The Measurement of Students' Attitudes Towards Scientific Field Trips

NIR ORION and AVI HOFSTEIN
Department of Science Teaching; The Weizmann Institute of Science, Rehovot 76100, Israel

Introduction

The importance and educational effectiveness of field trips, as an integral part of science education at the secondary school level, has been well documented (Brady, 1972; Mason, 1980; McKenzie, Utgard, & Lisowski, 1986; Lopushinsky & Besaw, 1986; Todd, 1988; Millet, 1988). Mallinson (1957), for example, claimed that "if one were to prepare a bibliography of articles from science journals extolling the possible values of field trips it would no doubt be as long as your arm. Indeed it might be as long as a dozen arms laid end to end."

Although an enormous amount has been published about field trips in science education, only a few of them involved quantitative research. Of those that did, the majority dealt with the cognitive value of field trips rather than the affective value. The available educational research about the field trip as a learning environment does not allow any definite conclusions both in the cognitive and affective domains. Most of the studies compared teaching strategies with and without field trips. Some of the studies report that the ability of students who participated in a field trip to observe, memorize, and recall facts, was significantly higher than that of the control group who did not participate in the field trip (Rosenthal, 1968; McCuslin, 1970; Brady, 1972; Folkomer, 1981; MacKenzie & White, 1982). Other studies report no significant differences in achievement (Benz, 1962; Glen, 1968;

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McNamara, 1971; Peck, 1975; Korn & Baker, 1979). Kern and Carpenter (1986) suggest that the advantage of field trips lies in attudinal aspects of the learning process rather than cognitive ones.

We suggest that the controversy in the literature reflects the status of the research in the area of outdoor education. There is a gap between expectations of teachers and researchers from field trips and what is actually known about the field trip as a unique learning environment. The development of standardized research tools could contribute to the closing of this gap.

Rationale and Purpose of Study

An attitude towards field trip questionnaire was developed in the context of a comprehensive study in the area of geological education in Israel (Orion, 1989; Orion, 1989a). The study was conducted in order to identify factors that influence the learning ability of students during a field trip in a natural environment (Orion, Hofstein & Mazor, 1988). This study investigated factors such as students' previous knowledge of the field trip topics, previous acquaintance with the area, past experience in the field, attitudes towards the subject matter, and previous attitudes towards field trips.

The instrument was developed in the context of: (1) a formative and summative evaluation of geological field trips, and (2) an investigation of the factors that influence the educational effectiveness of field trips.

The Development of the Inventory

The development of a reliable and valid attitude measure is a process that consists of several distinct stages (Gardner, 1975; Koballa, 1984). The main stages in this study were:

1. conceptualization—the attitude dimensions of the field trip;
2. item formulation;
3. content validation;
4. statistical analysis—construct validity, stage A; (factor analytic investigation and Cronbach's α reliability coefficient);
5. comparison of the expert's judgment with the statistical analysis; and
6. statistical analysis–construct validity, stage B (factor analytical investigation and Cronbach's α coefficient of the improved questionnaire).

Stage 1: Conceptualization

The first stage in the development of the instrument was to identify the various dimensions and components of students' attitude towards field trips. On the basis of a pilot study (Orion, 1984; Orion, Hofstein, & Mazor, 1986) using field observations, interviews with teachers and students and open-ended questionnaires, as well as personal experience with students in the field, the following four dimensions of the attitudes towards field trips were identified.

The Learning Aspect of the Field Trip

This aspect examines the various components of the students' perception of a field trip as a learning event; e.g., the understanding of concepts using field trips, the field trip as an instructional tool to enhance the learning of concepts, and the field trip as a motivation for learning.

The Social Aspect of the Field Trip

Outdoor activities are usually perceived, at all ages, as social rather than educational events, particularly because the unusual constraints of the classroom are removed. Our observations show that, generally speaking, the social aspect of a field trip is at the expense of the learning aspect (Orion, 1984).

The Adventure Aspect

For many students, the field trip is associated with past experiences which include leisure activities, e.g., visiting caves, climbing mountains, and crossing rivers. Students that have enjoyed such excursions in the past, may have certain "leisure expectations" for a learning field trip, whose affect is quite different. On the other hand, students who have had negative experiences on leisure trips may transfer previous attitudes to the learning field trip.

The Environmental Aspect

In general, one would expect that outdoor activities (including field trips) will increase the link between a person and his/her environment.

