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PERHAPS THE DECISION OF SOME STUDENTS NOT TO ENGAGE IN LEARNING MATHEMATICS IN SCHOOL IS DELIBERATE

ABSTRACT. A perceived lack of engagement of many students in middle years mathematics classes provides a challenge for educators. In this article we report a project that investigated students' perceptions of the extent to which their own efforts influence their achievement at mathematics and their life opportunities. We conducted 2 hour interviews with over 50 students, as well as collecting other data. The results suggest that a student's orientation to learning mathematics is not predicted by their achievement. Even students who were confident, successful and persistent exhibited short-term goals. It seems that classroom culture may be an important determinant of under-participation in schooling.

KEY WORDS: effort, engagement, goals, mastery goals, motivation, needs, performance goals, persistence

1. INTRODUCTION

Many teachers and teacher educators are motivated by a belief that education provides opportunities for students that can be independent of the family circumstance, or at least which seek to moderate possible negative effects of particular background characteristics. Yet, it also seems that the very students who have most to gain from active participation in schooling are those who are most difficult to engage, and this difficulty in engagement is most acute in the upper primary and junior secondary years. For example, researchers have noted a decline in school engagement of young adolescents as compared with their engagement in primary school (Hill et al., 1993), increased truancy and greater incidence of disruptive behaviour, alienation and isolation (Australian Curriculum Studies Association, 1996). Hill et al. (1993), for example, reported that, in the middle years (ages 10 to 14), there is a noticeable arrest in the progression of learning observed through the primary years (ages 5 to 12). The concerns about participation extend to out of school activities which are related to school engagement and academic achievement (Eccles and Templeton, 2002).

Indeed Australian schools seem to be unsuccessful in addressing inequalities. Lokan et al. (2001), for example, argued that recent curriculum reforms have failed to address the obvious disadvantage of particular groups of students, and have not resulted in significant gains in engagement, especially in the middle years of schooling. McGaw (2004) claimed that

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Australia is performing worse than other developed countries in this regard and he categorised Australia as high in quality but low in equity. In other words, while the achievement of students overall is high, there are wide differences between the high- and low-achieving students.

Discussion with junior secondary teachers, especially those serving lower socio-economic communities, confirms this lack of engagement which seems evident even in schools which are taking significant actions to address the relevance of the content, substance and type of tasks set, the validity of assessment and reporting regimes, and the inclusion of students through the adaptation of pedagogies and methods of grouping.

Various factors can contribute to lack of participation in schooling and positive learning outcomes. It is possible that students in the middle years lack confidence, or that they are deficient in skills, or that they give up easily, or that they do not see the relevance of mathematics, or that they are not aware of their difficulties, or that they feel they can be successful at school without effort on their part. To explore these further, we sought to investigate individual students' perceptions of the extent to which their own efforts contribute to their success in, and enjoyment of, school in general, and mathematics in particular.

1.1. *The pupils' sense of self-regulation*

The research explored an aspect of the motivation of the students – focussing on their capacity to regulate their own behaviour. Initially we saw this as something about which each student makes their own decision and response. The research takes an approach different from that of research that addresses student motivation by focussing on teacher actions (e.g., McComb and Pope, 1994; Middleton, 1995) and takes a different perspective from research examining or exploring affect (e.g., McLeod and Adams, 1989), beliefs (e.g., Leder et al., 2002; Pajares, 1992), feelings (e.g., Ball, 1988), or values (e.g., Bishop, 2001).

One of our assumptions is that a determinate of the apparent lack of engagement is the motivation of the students. Motivation has been defined as "the potential to direct behaviour that is built into the emotion control mechanisms. This potential may be manifest in cognition, emotion and/or behaviour" (Hannula, 2004, p. 24). The students' motivation drives the decisions they make. Of course decisions can be to act or to avoid acting, whether being driven by desire or fear (Brophy, 1986), and can be directed at needs. Needs may direct specific behaviours and can be categorised as focussing on self, cognitive functioning and social relationships (Nuttin, 1984, as cited in Hannula, 2004). Self needs relate to identity, autonomy and consistency. Cognitive functioning requires exchange of information

including comprehending self, others and the world, and social relating requires positive responses from, and a need to benefit, others. Whilst schooling has potential to activate each of these needs, it is not always successful and sometimes students satisfy these needs in ways opposite to the direction the school and the teacher intend.

