

Early School Leavers Experiences Of Learning Mathematics: The Discourses Of Mathematics Classrooms

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This paper draws on a Social Theory of Learning and Critical Discourse Theory to address the formation of identities in mathematics classrooms. From these perspectives mathematics classrooms are viewed as learning communities in which identities are defined through the discursive practices (Fairclough, 2001) learners engage in and those they do not. Identity formation brings to light issues of Discourses of participation and non-participation. The research from which this paper is drawn examines the accounts of early school leavers and non-completers' experiences in Secondary mathematics classrooms and TAFE¹ classrooms. The students indicated that they experienced difficulties learning mathematics in Secondary School because of the way it was taught, hence they did not identify with or participate in learning mathematics, rather, they were kept in marginal positions maintained by the practices that occurred in such classrooms. Consequently, they engaged in oppositional Discourses to the preferred Discourse, whereby they identified and participated on the boundaries of inclusion and exclusion from the mathematics classroom. In the TAFE setting, they were supported by its more inclusive practices, and the alternative Discourses the teachers drew on to enhance the students' mathematics learning.

Accounts of a small sample of early school leavers' and non-completers'² experiences of learning mathematics (Ewing, 2005, work in progress), indicate that three core assumptions underpinned their secondary mathematics classroom experiences: that mathematics is learned in discrete steps from textbooks unrelated to their lives; that students work in isolation as discrete atomised individuals; and that the classroom is silent and orderly. This paper argues that these assumptions underpin the traditional or preferred Discourse of S/Mathematics³ classrooms, restricting student access to participate and engage in learning mathematics. A traditional or preferred Discourse and its associated practices is the one most taken-for-granted⁴ in classrooms. Preferred Discourses in this sense go beyond ideology and are accessible, exercised and constrained by those in the most powerful positions (Fairclough, 2001), here, the mathematics teacher.⁵ Preferred Discourses may be the products of social institutions such as schools, and "embellish inequitable social relations" (Lemke, 1995). Within such an institution, there are multiple, alternate, even ideologically competing Discourses (Fairclough, 2001). Some Discourses may be similar and or overlap. Some may be alternate or oppositional to the preferred Discourse type. An alternate Discourse takes the preferred Discourse and restructures it in the "course of hegemonic struggle" (p. 95). For example, the teacher may also act as a counsellor as well as a traditional mathematics teacher. Although the practices may be kept distinct, the boundary between alternative forms of mathematics teaching and traditional forms weakens, producing a new discursive practice (Fairclough, 2001).

Oppositional Discourses, Fairclough (2001) argues, occur between Discourse types and groupings of various individuals, such as dominating and dominated groups in institutions – for example, the preferred S/Mathematics Discourse, a traditional mathematics teacher and mathematics students. Oppositional Discourses provide a conscious alternative to the preferred Discourse. Here, some students' home or community-based Discourses could be viewed as oppositional because they do not align with the preferred Discourse of the classroom. However, where dominated Discourses are oppositional, Fairclough (2001) notes there is pressure to contain them since they oppose or reject the preferred Discourse type of the classroom. Students, such as those in the study from which this paper is drawn, who consciously engage in oppositional Discourses are either excluded or exclude themselves from the classroom and thus perforce engage in a Discourse of non-participation or are contained within the classroom with conditions attached.

In short, a Discourse puts forward particular viewpoints, concepts and values, but in doing so, it has the potential to marginalise viewpoints and values considered important to other Discourses. It

¹ TAFE refers to Technical and Further Education in Australia.

² Early school leavers are defined as young people who left school before the school leaving age of fifteen or before, or on completion of Year 10. Non-completers are students who left school before completion of Year 12.

³ Capital S for S/Mathematics denotes to Secondary mathematics.

⁴ Fairclough (2001) elaborates this understanding further, stating that "such assumptions and expectations are implicit, backgrounded, taken for granted, not things that people are consciously aware of, rarely explicitly formulated or examined or questioned. The common sense of discourse is a salient part of this picture" (p. 64).

