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Using a Field Trip Inventory to Determine If Listening to Elementary School Students' Conversations, While on a Zoo Field Trip, Enhances Preservice Teachers' Abilities to Plan Zoo Field Trips

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This study investigated whether listening to spontaneous conversations of elementary students and their teachers/chaperones, while they were visiting a zoo, affected preservice elementary teachers' conceptions about planning a field trip to the zoo. One hundred five preservice elementary teachers designed field trips prior to and after listening to students' conversations during a field trip to the zoo. In order to analyze the preservice teachers' field trip designs, we conducted a review of the literature on field trips to develop the field trip inventory (FTI). The FTI focussed on three major components of field trips: cognitive, procedural, and social. Cognitive components were subdivided into pre-visit, during-visit, and post-visit activities and problem-solving. Procedural components included information about the informal science education facility (the zoo) and the zoo staff and included advanced organizers. Social components on student groups, fun, control during the zoo visit, and control of student learning. The results of the investigation showed that (a) the dominant topic in conversations among elementary school groups at the zoo was management, (b) procedural components were mentioned least often, (c) preservice teachers described during-visit activities more often than any other characteristic central to field trip design, (d) seven of the nine characteristics listed in the FTI were noted more frequently in the preservice teachers' field trip designs after they listened to students' conversations at the zoo, and (e) preservice teachers thought that students were not learning and that planning was important.

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Introduction

We are all three science teacher educators with a strong interest in informal science education as well as in formal science education. We have all spent extended time in zoos, museums, and in the field with preservice and inservice teachers who participate in the classes that we teach. We are well aware of the literature on informal science education as it pertains to field trips to the zoo, and we recap some of that literature in our paper in the review that follows. All of us teach elementary science methods courses, and we each struggle with the issue of time and must negotiate how much time we will allocate to informal science education. We all have zoos within 30 min of our institutions. For several years, we have pondered whether or not having our university students listen to and analyze elementary school students' conversations during zoo field trips would have an impact on preservice teachers' abilities to design more appropriate zoo field trips. In this paper, we review field trip design literature and use the literature to develop a tool to determine preservice teachers' abilities to design field trips.

Kisiel (2007, 2010) contends that it is important to understand teachers' perspectives of field trip design. In his investigation of teachers' preferences for the use of worksheets during a field trip, he found that 70% of the teachers in the study preferred to use a survey-oriented worksheet, instead of a concept-oriented worksheet. According to Kisiel, using a survey-oriented worksheet during a field trip does allow for a 'museum experience'. Conversely, when these worksheets are utilized, 'the development of a deeper understanding of a particular concept is lost. By limiting students' choices and ignoring students' interests and connections to prior knowledge, survey agendas, as suggested by Worksheet A [survey-oriented], miss valuable opportunities for student learning' (Kisiel, 2007, p. 39).

According to Kisiel (2007, 2010), the reasons for the disconnect between the teacher and the field trip setting are due to teachers' conceptions regarding field trips. Therefore, it is up to educators in informal settings to 'consider different means of teacher support that may help reduce apprehensions and shape attitudes regarding what a successful excursion might look like' (Kisiel, 2007, p. 41) and help teachers 'to become more aware of the characteristics of these nonclassroom settings that facilitate learning, such as visitor choice and control' (Kisiel, 2007, p. 41). Moreover, preservice teachers' methods courses offer an important opportunity to encourage teachers to develop science lessons that incorporate informal science programs such as zoos, aquariums, and museums (Bulunuz & Jarrett, 2010). The role of educating classroom teachers regarding field trip design is the responsibility of teacher educators. Teacher educators need to 'help teachers reflect more carefully on their pedagogy, regardless of the location of the lesson' (Kisiel, 2007, p. 41).

A review of the literature reveals extensive research related to: (1) learning in museums and zoos, (2) planning field trips to informal institutions, and (3) preparing to take students on field trips. This study is important because there is little research investigating preservice teachers' perceptions about designing field trips. Additionally, this study identifies and synthesizes the salient themes on field trips found in the literature and provides a baseline of how preservice teachers define the aspects of a good field trip design. Do preservice teachers inherently use their newly acquired and expanding pedagogical skills to incorporate successful, effective aspects of field trip designs?

The questions that guide this study are as follows.

- (1) What are the characteristics of successful educational experiences in informal learning environments as defined by the literature?
- (2) How does listening to students' (with school groups) conversations during a zoo field trip influence preservice teachers' field trip designs and ideas about field trips?

Conceptual Framework

Field Trips: Informal Education Experiences

Teachers, who take students on field trips, are seeking out-of-classroom experiences for students that cannot be provided within the classroom (Cox-Petersen, Marsh, Kisiel, & Melber, 2003; Kisiel, 2003a, 2006b) and have found museums to be an exceptional experiential learning resource that complements and/or enriches school curriculum (Bergseid Ben-Haim, 2006; Berry, 1998; Kisiel, 2006b; Sheppard, 2000). Moreover, learning in informal contexts has been recommended as an important element in promoting interest in science, motivating student/teacher and student/student interactions, and increasing knowledge (Pedretti, 2002).

Field Trips: What Teachers Need to Know

Teachers, who identify field trips as destinations for education (Tunncliffe, 1994; Rosenfeld, 1980) and take their students to the zoo for specific learning goals (Tunncliffe, Lucas, & Osborne, 1997), should be aware of the psychological needs of visitors, the key factors of informal learning, and the characteristics of a successful informal learning experience.

Perry (1992, 1993) has identified six psychological needs of museum visitors, all of which must be met for a museum experience to be successful and educational. The six needs are: (1) curiosity, (2) confidence, (3) challenge, (4) control, (5) play, and (6) communication.

Falk and Dierking (2000) defined three contexts that influence museum learning. In their contextual model of learning, those contexts include a (1) personal context—which includes the individualized prior knowledge, interest, motivation, expectation, and experience that a visitor brings to the museum; (2) sociocultural

context—which includes the possibility that learning, in an informal learning environment, may be influenced by people in the group and outside of the group; and (3) physical context—which encompasses the entire physical learning environment.

