

SUCCESSFUL OUTCOMES IN VOCATIONAL EDUCATION AND TRAINING
COURSES AND MATHEMATICS: HOW TEACHING PRACTICE AND
EXPECTATIONS INFLUENCE ACHIEVEMENT

Dr Bronwyn Ewing,
YuMi Deadly Centre,
Queensland University of Technology,
Queensland, Australia,
bf.ewing@qut.edu.au

Dr Grace Sarra,
YuMi Deadly Centre,
Queensland University of Technology,
Queensland, Australia,
grace.sarra@qut.edu.au

Professor Tom Cooper,
YuMi Deadly Centre,
Queensland University of Technology,
Queensland, Australia,
tj.cooper@qut.edu.au

Dr Chris Matthews, Griffith
University,
Queensland, Australia,
c.matthews@griffith.edu.au

Glen Fairfoot,
YuMi Deadly Centre,
Queensland University of Technology,
Queensland, Australia,
g.fairfoot@qut.edu.au

Keywords: vocational education, adult Indigenous learners, workplace numeracy

Abstract

This paper reports on a large four year Australian Research Council funded Linkage Project titled Skilling Indigenous Queensland, conducted in regional areas of Queensland, Australia from 2009 to 2013. The project investigated the teaching and learning of mathematics in Vocational Education and Training (VET) courses with high Indigenous student enrolments. It adopted a mixed methods design participatory collaborative action research (Kemmis & McTaggart, 1988) and community research (Smith, 1999) to develop a series of case studies. Teachers/trainers/teacher aides (N=39) and students (N=231) participated in the project. Nine courses and seven sites were the focus of the study. This paper attends to two aspects of the project—teaching practice and expectations and draws on data from twenty-one participants from three sites. Findings indicated that VET teachers had high expectations of students and

were communicated via the teaching practices used during learning sessions. Further, students had high expectations of themselves and their teachers.

Introduction

Technical and Further Education [TAFE] Institutes and VET across Australia play a major role in the provision of labour by responding to industry demands that are oriented towards an industrial training model, as well as addressing the barriers faced by disadvantaged groups such as Indigenous young people. As public providers, TAFE Institutes are required to respond to the needs of people disengaged from education and training, such as early school leavers and those who are unemployed and unskilled (Thomson & Hillman, 2010; Volkoff, Clarke, & Walstab, 2009). The challenges that these Institutes face in responding to such needs include trying to support Indigenous students who have experienced multiple and cumulative disadvantages through belonging to a number of disadvantaged groups such as low socio-economic groupings. Their needs are complex and therefore are not always met through broad client-based programs. As Institutes are faced with increasing demands to provide further educational and non-educational responses to such barriers, expanding consultation with communities and schools is necessary to address the increasing and more challenging needs of Indigenous learners (Bradley, Noonan, Nugent & Scales, 2008). In this paper we report on the teaching practices adopted by teachers and trainers and the expectations that teachers, trainers and students have for one another in order to achieve successful outcomes.

Background to the Project

In 2009, researchers from the YuMi Deadly Centre at the Queensland University of Technology commenced an Australian Research Council Linkage project that focused on ways to enhance the teaching and learning of mathematics in trades and certificate courses to Indigenous secondary students in Year 11 and 12 and adult learners enrolled in VET courses.

Preliminary discussions and consultations were held with key educationalists and community members in seven rural and remote centres. Questions about how courses were taught, students performed in the mathematics of courses were raised and discussed. Agreement was reached that each of the seven sites could nominate two courses that would be the focus of the four year project, they included: Metallurgy, Civil Construction, Indigenous Housing Repair and Maintenance, Children's Services Certificate, Retail, Horticulture, and the Remote Area Teacher Education Program [RATEP]. In 2010 first official visits to sites commenced. The next section provides a review of the literature pertaining to teaching practice and expectations

Literature Review

The research literature reinforced the importance of the relationship between teaching practice, teacher, student and parental expectations as a means to improve student achievement (Alloway & Dalley-Trim, 2009; Sarra, 2012; Stein & Hussong, 2007). Such a relationship is critical if each of the groups want better outcomes for students. Everyone has to invest into the challenges confronting students, including the students themselves (Sarra, 2012). Building strong relationships and having high expectations are vital throughout the teaching and learning process. Related literature strongly supports this claim.

Expectations in Teaching and Learning Contexts

Student achievement is closely associated with teacher expectations of groups of students (Bol & Berry, 2005; Lubienski, 2002; Sarra, 2012). Differences in teachers' expectations of particular groups of students were found to widen the gap between those students who could perform well academically and those who could not (Bol & Berry, 2005). The consequence for low achieving students is that emphasis is placed on teaching and testing basic, low-level skills (Lubienski, 2002). When particular groups of students demonstrate that they are

capable of achieving, they are confronted with the low expectations of the teacher, thus constraining their educational opportunities in that subject.