⁵ However, the Mathematics teacher is also positioned by the Discourse. It is important here not to construct binaries between teachers and students as the classroom context is more complex.

determines who is an insider and who is not. As part of that power and through positioning in Discourse, *struggles over identities* become *struggles over difference* (Chouliaraki & Fairclough, 1999, p. 96). That is, when a Discourse uses the first person plural *we* (p. 96) to construct a universal subject, it is effectively constituting an identity which represses difference. In this regard, such Discourses and the ensuing social struggles are linked to the forms of participation and non-participation and identities constructed in such contexts.

Participation as Negotiation and Decision Making

Articulating Critical Discourse Theory with a Social Theory of Learning provides an effective means for understanding the processes of power involved in the subjectification of students and how it is achieved through the discursive practices of S/Mathematics as identified from students' interpretations of classroom events and practices. In doing so, it makes transparent the relations between Discourse, discursive practice, and participation and non-participation.

A Social Theory of Learning commences with the assumption that learning is not something that occurs in isolation but rather, it develops through engagement and participation in the interactions and processes of a community (Lave & Wenger, 1991; Wenger, 1998). In this paper, this theory is foregrounded because of the centrality it places upon the processes of participation for learning, participation, and knowing in S/Mathematics. Participation affords students a wide range of opportunities to be active members of their learning communities; it is a complex process but one which is critical to successful learning in a social context. It allows – indeed requires – students to develop the necessary skills of communication, negotiation and decision-making. It provides the setting in which they can construct and shape an identity as members of a community (Wenger, 1998).

In Wenger's (1998) framework, the shaping of identities in communities involves a combination of forms of participation and non-participation. Here, the initial experience of non-participation does not necessarily lead to an identity of non-participation, because people – in this study, students of S/Mathematics – may become a part of a community to which they did not previously belong. Non-participation of this form is predictable and expected. From the periphery of a community the newcomer is exposed to the practices of that community and the manner of its articulation, and hence, over time engages with it, ultimately achieving more active participation. Wenger (1998) has described this process as the “non-participation of periphery” (p. 101). Here, newcomers are “granted enough legitimacy to be treated as potential members” (p. 101). They are provided with access to the community's members, their negotiated enterprise and their repertoire of resources. It is possible for this initial degree of participation to end in exclusion, however. If, over time, students are unable to make sense of the mathematics to which they are exposed, if they fail to develop or obtain effective explanations of what is going on, if they cannot negotiate meanings or receive adequate support for their learning – and this will be particularly the case as mathematics becomes more complex and abstract – their lack of understanding and their ineffective participation becomes a “relation of marginality” (Wenger, 1998, pp. 166-167). As a consequence, and because of the ingrained practices of that community, they may remain in marginal positions. The experience of non-participation becomes so dominant that “conceiving of a different trajectory within the same community” (p. 167) becomes very difficult or impossible. In such a “non-participation of marginality” students are ultimately either excluded or exclude themselves from participation in the S/Mathematics.

Method

Using semi-structured interviews, forty-three young people⁶ were interviewed about their experiences of learning mathematics at school and at TAFE. They were enrolled in a TAFE Youth Reconnected Program designed to support them with improving their literacy and numeracy skills in order to access further education and training (Department of Education, Science & Training, 2002). The program is Commonwealth funded and designed to support early school leavers who have not attained a Year Ten Certificate with improving their literacy, numeracy and life skills. However, young people who achieve a Year 10 pass can also enroll in this course as it provides them with access to further education and training. The interviews were conducted at the TAFE College in a space set aside for interviews. All the interviews were audio-taped and then transcribed by the researcher.

⁶ The forty-three young people did not come from one secondary school.