During a field trip, teachers should provide students with meaningful cognitive and/or affective experiences. The connections teachers make between the field trip and the curriculum influence the cognitive gains, while the holistic experience of the trip shapes the affective gains (Kisiel, 2005; Sheppard, 2000). To address the importance of the teachers' decisions about a field trip, Davidson, Passmore, and Anderson (2010) have identified and defined four characteristics or implications of successful field trip design. The characteristics as defined by Davidson et al. are: (1) planning, (2) visiting the facility, (3) making the field trip fun, and (4) combining student- and teacher-led learning. The following describes in greater detail the four characteristics and includes supporting research.

Careful planning of any field trip can help avoid disasters and lead to a successful event (Nabors, Edwards, & Murray, 2009). Moreover, to significantly impact student learning, teachers should incorporate pre-visit, during-visit, and post-visit classroom teaching into the field trip (Hooper-Greenhill, 2000; Kisiel, 2003a; Sheppard, 2000). Davidson et al. (2010) state that maximum classroom input equals maximum field trip gains. If teachers 'want their students to have maximum gains in learning, especially beyond surface learning of facts, teachers need to give students opportunities to build trip learning experiences into classroom activities and ideas, and follow through with these after the trip' (Davidson et al., 2010, p. 138). Teachers who solely rely on zoo educators or worksheets will find that 'student learning will most likely be shallow and fleeting' (p. 138).

When teachers use focussed pre-visit preparation, there is a positive effect on student learning and attitudes (Falk & Dierking, 2000; Gennaro, 1981). One of many issues to consider is student excitement. Students are inherently excited about a field trip, and their excitement may inhibit learning. Therefore, students' experiences in informal science learning environments should be focussed by the teacher's plans. Unfortunately, teachers are seldom prepared for field trips, students' excitement, and delineating student learning (Kisiel, 2003b). Teachers do not establish clear, specific objectives for visits to places of informal science learning. Moreover, there is usually little monitoring of learning during the visit (Kisiel, 2003b), leaving students with questions about how the field trip relates to instruction in the classroom. Indeed, children's descriptions of what they learn during a museum visit are based on their prior knowledge, interests, and sociocultural backgrounds. Students do not necessarily link their classroom-based experiences, the curriculum that teachers teach, the pre-visit classroom activities, and the educational objectives with their museum/zoo visit (Anderson, Piscitelli, Weier, Everett, & Taylor, 2002; Storcks-dieck, 2001). Therefore, teachers need to be aware of pre-visit classroom interactions and students' prior knowledge, foci, interactions, and reactions during a field trip, so that they may more effectively design field trip experiences.

Students, 'who visited arts-based museums and engaged in classroom experiences where specific and directly linked content, process, and vocabulary were introduced

prior to a museum visit' (Anderson et al., 2002, p. 227), were more engaged in and benefited from the field experience. Prior to the field trip, it is the teachers' responsibility to introduce the purpose and agenda of the field trip to their students. Additionally, it is important for teachers to identify students' possible misunderstandings in relation to the concepts that emerge during the informal science visit (Guisasola, Solbes, Barragues, Morentin, & Moreno, 2009) and to be mindful as to how the novelty of the visit can interfere with learning new information. Therefore, teachers' planning prior to the field trip does make a difference in students' post-visit understandings (Guisasola et al., 2009) and increases their learning during the trip (Orion & Hofstein, 1994).

To increase students' interests and knowledge during visits to informal education sites, teachers need to organize during-visit activities that are supported by appropriate pre- and post-visit activities, defined by explicit learning goals, and reinforced by the institution's personnel (Anderson et al., 2002; Bhatia & Makela, 2010; Davidson et al., 2010; Henriksen & Jorde, 2001). During field trips, teachers relate science to the informal setting by assigning task-oriented activities (Kisiel, 2010), extending an activity already undertaken in class, and/or relying on the interactions of students and chaperones (Griffin & Symington, 1997). However, field trips need to incorporate problem-solving skills (McLoughlin, 2004), tie into the curriculum, focus on the standards, and take into consideration the children's needs (Nabors et al., 2009). Rickinson et al. (2004) determined that if field trip activities are 'properly conceived, adequately planned, well taught and effectively followed up', they can offer 'learners opportunities to develop their knowledge and skills in ways that add value to their everyday experiences in the classroom' (p. 1).

Post-visit activities are an important part of the field trip. Even though meaningful post-visit activities that are connected to the curriculum do make a difference in learning (Falk & Dierking, 2000; Kisiel, 2006a; McLoughlin, 2004), they are incorporated into the field trip design less often than pre-visit and during-visit activities (Kisiel, 2010). Such activities are critical to anchoring student learning to the field trip. The lack of suggestions for post-visit activities confirms that this is the weakest link in theory and practice.

Problems occur when teachers do not feel comfortable taking students on field trips or they are not sure what to do during the field trip. This is especially true of new teachers (Kisiel, 2010). This lack of knowledge or feelings of insecurity may be satiated by interacting with the informal educators (McLoughlin, 2004; Melber, 2000; Parsons, 2010). Classroom teachers need to work closely with the staff, and the staff should 'work closely with classroom teachers to ensure there are clear, explicit learning goals, that the zoo educator knows how the trip fits in with pre- and posttrip classroom activities, and what the students want and expect from the trip' (Davidson et al., 2010, p. 138). Therefore, communication between informal educators and classroom teachers is important. However, the communication between informal educators and classroom teachers appears to be poor (Noel, 2007). Additionally, a disconnect exists between what informal educators see as their role in field trips and their actual roles. Informal educators often view their roles as motivational, but

should perceive themselves as educational collaborators, who work with teachers in schools to provide the best educational experiences to children during a field trip. Informal educators and classroom teachers can work together to insure that children are prepared for a field trip, have field trip related materials, and engage in a quality educational experience (Noel & Colopy, 2006). Moreover, research suggests that teachers need to speak with the informal educators and invite them to the classroom (Anderson & Lucas, 1997; Melber, 2000). Conversely, informal educators need to develop a relationship with classroom teachers and use their staff and exhibits to provide successful education experiences (Myers, Stanoss, Jenke, & Stowell, 2009). By working together, classroom teachers and informal educators can design successful field trips (Xanthoudaki, 1998) and build a culture of inquiry (Myers et al., 2009).