A study that investigated the social and academic expectations for at-risk Year 8 rural high school students in Australia identified that students who had a positive perception of education had higher expectations of themselves as opposed to those who did not (Stein & Hussong, 2007). The students with high expectations had more fulfilling school experiences compared to those students with low expectations and poor performance were likely to encounter barriers to schooling. Poor performance and achievement has been found to occur in the same social groups of students, that is, Indigenous and low socioeconomic groupings (Bol & Berry, 2005; Walkerdine, 1998). Unfortunately, when they are viewed as possessing the problem, they have been precluded from the very things they needed for their success, that is, ‘an interest in, and curiosity about their surroundings, perseverance, and enthusiasm’ (Walkerdine, 1998, p. 140). Instead, they are forced into an unbreakable cycle of poor performance and low expectations (Walkerdine, 1998). If students saw themselves as unsuccessful in their course they were not likely to have a strong sense of themselves as learners nor were they likely to participate in the learning of that classroom. This issue is not isolated to Indigenous Australian students.

A study of the reading performance of Maori, Pacific Island, Asian and New Zealand European students found that teachers did have expectations in reading for Maori students (Pringle, Lyons, & Booker, 2010); however, they were lower than their expectations for other ethnic groups despite the fact that Maori student performance at the start of the year was not lesser than the other ethnic groups. African-American high school students’ perceptions of their teacher’s expectations indicated that the majority of the students believed that their ethnicity was why their teachers did not have high expectations of them (Pringle, et al., 2010).

Success or failure in learning may be contingent on several related factors such as the practices of the classroom context and teacher expectations of students' potential for learning (Lubienski, 2002; Sarra, 2012). Therefore, questions about who is learning what, and how much is learned (or how little), are in some degree questions about the expectations implicated in the learning context. High teacher expectations are often translated into effective teacher pedagogy which in turn empowers students to attain these expectations (Jamar & Pitts, 2005).

The previous discussion highlighted several important aspects pertaining to expectations and their influence on student achievement. The relationship between expectations, student achievement and equitable and effective teaching is significant because each is influenced by the other.

Trialling a Model for Teaching Numeracy in VET Courses

In the project, we were concerned for equity and social justice in education and the recognition of the structured nature of inequality in contemporary societies, its consequences in unequal access to valued resources such as power and knowledge, and the ways and means by which this situation can be changed. In response, we sought to construct expanding emancipatory possibilities for teachers, trainers and students.

We piloted a model of teaching that was trialled in other Centre projects in primary schools in Australia with success (see for example, YDC Western Metropolitan Region Project, 2012b). The model, *Reality, Abstraction, Mathematics and Reflection (RAMR)* (YuMi Deadly Centre, 2012a) was trialled because of its focus on high expectations for Indigenous learners and effective teaching practice in mathematics and with a view to enhancing VET teaching practices as they emerged through the delivery of VET certificate courses. The model is underpinned by social constructivism.

Briefly, this theoretical position rests on the premise that what students can do with assistance is more indicative of their cognitive development than what they can do alone (Brown, Metz & Campione, 1996; Marti, 1996). Moreover, the focus is on the interplay between language and thought (Sierpinska, 1998) and cognitive development and culture (Lave & Wenger, 1991; Saxe, 1991). Researchers who claim that priority should be given to social and cultural processes (Engestrom, 1996; Levine, 1996; Minick, 1996; Voigt, 1994) draw mainly from Vygotsky's (1930) contention that social interaction and culture are constitutive of an individual's cognitive development. Extending the constructivist view, Vygotsky observed that a student's abilities are strengthened through quality social and cognitive interaction between the students and the teachers or trainers. In the learning context, the teacher supports students at the cutting edge of their competencies and adjusts the amount of scaffold (Bruner, 1985) or support, to take account of the new learnings of the student. Vygotsky (1930) refers to this as a student's "zone of proximal development" (p. 137), that is, the difference between a child's actual development and potential development at that point in time. The actual extent of this zone is determined through collaborative teaching and learning.

