

Student Centred Approaches: Teachers' Learning and Practice

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Student centred approaches to teaching and learning in mathematics is one of the reforms currently being advocated and implemented to improve mathematics outcomes for students from low SES backgrounds. The models, meanings and practices of student centred approaches explored in this paper reveal that a constructivist model of student centred teaching and learning is being promoted and implemented with some success. The ways in which teachers and leaders are being supported through network and school based professional learning are described.

A multi-faceted network approach to improving literacy and numeracy outcomes of students in low socio-economic status (SES) school communities is the context for the current study. It was developed and is being implemented in Victoria and is jointly funded by the Australian and Victorian Governments (DEEWR, 2008; DEECD, 2009). The Victorian Pilot combines the five areas of reform identified in the Australian Government's initiative: (1) leadership and whole school change; (2) lifting teacher capacity; (3) effective use of student data; (4) student centred approaches and interventions; and (5) engaging parents and community (DEEWR, 2008; DEECD, 2009). These reforms are being implemented in Victoria through networks of schools that work together to take joint responsibility and to learn and share effective practices. The networks and schools are supported by a network leader, teacher coaches, and regional numeracy and literacy leaders.

The particular focus of this paper is student centred approaches, the ways in which it is being defined and implemented by regional and school leaders and teachers, the practices of teachers, and their perceptions of its impact on student learning.

Background

Student centred approaches (SCA) to teaching and learning are informed by both constructivist and socio-cultural theories of learning. From both theoretical perspectives, the student is the centre, or focus, of all learning and teaching decisions. However the different theoretical perspectives as well as perspectives from different disciplines and education policy documents mean that this concept may be confusing for teachers. Most alternate terms used in the literature privilege socio-cultural theory, for example, personalised learning, independent learning, autonomous learning, and authentic learning. In this sense SCA "gives students greater autonomy and control over choice of subject matter, learning methods and pace of study" (Gibbs, 1992, cited by Sparrow, Sparrow and Swan, 2000). Black (2007) provided a framework for SCA encompassing a range of elements. These elements include student control over their own learning as well as teacher flexibility and responsiveness to students' lives, needs, knowledge and interests:



A student-centred approach to teaching and learning:

- Is based on a challenging curriculum connected to students' lives
- Caters for individual differences in interest, achievement and learning styles
- Develops students' ability to take control over their own learning
- Uses authentic tasks that require complex thought and allow time for exploration
- Emphasises building meaning and understanding rather than completing tasks
- Involves cooperation, communication and negotiation
- Connects learning to the community. (Black, 2007, p. 1)

Black (2007) cited three models of SCA: (1) Inquiry and problem based learning where students have control over their learning and there are high levels of co-operation among learners; (2) Authentic curriculum, for example, Queensland's New Basics Curriculum (DET Queensland, 2004) where learning is connected to students' interests and needs using rich and authentic tasks; and (3) Constructivism where teachers tailor their instruction to students' learning needs.

A search of the mathematics education research literature for SCA yields few studies yet the term is frequently used to describe effective teacher practice in mathematics. From the learning perspective, Cobb (1999) argued that mathematical learning "should be viewed as both a process of active individual construction and a process of enculturation into the mathematical practices of wider society" (p.136). Studies focused on improving mathematics teaching and learning often adopt a constructivist perspective of SCA. For example, the Early Numeracy Research Project (DEECD, 2007) and Scaffolding Numeracy in the Middle Years (Siemon, Izard, Breed & Virgona, 2006) each provided findings to show that effective teaching occurs when the student is the centre of all decisions about teaching and learning. Each of these projects provided guidelines to teachers on knowing students' strengths and weaknesses and using effective assessment tools (designed by these projects) to identify students' learning needs. They provided evidence of the effectiveness of targeted teaching and differentiating learning according to student learning needs based on growth in achievement. These and other studies indicated that SCA involves grouping students based on need, selecting models, representations and tools for working with mathematical ideas, making connections between and sequencing key ideas, strategies, tasks and representations, using open-ended tasks, using scaffolding prompts to aid mathematical thinking and learning, and providing choice of activities or tasks to students. Black argued that SCA is not yet well defined or understood by classroom teachers:

For student centred learning to flourish in more schools in disadvantaged communities, it needs to be better understood as a rigorous practice. Work is needed to develop sharper definitions of what student-centred learning constitutes, collate the evidence of its positive impact on student outcomes and disseminate workable models and supportive tools to schools. (Black, 2007, p. 37)

In this paper we describe the way in which teachers in low SES school communities have taken up the challenge of improving student outcomes by building their knowledge and developing practice that may be described as student-centred.