Field trips should be fun for students (Hamilton-Ekeke, 2007; Nabors et al., 2009), and social interactions should enhance learning activities (Davidson et al., 2010). ‘This could be brought about by allowing students to be in groups with their friends and could be focused by having students discuss what they saw, learned, and enjoyed with each other...’ (Davidson et al., 2010, p. 138). Additionally, if teachers allow students to define the groups, the teacher should still pay attention to gender, class, classroom history, and prior knowledge (Bätz, Wittler, & Wilde, 2010; Neff, 1977; Skop, 2008; Thomson, Buchanan, & Schwab, 2006). Even though teachers are concerned about maintaining discipline and control during the field trip (Kisiel, 2010) and believe that students are not capable of making good grouping decisions, allowing students to choose their own working groups gives them the feeling of control, may lessen the teacher’s workload, and may increase student discussion. In addition to self-grouping, the best field trips involve elements of both instructor-led explanations and student-centered exploration/discovery. Allowing students control and choice before or during the field trip encourages engagement and motivation. Davidson et al. (2010) suggest that critical theory could provide a theoretical perspective for how student engagement could occur. Critical pedagogy suggests that teachers become more aware of their dominance as an authority figure and utilize their ‘their position to help students participate in their education—give them a voice...’ (Davidson et al., 2010, p. 139).

People who visit places of informal learning arrive with different agendas, backgrounds, and reasons for the visit. Even students’ agendas differ from their teachers’ ideas about the field trip experience (Anderson et al., 2002; Storksdieck, 2001). Teachers usually overlook these competing agendas, but they are an important part of planning a successful field trip (Anderson, Piscitelli, & Everett, 2008). In order to prevent students’ misinterpreting the reasons for the zoo visit, teachers may provide graphic organizers and allow students to make suggestions about the field trip design (McLoughlin, 2004) and provide objectives for the field trip (Skop, 2008). Allowing students a voice ‘encourages them to take responsibility for their own learning’ (McLoughlin, 2004, p. 162).

Field Trip Inventory

Based on the characteristics of successful informal education experiences (Davidson et al., 2010; Falk & Dierking, 2000; Perry, 1992), the field trip inventory (FTI), a checklist of guiding characteristics that assist preservice and inservice teachers with field trip planning, was developed (Figure 1). The instrument may be used by university professionals to prepare preservice teachers to take students on field trips. The FTI uses three educational terms (cognitive, procedural, and social) and a number of descriptors that should be considered by teachers when developing a successful informal education experience. The characteristics of a successful field trip design are:

(1) Cognitive

- (a) *Pre-visit activities*: Classroom activities are completed prior to the visit and clearly and directly relate to the visit's learning goals. Moreover, the pre-visit activities that are completed in the classroom convey a strong correlation between the during-visit and post-visit activities.
- (b) *During-visit activities*: Field trip activities are completed during the visit and clearly and directly relate to the pre-visit activities. Students easily identify during-visit activities as an extension of the pre-visit classroom preparation. The during-visit activities are designed to develop the questions posed in the pre-visit activities and facilitate discussion during the post-visit activities.
- (c) *Post-visit activities*: Classroom activities are completed after the visit and organize, build on, and connect the pre-visit and during-visit activities. Moreover, the post-visit activities provide the students with an understanding of how the field trip relates to their learning in the informal environment. The post-visit activities are an important aspect of tying together all components of the field trip.

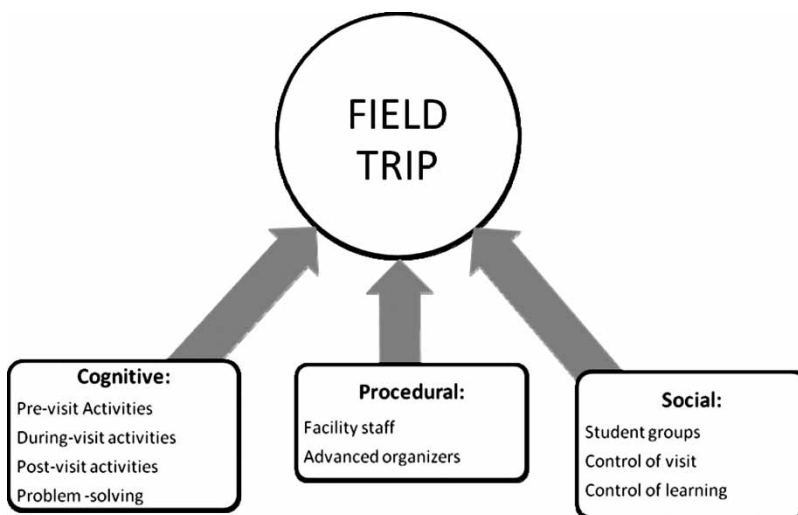


Figure 1. FTI model. Important aspects of field trip designs

- (d) *Problem-solving*: Students are engaged in pre-visit, during-visit, and post-visit activities that allow them to think creatively, analytically, and critically. This does not include a fill-in-the-blank worksheet. Students are challenged to interpret new information.
- (2) Procedural
- (a) *Facility staff*: Students have a desire to interact with staff because they are viewed as the ‘experts’. Students are primed for contact with the staff and want to learn about their occupations. Preparations may include scheduled or unscheduled meetings with the staff. It is important for the teacher to contact and visit the facility prior to the visit and meet the staff.
 - (b) *Advanced organizers*: The advanced organizer is a packet of information that provides students and chaperones with a map of the facility, a description of the facility, and a directory of the exhibits. It includes the route(s) the student groups will take around the facility.
- (3) Social
- (a) *Student groups*: Students expect to have fun. Students are grouped with their friends, taking into consideration how well they will interact and their ability to work well together. If students do not like their groups, they will be less likely to interact and experience significant discussions. Chaperones are included in the planning and understand the reason for the visit.
 - (b) *Control of visit*: Students and their learning are the reasons for the visit. Therefore, it is important to allow them some control of the visit. Allow students to choose their itinerary, what they will see, and/or the people in their group. This information should be included in the Advanced organizer. What do they expect to see? What do they want to see?
 - (c) *Control of learning*: Allow students a voice concerning what they learn during the visit. Students are provided with a directory or inventory of what they could see and/or do. Students are allowed to choose that they will study. What are their interests? What do they expect to learn? What is their favorite aspect of the visit?