Informed by social construction, the RAMR model refers to a pedagogic cycle of reality, abstraction, mathematics and reflection with the intention of supporting teachers and trainers with the teaching of mathematics, and then, the learning of their students (Matthews, 2008; YuMi Deadly Centre, 2012a). Reality refers to factors such as the material setting, the teachers and students present and what they know and believe, the language that is used, the social relationships and expectations of the people involved and their identities, as well as historical, cultural and institutional factors. It also includes the observations of mathematics taken from a teacher's and or student's perceived reality. In this sense, the focus is on how teachers and students produce their realities of mathematics in everyday life, as well as what

the activities of everyday life are. It is a process of co-construction. The teacher and students contribute to the construction of a particular shared reality in the learning context. Thus, for teachers to understand a learner's ideas, they need to orient themselves with respect to those ideas and the context within which they arise. From the perceived reality, the teacher supports the student to create abstract representations of it using the hands-body-mind—multisensory experiences, materials, language and symbols.

The process of abstraction emerges from the student's reality, and in doing so, enables them to represent the identified reality using their hands, body and mind, materials, symbols and language in a range of ways to create meaning. Here abstraction refers to some kind of lasting change, that is, the result of abstracting enables the learner to recognise new experiences as having the similarities of an already formed experience (White & Mitchelmore, 2002). In this learning process, they are creating meaning. That is, abstraction and learning becomes a social matter in which experience and its interpretation inform each other. Through this process, negotiation of meaning becomes a necessary condition for mathematics learning (Voigt, 1994). When students' interpretations differ from the teacher's, negotiating meaning is crucial. As students negotiate, reflect and communicate in that context and articulate their thinking socially, their developing conceptual understandings are increasingly reified, that is, they take a reality of their own because they are made more explicit within the context. Through this ongoing interplay of participation, reflection and reification, learners give shape to their experiences and meaning for mathematics learning (Goos, 2004). In this dialogic framing reality and abstraction are intrinsically relational. These elements and the knowledge formulated from them serve as a basis for further construction and negotiation of meaning, here, mathematical meaning because they have been abstracted from students' perceived realities. The next section explains what we did in the project.

Methodology

The project adopted a mixed methods design aimed at benefitting research participants and included: participatory collaborative action research (Kemmis & McTaggart, 1988) and, community research (Smith, 1999). Participatory collaborative action research refers to is a “collective, self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social and educational practices” (Kemmis et al., 1988, p. 5). Community research is described as an approach that “conveys a much more intimate, human and self-defined space” (p. 127). Community research relies on and validates the community’s own definitions. As the project is informed by the social at a community level, it is described as “community action research or emancipatory research” (Smith, 1999, p. 127). A series of collaborative action research case studies to improve numeracy teaching of Indigenous VET students was developed (Kemmis & McTaggart, 2000). The cases focused on the interaction between teachers’/trainers’ teaching approaches and Indigenous VET students’ numeracy learning.

Participants

This paper focuses on questionnaire responses from eleven students and semi-structured interview responses from four teachers/trainers, one principal and five students. Pseudonyms have been used to protect the identity of participants and specific sites.

Data Collection Techniques

Questionnaire surveys allowed for the collection of demographic data and written responses to questions related to maths learning to develop a preliminary understanding of how students perceived maths, where they learnt it and who they asked for help. The survey was administered to new students in 2012 ($N=31$) with a return rate of 35% ($n=11$) Semi-structured interviews allowed for deeper understandings related to expectations and teaching practice.

Analysis

The survey asked student participants about a range of aspects including number of years studying course, grade finishing school, aims, and views about learning mathematics. The 2012 results were diverse. For example, of the students who completed the questionnaire ($n=11$) ten were males (91%), and one was female ($n=9\%$). A number of the completed questionnaires emerged from the Certificate 11 in Civil Construction which had a high enrolment of males. One female was enrolled in the same course.

Students were asked about why they enrolled in the course they were studying. The purpose of this question was to identify the reasons for enrolment. Of the participants who responded ($n=11$) over half (55%) indicated that it was to “get a job” (See Figure 1). Although (55%) indicated this reason, it indicates the traditional marker of a successful transition - getting a good job and becoming a responsible citizen (Circelli & Oliver, 2012). However, the success of a young person is determined on a range of factors not just a good job. Of the remaining students, skills (18%) and certification (18%) were identified along with “something different” (9%).

✓ Insert figures 1 and 2 here

Students were asked to rate mathematics as easy or hard on a likert scale (1 being hard and 5 being easy) (See Figure 2). A range of responses were indicated with 54% showing 3, suggesting it is somewhat easy/hard; 27% indicated hard or moderately hard and 19% showed it was moderately easy. Of interest was that none of the students indicated maths was easy.

Participants were asked to indicate where they learnt maths (See Figure 3). Of the 12 responses (one student indicated 2 responses – school and on the job) six (50%) indicated ‘on the job’ with five (42%) indicating at ‘school’.