Hannula went on to describe goals as a specific object of needs. The example was given of a student having a need for autonomy and an unstated goal of challenging the authority of the teacher. We were interested in how the individual students' goals are pursued and their capacity to make decisions about their own goals. In this study we sought to gain some insights into factors that might influence the nature of the needs, goals and ultimately the decisions the students make about their participation in the learning of mathematics.

1.2. *Possible sources of the lack of pupil engagement*

In seeking to understand the basis for the decisions the students make, we sought to investigate their orientation to, and capacity for, self-regulation. The underlying model was derived from the work of Dweck (2000) who distinguished two perspectives on intelligence. One is a fixed perspective of intelligence entitled *entity* theory in which people believe that their intelligence is predetermined at birth and remains fixed through life. Dweck suggested that students who believe in the entity view require easy successes to maintain motivation, and see challenges as threats. The alternate perspective is where students see intelligence as malleable or *incremental* and they can change their intelligence and/or achievement by manipulating factors over which they have some control. Students with such incremental beliefs often choose to sacrifice opportunities to look smart in favour of learning something new. Not only their goals but also their needs regulate particular outcomes.

Directly connected to these views of intelligence are the ways that students describe their own needs and goals. Dweck suggested that entity "theorists" tend to be concerned with performing and looking smart (p. 23). Such an orientation is associated with *performance* related goals (p. 16), where students rely for success on tasks that offer limited challenge. When experiencing difficulties, the model suggests that such students lose confidence in themselves, tend to denigrate their own intelligence, exhibit plunging expectations, develop negative approaches, have lower persistence, and deteriorating performance. Such students particularly seek positive judgments from others and avoid negative ones.

Incremental "theorists", according to Dweck, appear to be concerned with learning new things and getting smarter (p. 23), suggesting that they

hold *learning goals* (pp. 16–17), sometimes called *mastery goals* or *task goals* (p. 19). People with such goals tend to have a hardy response to failure and remain focused on mastering skills and knowledge even when experiencing challenge. They do not blame others for threats, do not see failure as an indictment on themselves, but rather they hold learning goals which are to increase their competence when confronted with difficulty. Confidence in their own ability does not make a difference to students who see intelligence as incremental and success is not needed to build mastery goals.

Dweck argued that "theories of intelligence *cause* students to focus on performance goals or learning goals" (p. 24), with an entity view of intelligence leading students to focus mainly on performance goals and an incremental perspective allowing students to focus on learning or mastery goals. In other words, the students' regulation of their decisions and actions is a response to how they define their needs and how these define their goals.

It is interesting to consider the implications of this for teaching. A student who has *performance* goals might have been influenced by significant adults, such as parents and teachers, who over-emphasised the student's achievements while shielding him or her from negative feedback on performance, either directly by not commenting on errors, for example, or indirectly by reducing the demands of tasks posed. Dweck claimed that, by their actions, some teachers teach students that they are entitled to a life of easy low-effort successes, and argued that this is a recipe for anger, bitterness and self doubt. Dweck suggested that some teachers respond to students experiencing difficulty by providing easier tasks, the net effect of which is to create a climate in which challenges are feared rather than addressed.

Dweck (2000) argued that teachers can teach self regulatory behaviours such as decoding tasks, perseverance, seeing difficulties as opportunities, and learning from mistakes. This capacity for teachers to enhance positive self-regulatory responses is evident in quite separate research strands on self-fulfilling prophecy (e.g., Brophy, 1983), and motivation (e.g., Middleton, 1995).

Basically the research explored whether the performance/learning distinction is useful for describing responses of students to schooling and mathematics. Rather than the term *learning*, we have chosen to use the term, *mastery*, an alternative as discussed above. The questions that underpinned the research were:

(a) Is this performance/mastery distinction meaningful and can it be measured by whether the students persevere on tasks they find difficult?
(b) Are achievement and perseverance connected to either mastery or performance goals?