Critical Discourse Analysis provided the scope to make generalisations within the parameters of the select sample group about issues of power, subject positioning and Discourse which could then be applied to an analysis of the discursive practices in the traditional mathematics classroom and the TAFE classroom. NVivo (QSR, 2001), a qualitative computer-based program for analysis of textual materials, enabled an initial elucidation of these practices. They included: teacher and student interaction, teacher support, teacher explanation, teaching style, pace, streaming, textbooks, assessment, and board work. Drawing on a process of Thematic Organisation (cf. Gee, 1996, on Thematic Organisation) selected texts were then examined to ascertain the themes that students constructed around these practices, their evaluation of the practices, and the manner in which they were articulated into the web of meaning, attitudes and actions based on those students' experiences of S/Mathematics and TAFE mathematics. From this platform, Critical Discourse Analysis of a further selection of texts was then undertaken. This form of analysis enabled a further rich qualitative exploration of the reported practices of mathematics classrooms with particular regard to linking the theoretical and practical concerns of this study. It provided a means by which the theoretical constructions of Discourse could be applied to the particular situations reported in student texts, while those findings in turn contributed to a further development and elaboration of those theoretical constructions (Chouliaraki & Fairclough, 1999). It also made practical the theoretical constructions of identities of participation and non-participation and their associated Discourses of participation and non-participation.

Inside Mathematics Classrooms through Students' Interpretations

Drawing on Critical Discourse Analysis a number of issues are emphasised from the young people's accounts of their experiences. Only four accounts from the larger study are provided in this paper. Of significance, yet not surprising, was that the traditional approach to teaching mathematics in classrooms dominated the experiences of many of the students interviewed. This finding reinforces the issues raised by Fairclough (2001) about the unequal relations of power in such contexts and how these sites manifest contestation and struggle. They also highlight the concerns of Boaler (2002) and Schoenfeld (1994) who argue that teaching mathematics in this way is counter-productive for learning and learners. Classrooms where students are expected to reproduce what the teacher has told them have not provided them with opportunities to identify themselves as mathematics learners who participate in a classroom. Rather, this approach effectively marginalises learners because they are *required* to work in silence and accumulate isolated bits of information achieved mainly by passively listening, memorising facts and formulas. Contexts such as this are more likely to prevent participation, allowing non-participation and oppositional Discourses to dominate mathematics classrooms. These issues are brought to bear in the following three representative excerpts.

Kate: I do not know. We just go in the class, sit down and then he would start writing out on the board what we had to do. We would do it, but then if we got it wrong he would put us down, like 'cause we were in Grade 9. That was about it; we did work and then went out basically.

Analysis: *Teacher used the board to "teach" mathematics. Students put down if they answered incorrectly. Kate suggests that the teacher expected students to know the answers because they were in Year 9. Kate indicates this form of teaching and learning was the general routine of the classroom. Discourse is not neutral.*

In Kate's excerpt the discursive practices utilised by the teacher clearly set up unequal subject positions. The teacher, constructed by the Discourse of traditional mathematics as the sole authority, attempts to coerce and dominate students into learning by putting them down for incorrect responses. This practice is considered a negative attempt at maintaining a stabilised social order in the classroom. The problem here however, is that the teacher is in the subject position whereby they exercise and control access to the preferred Discourse, effectively determining who is an insider and an outsider in this context. Students like Kate are more likely to identify themselves as non-participants because of their struggle to access a mathematics which has been supported by tradition and which works on the maintenance of social order.

Angelique: Okay yeah we would just walk in sit down with our textbooks. He would write up all this stuff on the board, go to, you would have to go the page that he has written. Like if it is like, page 236 text blah, blah, blah. You would just go to that and he says work from your book. And then he gives you, writes all the answers on the board and that is all you do in high school, work from your textbook. And it was yeah, pretty difficult stuff not easy. It was hard because yeah, I did not know the basics like I said; and I did not know the basics so coming to do all this was hard, so I just blocked off. Like I would just sit there and that is how I got bad grades and stuff 'cause I would just sit there and would not pay attention. So now yeah, because I have realised that I have to get an education and they are building it from scratch not like at school, they would not start from scratch. They would not put me in a numeracy group because they said I was too smart, which was not fair.

Analysis: *Students learned mathematics from a textbook. Hegemonic status of the Discourse is maintained through the structure of textbook. The teacher would do the work on the board and “tell” students which page to turn to. Answers were written on the board. Social order and subordination are maintained through students having to wait to be told what to do next. Here the teachers exercise their power within the Discourse, regulating implicitly and explicitly who has access to the preferred Discourse. Angelique indicates this is the way she learns mathematics in high school. Here struggles over identities and differences are repressed or ignored. She finds learning mathematics in this manner difficult. Angelique engages in a Discourse of non-participation explaining she did not know the basics and so blocks off and just sits there and does not pay attention. At TAFE she has a more positive attitude to learning – the start of an identity of participation. She is also being taught the elements of the Discourse.*

Angelique very explicitly describes the routine of how she learned mathematics in high school. She also indicated that that is all *you* do in high school – work from a textbook. She states she found this process difficult and consequently she blocked off and did not pay attention. However, she realised she needed to get an education and that TAFE supported her with her mathematics learning. In the next excerpt Robert explains a *regular* maths lesson.