✓ Insert figures 3 and 4 here

One response indicated “everywhere” (8%). A presupposition here is that the student sees maths as something that is not simply isolated to school or on the job and that it is learned in many facets of life.

The purpose of asking students who they ask for help was to identify if students saw their teacher as the only avenue to provide assistance or whether it could come from other sources, such as family and or friends (See Figure 4). Of the responses ($n=14$) (some students indicated more than one person) seven (50%) indicated the TAFE teacher and two indicated school teacher. The responses suggest that students were more likely to seek help with mathematics within a TAFE or school environment and less likely to go beyond school. Notable is that one indicated anyone, two responses indicated Google or a calculator and two indicated ‘not applicable’. The next section discusses the results from the interview transcripts.

Semi-structured Interviews

Semi-structured interviews provided participants with the opportunity to talk about the influence of expectations on learning. The interviews were conducted at four sites in 2012. One principal, four teachers/trainers and five students took part in the interviews ($N=10$). Ethical consent was given by all interview participants. The interview data was transcribed and managed using NVivo, a software program designed to easily access the data and allow for the identification of text for analysis, thus, discounting text that received minimal attention.

The transcripts overall.

A word frequency analysis was conducted for all of the interview transcripts. This method of analysis allowed for understandings of the most frequently used words occurring in interviews. It also allowed for generalisations or themes to emerge from the data. The tag

cloud in figure 5 indicates the strength of the themes using a range of font sizes. The larger the font, the stronger the themes (See Figure 5).

✓ Insert Figure 5 here

The tag cloud indicates two major themes—community and teachers with other minor themes shown but which have the potential to underpin community and teachers. Linkage to community and teachers can be further analysed using a cluster analysis (see Figures 6).

✓ Insert figure 6 here

Cluster analysis is a technique that allows for the visualisation of themes in the data. It also allows items with strong similarity to be connected by linkage lines. The thickness of the linkage lines works to identify the strength of the themes. If items have thick linkage lines there is a strong connection between the items. Thin linkage lines indicate a weaker theme. In Figure 6, the clusters associated with classrooms and community are very strong and show strong linkages with a number of minor themes, for example, apprenticeship, struggle, teaching and business. Worthy of noting is the lack of linkage between classrooms and community. Rather, the linkage is between teachers, classrooms and community. This is also the case for other linkages such as classrooms, community and apprenticeships; and community, curriculum and classrooms. A key theme between the three of these linkages is community. Of interest is the limited association with discussion and interest. Narrowing the cluster analysis further, keeping only the strongest themes indicated one key cluster—community (See Figure 7).

✓ Insert figure 7 here

The community cluster is particularly strong with interesting links to branding, apprenticeship, thinking, teachers, difficult and curriculum. The next section discusses the students' transcripts.

The students' transcripts.

We used tag cloud analysis to identify key themes in the students' transcripts ($n=5$) (See Figure 8). The larger words indicated a strong focus on understand with minor themes of experience, interested, construction and different. An assumption here may be that understanding is critical for students who are keen to gain employment after they have finished their course.

✓ Insert figure 8 here

In the cluster graph (figure 9), the tag cloud themes from figure 8 are linked with other themes. For example, there are three key themes shown in the graph: 1) understanding, communicate and experience, 2) teachers and explains and, 3) learning and different.

✓ Insert figure 9 here

The themes were significant given the focus of the project. For example, the investigation of the practices used by teachers has revealed the connection between understanding, communication and experience and how they were interwoven with the teaching and learning process that took place in learning environments such as workshops and classrooms. A presupposition here is that learning and collaboration is situated in learning environments (Matusov, 1999). Within such a context all participants play an active role, with no particular person having all the responsibility, while the integration of students' contributions affords opportunities for negotiating meaning with other learners and teachers. Through these experiences, students and teachers develop relationships that are supportive of learning.

To further understand the significance of the themes indicated in figures 8 and 9, the following excerpts from three student transcripts highlight the importance of understanding, communication, learning and the role of the teacher and trialling the RAMR model during mathematics teaching and learning. In doing so, the students commented on their confidence, the communication between the teacher and themselves, learning in a group and that there

were places they could go to access further information about what they were learning as Artie explains:

... I'd like to gain a bit of confidence for the future, skills, um it's not the last for me anyway because I'm planning on doing the study on trades, see if I can get....I started yesterday, ...but confident, I'd like to go away confident from here which I am, Malcolm he's a good teacher, he helps. ... Oh he just gives us hints and all that. ... Because of the session we had here yesterday, I started....it got me thinking, it was a.....it was running through me head so I've got a, I went and got a book on maths and all that....a couple of them and I went home and just got stuck into straight away. ... I need a calculator but I tried. ... I'm starting to understand it a bit.

