Introduction

The emergence of socio-cultural approaches to learning over recent years has seen a greater emphasis on learners engaging with authentic, real-world problems. Research evidence suggests that people have great difficulty in applying the knowledge learned in one context to problems met in another context (Desforges), 1995. This view has important implications for teaching. If learning is embedded in the culture of the classroom, then learners will have difficulty using and applying their knowledge outside the classroom unless they have experience of engaging with real-world problems. This article acknowledges the importance of engaging children with authentic mathematical experiences in out-of-school settings and reflects on an initiative, which sought to provide an authentic context for student-teachers to engage in learning about such experiences.

Provision of outdoor learning experiences in schools

The outdoor environment offers an authentic context for learning and provides opportunities for pupils to develop a wide range of important cognitive, personal, social and emotional skills (Waite and Rea), 2007. Despite this, there are many barriers, which affect the provision of outdoor learning experiences in schools. Teacher confidence appears to be one of the key factors underpinning the extent of such provision (O’Donnell et al), 2006. Health and safety concerns, time constraints, limited resources and inadequate support may also limit children’s access to learning experiences beyond the classroom (Rickinson et al), 2004. Further, a study on the extent and nature of training in outdoor education offered in different types of initial teacher training courses revealed that some student teachers may be inadequately prepared for education outside the classroom; where there was a minimum expectation for training on learning outside the classroom on such courses, this requirement tended to relate to the acquisition of theory and understanding of such learning rather than practical experience (Kendall et al), 2006.

Provision of authentic experiences for student teachers

In an earlier article - MT219, September 2010 - I reported on an initiative in which students on the PGCE course at Stranmillis University College, Belfast, participated in a mathematics trail around the indoor and outdoor exhibits of the Ulster American Folk Park, one of Northern Ireland’s National Museums. Although students were able to explore the potential of the outdoor environment in supporting and enhancing children’s mathematical development, they were not actually engaged in the planning and provision of such experiences. The remainder of this article reflects on a novel approach to learning about outdoor education in primary mathematics. A short course - Planning and organising an outdoor mathematics trail - was offered to students in the final year of the BEd (Primary) course at Stranmillis University College. The course was designed to offer students an authentic context in which they would link current theory on outdoor learning in mathematics with practice in the preparation of meaningful outdoor activities for primary school children.

The course

The first phase of the course consisted of three college-based seminars:

- Exploring the use of the outdoor environment as a real-life context for developing mathematics;
- Risk assessment in relation to outdoor activities;
- Planning and organising a mathematics trail.

In the second phase of the course, the participants collaborated to prepare the mathematics trail. It was decided to use the grounds of Stranmillis University College for the trail activities and to invite Year 5 children from a local primary school to participate in the trail. Not only does the landscape of the grounds - which includes a variety of buildings, pathways, recreation grounds
and wooded areas - provide a valuable teaching resource, the accessibility of the grounds to the school ensured that the costs involved were minimal. Before the course began, students were given a short questionnaire in order to determine their views on outdoor learning in mathematics and to find out if they had had any previous experience of such work. Students were also asked to complete a questionnaire on completion of the course to discover what they had learned from the whole experience.

**Before the course**

One student had carried out a mathematics trail with a primary class on a previous school-based work placement and felt ‘pretty confident’ about taking a class outdoors for mathematics. A further two students had taken children outdoors to do some measuring activities while on previous placements. When asked how they felt about teaching mathematics outdoors, one student said she would be prepared ‘to give it a go’ and the other said, ‘I feel confident in being able to manage a class but unsure of how to implement the maths learning.’ The two remaining students had had no previous experience of teaching mathematics outdoors. The main issues which students felt would prevent them from teaching mathematics outdoors were pupil behaviour - 4 students, weather - 3 students, lack of knowledge/experience - 2 students, time - 2 students, and health and safety concerns - 2 students.

**After the course**

All five students found the experience of planning, organising and managing the mathematics trail with primary school children to be extremely beneficial and worthwhile. As one student summarised, ‘It gave me a deeper insight into the possibilities and benefits of teaching mathematics in the outdoors and developed my skills in being able to plan, prepare and undertake maths trails’. Responses suggest that the course had had an impact on students’ views on the potential of using the outdoors when teaching mathematics. For example, one student claimed, ‘I now believe that maths trails are a great tool, for helping children develop their maths…. I was also able to note the amount of maths that there is in the environment.’ Another student stated, ‘I would never have thought of taking children outside to learn about some of the things we were doing on the trail … I would have used text-books or worksheets.’ The students also demonstrated a deeper appreciation of the many benefits of outdoor learning experiences in mathematics. Comments included references to the fact that children had enjoyed ‘doing maths’ outdoors, and that the outdoors provided a meaningful context for learning, which in turn enabled children to see how relevant mathematics is in everyday life. As one student observed, ‘I was very impressed by how involved the children were when taking the trail: a worksheet would never hold their attention for that length of time.’

Despite the aforementioned benefits, there were a number of limitations with the course. Since students had not worked with the children before, it was difficult to design trail activities, which were closely matched to individual children’s levels of ability. Nonetheless, the students liaised closely with the class teachers beforehand regarding the content of the trail activities. Time was also an issue, with the trail taking much longer to complete than expected. However, one student noted, ‘When you have your own class then it would be easier because you would know at what level to pitch it at and also you would be able to judge the timing better.’ Other practical difficulties included finding an appropriate time for the trail activity. Students had different timetabling commitments and finding a time to suit both them, and the classes, was challenging. Weather also compounded the issue: the date for the trail had to be postponed at short notice due to adverse weather conditions.
Summary
Overall, the benefits of this initiative far out-weighed any difficulties, with all of the students highlighting how much the course had developed their confidence and competence in providing future outdoor learning experiences in mathematics. In the words of one student, *When I was on teaching practice my placement teacher had asked me to do an outside maths lesson and I really had no idea what to do. I now feel that I would be able to create a maths trail in a school setting, or within the school’s local area.*

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References

Kendall, S., J. Murfield, J. Dillon, and A. Wilkin. (2006). *Education outside the classroom: Research to identify what training is offered by initial teacher training institutions*, Nottingham, DfES.


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