Robert: Putting things up on the board pretty much. Giving out worksheets she would give out worksheets and just sit at her desk and I would just be like what? Um I just get her to help me with something and she would come up and talk to me, and I do not know. It was not what I wanted. Not at all not at all. I was just another one of her students that [who] went into her class and just sat there. And half the time I was not even in that class. I was just I was just, as kids, as teenagers do, if they cannot learn something they just switch off and just act like dickheads excuse my language yeah then they just send them to the isolation room and that was not getting them anywhere, she would not just spend time with them. ...I was yeah, one of the teachers at the isolation room, he was, he was [the] best. Yeah I would rather, I would rather go up there. Like I would misbehave on purpose because was not learning anything (indistinct).

Analysis: *This hegemonic Discourse is successful in projecting its own social order, subordinating students like Robert and denying their resources. Robert felt he was treated as a cipher, one of many non-participating students. Hence, Robert engages in an alternative resource – an oppositional Discourse – a Discourse of non-participation. The mathematics classroom then becomes the site of contestation with struggles over power. Those who don't, can't or won't conform to the preferred Discourse are repressed or excluded. Students for whom solidarity was a possible resource are marginalised from their class group. Teacher would not spend time with students. Misbehaving is a possible but counter-productive resource. Students excluded from classroom hence constructed as non-participants, also set on trajectory to failure. Robert indicates the teacher in the isolation room was supportive of his learning. Because he was not learning in class he would deliberately act up and exclude himself to get sent to the isolation room. Paradoxically, it would seem the practices of the preferred Discourse excluded which in turn led to exclude himself.*

Robert indicated very clearly his experiences of learning mathematics – from the board and worksheets. He then explained that if kids cannot learn they just switch off and *act like dickheads*. Robert then stated that he would misbehave so that he was sent to the isolation room where he claimed he learned better. The S/Mathematics classrooms became a site for struggle, with students like Robert excluding themselves from it. In the next excerpt Trevor discusses his experiences of TAFE.

Trevor: You get, as an adult, how they get taught, like at work and there is better things here, like you get any thing you want. You can have smoke breaks, and the maths is common sense. You get good support. Every time you get in trouble they try and get us out of trouble and things like and they keep us away from the shops so we do not get into bad behaviours or anything like that. Put your hand up and ask the teacher to come and help me. And she will come down and help me. If I got something wrong with addition, she will show me how to do and then I will get it right. She will set it out all for me and then I have to do it myself after that. Oh actually no, it is not similar but you have to go at the speed they tell you to do. Oh actually no, it is not similar but you have to go at the speed they tell you to do. Yes, because we only had an hour to do this test and everyone else had done theirs right on the spot and that is what the teacher told them to do but I just take it at my own pace and I only got half it done. I would get a fail. Bad because every time I got home, mum and dad would just chuck psychos.

Analysis: Trevor explains that at TAFE he is treated like an adult. He also explains he gets what he wants, e.g. smoke breaks. This different, less dominating approach to students is an effective learning resource. He states that the mathematics he is learning is common sense. That is, it engages with his background, experience and Discourse. The teachers are supportive of students and concerned to ensure a positive learning context without harsh sanctions. Again, these are significant resources for such students. The teacher supports students when they indicate they need help. Students are not treated as ciphers. The teacher explains to individual students how to work through mathematics problems before expecting them to do the work themselves. Trevor explains that TAFE is not like school. However, he still has to keep pace with the teacher. Trevor explains that from working at his pace at school he would only get half a maths test complete, resulting in him failing. He indicates the consequences of his not being able to keep pace and failing the S/Mathematics test. He further elaborates this point and indicates the negative effect of the home Discourse.