Because preservice teachers have had little or no training on how to incorporate informal learning environments into the curriculum, there is a need to educate them about conducting informal learning experiences (Melber, 2000). Moreover, involving preservice teachers in field trips could motivate them to take students on field trips (Munakata, 2005). Johnson and Chandler (2009) state that, ‘Having pre-service . . . teachers . . . experience such events forces them to think about what constitutes a productive field trip before they ever enter a classroom as well as consider components of the curriculum that would benefit from an environment-influenced education’ (p. 8).

Given that the components of the FTI are crucial for a successful, effective informal learning experience (Davidson et al., 2010; Falk & Dierking, 2000; Perry, 1992, 1993), it is essential to determine whether or not preservice teachers incorporate these factors into their field trip designs. If not, then the FTI may be a developmental tool that university faculty consider including in their curriculum to facilitate

successful field trip designs. This study uses the FTI as a diagnostic tool to evaluate preservice teachers' field trip designs.

Social Interactions During a Field Trip

The characteristics of a successful field trip as defined in this paper take into account sociocultural interactions, cognitive development, and influences on learning as a process. Within the sociocultural interactions and learning processes, individuals make sense of the world and cognitive development occurs (Bandura, 1986, 2001). Learning is embedded in the social interactions and the cultural dynamics of the group. Therefore, the verbal interactions between students, teachers, and/or other adults are an important aspect of the field trip experience. Conversations are an important part of knowing what students know because they provide a look at the 'hidden curriculum' (Stephenson, 2009). Therefore, given that social conversations are an integral part of learning and understanding students' knowledge (Stephenson, 2009), it is important to have teachers listen to students' conversations during a field trip (Tunncliffe, 1997a, 1997b).

Methodology

In order to answer our research question—does listening to elementary school students' conversations while on a field trip to the zoo enhance preservice teachers' abilities to plan field trips to the zoo and influence their ideas about field trips?—we used pre- and post-visit questionnaires, which centered on designing a field trip to the zoo for a class of elementary school students to elicit the preservice teachers' ideas before and after their zoo visit. Additionally, we asked students to analyze their conversation data and write a reflection on the data. The FTI was developed and used to determine if preservice teachers, who had never taken students to the zoo, designed field trips (either before or after the zoo visit) that included the characteristics of a successful field trip, based on our review of the literature. Additionally, the preservice teachers used a Preservice Teacher Conversation Observation Record (PTCOR) (Figure 2) to gather data while listening to school groups at the zoo. The preservice teachers analyzed their PTCOR data and were then asked to write a reflection on the data and to redesign their zoo field trips.

Data Collection

One hundred five female preservice elementary teachers from two universities participated in this study over a period of two years. Forty-three students were from a large state university, and 62 students were from a small, private liberal arts college. The university and college were located in the same city. All preservice teachers were elementary education majors enrolled in a science methods course, and participating in the activities described in this study was a part of their methods course. All preservice teachers visited the same nearby zoo. The preservice teachers gathered their

PRESERVICE TEACHER CONVERSATION OBSERVATION RECORD

DATE: EXHIBIT:

TERMS C: # of children A: # of adults	C: A:	C: A:	C: A:	C: A:	C: A:	TOTAL
Management Look. Come here. Stop that. Go there.						
Social Non-zoo related talk. Example: "hello", gossip about family, group plans, watching TV shows, etc.						
Exhibit Anything group members say that have to do with the exhibit. Example: exhibit information, exhibit design						
Location This is where the animal is. Example: It is over there. Where is it? It is not here.						
Informational about Animal Asking questions about the organisms. Adults providing information about the organisms.						
Emotional/Affective Example: I like/love them. It smells. I hate them. I am afraid of them. Noises such as Ah, Oh. Is it OK? I like its hairstyle. It is so cute.						
Habitat/Conservation Example: These live in Africa. They are endangered. I do not think there are many of these left in the world.						
Body Parts Example: It has a tail. It has big ears. It has 4 legs. It is brown. Look at its feet.						
Behavior What the organism is doing. Example: It is using the bathroom. It is running. It is looking at me. It is eating. It is scratching.						
Naming Any reference as to what to call the organism.						
Other						

Figure 2. Preservice Teacher Conversation Observation Record

conversation data at a large, naturalistic zoo in the southeastern USA in specific exhibits as assigned by the instructor. This zoo exhibits animals and plants in enclosures that attempt to recreate natural habitats and is accredited by the Association of Zoos and Aquariums.

Prior to and after the preservice teachers listened to school groups' conversations at the zoo, they were asked the same questions and also required to describe a zoo field trip.

- (1) Have you ever taken students to the zoo? (This question was used to determine if the preservice teachers had taken students to a zoo prior to the study.)

- (2) Design a class visit for your students to the zoo. Include as much information as possible about your design. (This direction was the centerpiece of the study, as it was used to establish if preservice teachers designed zoo field trips that included characteristics of the FTI.)
- (3) How does your zoo visit follow *National Science Education Standards*? (This question was included as a prompt to stimulate preservice teachers to think about the science curriculum as they designed their field trips to the zoo.)

We used the questions to establish a baseline of pre-visit pedagogical knowledge that could be compared with post-visit pedagogical knowledge and post-visit field trip design. By capturing pre- and post-visit zoo field trip designs, we were able to establish if preservice teachers included features of the FTI. Additionally, we were trying to establish if preservice teachers' zoo field trip designs would be affected by listening to school groups' conversations during a zoo visit.

To elicit a change in preservice teachers' zoo field trip designs, they were asked to record elementary school students' conversations during a zoo field trip. After a review of the published research articles concerning the use of the Tunncliffe Conversation Observation Record (TCOR) as a data-gathering tool (Tunncliffe, 1995, 1996a, 1996b, 1996c, 1997a, 1997b, 1998, 2000, 2001; Tunncliffe et al., 1997), we thought that the TCOR might be an effective tool to assist preservice teachers in recording students' conversations in a zoo exhibit and thus, given what we know about students' conversations at the zoo, prompt reflective changes in the preservice teachers' field trip designs.