The Study

The forty-three (43) government schools in this study belong to two networks of primary and secondary schools in regional Victoria making up about one half of the schools participating in the Victorian Pilot. The schools ranged in size from small rural schools of 14 students to moderately sized secondary schools of up to 542 students in regional centres. These two networks of schools were selected by the DEECD for

participation in the Victorian Pilot because of the low SES of the school communities in this network and the general underperformance of these networks overall and of individual schools when compared with other networks in Victoria. Some schools in these networks also have high proportions of Koori students or students who are new arrivals in Australia, refugees or meet the criteria for learners of English as a second language (ESL).

The study used a mixed methods design incorporating quantitative assessment of student mathematics outcomes and collaborative practitioner research methods (Davies, Cherednichenko, Kruger & O'Rourke, 2001) involving principals, assistant principals, numeracy leaders, numeracy coaches, regional network leaders and other regional project staff. The collaborative practitioner research involved the collection of personal accounts by email and round tables. We sought responses from between one and six teachers in each school (depending on the school size). We asked three questions of the participants:

- Can you please provide an account of what you have been doing to improve numeracy outcomes for school/network?
- Why did you adopt this action, approach or strategy?
- What observations have you made about the success or otherwise of your approach?

We received 69 responses, from 18 schools, about half of which were responses about numeracy (the others were responses to the same questions about literacy). We then conducted a series of round tables where participants shared their personal accounts and analysed them. In this process teachers firstly analysed their accounts to generate their personal theories. Then the participants collaborated in groups to construct concept maps of reform and effective practices using their personal accounts and theories.

Concurrently measures of student outcomes were made using student assessment data collected at six monthly intervals during the study, which is on-going, and reported elsewhere (Vale, Davies, Hooley, Weaven, Davidson & Swann, 2010).

The findings reported in this paper arise from the analysis of participants' personal accounts concerning mathematics teaching and learning. We have used Goos' (2006) application of Valsiner's (1997) zone theory to analyse and structure the reporting of findings. We start by providing the context in which teachers began to develop SCA (zone the promoted action) and the structures, processes and resources provided to support teacher change (zone of free movement).

Promoted Action, Structures and Resources

The regional office of the schools in these two networks had established a professional learning program for school leaders as well as strategies for improving student outcomes in numeracy prior to the implementation of the Pilot. These policies documented instructional leadership practices in numeracy (and literacy) and effective teaching and learning practices for mathematics. The practices promoted in instructional leadership programs include planning learning based on students' knowledge, differentiating curriculum, using inclusive curriculum and connecting knowledge. For example:

Effective classrooms are organised around the pre-existing understandings of students. Connected concepts are taught in depth, and students are supported in monitoring their own learning. (DEECD, 2007, Module 2)

Effective units of work explicitly link content (knowledge and skill), learning activities, intended outcomes and assessment criteria. (DEECD, 2007, Module 8)

These promoted practices align with a constructivist theory of learning and also advocate that students take some control of their learning.

The numeracy strategy emphasises the teaching of “differentiated lessons that focus on deep, connected numeracy understanding” (DEECD, 2008, p. 5). The professional learning activities delivered in network meetings for principals, numeracy leaders and teachers is based on the Zone of Proximal Development (Vygotsky, 1978) and focuses on three main ideas:

- Where is the student at?
- What is the next point for their learning?
- Teach in depth

The programs are designed to enable teachers to identify a students’ pre-existing knowledge in order to plan teaching for each student’s learning needs, to be explicit, to use collaboration in classroom settings to consolidate children’s learning, and to aim for independent thinking.

Schools and teachers in the Pilot have been assisted to develop and improve their teaching practice through concurrent professional learning programs and leadership roles and structures within schools. Professional learning programs are delivered to School leaders, numeracy leaders or teachers through network meetings and numeracy leaders facilitate professional learning through teams of teachers grouped into professional learning teams (PLT) in their schools. Numeracy leaders are classroom teachers who also have responsibility for leading improvement of practice and outcomes in their school or sub-school. Numeracy coaches are expert teachers of mathematics who have received additional training about coaching and in effective mathematics pedagogy. Principals assign their regional numeracy coach(es) to work individually with teachers to improve their practice. Numeracy coaches are also assisting numeracy leaders to facilitate PLTs.