(c) Do students see success at mathematics as desirable and a product of their own effort and action?
(d) Are positive student responses to school mathematics learning opportunities inhibited by factors such as lack of self awareness, lack of confidence and lack of success?

2. SOURCES OF DATA

Data were collected from students in one year 8 (age 13) class in each of four schools in a regional Australian city. The data sought students' responses to questions and tasks relating to learning both English language and mathematics. A survey was administered to, and interviews conducted with, about 50 students. The schools served predominantly low socio-economic communities, with students experiencing difficulties in learning mathematics well represented. Even though the research used survey methodology, it sought to explore factors influencing self-regulatory responses of individual students rather than to generalise results to other contexts.

The interviews took the form of a teaching conversation. Two sets of six hierarchical tasks on a similar topic were constructed in both English and mathematics, ranging from very easy to very difficult. In the case of mathematics, we posed a set of six tasks on the area of figures ranging from counting squares to a sophisticated task requiring interpretation of a scaled drawing. For each task the interviewer posed the task, sought the student's explanation of their strategy and their perception of whether they were correct. If correct the interviewer instructed the student to attempt the next task. The intention was that eventually nearly all students would confront the challenge of a task which was difficult for them. The students were asked how they felt about the challenge they experienced, and the type of support they needed to solve the problem. We also sought students' responses to a vignette about advice they might give to one of their peers who was a potentially high achiever but who deliberately does not try. The interviewers used a template to make a written record of students' oral responses to the area questions, and audio taped the parts of the interview in which students responded to open response items. The data from the open response items were converted to categorical responses using a process in which the categories were decided by inspection of all responses to a prompt and then the individual responses were coded to assign phrases to a particular category. Such assignments were double checked by the research team to maximise the accuracy of coding.

The survey included items adapted from three instruments proposed by Dweck (2000), and asked students to rate their self confidence and achievement, their persistence, their perception of the value of schooling, and what constitutes successful learning. A process similar to that for the interview data was used for categorising and coding responses to these open response items. These data were supplemented by the teachers' rating of their students' achievement and effort in mathematics and English. Only the results related to mathematics are presented here.

As indicated above, during the mathematics interview, students were asked up to six questions requiring the calculation of area, stopping when the student responded incorrectly. All students could complete the first question, a trivial task requiring them to count squares. The second task was also simple but required students to count half squares as well. All but one did this successfully. The third task asked students to draw a shape, in which the prompt suggested using half squares. Four more students were unable to do this.

The next task asked the students to calculate the area of the shape in Figure 1. Three more were unable to do this. Although the task is slightly easier than the curriculum for these year 8 students would suggest, it is nevertheless a reasonable challenge, and that 38 out of the 46 students could do this suggests that their mathematics progress is at least satisfactory.

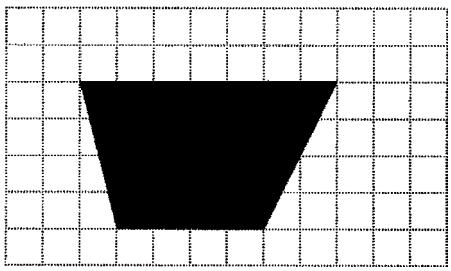

Figure 1. The 4th area question.

The fifth task was slightly more demanding, as shown in Figure 2, and this was at the level expected by curriculum for this level. That over one quarter of the students responded correctly suggests that these students, at least, are progressing well at their mathematics. There was a sixth, much harder question requiring interpretation of a scale drawing, some measurement, and calculations of the area of non-regular shapes that was completed correctly by four students.

The purpose of establishing the hierarchy of questions was so that virtually all students would eventually find one of the questions difficult. The questions more or less served the required purpose.