The TCOR was developed by coding conversations according to a systemic network based on the work of Bliss, Monk, and Ogborn (1983). A systemic network is a type of analysis that changes qualitative data into quantifiable data and is a means of grouping or categorizing things, in this case conversations, to be a parsimonious representation of the data, while preserving the relationships between categories in such a way that comparisons can be made between groups. The network can be regarded analogously as the sets of nested boxes into which the researcher puts each part of the conversation, while at the other end is the main descriptor, in this case 'groups' comments'. The reliability of the TCOR has been tested to a 92% inter-rater reliability. Therefore, the TCOR as a data-gathering tool has proven to be reliable and valid in establishing the content of zoo visitors' conversations while they interact in an exhibit. Since the ACOR used in this study was modified slightly from the original, it was called the PTCOR (Figure 2). The PTCOR allowed the preservice teachers to focus on the conversations they heard among elementary students, teachers, and/or chaperones in a zoo exhibit.

Pre-zoo visit. Prior to the zoo visit, we met with the preservice teachers and asked them to answer the three questions. (1) Have you ever taken students to the zoo? (2) Design a class visit for your students to the zoo. Include as much information as possible about your design. (3) How does your zoo visit follow National Education Standards? The preservice teachers in this study had never taken students

to the zoo. The preservice teachers took approximately 40 min (e.g. van der Valk & Broekman, 1999) to design their field trip. Only after the preservice teachers completed their field trip designs were they informed that they would be visiting the zoo to listen to and record elementary students' conversations while on a field trip to the zoo.

During-zoo visit. The 105 preservice teachers were divided into four different groups. Each group attended the zoo on a different day and all groups listened to elementary school students' conversations for one hour during their zoo visit.

The preservice teachers were asked to choose an exhibit where they would sit and record the conversations of elementary school groups using the PTCOR (Figure 2). If two preservice teachers chose the same exhibit, they were located in different areas of the exhibit so that they would be recording different conversations.

In order to ensure the reliability of the PTCOR, we met with the preservice teachers and discussed its use prior to the zoo visit. To record spontaneous conversations, preservice teachers were told to make a mark in the coordinating box when someone in the student group made a reference to a category. For example, if someone in a group said, 'Hey, look! It's over there! It's a cat', then the preservice teacher would make a mark in the boxes next to location and naming. The occurrence of the term was the focus of the students' study, not the frequency of times the term was repeated. Once the preservice teacher made a mark in a 'term box' for that group, they were told not to make another mark in that 'term box'. For example, if anyone else in this group continued to name the 'cat', the preservice teacher was told not to place additional marks in the 'naming' term box. Preservice teachers listened to school group's conversations for a total of two hours and completed the PTCOR, subsequently becoming more aware of the topics that dominated the conversations of school groups during a zoo visit. There were seven columns per PTCOR, but preservice teachers were provided with enough copies of the PTCOR so that they could record as many conversations as possible in two hours.

Post-zoo visit. As an out-of-class assignment, the preservice teachers were asked to analyze the data they gathered using the PTCOR, consider their experiences while they watched and listened to school groups, and write a one to two page reflective paper explaining what the data revealed and how the experience of listening to students' conversations at the zoo affected their thoughts about designing field trips. When they returned to class with their PTCOR and written reflection, they were asked to respond to the same three questions that were posed prior to their zoo visit. They were given as much time as they needed, but the process typically took them approximately 40 min. The same questions were asked a second time to determine if listening to school groups would elicit changes in the preservice teachers' field trip designs.

Data Analysis

Preservice Teacher Conversation Observation Record

All quantitative data collected by the preservice teachers using the PTCOR were tallied as a total for each of the conversation categories (Table 1).

Questions

The pre- and post-visit field trip designs were matched for each preservice teacher, and the data were independently read and coded by three reviewers with an inter-rater reliability of 90%. Any codes that did not match were discussed between the reviewers until a consensus was reached. The reviewers were a second-year education research assistant, a 14-year veteran middle school art teacher, and one of the authors. Reviewers were asked to determine if the preservice teachers mentioned the topics listed in the FTI in their zoo field trip designs. The responses were not judged on the depth of the answer. The criterion for an FTI component was met if the preservice teacher included that element in their field trip design (Table 2).

The reviewers were asked to code the designs by listing the number of the category, using numbers 1 through 9, and then assigning that category a one (the category was mentioned) or a zero (the category was not mentioned). For example, a code of 1-1 meant that the preservice teacher mentioned aspects of pre-visit activities, whereas a code of 1-0 meant that pre-visit activities were not mentioned. For example,

1-1

I would have my students do research projects on a species they would be seeing at the zoo. Before going to the zoo, the students would do internet based research on

Table 1. Total PTCOR results for all conversations recorded at the zoo (3,006 people, 636 conversations recorded)

Terms	Conversations	Percentage
Management	244	76
Naming	238	75
Location	238	75
Behavior	201	63
Emotional/affective	182	57
Exhibits	135	42
Social	133	42
Informational about animals	133	42
Body parts	130	41
Other	64	20
Habitat/conservation	35	11

