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Preservice Elementary Teachers' Perceptions After Visiting an Interactive Science Center

by *David H. Palmer*

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Overview

This paper reports an action research study involving preservice elementary teachers enrolled in a college science methods course (ie. the course focussed on how to teach science at elementary school). There was an interactive science center nearby which many local elementary classes regularly visited, so I decided to set my students the task of visiting the center and reporting on it. However, I was unsure as to what outcomes the students would gain from the experience. I therefore asked the students to each write a short passage explaining what they had learnt from the experience. According to their responses, the main benefit was that the visit reinforced the value of hands-on activities for teaching science and making it fun. Through the visit, the students also became aware of the center as a teaching resource, and developed ideas about the factors involved in organising an excursion.

Introduction

Over the last two decades, a number of authors have reported the effectiveness of informal learning centers such as museums and science centers. Science centers offering interactive, hands-on experiences are designed to promote an understanding of scientific concepts as well as the development of positive attitudes towards science (Henriksen & Jorde, 2001). A substantial volume of research has addressed children's learning experiences during their visits to these types of informal learning centers. Much is known about the effects of different kinds of exhibits on visitors, the distraction caused by the novelty of the environment, and pre- and post-visit strategies for enhancing learning during school-organised class visits (eg. Anderson, Lucas, Ginns & Dierking, 2000).

However, at the present time, there is a paucity of information about the effects of science centers on the learning and attitudes of teacher education students. This was a significant issue for me because, as a science tutor in a teacher education program, I felt it would be useful for my students to visit such a center, but I was unsure as to exactly what outcomes the students would gain from the experience.

My students were preservice elementary teachers, so they were not science specialists. In fact, I suspected that many of them had negative attitudes towards science: research has shown that

many preservice elementary teachers dislike science, especially physical science, and lack confidence in their ability to teach it (Jarrett, 1999; Tosun, 2000). This is generally considered a serious problem because negative attitudes may impair their teaching of science after they become teachers (Schoon & Boone, 1998). Consequently, I felt it was extremely important that I provide my students with positive science experiences so they could begin to develop more favourable attitudes towards the subject. A visit to an interactive science center might therefore have a double effect on these students - by helping them to think about planning for school excursions, and also by reinforcing the idea that science can be fun. The purpose of the present study was to find out if this was the case.

The main question for this research was "From the point of view of my preservice elementary teachers, what are the benefits of a visit to the interactive science center?"

The Science Center

The interactive science center was located in a section of the local museum. It had been operating for several years and was generally well-attended by elementary school groups as well as members of the public. It housed about 70 modules, and most modules consisted of an activity in which people could manipulate something then observe the result. Most of the modules related to physical science concepts such as electricity, sound, magnetism, pressure and light, but a number of modules were concerned with the human body (senses, reaction times etc). There were very few if any modules relevant to general biology, geology or chemistry. Each module was accompanied by instructions for how to use it, and an explanation of the relevant science concepts. Entrance to the center was free, and it was easily accessible from the college.

The Students

My students were 27 preservice elementary teachers who were enrolled in a one-semester science methods course. This course was part of a one-year Diploma of Education program at a college in southeastern Australia. All the students in the class had already completed an undergraduate degree in another discipline, and were now training to become elementary school teachers. They were in the 20-40 years age group and 83% of them were female.

The science methods course was compulsory for all students in the elementary education program. The course was specifically designed for these students and was the only science-related course in the program. Its main aims were to teach them some science content, to teach them how to teach science, and to provide experiences to help them develop positive attitudes toward science.

The course was presented as a two-hour workshop each week for 10 weeks. In most workshops, students were introduced to a science content area and to some science teaching techniques. The science content areas included Water, Air, Sound, Magnetism, Living Things and Astronomy. The course also contained study of science process skills, assessment strategies, teaching strategies such as investigating and problem solving, and safety issues.

The students in this course were required to visit the local interactive science center during their own time, between weeks 5-8 of the semester. They were encouraged to go at a time when there would be children there either with school groups during the week or children with their families during the weekend. I thought that if my students could observe elementary-aged children enjoying science activities then it would help to reinforce the idea that science can be fun, and that hands-on science activities are a good idea.

My students were required to spend at least one hour in the center, appraising the activities and observing children. They were given an assessment task to complete that required them to evaluate the center as a teaching resource, referring to the elementary school syllabus and to the quality, nature and relevance of the activities in the center. Attached to this assessment task was a further task that was not to be assessed, and which was intended to provide the information for this action research study the students were asked to write at least half a page in answer to the question "What did you, as a future elementary teacher, learn from this experience?" This section was a non-assessable component because I wanted the students to be free to state whatever they liked (if it had been an assessable task they might have been tempted to write what they thought I wanted to hear, rather than giving completely honest answers).