In this excerpt, Artie highlighted that gaining confidence for his future and the role the teacher was important for his learning and understanding of mathematics. Of interest was Artie's reference to a previous session that focused on the reality and abstraction elements of the RAMR model and how it prompted and enthused him sufficiently enough to seek out maths books after class to further assist in his understanding. India also indicated that significance of the teacher for his learning.

He explains it to us first to try get us to build it ourselves but as soon as we can't do it and we ask for help, he'll like break it down in a way so that we can understand and do it ourselves or if you're still having a bit of trouble. He'll just give us the answer you know, but at the same time that he's giving us the answer, he's explaining it so we understand at the same time, not just give us the answer.

Here India discussed how the teacher, Malcolm, scaffolded his learning using explanations that supported the students 'us' with building an item or object to ensure their understanding. Of interest, was India's comment about 'the answer'. A presupposition here is that as the student was building the teacher would tell the student what has to be done and then the

student demonstrates this directive. The next excerpt from Mark's interview expands on the support provided by the teacher, Malcolm.

It's the main thing that we can communicate and work as a team, that's good hey and Mick.....he'll explain like the details properly to us and you know at least we can understand it too you know, other people they can go about it another way but [Malcolm] he breaks it down a little bit and at least we can understand what you know he's talking about and which way it's done, even with you like he's doing business and that, found out an easier way that we can do it, there's always an easier way, just got to find it. ...I also got a little bit more understanding on how it works and what not you know. ... Oh it's good, you know we all.....we might have to just tell them a little bit to hurry up but we all get around to it and work as a team yeah, when it comes down to it we all get together and we do it you know. ... That's one good thing about it this little group that we've got cause we all can you know work together, communicate, it's all good you know. ... Well his /?/ help us like, come together, you know work as a team, and he explains things good you know and we can.....we all got a good understanding of how /?/ and that.

Mark indicated the significance of communication, working as a team and the teacher providing explanations in the process of teaching and learning. The nature of classroom relationships—between teacher and students and student and student—is crucial to student mathematics learning and it appears from the student's perspective that this is the case. An interactive classroom which is guided by the teacher allows students to find ways that allow them to investigate and discuss their understandings about construction and mathematics, and make connections to wider society (Schoenfeld, 1994, 2002). In short, through classroom interactions and communication, student understandings of what is constructive and

mathematical are transformed. The next section discusses the transcript from one of the five students who went on to become a farm supervisor during the project.

From student to supervisor.

Paul was of particular interest because at the beginning of the project in 2010 he was a student but had successfully gained employment as a farm supervisor during the project. The farm was one of two contexts where he learned Horticulture and achieved a Certificate 1, 11, and 111 in Horticulture. Several key themes were identified in Paul's account including: government, participant, supervisor and tomatoes (See Figure 10).

✓ Insert figure 10 here

Interestingly, the themes show Paul's journey from being involved in a Community Development Employment Program (CDEP) as a student/participant progressing to a supervisor who attends to growing tomatoes among other fruits and vegetables on the farm. The following excerpt from Paul's interview elaborates this process further.

I was a participant then and then I went for an interview for Supervisor and yeah I got it. About 3- 4 years now Supervisor. ... I done my courses, oh mainly to do with horticulture, yeah Cert I, II and III, ... that just propagating seedlings....all that, fruit trees.....cuttings off those, yeah and didn't like the classes much but didn't like writing you know, ... not at first, it was a, it was something you had to do when you were on CDEP when you're a participant but then it changed and I, I like got into it, sort of like it, yeah so, at first I didn't, I had to do it, yeah but then started liking it and it got easier, yeah. Up the TAFE, yeah it was mainly in the classes and yeah once we came back here, we started to learn things here and it made a lot more sense, them books and that you know, hands on, yeah they made a lot of things seem simple you know, yeah I didn't like the classroom much but I reckon out here on the farm, yeah but you can learn like maths and all that you know if you don't understand it much.

This excerpt highlights several aspects. First, Paul talks about how he became a supervisor as a consequence of studying his Certificate 1, 11 and 111 at the TAFE. His brief story is a story about self-determination and how through training he had achieved the position of supervisor (see Sarra, 2012). Second, Paul made the distinction between TAFE classes and the farm indicating that learning made sense when it was ‘hands on’ rather than in ‘them books’—he didn’t like writing. Third, as part of the requirements for CDEP, Paul had to attend classes and despite not liking it, grew to like it. A presupposition here is that attending the farm and learning how to grow fruit trees provided a ‘real’ learning environment that was more aligned with how he learned (see for example Lave & Wenger, 1991). Of further interest was his statement that ‘out here on the farm, yeah but you can learn maths’. The next section focuses on principals’ and teachers’ interview transcripts.