The personal accounts of numeracy coaches and leaders provide evidence of the practices that are being promoted and the structures and leadership approaches to support teachers. The following personal account explains that the leadership and network structures that bring together coaches, leaders and professional learning have been important for gaining commitment from teachers at different year levels in their schools:

We are starting to realise the value of using data to inform our planning and teaching. The model of having a link between the Maths Coach and the rest of the staff through a team of Maths leaders who are given extra training that can be tailored to the needs of their target area of the school and shared with their colleagues is an effective model that will gain strength over time as teachers who are feeling inundated are starting to see it as support rather than an imposition. (Numeracy Leader, Primary school)

PLT meetings and network meetings have enabled teachers and leaders to share their practice of SCA and discuss their students’ learning:

PLT meetings, which were not running regularly or with much of a focus are becoming value adding experiences for many of the teachers with the student at the centre of the conversation. This has not been an easy task and continues to need focused work and much support, but the three schools [school names deleted] have begun the journey. Activities like looking at student data to determine the teaching needs of a student or sharing students’ pieces of work are beginning to happen. Collegial sharing is happening between these three schools as a result of both the literacy and numeracy leaders being able to meet twice a term and continues to happen even though our formal group meetings have finished. (Numeracy Coach)

This account also illustrates that the process of change begins by discussing and analysing student work and achievement. In many of the schools particular assessment

tasks have been identified and used to enable teachers to find the student's level of understanding or fluency in order to plan for their further learning:

An assessment schedule was developed to include a number of assessment types such as Hume Fluency Assessment, On Demand tests etc. PD was then conducted on Assessment As, For and Of, with teachers discussing and/or displaying samples of each type and what these might look like across different levels. At present an assessment chart is being constructed with hyperlinks to samples as a reminder of what can be done. (Numeracy coach)

The following two accounts show how numeracy leaders have assisted colleagues to use the information gathered about their students and to reflect on their teaching to plan effective lessons. Each includes reference to identifying groups of students with similar learning needs and planning differentiated lessons or tasks:

In my role as Numeracy leader I have assisted staff to identify their groups, a common thread of need and plan differentiated lessons. I regularly undertake Numeracy walks to see what is occurring in classrooms and to gauge the levels of support required...We ran sessions on Differentiated lessons and spent some planning sessions, collectively planning a differentiated lesson to match an area of need. (Numeracy leader, Primary school)

I have spent Term 3 working in two classes, a grade 3 and a grade 2 to raise the levels of learning and the delivery the program. I have done this by analysing assessments with them, assisting in the formulation of similar need groups, co-constructing lesson sequences, differentiating tasks, locating activities and materials to meet needs, and providing feedback about my observations of the student's progress. Through the use of video I have been able to lead the teachers to evaluate the quality of their instruction and the physical organisation of their classes. (Numeracy Leader, PS)

Teacher Accounts of Student Centred Approaches

When we began to analyse the personal accounts of teachers, leaders and coaches we noticed that the actual term 'student centred' did not appear to have wide currency in any of the data collected. Teachers, numeracy leaders, school leaders and coaches more commonly used terms such as 'differentiated teaching', 'independent learning', 'personalised learning' and catering for 'individual students'.

Teachers who provided personal accounts believe that assessment for learning in the form of pre-testing and ongoing assessment are essential for plotting students' developmental pathways and planning sequential and differentiated lessons. They are aiming to design programs that match each student's zone of proximal development. While some teachers have been using data for a long time, they say that attending recent professional development activities has allowed them to make a connection between looking more deeply at assessment procedures, recording the data, analysing the data and using it to identify students' strengths and weaknesses. One teacher argued that a cycle of learning is essential – "assessment, analysis, learning program, assessment".

I have completed the Numeracy Fluency Assessment with each child and updated it throughout the year. This has given me an excellent basis for all of my numeracy program as I am conversant with the competencies of each child. I operate on a whole-small-whole method and have 4 numeracy groups. Hands-on activities with the expectation of accurate recording works well for me. Once again, planning as a whole team of Middle school teachers is fantastic. (Primary teacher)

We have conducted one-on-one interviewed for Year 7 & 8 students who have been identified at below the expected VELs level. These interviews identified points of needs for those students and we have then taught the students activities to progress these pupils. (Secondary teacher)

This year our school has undertaken a whole school approach to teaching Mathematics. To achieve this all teachers have participated in individual testing of all children – Prep-2 using the Mathematics Online Interview and 3-6 using Hume Fluency Assessment. The data from this testing

then was to be used to plan for individual needs and explicitly teach the skills and strategies at each child point of need.... The structure of a lesson was analysed and each section then modelled and practised during class lessons, and later discussed during unit meetings. Fluency tasks, differentiated lessons and reflection on the daily focus became an important part of our Mathematics teaching. (Numeracy Coach, Primary school)

Many personal accounts, such as the one above, include a reference to using some form of differentiated teaching linked to their use of assessment data including targeted teaching, use of grouping strategies and differentiated tasks:

By working with individuals or small groups you can assist students who are having difficulty with different maths concepts and make a difference. (Secondary Numeracy Leader)