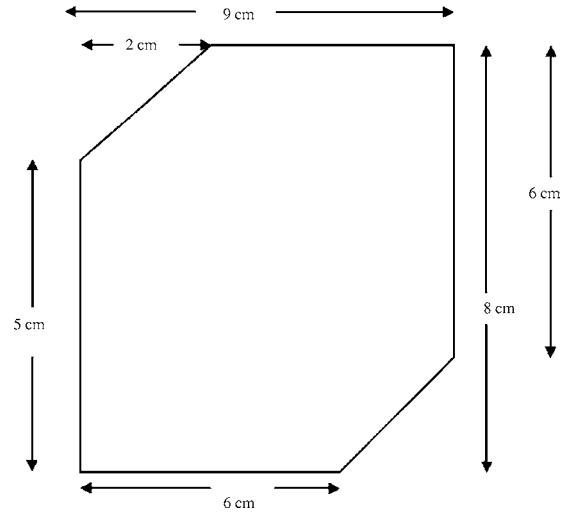

Figure 2. The 5th area question.

3. RESULTS

Essentially the Dweck theory predicted that some students would not persevere when they either found the task difficult or were incorrect. This was intended to be used as an indicator of whether the students have performance or mastery goals. We were surprised to find that, for both the English and mathematics tasks, all students persevered on task for the entire interview. This was 2 hours of concentrated sustained effort by every student.

This, of course, means that this measure of perseverance could not distinguish whether the students had performance or mastery goals. Certainly, these students were willing to persevere through difficult tasks under these conditions. It is suspected that if these particular students do not engage and do not persevere in class it is not because they cannot, but because they choose not to. This is discussed further below.

Items suggested by Dweck (2000) were also used on the survey to gain insights into the performance or mastery goal orientation of the respondents. In response to these items, the students appeared confident in their own capacity to learn mathematics. Table I presents results from selected items from the survey, on which the students rated their responses on a 6-point scale, including strongly agree, agree, mostly agree, with similar options for disagreeing.

Over one third of the students were very confident, most were confident, and they saw a link between achievement and effort. Further responses

TABLE I
Student self confidence ($n = 46$) (%)

	Strongly agree	Overall agree
I feel confident that I can learn most maths topics	38	94
I can learn anything in maths if I put my mind to it	41	94
If I find the work hard, I know that if I keep trying I can do it	37	91

TABLE II
Student self rating (%) of effort–positive ($n = 46$)

	Strongly agree	Overall agree
My friends say that I keep trying when maths gets hard	15	83

TABLE III
Student self rating (%) of effort–negative ($n = 46$)

	Strongly disagree	Overall disagree
You are either good at maths or not. You cannot get better by trying	56	82
If I can't do the work in maths I give up	31	96

related to their self description of their effort are presented in Tables II and III.

Nearly all students claim that they do not give up and most report that others would affirm their own effort even when the work is hard which we interpret to be a rejection of the entity view of intelligence. In both positive and negative forms, the responses suggest that these students see themselves as persistent, and further confirm that most consider effort and achievement to be linked.

The students' self perceptions were comparable with those of their teachers who were asked to rate their estimation of these students' effort and achievement. The ratings, choosing options from "poor" to "great" are presented in Table IV.

In other words, the teachers also rate the students predominantly as achievers who try hard. Based on these student self ratings and the teacher ratings, it could be assumed that the students are progressing well and try hard. These responses were not anticipated given the teachers of these classes reported that they have difficulty in engaging students in their mathematics learning, suggesting an overall impression of resistance to learning mathematics by students in their classes.

TABLE IV
Teachers' ratings (%) of student achievement and effort ($n = 46$)

	Great	Average or better
Achievement	29	82
Effort	46	90

It is interesting to consider the responses of the 12 students who demonstrated higher achievement by correctly completing question 5 as presented in Figure 2. The teachers rated eight out of these 12 students' achievement as great, and for 10 they rated their effort as great confirming that the highest question answered correctly is a reasonable measure of student achievement. About half of these students strongly agreed with the propositions in Table I, with the rest agreeing. Only three of these high-achieving students strongly agreed that their friends would say they keep trying when it gets hard. In other words, most of the high-achieving students do not feel they are seen by others as trying very hard. Of course, it could be that such students do not find the work difficult, and so do not feel they need to try hard, and would imagine that they are not perceived as trying hard. Although eight of this achieving group strongly disagreed with the proposition that you are either good at maths or not, and you cannot get better by trying, there were two who agreed. These latter two students could be vulnerable when they begin to experience difficulties in learning mathematics.

