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Abstract: Curriculum integration and working in teams are two key characteristics of middle schooling in Australia today. As part of a new primary/middle teacher education program an interdisciplinary team of academics has developed a course that aims to teach pre service teachers how to plan for and teach an integrated curriculum unit in an authentic context: their 6 week school placement. This paper will describe the first cycle of an action research project detailing the issues for the third year pre service teachers and for the staff involved in teaching the course as they come to grips with new ways of working. This is an action research project and the data includes course materials, staff notes and journals and student assignments. A number of key issues have emerged from this trial including pre services teachers' knowledge of how curriculum is constructed at this stage of their career and the difficulties of modeling this approach.

Introduction

Working in integrated teams across a range of disciplines is a complex task for experienced educators and for novices even more so. This paper explores what we as experienced teacher educators learnt about working across disciplines ourselves and what pre service students took from our teaching as they planned, taught and evaluated an integrated unit in an authentic situation, their practicum setting. This project is situated in the broad field of practitioner inquiry. As a teaching team we made a decision that it was important to track our progress through what was a very different way of working for both staff and students. We begin by providing some context for our work and including our view of curriculum integration before discussing the project and its outcomes.

The 3-9 Bachelor of Education program context

The relocation of one part of The School of Education to a new campus coupled with the implementation of new education programs, including the Bachelor of Education (Primary & Middle), that straddles two traditional levels of schooling, provided an opportunity to build on the innovative aspects of the former R-7 program. As teachers working with students in Grades 3-9, will be working in a world today of changing circumstances that are particular as well as emerging, it was decided a good starting point

was to identify and explore planning principles relevant to this age group and the times in which they live. These are consistent with the Education Review Report (Reid & O'Donoghue, 2001) commissioned to give guidance to teacher education programs at the University of South Australia (UniSA). The Bachelor of Education (Primary & Middle) program has as its aim, "to prepare educators who are professionally competent and primarily concerned with learners' wellbeing and who are committed to social justice, futures thinking, sustainability, education for community living, and sound pedagogical reasoning that is inquiry based".

In the first two years of the program students undertake one curriculum course in each of the learning areas. Whilst Science, Mathematics and Society and Environment are integrated to some extent, the Arts, Design and Technology, English, and Health and Physical Education are run as separate entities. Being successful in these curriculum courses is a prerequisite for the professional semester in first semester third year where the course Curriculum Integration is placed alongside a major practicum.

As we need to be producing graduates that have the ability to teach across a range of curriculum areas we decided that we would trial an integrated curriculum course. Many meetings ensued with interested academics from a range of disciplines discussing the possibilities of course structure, content and assessment. Ideas about, curriculum construction, curriculum integration, models for planning, using rich tasks as the basis for planning and authentic assessment practices were central to the discussion (meeting notes 22nd November). We also discussed the use of key speakers such as professors of education and school based practitioners to ensure we connected theory with practice.

The workshop sequence focused on such topics as curriculum construction, history of curriculum, curriculum integration, advantages and disadvantages of curriculum integration, principles of powerful learning, ways of organizing curriculum, analysis of classroom observations, the place of literacy and numeracy in the curriculum and the planning of an inquiry unit. Working towards planning and implementing an inquiry unit with their practicum class was the key outcome for students.

Curriculum Integration: A Theoretical Framework

Many educators have written about Curriculum Integration and our course has been informed by Beane (1995), Dufficy (2005), George (1996); Lake (2004) and Venville & Dawson (2004). Research examining integration in practice is still relatively rare (Hargreaves et al, 1996 cited in Wallace, Rennie, Malone & Venville, 2000). What is an integrated curriculum? Venville & Dawson (2004, p148) suggest that it is not an easy question to answer due to the diversity of approaches that currently exist. They suggest that key features of an integrated curriculum include; investigations drawing on several discipline areas, flexible timetables, team teaching, student-centred learning and high levels of interaction between students, between students and teachers and between teachers.

Teachers and researchers do not know all the answers to questions about the advantages and disadvantages of integrated teaching practice and the consequence in terms of student learning. Educators supporting integrating science, technology and mathematics argue that the three disciplines overlap and that disciplines are 'artificial

creations, artifacts of evolution and history that fragmented and compartmentalised knowledge' (Sizer cited in Hatch, 1998, p.18). The advantage of an integrated topic is that children experience comprehensive treatment of a topic and work on different aspects of the central idea. An integrated approach can introduce interconnections, and juxtapositions that capture the learner's imagination and allow the child to work in preferred areas of interest and styles whilst encouraging a broader perspective (Tytler, 2004).

Opponents argue that each discipline operates under fundamentally different ways of knowing. Gardner believes that 'robust understandings of important phenomena and concepts depend on the study of disciplines' (Gardner cited in Hatch, 1998 p. 19). Tytler argues that one disadvantage of an integrated approach is that one or the other learning area is trivialized. Science is often the subject that suffers particularly if it is simply a matter of trying to incorporate it within a broad topic. However placing science at the hub of a topic means that science skills and concepts can be promoted as a focal point whilst allowing the process subjects of English and Mathematics to adhere to the science content, giving these subjects purpose and authenticity (Tytler, 2004, p121-2).

We argue that it is essential students are introduced to the various disciplines and that the relationships between them are also established. We were also keen to make links where-ever possible to the pre service teachers in their practicum setting. To scaffold them for success each learning area presented a planning proforma focusing on a small task which was modeled in the workshop and then trialed with a small group of children. For example the science involved children sorting and classifying rock like objects. Returning to the following workshop the students shared knowledge about what they learnt about children's understanding of rocks. This was to ensure that pre-service students knew something about 'where their students were at' so as to plan meaningful and connected learning experiences. It also maximized the chance of the pre service teachers constructing a curriculum across disciplines as they had previously spent time differentiating the characteristics of, for example what makes science, science and what makes technology, technology etc (Stein et al, 1999). We believed that these understandings were important if the pre service teachers were to make connections and prepare holistic learning experiences for the children in their practicum classes.

We support the position that authors such as Jucker (2004) and Capra (1993) take in that content of learning must embrace interdisciplinarity, systems thinking in order to address sustainable action on local regional and global economy, cultural and environmental issues. Jucker (2004, p16) an ecologist argues that we need to overcome specialization and venture into all aspects of the topic. This means:

We will make mistakes, we find it difficult because we are unaccustomed to thinking in systems- we shouldn't be afraid of making fools of ourselves because we need to get better at looking at the whole story- our survival depends on it.

Similarly we have been informed by Capra (2000) who argues that we need a new way of seeing the world, and a new way of thinking, that is thinking in terms of relationships, connectedness and context. This will enable us to become eco-literate Capra (2000, p270). Making connections with students' life worlds, integrating bodies of knowledge and using rich tasks as a basis of curriculum planning are strategies that have been encouraged in middle schooling (Hattam & Prosser, 2006, Education Queensland, 2004). This encourages intellectual quality and connectedness, two aspects of

‘productive pedagogies’ part of Education Queensland Department’s (2004) New Basics project. This wide ranging project has also influenced our thinking in this course.

Research Methods

Within this conceptual framework and given that *Curriculum Integration* was a new course in the Bachelor of Education, the aim of this project was to reflect on the course, our teaching practice and how our students took up the course, the obvious choice of research method was action research or more broadly practitioner inquiry. This was also a method with which the team was largely familiar albeit in different ways. Action research has long been in use in educational research although there are many different interpretations ranging from ‘quasi –experimentation through cyclical and participatory approaches (Mills, 2003) ...to [] emancipatory approaches (Dick, 2004, p432). As professionals inquiring into our own practice we were drawn to the participatory and reflective aspects of action research and a desire to make changes to this course and thereby to influence the program as a whole. Dick (2004, p 433), citing Armstrong and Moore (2004) points to ‘the fluidity and responsiveness of action research’ and these were two aspects of action research that fitted with our purposes very well. The course was in a development stage when we began the research and we wanted to be able to further develop it by responding to students’ needs and to improve our delivery of the course via reflection on our practice. The teaching team saw the research as an integral part of the process of developing the course.

Our approach to the research was characterized by:

- A critical and collaborative approach to the inquiry
- A commitment to responding to what we were learning about the course content and our teaching of the course
- A commitment to change for the following year as a result of the research
- Openness and transparency with all participants

The questions guiding this research were:

- What were students’ understandings of ‘integrated curriculum?’
- How well had students’ previous studies in curriculum courses set them up for successful planning of an integrated unit?
- How well would this course develop students’ abilities to plan an integrated unit for their third year practicum?
- How and where does a course such as *Curriculum integration* fit into the Bachelor of Education?
- What were the issues associated with trying to run an innovative course within the confines of a university program?

Who Was Involved?

There were four members of the teaching team each from a different discipline area; Science, Mathematics, English, Design and Technology and Physical Education. One member of the team had been involved with teaching multidisciplinary courses and

three members of the team had some knowledge of the majority of students in the course. There were approximately one hundred students in the third year of a Bachelor of Education (3-9) enrolled in four classes.

The Research Process

The research process began as soon as a teaching team was confirmed. Because the course had not been taught before this meant that the teaching team had to develop the course materials including the readings, the teaching materials and the workshops. There were four members of the team and all agreed to be part of the project. Students were informed of the project on the first occasion that they met with the teaching team. This was in late January as part of an induction day to their third year practicum. In this practicum students are in schools for the first two days (staff development days) and then the first week with the students. It is then recommended that they keep in touch with their class half a day a week until university commences. Around 90% of students do this.

Data Collected

The data collected included minutes and notes from the team meetings. These were circulated to and verified by the teaching team each time we met. The notes included our discussions about how students were taking up the course, course materials and in particular readings for the course, how the course was to be organized, the kinds of learning experiences in which we would involve the students, evaluation of workshops and plans for new workshops. We also collected as data our teaching materials, student assignments and some examples of the student round table presentations.

Ethical Issues

This research did involve some ethical dilemmas particularly relating to the students. The teaching team recognized that students were part of the research by virtue of the fact that any inquiry into teaching practice means some sort of student involvement. Students were told that we were researching our practice and the course as a whole. The teaching team viewed the students as research participants but all students did not view their role in this way and initially saw the research as something being enacted upon them. ‘Are we just to be guinea pigs?’ was the comment from a minority. Anecdotal evidence sought in the following semester suggests that students changed their minds about this after they had completed the *Integrated curriculum* course and their third year practicum in which they taught an integrated unit of work. In fact when students returned from their practicum to present at the round table assessment almost all were very enthusiastic about sharing their experiences, knowledge and classroom artifacts with other students and the teaching team. Many students gave permission to the teaching team to use their assignments to develop this paper.

Pre service Teachers' Understandings of How Curriculum is constructed

Students in the first semester of third year have spent approximately six weeks on practicum and as part of university course work they have had some exposure to the various discipline areas of the primary middle school curriculum. They have also experienced an interdisciplinary approach to curriculum in at least 3 courses. However they have not studied a course that takes as its focus the construction of curriculum in primary and middle schools. We therefore began the course by briefly exploring terms, the social construction of curriculum and how curriculum changes over time. Students were given a range of readings and asked to comment on these in light of their own schooling experiences, their university experiences and their practicum experiences. Students were then given the task (see below) of finding out what was happening in the classrooms where they had been placed for the third year practicum. Questions such as the following guided their observations and they were encouraged to engage their teachers in discussions about what they were seeing and what they had learnt at university. Time was spent in workshops discussing the school visits and the data they collected.

Classroom Task

- In your classroom/school how do you think knowledge is organized?
- Why do you think it is organized like this?
- Ask your mentor teacher and maybe another teacher how and why they think the curriculum is organized like this.
- Are aspects of the school curriculum privileged? Why do you think this is the case?
- How different/similar is what you see to what you can remember experiencing in your 3-9 schooling?

The first assignment related directly to this task.

Drawing on the readings and your orientation research and analysis write an essay arguing for an integrated curriculum in your practicum setting. Firstly identify the strengths and weaknesses of the way curriculum as you see it is constructed in your classroom. Secondly describe what an integrated curriculum does or could look like in your classroom.

Students' responses to this assignment were quite disparate. There were students who did the task very well drawing on their learning from the readings and lectures, relating that to what they were observing in their classroom and providing examples of the practices they were observing. There were also students who did not know how to use the readings and lectures, and did not know how to make sense of what they observed in their classrooms. Some students did not know how to write a coherent argument. Most concerning to the teaching team was that some students did not know how to "see" the curriculum in their classrooms given that in workshops we had spent quite a deal of time discussing the data they brought in from these classrooms and drawing attention to how curriculum was being constructed in the university. A closer examination of the assignments showed that the students who did the task well were well supported by their

mentor teachers who spent time with them discussing aspects of their curriculum whilst those who struggled appeared not to have developed the relationships with their mentor teachers that allowed for such in depth discussion.

Teachers did not always understand what students were trying to do, pointing to some communication issues between the teacher and the student and perhaps between the university and the school or teacher. Some students were reluctant to ask or question their teachers. The ever present issues of power in the student teacher/mentor teacher relationship also contributed to some students having limited success with this assignment.

Pre service teachers who completed the assignment well were able to critique what they were viewing but also to recognize the strengths and weaknesses. For example one student wrote about mathematics saying "... [Maths] is done in isolation (from other subjects) and is delivered as a series of worksheets, where learning is centered upon learning the rules of the algorithm...where practice is seen as a means to an end..." She notes "the benefits associated with the way the curriculum is constructed are definitely present for my teacher and to a lesser extent for the students...by organizing knowledge into separate subject areas the teacher knows what she is expected to teach within each learning area and how she is expected to teach it." She then relates this to the readings drawing on the arguments for a traditional curriculum as described by George (1996) and Lake (2004). Pre service teachers who found difficulty with the assignment were able to mention one or two aspects of an integrated curriculum albeit in very simplistic ways. For example the integrated curriculum was described by two students as 'an overlap in subject areas' without drawing on the readings to show how or why this might be occurring.

Planning, Teaching and Evaluating the Integrated Unit

The pre service teachers were placed in collaborative teams of three to provide support for each other, to scaffold ideas and to practice the idea of planning as a collaborative process. They gathered information about the students in their classrooms in a variety of ways including through discipline specific tasks as described earlier, observations in and outside of their classroom and through discussions with the students and their teachers. The selection of an appropriate issue or topic was important but equally important was the construction of an essential question that could guide the planning of an integrated unit. This provided a framework for pre service teachers to identify the learning outcomes for each way of knowing. As (Jacobs, 1997 cited in Chiarelott 2006, p 13) describes, essential questions 'are an exceptional tool for clearly and precisely communicating pivotal points of the curriculum.' They help to articulate the learning expectations. They suggest to students the key concepts, skills and values they will encounter in the unit. The learning sequence exposes the students to a range of experiences which results in the students being able to develop an understanding of the key concepts etc. The essential question also helped the pre service teachers provide a context for the content of several discipline areas.

Using their understanding of what children's capabilities were and conversations with the teachers the pre service teachers planned an inquiry unit based on a topic. An

essential question was used as the basis to explore a relevant issue from two ways of knowing. Pre service teachers also had to be explicit about an aspect of Mathematics and English. The focus of the planner was: What is the learning? How do you teach it?

In our trial we tried to encourage our pre service teachers to connect where possible to students' life worlds and to take a socially critical perspective of the topic by asking questions such as, what difference will it make in the students' lives if this topic is taught? Linking to students' life worlds was a crucial aspect of the pre service teachers' learning because they could measure how the students had changed as a result of participating in the learning (Laevers, 2006).

Some Essential Questions That Were Used Included

- A multicultural society – What do other cultures bring to Australia?
- How pulleys make life easier?
- What values underline the world cup soccer and participating countries?
- What are the links between the heart and the body?

Planning for learning was the focus for two of the three assessment items. Firstly pre service teachers completed an oral presentation about their planning. This was to their group of three colleagues and the lecturer. The essential question was stated during the introduction and participants could see whether the learning experiences would lead to connected thoughts and actions. After the planning presentation the pre service teachers implemented the learning sequence during their 6 week practicum. The final assignment at the conclusion of the practicum was a Roundtable where pre-service teachers presented the learning outcomes both in terms of their planning and student achievement. There was an emphasis on 'new knowledge' based on experience and reflection (Brandenburg, 2004 p. 168) Again the essential question was the vehicle that ensured coherence in the presentation.

As described by the National Schools Network (2002) the Roundtable is a public demonstration of student learning. It is the place where students are able to clearly describe to an audience, their understanding and knowledge of a topic. The Roundtable provides an opportunity for students to share insights into their learning. As they talk they indicate the extent to which they have internalised the knowledge and reveal, the depth and transfer of their conceptual understanding. The Roundtable also supports an approach to learning which values student control and autonomy, helps build confidence to talk in small groups about beliefs and practices and helps learners reflect on their strengths and weaknesses. In this project pre service teachers' learning was supported, valued and celebrated. The Roundtable allowed them to share their experiences and ideas with their colleagues rather than just one lecturer. Above all it was this sharing with others in their learning community which resulted in a very powerful experience for the pre service students.

Pre service teachers and staff perspectives of the course

Feedback suggested that the course was challenging yet rewarding as one pre service teacher in her course evaluation stated:

It is practical! Finally we are doing something that ties in so well with school. It was great to plan with the help of uni lecturers and other students, teach the planned unit and then assess what the learning was and my teaching. It was furthermore exciting to hear how other people's units went to hear other ideas. I really enjoyed this course and think it was fabulous to learn how to plan integrated units, assess learning, my teaching and how I would do it differently if I did it all again. I also felt this course brought me closer to other students as we had the chance to plan and work collaboratively with one another (Course Evaluation Instrument (CEI) data July 2006).

For the staff involved teaching this course was both frustrating and exciting. Frustrating as we dealt with pre service teachers' anger and concerns during the planning process but exciting when they returned from their practicum with some amazing stories and examples of what their planning and teaching had produced. We know that we pushed them, way out of their comfort zones and feedback on the course revealed that. For example another comment from the CEI data said:

The course appeared to take too long to make sense, which lead to many people feeling unhappy with the direction of the course. In the end it became more clear (sic) but I feel that to reach this point it took too long.

However since that time many students having had further time to reflect have come back to us to say things like, 'On reflection I realize just how much I learnt in that course,' (Jodi, PC October 2006).

As a teaching team we were also pushed out of our comfort zones as we wrestled with some of the big ideas in disciplines with which we are not so familiar in order to help pre service teachers' understandings in each area as well as across the disciplines. We needed to be able to specifically articulate what we considered important for our discipline and to have many conversations about what that meant for curriculum integration.

Conclusion

In concluding this paper we return to the research questions which shaped this project. Firstly the issue of pre service teachers' understandings of integrated curriculum. As described above the first assignment which centred on this topic revealed a wide range of understanding. However, by the time the pre service teachers had completed their practicum which included teaching an integrated unit; their understanding as revealed at the Roundtables, had increased significantly. This could be seen in how they talked about their unit of work and in the samples of student work they presented. It was also obvious that many had increased their understandings of particular subject areas and how these can be planned. This was positive news for the teaching team because the second question we considered in this project was about how well pre service teachers' previous studies in curriculum courses had set them up for successful planning of an integrated unit?

The teaching team assumed that because they had completed a course in each curriculum area that they would have a basic knowledge in the different ways of knowing. What we found was that the pre service teachers were really only confident in their general study area of expertise. The curriculum courses had not provided sufficient background for them to integrate effectively. It was therefore incumbent on the *Integrated Curriculum* course to develop the pre service teachers' abilities to plan an integrated unit for their third year practicum. How well were we able to do this?

Whilst it was very labour intensive for the teaching team we believe the course did result in successful outcomes for almost all students. The use of the essential questions was a key element to this success. Whilst the idea of essential questions was challenging initially, they did ensure a holistic approach to curriculum construction was achieved. For each pre service teacher to be set up for success involved an enormous amount of mentoring from academic staff. Much of this mentoring was one on one: a teaching model that does not fit well in a university undergraduate program.

On reflection there were several issues that would restrict the course being run on a regular basis. It was very labour intensive and none of the teaching team would consider repeating the course in its current structure. The mismatch between school practice and our innovative integrated curriculum was difficult for many of the pre service teachers. Many were in situations where it was difficult to teach the planned unit. Some were told that certain topics could not be taught, for it must be said, a wide range of valid reasons. This meant that the teaching team also became involved in a pastoral care role so as to ensure the pre service teachers maximised their learning in the practicum in a supportive environment. There was constant challenge for the teaching team. Working in interdisciplinary teams involves enormous amounts of planning which of course has effects on other teaching, research and administrative commitments at university. So whilst the modeling of sound middle school methodology was achieved the university staffing formula does not match the needs of this innovation. Should such a course be repeated changes to staff student ratios would be an important consideration.

However despite the workload issues we do believe that a course such as this does have a place in a Bachelor of Education program. We certainly underestimated the complexity of this task for pre service teachers two and half years into their four year degree. As a teaching team we have decided not to teach the course in its current form next year. We recognize that a course such as this is better placed in fourth year when pre service teachers have had more experience in schools and more time to experiment with teaching all areas of the curriculum albeit separately. After discussions within the program team it has been decided that the curriculum integration course at third year will only involve Mathematics and English. At the time of writing, this course is still in the planning stage but as we are both involved we will take what we have learnt from this trial to the new iteration of the course.

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