The principal’s and teachers’ transcripts.

An analysis was conducted drawing on the principal’s ($n=1$) and teachers’ transcripts ($n=4$). Overall the interview data indicated a range of themes related to expectations of students, expectations of community, and expectations of teachers. Of interest were the theme Indigenous in figure 11.

✓ Insert figure 11 here

In the cluster graph (figure 12) this focus is further emphasised. There are several themes identified including students, communities, community, education, and indigenous. A presupposition here is that these were critical when discussing expectations.

✓ Insert figure 12 here

Of interest are the minimal linkages to teachers, teaching, training and opportunity. A further presupposition here is that teachers are less likely to discuss themselves, choosing to focus on students, communities, education and Indigenous students.

The cluster graph in figure 13 highlights two major clustered themes: 1) students, classroom and communities and, 2) education, curriculum and community. Both clusters suggest there is a strong link with community.

✓ Insert figure 13 here

This aspect is explained in the following excerpt from Miller a teacher.

Yeah it's about understanding the relationship between a school... the Indigenous community that it services and finding out how the school responds to the needs of that community, finding out how language and culture is embedded in the curriculum, the pedagogy, the ways in which the teachers work with the students, the ways in which the administration of the school works with the students and with the community. The ways in which the community is able to influence what occurs at the school, at the decision making level and in the classroom at the chalk face, it's all about discovering how the pedagogy of the school is assisting self-determination for Indigenous people, self-determination is a big concept and I always tell my students not to lose some of these concepts that we're studying when they're actually doing their interviews and they're talking to people depending on who the person is.

In this excerpt, Miller discussed the significance of building strong relationships between community and school. In doing so, the importance of language, culture, curriculum and pedagogy were seen by Miller as critical to such relationships (see for example Saxe, 1991). Of critical importance in this excerpt was how the pedagogy of the school was identified and contributing to self-determination for Indigenous people (see Sarra, 2012). In the next excerpt Julia discussed some of the strategies that were adopted in her school.

Our Year 11 and 12 students, we're looking for them to come out with levels that are equivalent to traineeship sort of level, for them to be able to get a traineeship or apprenticeship. Competent across literacy and numeracy as our two main focus

subjects with some idea of what sort of area they'd like to go to whether it be horticulture, agriculture or business or those sorts of things. Each of the teachers in those classrooms do a lot of work with the kids as they enrol, what they're looking for and where they're looking to go and do a lot of work with career development, especially Graham's group. He does a lot with pushing kids towards traineeships or apprenticeships. The office does a lot of liaising with Council, other agencies, RTO's and those sorts of things that have got apprenticeships and traineeships on offer. And then we feed that back to kids so we sort of say, once Graham's got some more information about what they're interested or sees what the kids are interested in. We can push for those apprenticeships if they come up and then we look at pushing them towards those directions and making opportunities available.

In this excerpt Julia explained some of the strategies used by the teachers. She emphasised the importance of making connections with the council, agencies and Registered Training Organisations (RTO) who could provide support for students. In the next excerpt Malcolm discusses how his students influenced members of their community.

And that's what they have a thirst for and even the younger guys, I've been told by a couple of elders in town, even the younger guys if they can show that they're intelligent enough, they sort of like jump type of thing above other people and they say oh if you need a question answered, go see that fellow over here, he's a smart fellow. They start doing that and then all of a sudden someone else in their community (says), I want to be a smart fellow, where did you get your smarts from? Then they say I went back to school or I went back to TAFE or I go to extra training, go along and have a crack at it. I've lost count of how many people and I don't mind the boys handing out my telephone number to anyone but people that ring me up when are you doing the next course, so we were going to go down and see (the) Skills

(Centre) and have a talk to them. I've been with (the) Skills (Centre) now 2 years solid, teaching with them because and it looks like next year I've got the next 6 months already booked out, so there's not a shortage of work in town to do and there's certainly not a shortage of the people wanting to better themselves as they go along and that's.....for me that's my goal, if they want to better themselves and get somewhere ahead, I'll give up anything to do that, that's fine.

In this excerpt Malcolm described the feedback he received from elders in the community. He also explained the impact of students as role models for other young people in the community and that they too can enrol to learn and improve their future opportunities (see for elaboration of role models, Phillips, 2012). Of significance in the excerpt was Malcolm's comment 'I'll give up anything to do that'. This comment suggests that he was very committed to his training and to the students who were enrolled in the courses he taught. This was further reinforced in his comments about the potential of being booked out for the future. The above excerpts provided insights into the critical elements of what is constitutive of teaching and learning – high expectations and pedagogy that is supportive of student learning. In doing so, there was an emphasis on the relationships with community and how it was intertwined with the education process. To this end, the next section discusses the implications of the project.