There were eight students who did not complete question 4, and these could be considered as below the expected level. The teachers rated the achievement of five of these students as good, with the rest lower, and three of them as making little or no effort at mathematics. Perhaps, in this case, the highest correct question underestimates the performance of these lower-achieving students, nevertheless the results of the group are used for comparative purposes. Only one of these students did not agree with the propositions in Table I, and two students strongly agreed with them. Only one disagreed that their friends would say they keep trying when it gets hard, and none agreed with the proposition that you are either good at maths or not, and you cannot get better by trying. Only one agreed with the proposition "If I can't do the work in maths I give up". In other words, students in this group were confident in their potential to learn maths and saw effort as connected to achievement.

Overall, both the high-achieving and low-achieving students are confident in their ability, feel they try hard, and see achievement as connected to effort. The high-achieving students report perceptions of effort lower than we anticipated, although it might be that either such students do not feel they need to try hard, or that they prefer to create that impression. The

lower-achieving students reported higher self-perceptions of their effort than we anticipated. It seems that there is no obvious link here between achievement and self-perception of effort.

To gain some insights into what the students overall considered to be success in mathematics, on the survey they were invited to give an open response to the prompt "I know when I am doing well in maths." While there were varied responses, 24 of the responses were categorized as "Getting correct answers and completing the work"; 23 as "Seeking teacher praise and good marks"; and 11 as "Emphasising learning and understanding." Some students had responses scored in more than one category. We would rate only the 11 students giving the third category of response as clearly having mastery goals. We rate the 23 students giving the second category of responses as clearly performance oriented, and we infer that responses in the first category are indicative of a performance orientation. Interestingly, all of the 12 higher-achieving students gave performance-oriented responses. Only one of the low-achieving students mentioned understanding. In other words, all but one of the students we rate as mastery were neither in the high- or low-achieving group. This is compatible with the Dweck model as is discussed below. Care needs to be taken in interpreting these responses since it would be possible for students with mastery goals to give responses interpreted as performance goal-oriented. Nevertheless while the spread of responses was as we had anticipated, the responses by the high-achieving students surprised us.

To gain a sense of the importance the students attribute to mathematics, they were invited to give an open response to the prompt: "What are the advantages of being good at maths?" About half of the responses were related to getting a better job or assisting them in their life generally. We take these responses to indicate an acceptance of the utility of mathematics, and provide a rationale for learning it. The other half of the responses were school and mark (grade) oriented. This may be evidence that substantial numbers of students have limited perception of the value of mathematics, and see it mainly as a school-oriented task. Such perceptions would be vulnerable to external threat. It is possible that students who see success as related to correct answers and teacher affirmation and who also see mathematics as a school task may well give up easily if the teacher's affirmation stops for any reason. Interestingly, 11 out of the 12 high-achieving students gave job or life oriented responses whereas only three of the eight low-achieving students did so. Even if the high achievers have a performance orientation, their acceptance of the value of mathematics may give them a rationale for perseverance. This would not be true for the others.

To gain further insights into student perspectives on effort or persistence in mathematics learning, they were posed with a scenario of a friend who

was good at mathematics but does not try. When asked to explain why this might be, in open response format, nearly half of the responses were like:

- pass without trying;
- to be popular;
- they get picked on/bullied/teased;
- it's not cool.

We interpret these responses as indicating that the students feel that it is common for students to appear not to try hard as a result of complying with a classroom culture that censures achievement and effort. This finding was even more marked for the corresponding prompt to the same students posed in a context related to perseverance in learning English language. The responses explain a lack of observable effort as being, on one hand, a result of a desire to be popular or cool, and on the other hand, from fear of retribution from peers. This was an unanticipated finding from the study and indicates that motivation, and resulting decisions on needs and goals, may be as much as product of group or cultural factors as individual goals. It may also be that the students were reflecting a more widespread view, even evident in television soap operas, for example, that students who are good at mathematics are not popular.