Table 2. Representative quotes taken from students' field trip designs

Field trip inventory	Students' representative quotes
<i>Pre-visit activities:</i> classroom activities completed prior to the visit	<p>'I would create a scavenger hunt. I would prepare a handout of animals to look for. ... Students would be assigned to different animals'</p> <p>'Students create a zoo log before they leave and then at the zoo have to write 3 facts of 10 different animals down'</p>
<i>During-visit activities:</i> field trip activities completed during the visit	<p>'I would have an activity that requires students to read the exhibit signs because I did not observe any field trip groups discuss the signs or talk about the habitat of the animals'</p> <p>'Students would be expected to pick their favorite animal they saw, draw it, and write a few sentences about the animal. That could include eating habits, environment, skin color, etc.'</p>
<i>Post-visit activities:</i> classroom activities completed after the visit	<p>'Each group would spend a significant amount of time observing 1 specific exhibit. This way each group would learn a lot about 1 species and then teach the rest of the class about what they learned through research before and after the field trip and through their observations at the zoo'</p> <p>'When they return to school they would create a replica of their favorite animal habitat and do research on how it compared to this animals natural wild habitat'</p>
<i>Problem-solving:</i> activities described allow students to think creatively and critically. This did not include a fill-in-the-blank worksheet. Students were challenged to interpret new information	<p>'I would have students discuss how zoos are related to being a good citizens and being able to act respectfully in different areas of society'</p> <p>'I teach kindergarten, but I would have students count the numbers of legs they see on animals. Then I would have them try to figure out why some animals have 4 legs and why some animals have 2 legs and why some animals have no legs'</p>
<i>Facility staff:</i> preservice teachers mentioned how students will interact with staff. For example, mentioning zoo staff and meeting with zoo staff	<p>'I would like to have a zoo representative come to the class to build interest'</p> <p>'I would also maybe have a guided tour with a zoo expert so that the students could get the most out of their trip'</p>

Student groups: any mention of students having fun, students being grouped with their friends, taking into consideration how well they interacted, and their ability to work well together. This did not include general comments concerning management, such as chaperones

Advanced organizers: any information provided to students prior to the zoo visit, a map of the facility, a description of the facility, a list of what students will see, and the places they will visit

Control of visit: any mention of students being allowed to choose their itinerary during the visit

Control of learning: any mention of students given an opportunity to determine the organisms or exhibits, which they would like to study

‘I would just want the students to explore and enjoy’
‘We would discuss behaviors and everyone would choose a buddy to be with at all times’

‘I like this idea and probably would introduce the students prior also of which animals they are about to see. They can in this way research some on their own and compare their facts with those at the zoo’
‘I would first prepare them while at school (either a couple days before, and/or up to the day of the trip) by going over activities, things they may see, info they might need/want to know’

‘I would have them design a schedule ahead of time, as a class. This way, I would know what they are interested in seeing’
‘Maybe students could pick what group they want to be in (considering behavior)’

‘I would let students pick one exhibit to study’
‘I would let students pick one animal to find out information about. When they are in that animal’s exhibit they will teach the other students what they know about that animal’

2-1

their animal. At the zoo, the students would spend a significant amount of time observing the behaviors and environment of their animal, recording their

3-1

observations. After the trip, the students would compile their online research with their field study to create a full research project, especially concentrating on what

4-1

they learned in contrast and comparison to their initial research.

Therefore, each pre- and post-visit design was analyzed nine times to determine the presence or absence of each of the nine categories. The reviewers were instructed to read and code for each of the categories separately so as not to confuse or lose data. Once a field trip category was coded for within a field trip design, it was not coded again. Therefore, the data were coded for the presence (1) or absence (0) of a category, not for frequency. The inclusion of the categories in the preservice teachers' field trip designs was examined pre- and post-visit. The reflections were read, and similar answers were counted.

Results

PTCOR and Analysis

Preservice teachers recorded a total of 1,524 conversations, involving 3,615 children and adults, during their visits to the zoo. PTCOR results (Table 1) showed that management (76%), naming (75%), and the location of the organism (75%) accounted for the majority of the students', chaperones' and teachers' conversations. Habitat/conservation comments were recorded the least (11%).

After analyzing their data, the preservice teachers were asked to write a one to two page paper describing their data and reflecting on what they learned about taking students on field trips. The writings were read by the authors to determine categories. Twelve categories of information emerged from these written reflective papers. They were (followed by the number of students, $n = 103$, who mentioned the category): it is important to plan (67), no learning occurs during a field trip (57), students are not well managed (49), staff are important (29), students need to have fun (27), field trips are difficult (26), it is important to visit only a few exhibits and not the entire zoo (22), field trips are a waste of time (19), during-visit activities (9), pre-visit activities (8), the field trip needs to be well organized (8), and post-visit activities (4).

Field Trip Inventory

Preservice teachers were asked the same three questions before and after they listened to school groups' conversations at the zoo. After the pre- and post-visit field trip

Table 3. FTI categories ranked by frequency prior to and after listening to students' conversations

FTI category rankings prior to listening to students' conversations	FTI category rankings after listening to students' conversations
During-visit activities (67)	During-visit activities (89)
Student groups (56)	Student groups (83)
Pre-visit activities (55)	Post-visit activities (53)
Post-visit activities (52)	Advanced organizers (52)
Advanced organizers (32)	Pre-visit activities (47)
Control of learning (18)	Control of visit (18)
Control of visit (7)	Control of learning (18)
Facility staff (5)	Facility staff (17)
Problem-solving (2)	Problem-solving (16)

designs were analyzed, we determined that two of the preservice teachers had taken their classroom students to the zoo between the pre-zoo and post-zoo questionnaires, so we excluded them from the study. Data were analyzed for 103 preservice teachers.

Table 3 is an examination of the rankings of the various FTI components both pre- and post-zoo visit. The order of the components included in the field trip design changed after preservice teachers listened to elementary student groups' conversations in a zoo exhibit. The discussion of the results was based on the order of the theoretical framework (FTI), not the rankings that resulted from the data analysis.