Stage 2: Item Formulation

In the construction of items phase; fifty items were originally constructed to represent the four attitude dimensions. Each item is assessed on a four-point Likert-type scale (4—fully agree, 3—agree, 2—disagree, 1—fully disagree).

Stage 3: Content Validation

In the judgment phase, a group of 10 curriculum developers and teachers were selected to validate the content of the questionnaire. They were given the items and guidelines prepared using the criteria listed by Edwards (1957). The experts were asked to group the items according to dimensions and to assess the quality of each item, in the context of clarity, ambiguity, generality, etc.

The judges identified five different dimensions and 37 "good" items. The remaining items were abandoned either because they did not satisfy the quality criteria or because the experts disagreed about the dimension to which the items belonged.

Stage 4: Statistical Analyses—Construct Validation

The original 37-item inventory was administered in the academic year 1986–1987 to a sample of 287 grade 9–11 students (age 14–17), enrolled in 12 classes from eight schools in Israel.

The items were intercorrelated and the correlation matrix was factor analyzed using Principal Factor Analysis with Varimax rotation. Five factors were retained covering 50% of the total variance. Loadings exceeding 0.4 were considered when identifying the factors. Five items which had loadings below 0.4 were omitted.

The factors based on the Factor Analysis were unit weighted. The factors obtained through this procedure are similar to the ones obtained from the content validation procedure conducted by the experts. This finding supports the content validity of the measure. Four of the five factors are identical to the dimensions identified in the conceptualization stage: learning in the field, the social aspect of the field trip, the adventure aspect, and the environmental aspect. The factor analytic investigation supports the judgment made by the experts, namely that the learning dimension should be separated into two independent scales: "the field trip as a learning tool or learning aid" and "individualized learning during the field trip." The factor analytic investigation confirmed the hypothesis that attitude towards field trips is not unidimensional and consists of five distinct dimensions. The internal consistency of each factor was satisfactory, as evidenced by reasonable values of the Cronbach's α reliability coefficient.

The refined 32-item inventory was used again in the next academic year (1987–1988) in a sample of 371 students grades 9–11 in 17 classes (Cronbach's α for the total inventory is 0.86). The Factor Analysis and Cronbach's α reliability coefficient (Table 1) revealed a similar secnario to the one obtained in the first year.

The five dimensions (scales) and sample items of the final questionnaire are given in Table 2. (the final questionnaire is presented in the Appendix).

Examples of Using the Inventory for Further Statistical Analysis

In this part, preliminary results of an evaluation study in which the inventory was used in research are presented. The aim of this section is to present the reader some examples of the use of the inventory in research.

Comparison of 9th-, 10th-, and 11th-Grade Students

The ability of the inventory to identify differences in attitude due to grade variable was tested by comparing students' attitudes towards field trips. Two groups were involved in this study: group 1—combined population of 9th- and 10th-grade students ($N = 405$); group 2—11th-grade students ($N = 298$).

The first group consisted of students who were in the compulsory phase of their education, whereas the second group opted to study geography. Table 3 presents the mean and standard deviation obtained for each group in the various scales of the attitude inventory, together with the concluding t-values. These results were obtained prior to the geological field trips, i.e., based on students general and

TABLE 1
Factor Analysis (Varimax Rotation)—Attitudes Towards Field Trips (N = 371)

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1	0.70				
2			0.60		
3	0.45				
4				0.60	
5	0.71				
6			0.45		
7	0.61				
8				0.80	
9	0.62				
10			0.42		
11					0.44
12			0.40		
13					0.53
14	0.46				
15	0.64				
16		0.49			
17	0.59				
18					0.57
19				0.76	
20			0.58		
21		0.54			
22					0.57
23			0.62		
24	0.40				
25	0.53				
26					0.59
27	0.55				
28			0.52		
29	0.49				
30				0.44	
31		0.40			
32			0.40		
Variance	15%	5%	7%	6.8%	7.5%
Cronbach's α	0.87	0.62	0.71	0.78	0.77

previous experience with field trips in the context of science education. Significant differences for the two groups were obtained on the scales which deal with the learning and social aspects of field trips. The results show that the 11th-grade students perceived the field trip more as a learning event compared with the 9th- and 10th-grade population. It was found that the 11th-grade students also regarded individualized learning as more significant. On the other hand, 9th- and 10th-grade students regarded the field trip as more of a social event.

