Community engagement: Talking about mathematics

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Abstract

Implementing assessment into early childhood (EC) undergraduate courses necessitates supporting learners in informed and intentional ways; since knowing how to teach comes from within the act of teaching itself. Consequently their practical knowledge builds through deliberate events which stimulate further insight and skill in what they do. Taken-for-granted assumptions that undergraduate students bring to the classroom can be challenged in such ways that they make implicit ideas explicit subsequently changing them to correspond with their new practices. Students can "test" out alternative approaches in real classroom contexts and then refine their own practical knowledge through reflection.

Assessment for Learning

Assessment for learning (Black & Wiliam, 1998) with early childhood undergraduate students holds potential for influencing the learning of classroom teachers and the learning opportunities of their students. Further, the use of such practice supports ongoing program improvement. Assessment experiences can inform ongoing instruction by revealing what undergraduate students understand well enough to apply. Embedding assessment experiences require expertise from school-based educators, university–based educators and undergraduate students working closely together to develop and discuss their practice. This concentration of effort when supportive structures and processes are in place, provides opportunities for sustaining conversation and relationships necessary for the sustained learning activities embedded in assessment (Darling-Hammond & Snyder, 2000).

This focus reflects change in the way students in teacher education have been assessed in the past the pedagogical framework has largely remained consistent, reflecting dated practice (Thiessen, 2000). Undergraduate programs have largely been framed around three main phases: 1) studying about practice 2) observing and trying out practice in simulated or actual classroom conditions, and 3) comparing and elaborating practice in classrooms (Thiessen, 2000). However, a reflective dimension and professional knowledge have now emerged, thus becoming central to the teaching and learning process. This emergence is changing the definition of what undergraduate students need to learn and develop, since reflective practice goes beyond the concerns of the individual to critiquing, challenging and transforming practice (Griffiths, 2000). Darling-Hammond & Snyder (2000) report that an increasing number of teacher education programs are using authentic assessments of teaching as "one set of tools to help novice teachers create, in a principled fashion, bridges from generalizations about practice to apparently idiosyncratic, contextualized instances of learning" (p. 524). Such instances include, experiences that are problem oriented and include actual acts of teaching which feature direct interaction with students.

University-based educators are expected to support students with their engagement and learning at both sites, the university and the school. This role encompasses similar functions to those as described by Bates (2005), that is, administrative, educational and supportive functions. The educators assist the students to access and engage with the schools and teachers and support them with organisational issues. Such issues include understanding the varying discourses within the school and university context and how to access and communicate effectively using these discourses. The university-based educators also support students with linking their developing theoretical knowledge to the practice of teaching. Explicit discussions focus mainly on pedagogy, discipline knowledge, learning, learners and the students' developing awareness of the responsibilities associated with teaching in the early years of schooling. The students are supported with drawing on appropriate discourses and their developing professionalism as future educators in school communities. This function is considered necessary as accessing a community can present challenges for learners.

Accessing and participating in communities such as school allows students to engage in opportunities for learning. Such opportunities allows for mistakes, which, in turn create opportunities for learning. The university staff and teachers, who provide and indeed expect student participation whereby

learners construct an identity as effective teachers endorse this access. However, endorsement does not necessarily ensure access . Access is dependent on how students are prepared at university before and during their teaching experience and the extent that school and university staff are able to mentor as well as supervise the quality of the students' learning experiences (Crebert, Bates, Bell, Patrick, & Cragnolini, 2004). Further, access will be dependent on the liaison between the school and university-based educators about learning outcomes that will benefit students in their learning experience (Crebert, et al.).

The learning experience

The students' learning experiences, involves participating in a collaborative project linking one Australian university, 6 inner city schools and 1 organisation. The project aims to enhance a culture of innovation by linking undergraduate student assessment with the real world of teaching and learning contexts. It encourages innovation in mathematics education by focusing on improvements and changes to fifty teachers' and one hundred and twenty undergraduate students' approaches to the teaching and learning of mathematics; thus enhancing the learning outcomes of approximately eight hundred children in the early years of schooling. Learning experiences supportive of student interest and engagement is crucial.

The project links with the National Literacy and Numeracy celebrations (Department of Education, Science and Training [DEST], 2006a) held in Australian schools each year. It links undergraduate early childhood students with classroom teachers, encouraging professional conversation about mathematics, teaching, learning and early learners. This focus aligns with the National Priority promoting and maintaining good health - a healthy start to life, and strengthening Australia's social and economic fabric (DEST, 2006b). It also aligns with current efforts to reconceptualise learners as cooperative, collaborative investigators. This strategy is shaping the *Mathematics Years 1-10 syllabus* (Queensland Studies Authority [QSA], 2004) and the *Early Years Curriculum Guidelines* (QSA, 2005).

The proposed project builds on pilot work initiated and conducted by the author in 2005. In this project, 4 schools, thirty-three teachers, and sixty-seven early childhood undergraduate students were brought together to participate in the National Literacy and Numeracy Celebrations [NLNC] supported by the Australian Federal Government. Teachers met in their own time with students to plan learning experiences to be implemented during the NLNC week. The students worked in the classrooms of mentor teachers to facilitate mathematical investigations. The schools had been previously involved in exploring the Mathematics Years 1-10 syllabus (QSA, 2004).

The student' reflections on their learning experience

The project extended on the undergraduate students' learning with the intention of developing a community approach to the teaching and learning of mathematics in early childhood contexts. The schools and undergraduate students worked collaboratively to plan, implement and evaluate real world mathematics investigations appropriate to early childhood students' needs. The following accounts are from students' written reflections of their experiences in the project.

> Reflecting upon the group with which I did work, it was immediately apparent they were well positioned to engage with the activity, as the group all spoke English as a first language. Although this group were a Preschool group the teacher advised me the group had done a lot of work with numbers and that the activity appeared to be well pitched for the group. Whilst running the learning experience I was surprised to find that nearly all of the group were able to identify the numbers on the flashcards without the need to count in a forward number word sequence (FNWS) and associate a dot to each word. As it appeared that the vast majority of this group could *subitize* number formations up to six, my focus turned quickly to the counting strategies the children were engaging in to determine if the group they had formed was the same in numerosity as the flashcard presented. This highlighted to me the importance of having a thorough knowledge of the children's level of ability so that experiences can be appropriately pitched and sufficiently challenging. (Student reflection)

The students' reflection on her experience indicates her developing awareness of the issues that confront many classroom teachers. This was evident in the phrases, "the group all spoke English as a first language," "the activity appeared to be well pitched for the group," and "having a thorough knowledge of the children's level of ability." The reflection also shows the student's developing mastery of mathematics discourse to explain and describe what she did with the students. In doing so, the student is

articulating this discourse with her learning about teaching and how to engage learners in mathematics learning. The following account elaborates this idea further.

> If students had time to think about the relationships and explore different methods of finding things I feel that they would have gained critical knowledge that was not able to be explored. I also felt that students did not have time to reflect and use their metacognitive skills. Reys, Lindquist, Lambdin and Smith (2006) suggest that students who are encouraged to use metacognition to reflect on their thinking are more likely to search for understanding and endeavor to make sense of the mathematics that they are learning. Without having this aspect present in my experience it was most likely just seen as a 'fun game' to most of the students. I feel that the students did not get time to look at the multiplication and the mathematics learning within the game. Having had this experience it is very easy for me to see how the mathematics can be lost in activities when certain aspects get left out or missed as time has run out. (Student reflection)

The tension between time to think and explore and getting through the learning tasks is emphasized in this student's account. In particular, the implication of not providing enough time for the students to reflect on their thinking was that they saw the task as a game. This realization was significant for the student and is shown in her comment about how mathematics can be "lost" in tasks that were intended for learning but have produced different outcomes.

The following account indicates that as a consequence of her participation in the project experience she has had an opportunity to think about her teaching practice.

> This community learning experience has given me the opportunity to critically reflect on my teaching practices, to help me evaluate and make sense of the learning that occurred. From this learning experience, I am able to see that by introducing new mathematical concepts through children's' literature, this helps children to understand that mathematics is a natural part of their physical and social worlds. (Student reflection)

In this account the phrases "critically reflect on my teaching practices," and "help me to evaluate and make sense of the learning" work to show the benefits for this student in her learning as a consequence of participating in the project. In doing so, the emphasis on how early learners can be supported with their new learning is highlighted.

Discussion and conclusion

This project meets the specific needs of undergraduate students, teachers and students by signifying mathematics as cross-curricular thus enhancing mathematics learning in practical ways through a range of strategies, including explorative and investigative tasks using hands-on materials. It encourages and continues the building of a learning community where teachers, students and early learners, are afforded the experience of sensing how a community of mathematics learners articulates itself. The project provides opportunities for engaging in the sharing of repertoires and resources. This occurs through a range of experiences including a reflective learning together conference where professional conversations take place.

Sustaining a difference to the project learning communities requires ongoing community maintenance. This is done through planned and implemented regular professional development days and sessions where teachers and students have opportunities to engage and reflect on their practice, the impact on early learners, the resources used and social learning contexts.

The outcomes from this project provide an exemplar that demonstrates best practice in using assessment for learning in undergraduate early childhood courses of study. The exemplar will inform assessment practices across universities and exemplify how such practice can be achieved successfully through strong links with schools. It threads the nexus between theory and practice in more authentic ways. This project benefits schools that are focusing on ways to better support early childhood mathematics -- an area not well resourced. The project brings together reflective learning communities, thus providing a rich environment for mathematical discussion and participation from all involved.

The trialling and implementation of a community-based learning experience for undergraduate university students requires a commitment by all parties involved in the project to actively support

students with achieving their academic and career goals. Such commitments mean that positive relations, reasonable assessment and clear and concise expectations are well-defined to ensure pedagogical value for the students. Indeed, Gibson et al (2006) point out that expected outcomes that are clearly articulated are important for successful learning for the students. The focus should not only be on the quality of the experience but also on the quality of the reflection in relation to the agreed learning outcomes (Smith & Betts, 2000).

Therefore, several recommendations for future experiences of this kind include, the professional development of school and university staff about assessment for learning in communities such as schools so as to raise their awareness of the benefits of this approach to student learning and that substantial learning occurs in both contexts and needs to be realised and recognised. Clearly defined expectations and outcomes between the university and school and staff at both sites are necessary. Well-defined expectations and outcomes means that all parties involved will be able to better support students with achieving their goals. The restructuring of robust assessment that meets the requirements for the undergraduate early childhood degrees and for the opportunities presented within the context of school needs to be well thought out. Finally, careful consideration needs to be given to designing and implementing assessment that is recognised as part of the students' learning program and not in addition to their schedule of study.

These recommendations do not address all the issues related to assessment for learning, only the issues raised in this paper. They are the result of creating, implementing and participating in the trial project as the university-based person. This form of assessment has a number of benefits for students, schools, teachers, universities and academic staff. Such benefits include the development and implementation of new learning experiences for students that provide them with a deeper level of engagement in the act of teaching and linking this with the theoretical perspectives that inform teaching, learning and knowledge.

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