Interestingly, many students indicated that they feel that this lack of effort by some students is an issue that should be addressed. When asked what advice they would give this friend, out of the 38 students who responded 24 suggested they would talk to their friend and encourage them, including explaining that it is acceptable to make errors, seven responses were related to enhancing job prospects, and 4 were related to effort. When asked to suggest how teachers might respond to their friend 34 out of 44 responses were related to talking to the students, encouraging them and respecting them. Only 5 made punitive type suggestions. When asked what the friend could do to help themselves 20 responses related to effort, 11 to belief in themselves, and 12 to seeking help or following instructions. These responses seem extraordinarily insightful, mature, and empathetic. Perhaps, even though recognising the peer pressure to appear not to try, the students see a need for teachers to offer strategies for overcoming the pressure.

Another aspect of the data was the prompts that sought to examine the extent to which the students regulate their own thinking process. The individual interviews proceeded through the questions in order until the student was not able to answer a question correctly. All students were asked to comment on the question that they got incorrect. Note that these were not always the same question. When asked in what ways they found

the task difficult, 18 out of 42 students gave responses indicating awareness of the processes for solving the tasks. For example, these students made comments such as:

- adding up the halves and the triangles;
- trying to get the right amount of squares;
- trying to measure in correct centimetres;
- trying to convert centimetres to metres;
- trying to make the shapes into squares;
- trying to make rectangles out of triangles;
- adding up the sides and taking away the corners.

The students were clearly able to reflect on the mathematical processes within the solving of these area tasks. These comments listed here are interpreted as suggesting that these students are reflective and focused on the mathematical concepts at hand.

There were four students who were correct in all six questions so were not asked this question. Of the eight students who answered question 5 correctly, there were five who gave responses, like those above, that indicated a capacity to reflect on mathematical difficulties they experienced in their attempt at question 6.

The rest of the students overall gave less-specific responses, such as:

- try to figure out the answer;
- not having my maths folder with me;
- remembering the process;
- I forgot how to do it;
- I couldn't get the shape together.

These comments suggest less awareness of, and attention to, the mathematics and the relevant processes for solving the problems. Perhaps such students, if they are unable to identify the sources of their difficulties, would be less able to devise their own strategies to overcome difficulties they are experiencing.

When asked when they first found the question difficult, 12 out of 42 who responded gave insightful responses such as:

- when I looked at the quarters and halves;
- when I had to measure the corners;
- when I did perimeter and not area;
- when I got to the edge and had to count them;
- trying to find the measurement of the triangles;
- remembering to cut the triangles to make into squares;
- after putting it into a square.

This group of comments is focused on specific difficulties students encountered in working with the mathematics. The students seemed able to reflect on their mathematical activity and on the difficulties they encountered. Such awareness suggests that students would potentially be able to identify their needs in learning such mathematics and therefore be able to pursue particular goals in their learning. Interestingly, of the eight students who answered question 5 correctly, there were only two who gave this type of response related to their attempt at question 6.

The rest of the responses overall were less specific to the mathematics within the task, such as:

- when I got the first answer wrong;
- when I read the question wrong;
- after making counting errors;
- when I couldn't figure it out.

As with the second group of comments above, these responses suggest less awareness of and attention to specific aspects of mathematical activity, and may indicate that such students would not be able to identify and overcome sources of their difficulties.

When the students were asked what made the question difficult, about a third of the respondents gave insightful responses such as:

- the shape not marked clearly, with no lines;
- the shape was hard to work with;
- there were lots of equations;
- counting the half squares/triangles;
- trying to get the odd squares to equal full squares;
- when the triangles started to confuse me;
- the corners.

These students were able to articulate a mathematical basis for their difficulties. Of the eight students who answered question 5 correctly, all gave this type of response. In other words, these high-achieving students were all able to articulate what made the question difficult, but not when the question became difficult. Perhaps the latter is less important than the former, especially for high-achieving students.

Another third of the responses referred to remembering, such as:

- had not done area in a long time;
- trying to remember last year's maths;
- I couldn't remember what to do;
- remembering what symbol to use to work out the answer;
- not remembering the rules of area.