Discussion

A number of key themes have emerged from the data in this paper. They are shown in figure 14. The project has positioned itself in a growing body of evidence-based research that emphasises the importance of schools, TAFE Institutes and communities to build relationships and have high expectations of the students enrolled in Certificate Courses. Although the students in this paper rated mathematics as average, this is not enough. The significance of learning concepts, skills and processes as they study for their Certificate

✓ Insert figure 14 here

Course so they understand and experience what mathematics in a range of contexts will enhance their achievements. By actively supporting teachers and trainers with their practice as they teach numeracy in certificate courses they are following up their ideas and collaboratively examining their work and how it assists students and “fits” with the curriculum, the community and industry.

As a consequence of the project, there are several implications to consider: 1) it is likely that teachers and trainers who actively engage in developing their practices and continue to adopt the RAMR model to support and sustain the learning of their students, are more likely to be collaborative in their endeavours to support their students and in some instances their communities. They are more likely to refine their knowledge and skills associated with the particular courses they teach; 2) increasing efficacy was identified in the overall data. Statements about engaging and building relationships with students and communities was evident; 3) with changes in practice come trials of new ideas, including those that are difficult and which present challenges for teachers and students. This process interweaves struggle and risk taking. Acknowledging these important aspects and working through them will enhance the teaching and learning process overall; 4) there is a strong interest for supporting students to build and enhance their future opportunities through training and employment. Such interest demonstrates the commitment of teachers who have the knowledge, skills, expectations and employment awareness to actively prepare students for the future; 5) there is an interest from students to fulfil their aims and aspirations and in doing so, successfully achieve further training and employment and; 6) where teachers adopt a team approach in the classroom, students develop a strong sense of belonging and identity as a learner.

Acknowledgements

1. One student, Paul, was successful with gaining employment as a farm supervisor.

2. One student was awarded a scholarship in ARCVET project to study for his Masters of Research. He also worked as a research assistant. He successfully gained his Masters of Research and in doing so has recently been awarded with QUT, Faculty of Education Master of Education – Research Outstanding Thesis Award. At the completion of the Masters project in 2012, he was appointed as the Indigenous Engagement Advisor for Thiess Pty Ltd, Australian Mining Division, Brisbane.

Reference list

- Alloway, N., & Dalley-Trim, L. (2009). 'High and Dry' in Rural Australia: Obstacles to Student Aspirations and Expectations. *Rural Society*, 19(1), 49-59. doi: 10.5172/rsj.351.19.1.49
- Bol, L., & Berry, R. (2005). Secondary mathematics teachers' perceptions of the achievement gap. *The High School Journal*, 88(4), 32-45.
- Bradley, D., Noonan, P., Nugent, H., & Scales, B. (2008). Review of Australian Higher Education: Final report. Canberra: Department of Education, Employment and Work Relations.
- Brown, A., Metz, K., & Campione, J. (1996). Social interaction and individual understanding in a community of learners: The influence of Piaget and Vygotsky. In A. Tryphon & J. Voneche (Eds.), *Piaget - Vygotsky: The social genesis of thought* (pp. 145-170). UK: Psychology Press.
- Bruner, J. (1985). Vygotsky: A Historical and Conceptual Perspective. In J. V. Wertsch (Ed.), *Culture, Communication and Cognition: Vygotskian Perspectives*. Cambridge: Cambridge University Press.
- Circelli, M., & Oliver, D. (2012). Youth transitions: what the research tells us. A National Centre for Vocational Education Research Consultancy Report. Adelaide: National Centre for Vocational Education Research.