Cognitive: Pre-visit, During-visit, Post-visit activities, and Problem-solving

Prior to listening to the school groups, 55 of the 103 preservice teachers mentioned pre-visit activities while answering question 2 on the survey (Figure 3). After listening

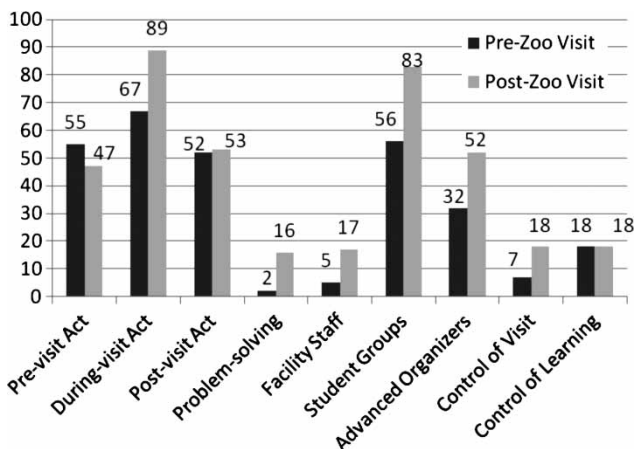


Figure 3. Preservice teachers who mentioned the FTI components (n = 103)

to school groups, the number of preservice teachers who mentioned pre-visit activities was 47. Preservice teachers who mentioned pre-visit activities identified them in the following ways: read books, spend time preparing (no detail given), talk about the trip throughout the week, do a themed unit on zoos, or discuss the different types of animals. The pre-visit activities designed by the preservice teachers did not have depth in terms of pedagogy or content knowledge. For example, the most comprehensive pre-visit activity description was 'I would design a unit about animals and animal groups. During the unit, I will read books about animals, have students read books about animals and we would discuss the different habitats animals live in'.

During-visit activities were described more often than any of the other categories, prior to (67) and after (89) listening to school groups' conversations (Table 3). Twenty of the preservice teachers, prior to and after listening to conversations, thought that '... a scavenger hunt or fact finding task...' was important. A preservice teacher described her scavenger hunt in the following way: 'I would have it set up like a scavenger hunt. Each group would have to find certain information. This way they would have to read the exhibit signs'. Preservice teachers, who did not specifically name a 'scavenger hunt', did mention similar ideas for activities that students would perform during the zoo visit. For example, one such approach to during-visit activities was described as 'an interactive map/question sheet for students to fill out as they go through the zoo. The students can write the names of the animals they visit in each section of the zoo'.

Prior to the zoo visit, preservice teachers mentioned post-visit activities (52) less often than pre-visit (55) and during-visit activities (67) (Table 3). After the preservice teachers visited the zoo, only one student mentioned post-visit activities (53). Therefore, approximately half of the teachers mentioned post-visit activities, both before and after they listened to students' conversations at zoo exhibits. Additionally, preservice teachers did not identify specific plans for activities that students would complete after a zoo visit.

Statements that were identified as post-zoo visit activity comments were preceded by the words 'after the visit they will...'. This was followed by the following: write essays, create a replica of their favorite animal's habitat, do research on their favorite animals, present their experiences to the class, write a short summary of what they learned, or write a poem. Prior to the zoo visit, in which preservice teachers listened to elementary students' conversations, 52 preservice teachers mentioned post-zoo visit activities (Figure 3). After listening to students during a zoo visit, 53 preservice teachers mentioned post-zoo visit activities. For example, a preservice teacher wrote that, 'When they return to school they would create a replica of their favorite animal habitat and do research on how it compared to this animal's natural wild habitat'.

Prior to listening to students' conversations, two preservice teachers mentioned problem-solving (Table 1 and Figure 3). However, in the second lesson description, 16 students mentioned problem-solving. These descriptions included 'I would have students discuss how zoos are related to being a good citizen and being able to act respectfully in different areas of society'.

Procedural: Facilities Staff and Advanced Organizers

Before visiting the zoo and listening to elementary students' conversations, five preservice teachers mentioned facility staff. After listening to students' conversations, 17 preservice teachers mentioned facility staff (Table 3). Preservice teachers stated that they would contact the zoo prior to the visit, request learning materials, set up a meeting between students and staff, and determine when zoo staff would be feeding animals.

Advanced organizers were described by 32 preservice teachers prior to the zoo visit and 52 preservice teachers after the zoo visit. Generally, preservice teachers stated that students would be provided with a list of animals they might see, they would be given a map of the zoo before they visited, and students would use maps to plan their route through the zoo. Additionally, preservice teachers determined that it would be better to visit only one section of the zoo, focus on that section, and have students spend more time in one exhibit.

Social: Student Groups, Control of Visit, and Control of Learning

Social comments were not considered unless they specifically described student grouping, chaperone involvement, student choice, and students' control of the visit and what they learned (Table 2). Comments concerning the number of students and chaperones in the group were not counted as social comments because they were not depicted in the FTI categories. Fifty-six preservice teachers mentioned student grouping based on the criteria listed in the FTI prior to the zoo visit. However, after listening to students' conversations, 83 preservice teachers explained how they would put students in groups based on experience and would consider how well they got along (Table 3). Thirty-four of the 83 preservice teachers, who referred to grouping, thought that including chaperones in the planning was important.

Control of visit (7) and control of learning (18) were not used often in preservice teachers' field trip designs (Table 1). Moreover, after listening to children's conversations during a zoo visit, preservice teachers' usage of control of visit (18) comments more than doubled, but their use of control of learning (18) comments did not increase.

Reflection

After the preservice teachers observed the students and analyzed the PTCOR data, they were asked to reflect on their observations (Table 4). The preservice teachers' reflections of the field trip, in which they observed students, revealed that the preservice teachers thought: (1) learning did not occur (84) (2) the field trips was a waste of time (66), (3) students were not interested in the visit (45), and (4) chaperones did not do anything (42). Based on these observations, the preservice teachers stated that they realized field trips are difficult (58) and therefore planning is important (93).

Table 4. Teachers' reflections after listening to school group's conversations at a zoo exhibit ($n = 105$)

Reflection	Number of teachers
Planning is important	93
Students do not learn	84
Field trips are a waste of time	66
I see how difficult field trips are	58
The field trip should focus on one part of the zoo	49
Students were interested	45
Chaperones do not do anything	42
Teachers need to get students excited about the field trip	34
Group size is important	28

Preservice teachers explained that when planning a field trip they need to focus on one part of the zoo (49), get students excited about the trip (34), and consider group size (28).

A preservice teacher stated that

As a teacher, I now see how hard it is to have a successful field trip. It's obvious from the data that the children didn't learn very much about the exhibit(s) or animals. To have a field trip like this, it would be very beneficial to have groups of students observe one exhibit that they can report on. This way the students have a guide to help them truly learn something new while still having fun. If teachers prepare the students in advance, then less time will be spent on management and more will be spent on learning.