Rather than thinking about the mathematical concept within the questions, these responses suggest the students saw mathematical activity as an instrumental activity (e.g., Skemp, 1976) that required them to remember and use rules when a task became difficult. This may suggest a performance orientation where students are more focused on seeking cues for achieving the correct answer than on the process of working with the mathematics.

The rest were less specific, such as:

- I haven't done a shape like that before;
- having to draw an x on the squares;
- it was a complicated shape;
- assuming unlabelled sides were two centimetres.

There were students who, through their responses, demonstrated sufficient awareness that this would allow them to regulate their attempts and the questions positively. Most, though, gave a sufficiently vague response that, if this represents the full scope of their awareness, would be insufficient to allow them to regulate their own thinking. It is assumed that all students would benefit from greater attention to metacognitive aspects such as approaches to problems, identifying sources of difficulty, and strategies for overcoming such difficulties. Presumably, a pre-requisite to adopting reflective or metacognitive approaches is an orientation to persevering, even when the task is difficult.

4. Discussion

In Australia, participation of students in research in schools is only possible after specific and informed approval has been received by the researchers from the parents of the students. This is often done by writing a letter to the parents and awaiting a signed statement of agreement in return. In interpreting the above results it should be noted that the process of seeking such approvals from parents across grades and schools meant that only students who returned the agreement forms were included. This may have had a biasing effect. Nevertheless there was a spread of achievement evident and so the results are informative at face value.

Overall, these students were surprisingly confident in their own ability, they perceived themselves as trying hard, they saw these as linked, and they achieved up to expectations on the mathematics tasks. The teachers' ratings generally confirmed the student self-ratings. The students seemed very aware of the importance of effort. It seems that the schooling of the students in this study has developed in many of these students an awareness of the importance of effort, and in some a metacognitive awareness of their

attempts. Many students seemed aware that there was at least some peer pressure to appear not to try hard.

We suspected that students would give up when posed difficult tasks and this would provide the prompt for our discussions. However, in both the English and mathematics tasks all students persevered for the whole time. It should be noted that the situation was artificial in that an adult observer was with the students individually for all the time, and this does not reflect a classroom situation. Nevertheless it does show that all of these students were willing to persevere under these conditions. Perhaps teachers could seek to simulate such conditions with difficult students at times. That is, for example, teachers might seek to spend time closely monitoring the progress of individuals, and interact with them one on one, although obviously serially with other students.

Inferences from some responses suggested that generally the students have a performance orientation, not only to mathematics but also to effort. Many saw success as pleasing the teacher, and they also saw effort as pleasing the teacher as well. It confirms the Dweck conjecture that orientation to mastery or performance goals is not connected to confidence or achievement. Teachers will not address the students' orientation to performance or mastery goals or their participation in schooling solely by improving confidence, achievement or even awareness of the connection between effort and achievement (although these are obviously desirable).

Many of the responses that we interpreted as evidence of a performance orientation, may be related to short-term goals. In other words, the students saw pleasing the teacher, getting questions correct, getting the work completed, and scoring well on tests as the desirable goals. Students may benefit if teachers direct attention explicitly to the longer-term goals of deep understanding, linking new knowledge to previous knowledge, linking new knowledge to its usefulness and application, and generally focusing on the mastery of the content rather than performance to please the teacher or parents, or even their own self esteem through any competitive advantage.

Most students do see success at mathematics as desirable and a product of their own effort and action. Interestingly the higher-achieving students, even though performance orientated, were also among the half of the students who saw mathematics as valuable for life or employment. This gives these students some rationale for participating in schooling. Students who see mathematics as a school-orientated task and also have performance goals would be particularly vulnerable to giving up, especially if the teacher's affirmation is withdrawn for any reason. Teachers could well find ways to make connections between the content and its long-term value.

The students seemed insightful and sensitive about how teachers or other students can support a student who was not trying hard. This could be used by teachers as a way of supporting interventions.

Many students seemed aware of their affective response, especially related to effort, but only some demonstrated cognitive awareness. Only some of the students were aware of the processes for solving problems, only some could articulate the difficulties they were experiencing, and only some could describe what made the question difficult. Perhaps the former awareness could be used to improve the latter.