I designed a grid to match the NFA [Number Fluency Assessment] which I encouraged staff to use. This gave a quick overview of a class, so teachers could quickly see what skills were required by whom. Grouping students for instruction was also easy to see. I have used this grid every week to select my groups and my areas of focus. (Numeracy leader, Primary school)

When you teach P-2 and 3-6 with just a few kids in each grade it presents enormous challenges. Team teaching to conceptual need overcomes this challenge as does the inherent flexibility offered by a program like Mathletics. (Principal, rural school)

The teachers in this study have commented positively on the use of targeted and differentiated teaching for their students' learning:

Providing lesson that are aimed specifically at the gaps in students abilities and learning have made great improvements to most students learning. (Yr 3 teacher)

The students are progressing well, they enjoy Maths sessions and are keen to articulate their learning and very confident to verify aspects they do not understand. (Primary teacher)

I have noticed that my students are more engaged as they are working at a level that suits them and they also have a more positive attitude towards mathematics as they are experiencing success. My higher achieving students have thoroughly enjoyed the challenges I have put to them and my lower students have been able to grasp concepts that would otherwise have gone over their heads. (Yr 1-2 teacher)

Others described improvements in their teaching practice or that of their colleagues:

The assistance I have received, in particular having the opportunity to work closely with a numeracy coach, has completely changed and improved my approach to teaching maths by:

- Showing me how to take apart and identify appropriate teaching sequences for each maths topic we cover
- Allowing me to practise and refine the structure of each lesson. I have always been aware of the suggested structure (whole, small, whole), but having a coach in the room allowed me to look at each aspect of the lesson in detail, see relevant demonstrations in context, and identify my own strengths and weaknesses
- Introducing to me specific assessment tools and being shown how to use the data from these for planning

My maths lessons now flow in a relevant sequence, I am confident with the content of my lessons, I know that each student is working at a level that they need to, and each of my lessons flows ... (Primary teacher)

The numeracy approach that I have taken this year has been quite successful, particularly once I was taken into the numeracy coaching program. I have found this to be particularly effective. My numeracy lessons are much more sequential, and differentiated targeting individual students needs much better. (Yr 3 teacher)

...I have observed the children being better organised, working in a quieter and more focused way and explaining their thinking more articulately. Both teachers are teaching in a more focused way, instructing with more clarity, demonstrating stronger modelling that includes their thinking

strategies and using their observations of one lesson to help plan the next. (Numeracy leader, Primary School)

Teachers' observations of improved learning are corroborated by analysis of assessment data which found greater than expected growth for primary students in a six-month period (Vale, et al., 2010). However this was not the case for secondary students.

Conclusion

Individual personal accounts from teachers and numeracy leaders attest to their acceptance and commitment to SCA that focus on developing fluency and understanding for improving student numeracy learning. Principals, numeracy leaders and coaches reported that professional learning teams were using, or developing skills in using, assessment tools and data to plan their teaching, and that they were promoting a range of differentiation tools, tasks, materials and resources to enact differentiated teaching.

The personal accounts of teachers about their practice and the personal accounts of coaches, leaders and Principals who reported on the practice of their colleagues provided evidence that teachers have begun to implement differentiated lessons and personalise numeracy learning. There were diverse understandings and practices in differentiated teaching and learning including:

- Using data to group students in ways that were either flexible or inflexible;
- Using flexible arrangements to personalise numeracy learning;
- Using tasks and materials appropriate to the student's stage of development; and
- Using fluency tasks for individual children in the classroom.

Individual personal accounts of teachers who have been coached and numeracy coaches and numeracy leaders also provided evidence of improvements in primary teachers' knowledge and capacity to take informed action in the classroom, that is, plan lessons that are based on students' "point of need," and support development of "deep, connected understanding". These changes in practice include:

- Planning lessons that focus on key concepts;
- Using explicit language to model concepts and explain thinking and reasoning;
- Planning lessons using the whole-small-whole structure more effectively;
- Using new insights into developmental pathways for mathematics learning to plan a sequence of lessons that flow and connect mathematical concepts and thinking; and
- Spending sufficient time on key concepts to sustain future learning.

While these teaching practices are not elements of SCA, this study shows that they are pre-conditions, related to the zone of proximal development, for teachers being able to implement SCA for mathematics learning.

In this study regional leaders and teachers have adopted Black's (2007) third model of student centred approaches to teaching and learning where teachers' tailor their instruction to meet the needs of their students. There were fewer accounts received from secondary mathematics teachers and, according to the numeracy coaches, developing similar practices in secondary classrooms is their challenge for 2010. Perhaps a broader view of SCA is also required to engage secondary students; an interpretation that makes connections with their lives, uses authentic tasks and develops their ability to take control of their own learning.

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