Trevor compared his experience at TAFE with how an adult is taught at work. He indicated learning mathematics at TAFE was more common sense and there was more support as he learned. He recounted his experiences from school and explained that he could not learn at his own pace. This applied to when he was tested as well, hence he would only get half the test done, consequently failing. Trevor explained one consequence of that failure; his parents would *chuck psychos*.

Discussion and Conclusion

On the basis of the analysis of the excerpts provided, this paper argues that the students are expected to understand the preferred Discourse of S/Mathematics. The problem here, however, is that the teacher is in the subject position from which they exercise and control access to the Discourse, effectively determining who is an insider and an outsider in this context. In this situation, those students who do not engage in the preferred Discourse are either constrained or eliminated. Angelique's account emphasises the status of the preferred Discourse. The students' accounts also highlight the disparity between what the rhetoric of education states, and what actually occurs in classrooms. More importantly, they epitomise why and how the discursive practices utilised in S/Mathematics classrooms result in struggles and students consciously engaging in oppositional Discourses. Recent recommendations advocate that teachers develop in learners the ability to communicate ideas and collaborate with others as they develop mathematical understandings (Ministerial Council on Education, Employment, Training and Youth Affairs, 1998; Queensland Studies Authority, 2004). Nevertheless, from the students' accounts it is evident these recommendations are not enacted in S/Mathematics contexts, relegating some students to the periphery of their classrooms or eliminating them, leaving them with little chance of engaging in the Discourse of mathematics. Further, the discursive practices drawn on maintain students in particular and subordinate subject positions, so that they identify themselves within particular social roles which are low in status and socially isolating. In such a context, success in learning mathematics is less likely to occur, with students more likely to engage in oppositional Discourses – Discourses of non-participation.

It can be argued that the reason the students referred to in this paper chose not to participate in their learning was because they had personal learning difficulties. Whilst this may be the case, a close analysis suggests that these students may never win. That is, despite their efforts to try, learning mathematics from a text, with little or no support from the teacher, just became too difficult. Such taken-for-granted practices contribute to the maintenance of unequal power relations in S/Mathematics classrooms. In consequence, when students contest or challenge this Discourse they

are either coerced or eliminated from the classroom. In some instances, this exclusion may contribute to students leaving school early. Through this process, students are blamed for their inability to learn when in fact the opposite is the case – the language and taken-for-granted practices of the preferred Discourse drawn on effectively position students as learners who have learning difficulties or who are problems in the classroom.

This paper has emphasised the implications for mathematics Education policy and practice. It highlights the powerful influence of the preferred Discourse of mathematics on students, particularly early school leavers and non-completers such as those in this paper and those who were a part of the larger study. Previous research has shown that school achievement is a strong determinant of non-completion (Ball & Lamb, 2001). This paper addresses the link between poor achievement and non-completion by showing that when a preferred Discourse dominates in classrooms, utilising discursive practices that serve only the teacher, students such as those in this paper are marginalised and or excluded. Such exclusion contributes to their low status and failure in mathematics. In consequence, they have inadequate mathematical knowledge and skills to meet the demands of the workplace, and are at high risk of unemployment at a young age and a greater cost to society. Hence, this paper calls for alternate Discourses of mathematics that acknowledge the Discourses students bring to school and their different and possibly more complex learning styles which would then contribute to their experiencing real success in mathematics classrooms.

This study provides evidence for the continuing influence of the practices which are taken-for-granted in mathematics classrooms. Such practices have focused on the teaching of mathematics in discrete steps, where learning of abstract content occurs in isolation and removed from students' everyday lives. From the evidence provided in the larger study, and this paper, such an approach is counterproductive for mathematics learning and students, particularly for those students who are already performing poorly at it.

This study is also significant for its application of a Social Theory of Learning to mathematics education. A Social Theory of Learning, the focus of this study, provides a different theoretical position to traditional mathematics education, and a different and more effective view of teaching, learning and knowledge. When threaded with Critical Discourse Theory, it provides the field of mathematics education with a different lens with which to view identity, participation and membership in classrooms and the influences of the discursive practices of the preferred Discourse of mathematics.

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