It seems that some high-achieving students rated their self-perception of effort as low, and two had an entity view of intelligence. Lower-achieving students saw the connection between effort and achievement and nearly all claimed that their friends would see them as trying hard even when the tasks are difficult. While the reasons for this apparent discrepancy may be different, it confirms the Dweck contention that self perceptions of effort and achievement are not necessary related.

In an open item, nearly half of responses to a prompt seeking explanations for under-participation suggested that either students deliberately do not try in order to comply with a particular classroom culture or avoid the perception of trying due to threats of sanctions by peers. The students seem to have the necessary self confidence and appreciation of the contribution of effort and persistence, and are even aware of ways to support others in improving their effort, but may under-contribute due to characteristics of the classroom culture. Teachers and schools could well address this issue as a priority and seek strategies for addressing it.

5. CONCLUSION

The fundamental impetus for our research came from reports nationwide (e.g., Lokan et al., 2001) and locally (e.g., Sullivan et al., 2002) that schools were failing to address factors inhibiting the learning of disadvantaged students. The schools we chose as sites for this research served predominantly lower socio-economic communities and, in informal discussions, teachers reported that many of their students were unmotivated and lacked perseverance. Our approach was to focus on the motivation of individual students and to determine whether the Dweck distinction between students having performance or mastery goals would be meaningful in describing or explaining achievement, effort, or perceptions of the value of learning mathematics of individual students.

In terms of the research questions posed earlier, it seems that the performance/mastery distinction might be meaningful, but in this case it

was not able to be measured by the degree of perseverance, since all students persevered, and even the items taken from the Dweck instruments were difficult to interpret. For this distinction to be of use to researchers and teachers the development of further instruments might be necessary.

Neither achievement nor perseverance seemed connected to either mastery or performance goals, and if anything the high- and low-achieving students were less likely to have mastery goals than those in the middle. Interestingly, this orientation for high-achieving students to have performance goals is predicted by the Dweck model and has been noted by a range of other commentators (e.g., Tomlinson, 2001), especially those arguing for a need to challenge higher-achieving students. In short, the claim is that teachers spend much time praising the higher-achieving students who respond by connecting teacher praise with achievement. In this, such students could be described as praise junkies, who would be vulnerable once the praise stops.

Positive student responses to school mathematics learning opportunities did not seem to be inhibited by factors such as lack of self awareness, lack of confidence and lack of success, but rather by both direct and indirect pressure from their peers not to try hard in school. This may be directly connected to the students' needs. Earlier the needs for identity, autonomy and social functioning were identified as key drivers of needs and therefore goals. As an aside, the more basic need of survival must be satisfied before these other needs can even be considered. Students who have not had breakfast, and are not certain about any other meal, for example, are unlikely to consider their other needs. For those students who can go beyond survival, if social needs are satisfied by conforming to the demands of the group which censures effort and achievement in schools, and especially if the need for autonomy can also be satisfied by defining oneself as opposed to school, then schools have a very difficult task to overcome this culture. It seems to us that this classroom culture may be a more important determinant of participation than the curriculum, methods of teaching, modes of assessment, teacher experience, level of resources, or anything else.

There are three possible directions for future research. First, because the model was essentially focusing on the individual students, we did not seek to measure the actual perseverance of individual students in class, or even the levels of engagement of individuals or classes. Given the persistence of all of the students interviewed even when confronted with difficult tasks, their positive self-reports of their effort, and their recognition of the value of effort, it may be informative to observe such students in their mathematics classes and seek to identify any relationships between their self perceptions of effort and their behaviour in class.

Second, it seems that the influence of the group over the individual may be powerful. This is similar to what Bandura (1997) termed *perceived collective efficacy* which he defined as "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainments" (p. 475). An important direction for future research could be to examine individual views of the capability of the group to achieve their collective or the individual's goals, and the extent to which they feel the group inhibits or enhances their personal motivation and orientation to learning.

Third, teachers may well appreciate research into possible interventions for classes in which an overall culture censuring apparent effort predominates, especially interventions focusing on assisting students in overcoming such negative influences.

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