations:

1. **Provide clear learning goals and objectives.** Share them with all participants (classroom teachers, students and presenters) and use them as a basis for evaluation and assessment. These should be written as the outcomes learners will gain from the experience (i.e., students will demonstrate water quality testing and know the purpose of each test).
2. **Develop a theme for the field day** and limit the number of key supporting ideas to from five to seven.
3. **Use appropriate teaching methods**, such as hands-on activities, role-play games and other active learning methods. Explore ways to incorporate a variety of learning styles (auditory, visual, tactile, kinesthetic, logical, linguistic) to reach all learners.

4. **Support behavior change** by offering realistic ways students can have an impact. If possible, explore case study or issue investigation formats as a context for the field day. Encourage students to discuss issues with their families or take homework home to share. Present both sides of an issue and let young people debate the outcomes.
5. **Create a strategy for program integration** that includes preliminary or follow-up activities, or both. Explore ways to connect the field program to a classroom curriculum, either by creating a curriculum or tailoring the field program to a curriculum already in use. If creating your own curriculum, be sure to involve teachers in the design and planning, and offer in-service training if necessary.
6. **Prepare the players.** Prepare classroom teachers for a field trip by sharing expectations, learning goals and objectives, and the program theme. Similarly, students should be prepared to learn and be aware of the theme and learning goals. Offer an orientation session or provide pre field trip preparation materials to reduce distracting novelty. Field trip leaders and presenters need to know the theme and learning goals, and may appreciate further information or training on age-appropriate or creative teaching methods.
7. **Develop and implement regular program evaluation and assessment.** Look beyond participant satisfaction and implement qualitative or quantitative methods that demonstrate students' change in attitudes, knowledge, or behavior after the field trip program. Think in terms of outcomes the students can demonstrate and the best way to obtain that information. It may be through a written survey, observation, interviews, or talking to parents and/or teachers.

For additional information on Environmental Field Days visit:

http://www.extension.umn.edu/FieldDays/ *A special thanks to JoAnne Peters for her thesis work at Antioch University, Seattle that started this work on Field Days.*

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Table 1 (Page 10)

Table 1: Environmental Field Day (EFD) Programs in Minnesota

Category	# of programs	# of counties
EFD programs in Minnesota	32	66
Programs coordinated by MN Extension	21	41
Programs coordinated by other agencies	11	36
Counties served by multiple ECD programs		15

Figure 1 (Page 11)

Funding sources for Field Days:

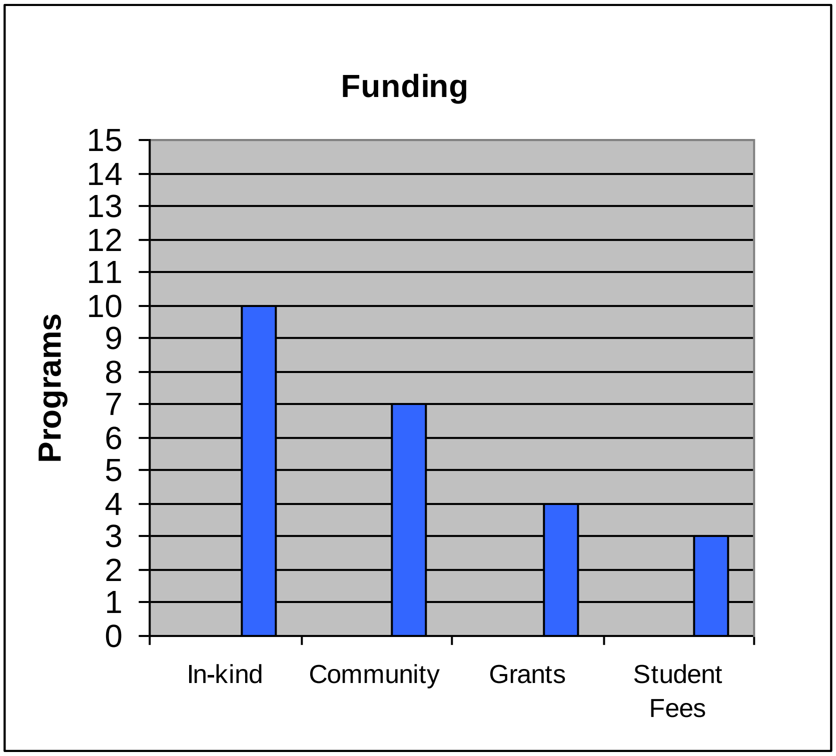

Figure 2 (Page 11)