- Engestrom, Y. (1996). Work as a testbench of activity theory. In S. Chaiklin, & J. Lave, (Eds.), *Understanding practice: Perspectives on activity and context* (pp. 64-103). Cambridge: Cambridge University press.
- Goos, M. (2004). Learning mathematics in a classroom community of inquiry. *Journal of Research in Mathematics Education*, 35(4), 258-291.
- Jamar, I., & Pitts, V. R. (2005). High Expectations: A "How" of Achieving Equitable Mathematics Classrooms. *Negro Educational Review, The*, 56(2-3), 127-134.
- Kemmis, S., & McTaggart, R. (1988). *The action research planner* (3rd ed.). Geelong: Deakin University.
- Lave, J., & Wenger, E. (1991). *Situated learning legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Levine, H. (1996). Context and scaffolding in developmental studies of mother-child problem-solving dyads. In S. Chaiklin, & J. Lave, (Eds.), *Understanding practice: Perspectives on activity and context* (pp. 306-326). Cambridge: Cambridge University Press.
- Lubienski, S. (2002). A closer look at black-white mathematics gaps: Intersections of race and SES in NAEP achievement and instructional practices data. *The Journal of Negro Education*, 71(4), 269-287.
- Marti, E. (1996). Mechanisms of internalisation and externalisation of knowledge in Piaget's and Vygotsky's theories. In A. Tryphon & J. Voneche, (Eds.), *Piaget - Vygotsky: The social genesis of thought* (pp. 57-82). Uk: Psychology Press.
- Matthews, C. (2008). Stories and symbols: Maths as storytelling Retrieved 24/08/09, from http://www.aeu-vic.labor.net.au/professional/files/PV_Mathews_6_3.pdf
- Matusov, E. (1999). How does a community of learners maintain itself? Ecology of an innovative school. *Anthropology and Education Quarterly*, 30(2), 161-187.

- Minick, N. (1996). Teacher's directives: The social construction of "literal meanings" and "real worlds" in classroom discourse. In S. Chaiklin, & J. Lave, (Eds.), *Understanding practice" Perspectives on activity and context* (pp. 343-374). Cambridge: Cambridge University press.
- Phillips, T. (2012). *Cultural factors affecting tertiary education access for Bundjalung men*. Masters of Research, Queensland University of Technology, Brisbane. Retrieved from http://eprints.qut.edu.au/54626/1/Todd_Phillips_Thesis.pdf
- Pringle, B. E., Lyons, J. E., & Booker, K. C. (2010). Perceptions of Teacher Expectations by African American High School Students. *The Journal of Negro Education*, 79(1), 33-40.
- Sarra, C. (2012). Strong and smart - towards a pedagogy for emancipation. Education for first peoples. London: Routledge.
- Saxe, G. (1991). Culture and Cognitive Development: Studies in Mathematical Understanding. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Schoenfeld, A. (1994). Reflections on doing and teaching mathematics. In A. Schoenfeld (Ed.), *Mathematical thinking and problem solving* (pp. 53-72). New Jersey: Lawrence Erlbaum Associates.
- Schoenfeld, A. (2002). Making mathematics work for all children: Issues of standards, testing and equity. *Educational Researcher*, 31(1), 13-25.
- Sierpiska, A. (1998). Three epistemologies, three views of classroom communication: Constructivism, sociocultural approaches, interactionism. In H. Steinbring, M. G., Bartolini Bussi, & A., Sierpiska, (Eds.), *Language and communication in the mathematics classroom* (pp. 30-64). Reston: National Council of Teachers of Mathematics.

- Smith, L. T. (1999). *Decolonizing methodologies: Research and Indigenous peoples*. Dunedin: University of Otago Press.
- Stein, G. L., & Hussong, A. (2007). Social and Academic Expectations about High School for At-Risk Rural Youth. *American Secondary Education*, 36(1), 59-79.
- Thomson, S., & Hillman, K. (2010). Against the odds; Influences on the post-school success of "low performers". Adelaide: National Centre for Vocational Education Research.
- Voigt, J. (1994). Negotiation of mathematical meaning and learning mathematics. In P. Cobb, & Yackel, E. (Ed.), *Learning mathematics: Constructivist and interactionist theories of mathematics development* (pp. 171-194). Dordrecht: Kluwer Academic Publishers.
- Volkoff, V., Clarke, K., & Walstab, A. (2009). The impact of TAFE inclusiveness strategies. *Australian Bulletin of Labour*, 35(3), 561-607.
- Vygotsky, L. (1930). *Mind in society: The development of higher psychological processes* (M. Cole, Trans.). Massachusetts: Harvard University Press.
- Walkerdine, V. (1998). *Counting girls out: Girls and mathematics*. London: Falmer Press.
- White, P., & Mitchelmore, M. (2002). Teaching and learning mathematics by abstraction. In D. Tall & M. Thomas, (Eds.), *Intelligence, learning and understanding in mathematics: A tribute to Richard Skemp*. Flaxton: PostPressed.
- YuMi Deadly Centre. (2012a). *Overview: Philosophy, pedagogy, chance and culture* (Vol. 1). Brisbane: YuMi Deadly Centre, Queensland University of Technology.
- YuMi Deadly Centre. (2012b). YuMi Deadly Maths Western Metropolitan Region Schools Project 2012 Interim Report. Brisbane: Queensland University of Technology.