Limitations of the Study

This study has some limitations that restrict its generalizability. This study was completed in a zoo by preservice elementary teachers, and findings may not be generalizable to other places of informal learning, other grade levels, and practicing classroom teachers. Additionally, preservice teachers only visited the zoo and listened to school groups' conversations once. This may affect the validity of the study.

The data collection is limited to pre- and post-test questionnaires completed by preservice teachers and the preservice teachers' use of a conversation analysis tool. The conversation analysis tool allows the preservice teachers to record conversational topics, which occur between children and adults in exhibits during a field trip.

Discussion

The expectation that preservice teachers listening to elementary students' conversations during a zoo field trip might have some positive impact on the preservice teachers was supported for this sample. Our analysis reveals that the preservice elementary teachers in this study did benefit from listening to and tabulating elementary students' conversations during a zoo field trip. Preservice teachers' awareness of

the need to design activities for their students while visiting the zoo and to include problem-solving activities, to attend to staff interactions, student group dynamics, create advanced organizers, and plan for student control of learning increased. Recording elementary students' conversations and reflecting on the observation not only provided the preservice teachers an opportunity to listen to the interactions among students (and teachers and chaperones), but was also beneficial in increasing their awareness of interactions between students, chaperones, and zoo staff. After listening to students visiting a zoo and reflecting on the visit, the preservice teachers identified cognitive objectives as important characteristics of a field trip design and recognized the significance of field trip preparation.

Even though preservice teachers in this study identify cognitive objectives and previous studies describe the importance of inservice teachers' scaffolding the learning before, during, and after the zoo visit (Kisiel, 2007, 2010; Davidson et al., 2010), the during-zoo lessons designed by the teachers include simple question and answer worksheets. Unfortunately, this means that during the zoo visit, students will not be involved in problem-solving and may not be able to tie the reason for the visit to the classroom. What and how the students learn depends on the students' learning opportunities. Therefore, if teachers continue to use scavenger hunts as a basis for learning, then both teachers and students are minimizing the potential value of a field trip.

The preservice teachers' reflections are an important aspect of this study. The reflections reveal that when the preservice teachers are asked to listen to student groups during a zoo visit, the teachers believe that learning does not occur during the zoo visit and that field trips are a waste of time. Due to these observations, preservice teachers state that field trip preparation is important. However, the reflections do not influence major changes in their field trip designs. Therefore, we suggest that other interventions are needed, such as classroom discussions concerning the preservice teachers' findings and how they influence field trip design. Additionally, assigning readings concerning field trip design research will provide preservice teachers with supplementary information.

Providing the preservice teachers with an opportunity to listen to students' conversations during a zoo visit gives them a chance of increasing content knowledge and pedagogical knowledge. Based on this study, we believe that the implications for university educators are that field trip design and informal educational experiences should be provided for future classroom teachers. If we work with preservice teachers to design field trips, before they become overwhelmed with their own classroom, a field trip is more likely to have an educational context. Allowing preservice teachers to listen to students' spontaneous conversations during a field trip can be employed to serve in the preparation of teachers. Listening to students' conversations during field trips has the potential to generate knowledge about promoting reflective practice; hence, providing preservice teachers with an opportunity to reflect on their students' cognitive and affective learning. Taken together, the various components of this study and other studies on field trip design suggest that the promotion of field trip design training in teacher education programs may lead to more educationally focussed field trips.

According to the findings from this study, preservice teachers recognize that field trip preparation is important, but do not understand the preparation involved in designing quality field trip experiences. This study supports the conclusion that preservice teachers would benefit from the inclusion of field trip pedagogy in university teacher training programs. Preservice teacher educators should introduce preservice teachers to the role of the field trip and identify how the field trip will enhance the curriculum for the preservice teachers' classroom students. Preservice teachers should be introduced to the idea that preparation, follow-up activities, and reinforcement discussion are a vital part of field trip planning. Moreover, the visit should be planned as a three-part unit: before, during, and after the field trip. Preservice teacher educators need to encourage the preservice teachers to identify the concepts and skills that a field trip can develop. By providing an effective, informative field trip experience for preservice teachers, teacher educators will reinforce the field trip concepts developed in this study. Preservice teachers need to discover that a successful informal experience scaffolds the classroom students' formal conceptual development and may have a profound effect on the students and their motivation for learning.

The FTI model (Figure 1) developed in this study provides a checklist of the knowledge a preservice teacher needs to develop a cognitively successful field trip. Preservice teacher educators may use the FTI as a teaching tool or checklist to assist preservice teachers in assuring that their field trip designs cognitively engage students. The cognitive, procedural, and social characteristics must be integrated and overlap to build a strong field trip design. If one of the field trip characteristics is removed, the framework collapses and cognitive engagement may not occur. If teachers do not take into account the cognitive, procedural, and social characteristics of a good field trip design, then a learning experience may not take place. For example, students need to have problem-solving interactions before, during, and after the field trip in order to maximize their cognitive experiences. This would require the teachers to work with the zoo's educators to plan the visit and to include opportunities for students to interact with the zoo's staff. Moreover, allowing students' input into the development of the field trip experience is an important element of cognitive development. Teachers need to consider how students are grouped and allow students some say in what they see and learn.

In conclusion, this study suggests two major activities that would facilitate student learning in informal settings. First, that informal institutions and preservice teacher educators need to collaborate and secondly, that preservice teacher education programs need to teach field trip design, which should include: (1) identifying the field trip purpose; (2) recognizing curriculum-based field trip objectives; (3) sharing the objectives of the field trip with students; and (4) planning relevant before, during, and after visit activities (Figure 1).

Future investigations concerning field trips should include a larger data pool to ensure statistical power and should include personal interviews to capture ideas not included in the questionnaires. Additionally, the FTI was not used to establish the quality of the designs, but was used to analyze if the preservice teachers included the traits of the FTI. Therefore, further studies should use the FTI to investigate

the quality of the field trip designs. Moreover, this study was completed with elementary preservice teachers. Therefore, the study could be expanded to include middle level or secondary preservice teachers and inservice teachers. This study provides a baseline for using the FTI and could be used as a comparison for future research. Additional research design elements could also include an experimental group that learns to use the FTI prior to the field trip design study.

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