TABLE 2
The Dimensions of the Inventory and Sample Items

No.	Dimension	Sample Items
1	Learning tool	1. The field trip helps in the understanding of material learned in classroom. 2. The field trip is important since it demonstrates and illustrates concepts learned in class.
2	Individualized learning	1. Working individually during a field trip is important for understanding the learning material. 2. In the field trip, working with worksheets interferes with enjoyment of the event.
3	Social aspect	1. The field trip is important for me, since it helps me to get to know more friends. 2. What I like best in field trips are the jokes told by my friends.
4	Adventure aspect	1. I like field trips which involve a lot of walking. 2. What I like best in a field trip is the adventure; e.g., climbing mountains, crossing rivers, etc.
5	Environmental aspect	1. I like to go on field trips, since it is important for me to understand the environment in which I live. 2. The field trip increases one's awareness of environmental issues.

It seems that although both groups considered field trips rewarding and enjoyable, 9th- and 10th-grade students' attitudes are influenced more by the social and adventure aspects of the field trip than by the learning aspects.

Since the data was gathered before the field trip, the differences may be explained as due to maturation, or they may reflect previous experiences in field trips, or both. This finding emphasizes the need for preparing the students, before taking a learning field trip, in order to reduce the gap between their expectations and the reality they will meet.

TABLE 3
***t*-Test—Comparison of 9th- and 10th-grade Students with 11th Grade (Pre-Field Trip) (Likert type 1–4)**

	9 + 10th (N = 405)		11th (N = 298)			
Scale	M	SD	M	SD	t	P
Learning tool	3.16	0.44	3.28	0.42	3.7	0.0002
Individualized learning	2.31	0.60	2.44	0.61	2.7	0.008
Social aspect	3.01	0.44	2.90	0.42	3.2	0.002
Adventurous aspect	2.98	0.70	2.90	0.66	1.6	NS
Environmental aspect	3.03	0.54	3.07	0.57	0.9	NS

TABLE 4
***t*-Test—Comparison of the Pre–Post Attitudes Towards Field Trips of the 11th-Grade Students (Likert-type 1–4) (*N* = 177)**

Scale	Pre		Post			
	M	SD	M	SD	*t*	*P*
Learning tool	3.3	0.4	3.4	0.4	2.1	0.04
Individualized learning	2.4	0.6	2.8	0.6	7.4	0.0001
Social aspect	2.9	0.4	2.7	0.4	5.2	0.0001
Adventurous aspect	2.9	0.7	2.9	0.6	1.2	NS
Environmental aspect	3.0	0.5	3.0	0.5	0.1	NS

Students' attitudes were also obtained after participating on a geological field trip. This was a one-day trip which included seven learning stations. The learning at each station was conducted in two stages. Initially, the students were divided into teams that worked separately, guided by a workbooklet. This was followed by a group discussion conducted by the teacher, to summarize the learning activities at the station (Orion, 1989). Tables 4 and 5 present *t*-test analyses comparing pre- and post-attitudes of the two grade groups.

From Tables 4 and 5 it is seen that the 11th-grade population demonstrated significant improvement in the attitude concerning the learning aspect of the field trip. On the other hand, decline in attitude was obtained for the scale which covers the social aspect of the field trip. For the younger group (9th- and 10th-grade classes), a decline in the attitude concerning the social aspect of field trip was also observed.

The significant increase in the 11th-grade attitude towards the individualized learning dimension, together with the significant decrease in the "social" and "adventure" dimension, can be regarded as a desirable change. The 11th-grade students' perceived the field trip less as a social–adventurous event, and more as a learning event.

From these findings, one can conclude that, for the 11th-grade group, the geological field trip was more of a learning event, compared with their younger pop-

TABLE 5
***t*-Test—Comparison of the Pre–Post Attitudes Towards Field Trips of the 9th and 10th-Grade Students (Likert-type 1–4) (*N* = 121)**

Scale	Pre		Post			
	M	SD	M	SD	*t*	*P*
Learning tool	3.2	0.4	3.2	0.5	0.2	NS
Individualized learning	2.4	0.6	2.5	0.6	0.8	NS
Social aspect	2.9	0.5	2.8	0.5	2.7	0.01
Adventurous aspect	3.1	0.7	2.7	0.7	5.9	0.0001
Environmental aspect	3.1	0.5	3.0	0.5	1.9	NS

TABLE 6
***t*-Test—Comparison of Boys and Girls (Pre-Field Trip) (Likert-type 1–4)**

	Girls (N = 360)		Boys (N = 300)			
Scale	M	SD	M	SD	t	P
Learning tool	3.25	0.41	3.16	0.47	2.4	0.02
Individualized learning	2.41	0.57	2.30	0.66	2.3	0.02
Social aspect	2.96	0.44	2.98	0.42	0.6	NS
Adventurous aspect	2.88	0.68	3.05	0.69	3.2	0.001
Environmental aspect	3.07	0.53	3.02	0.57	1.2	NS

ulation counterparts. This conclusion is supported by other sources of information conducted in the study (observations, interviews, achievement test) that indicated that, for most of the 11th-grade classes, this field trip was indeed a learning event.