Highlights identified by program facilitators:

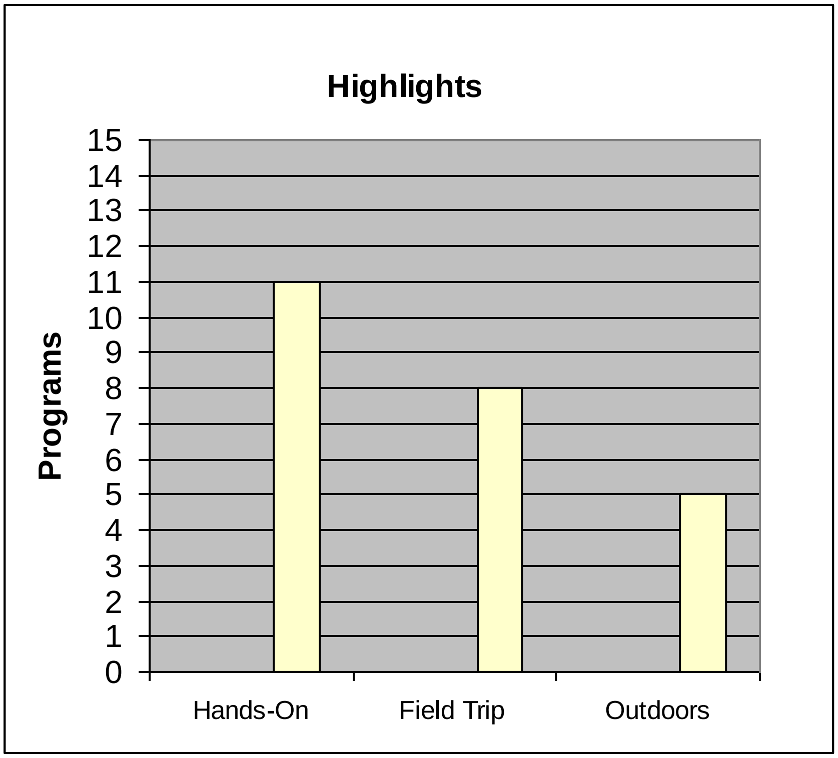

Figure 3 (Page 11)

Challenges identified when putting together a Field Day Program:

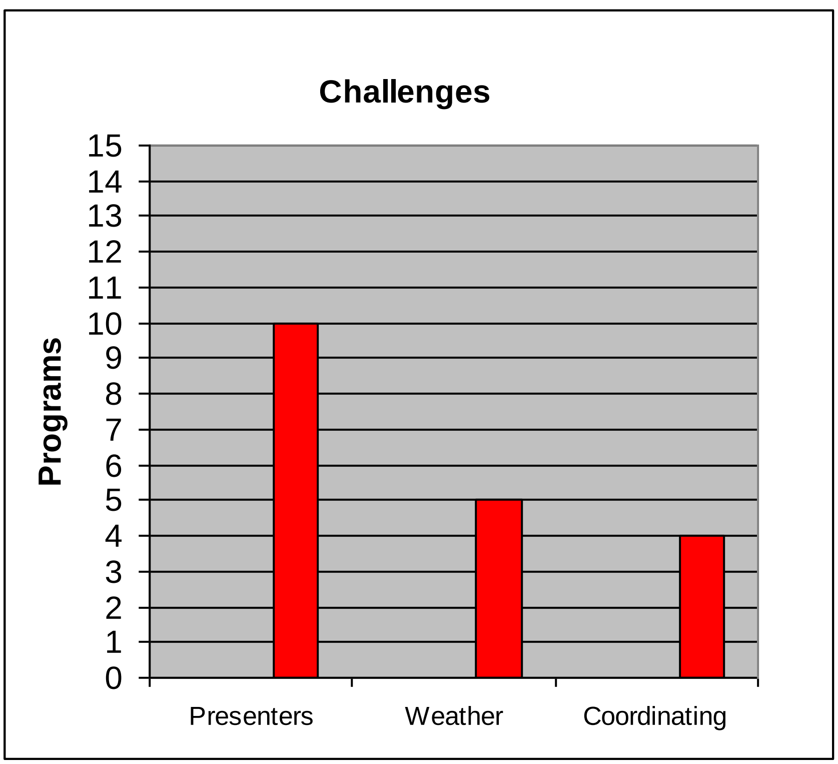

Figure 4 (Page 11)

Teachers organized the following:

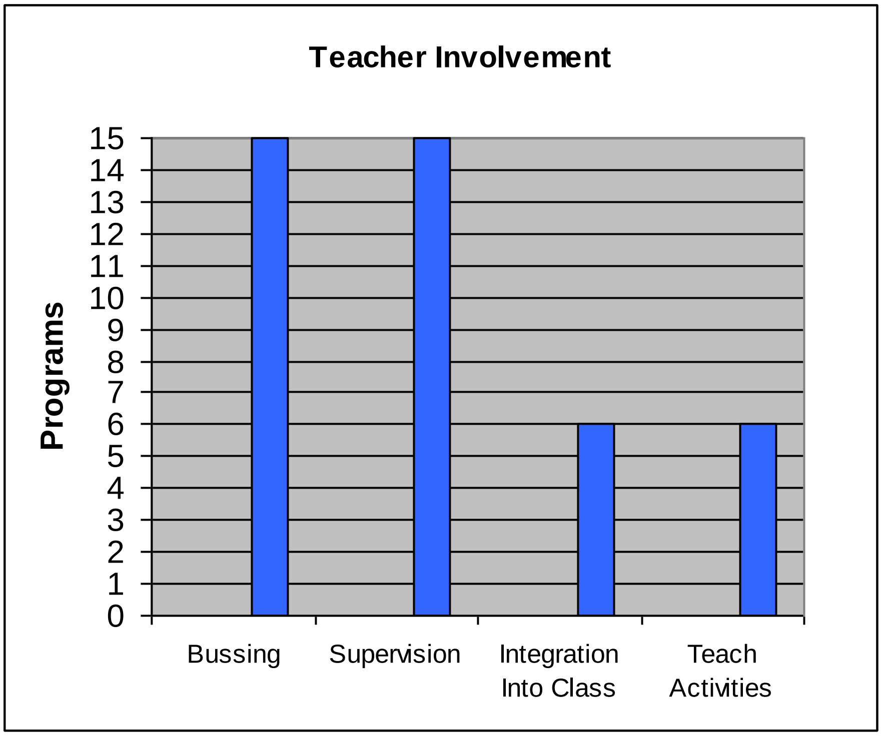

Figure 5 (Page 12)

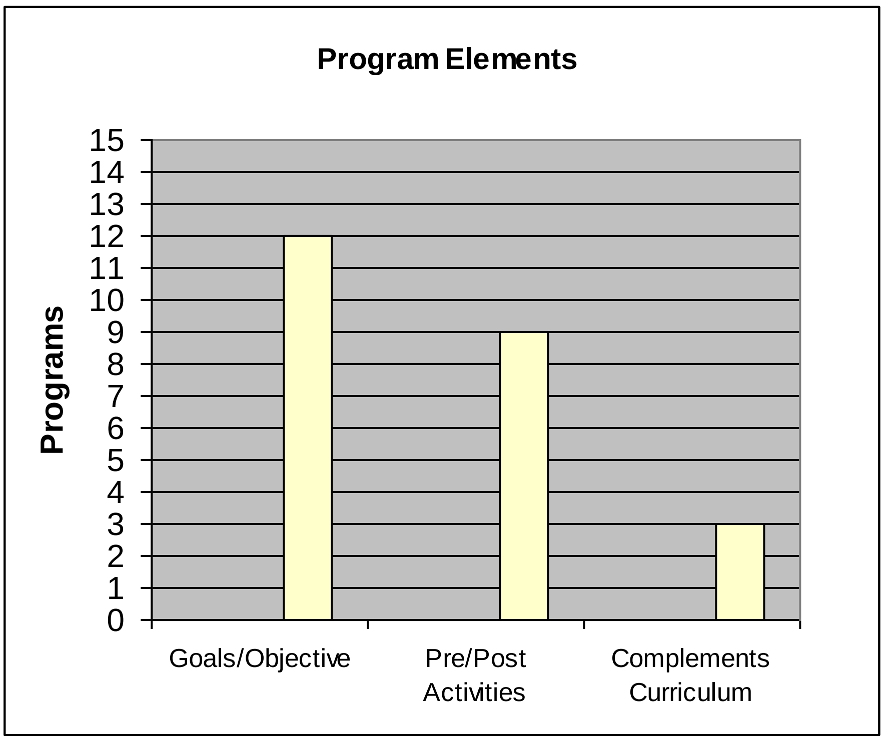

Figure 6 (Page 12)

Types of evaluation completed for Field Days: