Achieving positive outcomes in numeracy for indigenous students

Rebecca Cronin, RMIT University

Chris Sarra, Cherbourg State School

Nicola Yelland, RMIT University.

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Abstract

It has long been recognised that Indigenous students are the most disadvantaged group in Australia’s education system (e.g. Ritchie & Edwards, 1996). Research has shown that funding (e.g. ABSTUDY) from Federal government initiatives, has not had a significant impact on improving outcomes for Indigenous children's education (Gibson, 1998). Research carried out by DETYA (2000) also identified areas of concern, and it is clear that more needs to be done to improve the educational opportunities for Indigenous students so that they can succeed at school. In this paper we highlight dimensions of teaching and learning with Indigenous students and the ways in which more positive educational outcomes may be achieved.

Burnett (1999) postulated that the race of a society or population is "deeply rooted in the material practices and structural relations of power which define meanings and social values" (Burnett, 1999, p. 50). In Australia, since colonization, the Anglo-Australian race has dominated, and political policies have enabled this domination to be privileged. This paper will also consider the ways in which teachers can take into consideration the ‘material practices and structural relations’ for Indigenous students in their classrooms and examine the relevance of this to improving their educational outcomes. It will also suggest ways in which we recognise difference and incorporate it into a productive pedagogies model.

Introduction

Aims of the study

This research was an investigation into the teaching practices that were thought to enhance positive educational outcomes in numeracy for young Aboriginal students. The purpose of this study was to critically evaluate the role of pedagogical practices in facilitating mathematics lessons, and to evaluate the ways by which teachers can create meaningful numeracy experiences for Indigenous students.
Methodology

As this study required a design that accommodated the complex nature of teaching and learning mathematics for young Aboriginal children, and the cultural context of the learning environments, an evaluative case study (Bassey, 1999) was used. This was done to enhance the understanding of the pedagogical approaches appropriate for young Aboriginal children in an urban context, and to evaluate the teaching practices in numeracy/mathematics, informed by a "chain of evidence" or case study data base - for example in the form of interviews, observations of teaching and student work samples.

The proposed research employed a case study design to explore exemplary teaching practices in mathematics for young Aboriginal students. Case study design is appropriate for exploring a phenomenon within a particular context (Creswell, 1998).

It was postulated that the effectiveness of the teaching practices could be determined by using an evaluative case, which has formative and summative components (Bassey, 1999). In this study, formative evaluation was used to monitor and continuously inform the researcher of teaching practices that teachers employed and why. Summative evaluation was used at the conclusion of the study to assess the overall effectiveness of particular practices that were implemented.

A case study was used to develop a theoretical framework that enabled the analysis of the data about teaching mathematics to young Aboriginal children in the rural Indigenous community of Cherbourg, in Queensland. Initially this framework was informed by research literature, and teacher craft knowledge (Yin, 1994).

The issues that have been explored in this study comprised (a) factors that influence Aboriginal children's learning of mathematics, (b) teaching practices that have been used in the participating Aboriginal School, and (c) the criteria of an effective instructional program in an Aboriginal school.

This study highlighted the importance of improving educational outcomes in mathematics for Indigenous students who are currently the most educationally disadvantaged students in Australia.

Justification for the Study

Government funded research projects (DETYA, 2000) that have targeted Indigenous students numeracy skills, have shown that most common approaches trialled when teaching Indigenous students mathematics, were within a withdrawal program and predominantly small groups were used. Because most teaching trials (DETYA, 2000) were of this nature there was cause for concern when examining outcomes of that research for the purpose of this study, due to the fact that the reality is that Indigenous students are in a whole class situation. The scenarios of teaching trials that involved withdrawing students were deemed by the researcher to not be an appropriate mode of teaching. The aim of this research was to examine teaching practices in a mainstream classroom that were effective in providing opportunities for meaningful, authentic learning to occur.

For equity to prevail in schools today it is imperative that classroom teachers are aware of the ethnic diversity that exists in Australia. As teachers bring to their classrooms particular attitudes, skills, values and expectations, which are a result of the teachers socialising experiences, students also arrive at school with a bank of knowledge, values, expectations, skills and attitudes, which may or may not correspond to those of the teacher. If a teacher is
aware of the diverse contexts from which students come then inter-personal, inter-group and cross-cultural communication will be enhanced (Pardington & McCudden 1993).

In Australia to date all Indigenous groups experience the influences of the dominant mainstream society. Pardington & McCudden (1993) argued that the Indigenous people who have had the most demanding and longest contact and who are detrimentally affected are those in urban and rural-urban conditions.

**Cherbourg State School Profile**

This study took place in one school in Queensland - the rural Aboriginal community of Cherbourg. Cherbourg State School is an Aboriginal community school in the South Burnett District in Queensland, catering for approximately 250 local children. Educational programs range from Kindergarten to Year 7. As part of the school program, community agency involvement to address relevant community issues such as health, nutrition, safety, child protection and religious education is encouraged.

In 2002 the school was staffed by a Principal, 6 Primary classroom teachers, 1 specialist Aboriginal Studies teacher, 2 Preschool teachers, 1 Kindergarten teacher, 0.5 Reading Recovery teacher, 0.5 Resource consultant, 0.5 Teacher Librarian. An Indigenous teacher aide supported each classroom teacher. Indigenous teacher aides were also used effectively in the capacity of Family Support Workers. The school also received specialist support for one day per week in the following areas of Music, Physical Education, Guidance Officer and Learning Support Teacher.

**Context of the study**

This research was carried out over a one year period in the four early childhood classes - preschool, grade one, two and three. The aim was to obtain information about the ways in which the four teachers assisted their student's numeracy development. The areas that this study examined related to pedagogical practices, teaching styles, methods and cultural values, as well as the mathematics curriculum and learning outcomes. In addition to this, it was important to gain an understanding of the types of activities and materials previously utilised and to examine the teachers' expectations of their Aboriginal students. The ways in which the teachers valued the children's culture was also examined, to determine how that factor affected children's demonstrated outcomes in state wide tests, as well as in their everyday mathematical and numeracy experiences.

In the community of Cherbourg the children are accustomed to sharing in so many areas of their life. In the classroom, all of the children encourage each other to strive to reach their maximum potential in all areas of the curriculum, and want each other to have the right answer. One teacher said "They show respect for each other and demonstrate communicative processes by taking turns in classroom discussions. They share materials well, try not to call out the answers and are better at putting their hand up. They will still whisper the answer to a person next to them if they don't have their hand up - in order that they may have an opportunity to participate in a positive way to classroom discussions just so that they know the answer". The children have a real sense of 'community' in the classroom.

The issue of testing is difficult for many reasons but mainly because sharing is a part of the children's culture. One teacher explained that the school community does not want children to lose any sense of community in their participation in the individual tests. It is important however, that the students at Cherbourg are able to perform on such tests, and that they realise that taking the test is important.
At Cherbourg State School we aim to generate good academic outcomes that are comparable to other schools around Queensland, and further to nurture a strong and positive sense of what it means to be Aboriginal in today's society.

Cherbourg State School Annual Report, 2000

Concerns and Issues

After consulting with the four early childhood teachers who agreed to participate in this study, it was evident that the nature of the research would differ greatly with each teacher. A major goal of this research was that it should not be invasive of the teachers personal time, it had to be of assistance to the teacher and it had to address an area of mathematics teaching that the teacher identified as being of concern.

For the purpose of this paper the data from two of the four case studies generated will be presented. The two examples that will be discussed are of a contrasting nature, and the descriptions are appropriate examples of the range of issues that are relevant to teaching Indigenous students.

Case Study One

The grade one teacher was very enthusiastic about participating in the study and had a very positive view of the student's ability and always expected the best of them. This teacher had an understanding of a range of issues that affected the lives of her students and was realistic about the conditions of her student's lives that were out of her control. For this reason the year one teacher highlighted that the issues that faced her students were difficulties that pertained very much to their use of standard Australian English. In conversations we decided that a unit of work that was language based and very much integrated across the key learning areas, whilst explicitly addressing the outcomes of the mathematics syllabus, would be planned and implemented.

The unit planned was based on the measurement strand of the syllabus, and the aim was to emphasise depth in mathematical thinking rather than superficial exposure to a series of fragmented topics.

Significant features of the planned mathematics opportunities:

- Students spend time exploring activities in depth. Manipulatives were provided so that there were opportunities for students to explore and experiment with the concepts or outcomes. The students worked in small groups, and their discussions were observed, which demonstrated, that the activities provided the opportunities for rich language experiences.
- Students were encouraged to find more than one way or solution to a problem. Due to the open-ended nature of the problems there was more than one way to approach the tasks.
- Students needed to invent their own strategies and approaches, rather than relying on memorised procedures. Problems were posed to the students that enabled them
to analyse the skills or knowledge they would need to know, in order to solve a problem.
- A variety of resources and materials were available - including technology, as a natural part of children's everyday mathematical work.
- Children need the opportunity to express their mathematical thinking through drawing, writing and talking.
- The structure of each lesson commenced with the whole class proceeded to smaller groupings then reverted the whole. The opportunity to explore the mathematics in their environment and talk with their peers was noted as a critical factor for language acquisition.

In order for the students to develop the understanding about the useful nature and relevance of mathematics in their lives, daily routines in the classroom were carried out. These included Daily Maths Routines, which involved posing questions. For example:

- How many children are here today?
- Days of the week - how many days of school have we had this week? How many days of school are left in this week?
- What time is it? In one hour's time, what time will it be?

The Core Learning Outcomes that were selected were derived from the trial version of the Queensland Mathematics syllabus. The syllabus states ...

*Students select the appropriate attribute (length, mass, area, volume) to compare the size of objects, explaining their thinking using everyday language.* P.48 Trial Syllabus.

**Productive Pedagogies:**

This module focused on the dimensions of **Intellectual quality** and **Connectedness**. The Queensland School Reform Longitudinal Study Final Report identifies four dimensions of the productive pedagogies:

- Intellectual quality
- Connectedness
- Recognition of difference
- Supportive class environment

From engaging in this module students will develop:

- **Higher-order thinking** - students combine facts and ideas and synthesise, generalise, explain, hypothesise or arrive at some conclusion or interpretation.
- **Deep knowledge** - establishing complex connections to a topic or issue.
- **Deep understanding** - students grasp complex relationships between the central concepts of a topic and as a result of these deep understandings they can produce new knowledge by discovering relationships, solving problems, constructing explanations and drawing conclusions.
- **Substantive conversation** - conversations and interactions are among students and between students about the focus of their learning and inquiry. Dialogue and intellectual substance, logical extensions, and synthesis are included in the conversations within the class.

**Connectedness** focuses on:
- **Knowledge integration** - integrating across the Key Learning Areas.
• **Background knowledge** - acknowledge students' prior knowledge and backgrounds and making connections to the learning.
• **Connectedness to the world** - learning takes place in a real world context, making connections to the wider social context where the student lives.
• **Problem-based curriculum** presents students with specific real life problems to solve.

Examples of activities in the module of work that considered the dimensions of Intellectual Quality and Connectedness were...

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<thead>
<tr>
<th>Intellectual Quality</th>
<th>Connectedness</th>
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<tbody>
<tr>
<td>• Problem posing and problem solving experiences</td>
<td>• Daily routines</td>
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<tr>
<td>• Open ended tasks and activities</td>
<td>• Constructivist approaches - ie: Class discussions to explore children's</td>
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<td>( No work sheets were used)</td>
<td>understandings</td>
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<td></td>
<td>• Follow up activities that the children could carry out at home with their</td>
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Case Study Two

The grade three/four teacher was also very enthusiastic about participating in the study, and really wanted to improve the learning opportunities for her students. There were two areas of need that she had identified and wanted to work on. The first was addition. The second was how to address preparing her students for the grade three test, so that she could assist them to develop higher self-esteem about their ability in this mathematics context of completing tests.

The teacher indicated that in order to try to motivate the children, she tried various forms of bribery - such as sport, games and lollies. She said "I am in the process of changing, though to a more personal approach with individual performance charts. I don't want them to think they always need to be rewarded for working. For completing work they will get coloured stars, and work up to a gold star. After so many gold stars we may have some kind of celebration."

She thought that the children did not experience stress in relation to their schoolwork, but that they were just lacking in confidence. She said that this could be seen by their constant asking of her "Is this right Miss?"

We planned for the children to have an increased opportunity to feel confident about completing a test and hence the children needed the appropriate literacy skills to enable them do so. Questions were written by the researcher that was similar in degree of difficulty and content to those seen on past tests. There were only five questions on a page initially, so as to not overwhelm the students. The students were given one page of test scenarios per day to complete for two weeks. The children were arranged into groups of four students per group, and in these groups the students and teacher/teacher aids could talk about the questions - for example the children would be prompted to think about what the question is asking or whether or not there were any unfamiliar words.
At the beginning of the third week of test preparation, the classroom teacher wanted to see how able the students would be, to work through a past exam in its entirety. The researcher was visiting the school at this time and the classroom teacher asked the researcher to conduct this trial test under test conditions.

Conclusion

This research is work in progress, and the process of evaluating all of the data is yet to be completed. Thus far the study has shown that the principles of effective teaching and learning or the productive pedagogies, are relevant and applicable when teaching Indigenous students. A 'special approach' was not required but rather good pedagogy is good pedagogy. Teachers of Aboriginal children need to be culturally sensitive just as all teachers should.

According to 'The Principles of Effective Learning and Teaching' which...

- founded on an understanding of the learner;
- requires active construction of meaning;
- enhances and is enhanced by a supportive and challenging environment;
- is enhanced through worthwhile learning partnerships; and
- Shapes and responds to social and cultural contexts.

(Department of Education Queensland 1994, p. 1).

These principles suggest that if the teacher has thorough background knowledge of the learner and their social and cultural context, than there is greater chance that more meaningful learning and teaching will occur. Against this background, building good teacher-student relationships becomes paramount.

At Cherbourg State School teachers are directed and supported to establish better connections with the parents/guardians of their students, in the interest of developing a greater knowledge of the contextual issues the children bring into the classroom. This in turn allows the teacher to develop learning experiences that students are much more likely to 'connect' with.

Here there are clear implications for how one sees the role of teaching in an Aboriginal community. In the mainstream classroom a teacher may be able to focus mostly on planning and pedagogy, without considering at length the real life experiences of their students. The extent to which the teacher 'connects' with the students and the students 'connect' with the teacher is greater, albeit perhaps not great enough.

In an Indigenous community context, the extent to which the teacher and student 'connect' is significantly diminished, given the greater difference between the backgrounds of the teacher and student. Against this background, the professional teacher, who is more interested in student learning outcomes, will develop an interest in the child's cultural and social context - which is just as great as their interest in the syllabus. In fact, it is argued that if a teacher is not prepared to engage with the student's social and cultural context, then they may as well not bother to engage with the syllabus either. It is further argued that those not prepared to engage with the student's social and cultural context are of no productive use to Indigenous students or Indigenous communities and one must question their use to a highly reputable teaching profession.
As the data from the case studies are analysed throughout the remainder of this study, it will be important to consider the ways in which we recognise difference and incorporate it into a productive pedagogies model, as well as the ways in which teachers can take into consideration the ‘material practices and structural relations’ for Indigenous students in their classrooms, and examine the relevance of this is to improving their educational outcomes.

References