Gender Differences

The mean response of boys' and girls' perceptions of a field trip, together with t-values of differences, is presented in Table 6. These results were obtained prior to the geological field trip. On the whole, the differences between boys and girls concerning their attitudes towards field trips are fairly low. Minor differences are seen (Table 6) where boys rated the adventure aspect significantly higher, and the girls rated the two learning scales, "learning tool" and "individualized learning," significantly higher. These results seem reasonable, since it could be expected that boys prefer physical activities.

Comparison between the attitudes of boys and girls before and after participating in the geological field trip showed no significant difference between the two populations. This finding strengthens our notion that field trips are as attractive to boys as they are for girls. In an era when we try to abolish gender differences in sciences, these findings are important and encouraging. More research is needed in this area.

Summary and Applications

The major findings and conclusions of this study are:

1. The study verified the assumption that "attitudes towards field trips" is not unidimensional.
2. Five dimensions were found: "instructional learning tool," "individualized learning," "social event," "adventure event," and "environmental aspect."
3. The inventory was found to be valid and reliable.
4. The inventory was found to be sensitive to differences in age and gender.
5. The inventory was found to be a useful measure for pre- and post-research, which involve students' perceptions and attitudes about field trips.

This inventory was developed in the context of geological education. However, it can be used to assess student perceptions in other scientific disciplines (i.e.,

biology, environmental education, industrial chemistry, etc.). It is also suggested that the inventory could be used by individual teachers to obtain information on their students' expectations before the field trip and as a feedback tool after the event. This inventory could be used as part of a more comprehensive study in which different field trip techniques are tested, e.g., written descriptions versus oral, long stays at a few sites versus short stays at many sites, etc. It is suggested that the inventory could also be used in other countries with different cultures and educational systems.

Appendix

Attitudes Towards Field Trips (*Final Questionnaire*)

1. The field trip helps in understanding of material learned in class.
2. What I like best in field trips are the jokes told by my friends.
3. The field trip is a waste of time (−).*
4. What I like in a field trip is the adventure; e.g., climbing mountains, crossing rivers, etc.
5. I would like to participate in more field trips since this is a good way to learn the subject.
6. I would like to have more field trips since they are a lot of fun.
7. The things I observe in the field trip do not help me in understanding the material taught in class (−).
8. I like field trips which involve a lot of walking.
9. It is a pity that we do not have more field trips, since this is an enjoyable way to learn.
10. What I like most on field trips are the adventures.
11. I like to go on field trips, since it is important for me to understand the environment in which I live.
12. I return from field trips with a lot of experiences.
13. The field trip increases one's awareness of environmental issues.
14. After a field trip, I do not remember the explanations given by the teacher (−).
15. The field trip is important since it demonstrates and illustrates the concepts learned in class.
16. In the field trip, working with worksheets interferes with my enjoyment of the event (−).
17. The material learned during a field trip will remain in my memory for a long time.
18. I would like to have more field trips, since it helps in educating for nature conservation.

* (−) Items reversed for scoring.

19. I do not like field trips which include a lot of walking (−).
20. The good atmosphere with my friends during a field trip is the main reason for my enjoying the event.
21. Working individually during a field trip is important for understanding the learning material.
22. The field trip does not contribute to my connection with the country (−).
23. I would like to have more field trips, since they help in building class spirit.
24. Learning in the classroom is more effective than learning during a field trip (−).
25. The field trip increases my enjoyment of the subject matter.
26. Familiarity with different parts of the country increases my connection to my country.
27. The field trip does not increase my interest in the learning material (−).
28. For me, the field trip is important, since it helps in getting to know more friends.
29. I understand natural phenomenon better after observing them in a field trip
30. I like field trips despite the difficulties on the roads.
31. Field trips make me take an interest in and search for additional information in the literature.
32. The comments and jokes made my classmates during a field trip interfere with my ability to concentrate on learning (−).

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