The Students' Responses

Although the students had been asked to write at least half a page I was not sure whether they would actually submit that much, because the task was not assessable. However, most of the students did write about half a page, although some wrote considerably more (up to 250 words). There was therefore a lot of detailed information submitted.

The students' responses revealed that there were four main types of benefits from attending the science center. These are described below, in order of frequency.

The most common benefit that students described was learning that hands-on science has benefits for learning, particularly because it makes science fun. This general idea was reported by 70% of the students. The following are some representative examples of the main types of responses in this category.

Seeing children participating in the activities reinforces the idea that science is more interesting and easy to understand when it can be visualised and practiced hands-on.

It highlights the benefits of getting students interested in science and technology by providing hands-on experiences.

As a future teacher, I have learnt that students enjoy interesting, colourful and practical activities. Seeing them getting excited over the different activities makes me realise how important it is for them to learn science in a fun, challenging and interesting way.

The enthusiasm of the kids to participate in almost all activities was clearly evident. The assisting parents were also keen to participate, being observed on several occasions pushing their kids out of the way to get to the activities themselves.

From my visit to [the center] I realised just how fun and interesting science and technology can be.

One of these students noted the importance of gender:

. . . there were an equal number of boys and girls all enjoying the activities. With the male dominance in science and technological fields in the community, as a teacher I must encourage equal participation.

Enjoyment of hands-on activities was not only restricted to children - several of the students in this group also reported their own enjoyment of the experience. For example,

I personally enjoyed the experience of trying new activities. . .

I found the center to be really fascinating and engaging.

I found testing of the activities both interesting and enjoyable.

The second most common category of response (52% of students) was those comments that described the value of the center as a teaching resource. Most of these were positive comments:

I have learnt that [the center] is a great resource that teachers should take advantage of . .

I see [the center] as a really valuable resource for teaching. . .

However, several of these students were critical of the level of language used in the scientific explanations. For example, one stated,

Most of the explanations were aimed above elementary students' knowledge and understanding.

The third most common category of response (48% of students) was comments that described ideas for how to organise a class excursion or field trip. It was apparent that the students had used their experiences at the center to think about the factors necessary in planning field trips. For example, one student wrote,

It has made me realise that in order for students to learn or gain further knowledge on an excursion, that the excursion must be planned. Do I want students to discuss the activities together? Do I want students to work in groups and report about a particular activity, or should I hand out a worksheet for students to complete? How am I going to get students to engage and use their process skills of investigation? How am I going to get the most out of the students and the excursion?

The fourth most common category of response (15% of the students) was ideas for how to incorporate hands-on activities in the regular classroom. Some of these students proposed ideas for modifying some of the center's activities so they could be used in the classroom, while others made more general observations about hands-on activities. For example, one student wrote,

[It] made me aware of the need to provide science activities for my students which are developmentally appropriate. Instructions need to be clear and suitable for the literacy level of the students, and the activities need to be suitable in relation to the manipulative skills required by the students to complete them successfully.

My Conclusions

The main purpose of this action research was to identify any benefits that students perceived from their visit to the interactive science center. All of the students did describe at least one positive benefit, and most of them described two or three benefits. The benefits were of four main types: (1) the visit reinforced the value of hands-on activities for teaching science and making it fun; (2) it made the students aware of the center as a teaching resource that they could use with their future students; (3) it stimulated the students to think about the factors involved in organising an excursion; and (4) it provided some ideas about activities that they could transfer into their own classrooms in the future. I therefore concluded that the visit to the center did have useful and relevant benefits for these future elementary teachers.

In addition, there were two other interesting ideas that can be inferred from the students' comments. The first was that much of the value that the students had gained from the visit was from watching children engage with the activities, rather than just doing the activities themselves. By watching the children's behaviour as they interacted with the activities, my students could appreciate the fun they were having and anticipate some of the behaviours that children might have on an excursion. For example, one student wrote,

The grade four students that I observed ran around the center, excited with each activity, with some activities sustaining student interest longer than others. . . Although the students appeared to be having a fantastic time, they were very noisy running from one end of the center to the other. It would obviously be important to discuss correct behaviour in a public place when representing your school.

The other pleasing aspect which came through from the students' responses was that the experience had made them *think*. It particularly made them think creatively about how they could structure an excursion so children could gain the maximum benefit from the experience.

In conclusion, the visit to the interactive science center did have a considerable range of benefits for my students. The finding that came through most strongly to me was the importance of my students being able to observe children at the center. I feel that many of the benefits of the experience came from watching children doing the activities, rather than my students just doing the activities themselves.

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