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Looking Inside Classrooms: Teachers Engaging Students, Students Being Responsive

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Teachers engage students through activities, equipment, physical involvement, challenge, and discussion. Students respond as a result of their thinking visually, conceptually, strategically, meta-thinking, feelings, beliefs and attitudes. How is their attention attracted externally and internally? How will students’ develop conceptually? A number of classroom scenarios will illustrate these various issues. These are best practice examples worthy of sharing with other teachers.

Inside Classrooms

Over the past three years, I have had the privilege of observing some good teachers in practice. The number is over thirty and in most cases I was able to observe more than one lesson. These teachers work in different states of Australian and overseas where classroom conditions may not be quite as good as in an Australian classroom. Most classrooms were full of students from a variety of language backgrounds and for whom English was a second language. The schools themselves were both private and government schools. Each teacher was also interviewed about his or her teaching. Most of the lessons were on Space and Geometry. In addition, I have been able to read some written reports by teachers of their implementation of different lessons.

• When observing these teachers, key issues kept arising:
  • The teachers’ background, personality, planning, risk-taking, and satisfaction with their teaching;
  • The materials from which they were working;
  • The selection of key activities which were adapted across a range of levels;
  • The on-task behaviour of the students and how the teachers were achieving this;
  • The interaction of the students in the classroom and their freedom to express ideas;
  • The teachers’ perceived roles within the school due partly to the school valuing quality teaching and inter-teacher cooperation.

There was diversity among the teachers and at times it can be said that they were restricted in achieving the standards they might have wished for one reason or another but this did not seem to dampen their enthusiasm for teaching.
The Teachers

Undergraduate and Postgraduate Education

Three teachers referred specifically to their engagement during initial teacher education or postservice courses. In two cases, the learning clearly involved the teachers trying out ideas like group activities, keeping records of student progress, and evaluating their own teaching. In the other case, the teacher simply said the lecturer was inspiring. Each had pursued these ideas. In two cases, this was despite the dominance of a textbook and a school culture that did not specifically encourage group work or concrete materials. A couple of teachers referred to having to fall back on their own resourcefulness and make up many teaching ideas on the small glimmer of ideas they had heard during training or seen in other classrooms.

Teamwork and Risk-Taking

Other teachers were not specifically strong but with the encouragement of teamwork in the school, and building confidence with teaching another subject like English, they were planning lessons from which students were still likely to learn because the lessons were open-ended investigations and teachers could often learn with the students. Indeed, even where teachers were fairly confident and capable in mathematics, the ability to learn with the students and to take risks was very evident. The risk-taking included running a new activity, trying something which might result in a student saying something they may not have the answer for, and having a reasonable idea of the result but not being able to actually carry out the activity themselves in advance. Whole class discussion in which the teachers did not necessarily know all the answers nor give the answers were quite a feature of the classrooms. Getting the answers was not the major point of mathematics. Processes and conceptual understanding were far more important. For example, in a Year 6 classroom, one teacher was working on decimals and she had cut and pasted some exercises from some textbooks. One of the questions was $0.5 \times 0.8$. The answer did not give two decimal places as the teacher had suggested. Now the students were able to explain that these were both tenths and so the answer would be hundredths, 2 decimal places. However, they were getting the answer 0.4 with one decimal place. They checked the idea of a half of 0.8. Some girls checked with a calculator and explained. The teacher conceded a simple rule of 2 decimal places giving 2 decimal places was not quite clear.

Planned Steps

Every quality lesson had several steps that the teachers had planned. There was generally an introduction in which key ideas and strategies were discussed with the students before they were sent off to small groups or pairs or individual work. The work which the students had to do varied from the game activity or construction to book work. The book work might have been guided by a textbook or a worksheet but
generally required some problem solving on the students part. The book work might have consisted of recording during the activity or afterwards as a reflection or an application. Whenever there was activity, the teacher would know exactly what she or he wanted the students to learn, why the activity might be set with specific developmental steps, and what kind of questions would draw out the key ideas. Questions were asked of the students as they carried out the activity. All teachers planned some form of sharing session at the end of the lesson. For example, in one lesson using geoboards, the teacher had students first make one square and the whole class discussed these and why they were all squares. Then the class had to make many rectangles, followed by any four-sided shapes which could be sketched. These were then discussed in detail.

A particular feature of the classrooms was the use of paired tasks and active involvement of the students in the introductory phase. For example, in one Kindergarten class the students were each given a card and they had to find their partner and sit down. This led to a discussion which was the lead into the next part of the explanation. In this classroom the cards were dot and numeral cards. In a K-1 classroom, the cards just had 2 and low 3 digit numbers. The students found partners for all sorts of reasons. For some they were the consecutive numbers, for others they were both even or part of counting by 5, some were the same digits, and so on. In a Year 3 classroom, the students were grouping a row of students into equal groups. In a Year 5 classroom, the students demonstrated pacing out steps across the front of the room, measuring the step in cm and then deciding the length in cm. They were then to apply this to some outdoor measurement around the school and to some map marking.

**Realistic Experiences**

Even in the classrooms in which the teacher lacked resources or a good teachers’ guide, the teachers planned as best they could building on a key idea to create a realistic mathematical experiences for the students. This varied from drawing a map of their house, to playing a game where two students at the front answered questions from the class on the topic, to shape hunts in the environment, to specific work for different ability groups, to stories. For example, odd and even were introduced by a story about these two people who liked to be visited by the numbers that were the same kind. In another classroom, an analogy or story about surfing reminded students of the procedural steps in a written algorithm.

**Enjoyment**

For one teacher, the challenge game was less competitive for the weaker students because the teacher rotated partners in both directions around the circle. There was more chance for two students to be more equally matched rather than the best student dominating. When a good student had a turn, they were really going to try to beat this student. With many facial expressions and chatter, the teacher just made the whole
thing enjoyable. Being challenged was a key aim and part of the fun. Another teacher also smiled the whole way through the class introductions as she involved different students in the explaining and examples. Everyone felt good about what they contributed. In another classroom the Student Teacher Learning Difficulties who was supporting the classroom teacher, frequently interacted with the teacher and involved the students in the challenges and banter about the mathematics. These examples could be repeated for many classrooms. The encouragement to enjoy mathematics and do it well was a key goal emanating from the teacher and taken on board by the students.

**Teacher Satisfaction**

All teachers appeared to put an effort into their teaching. They would prepare materials for the lessons, discuss them with colleagues, and when planning look up resource books and refer to the syllabus or teachers’ guides. They also built up good resources for teaching and were able to use and adapt them over a number of years. They made an effort and they were satisfied with the results. They felt sure that their good rapport with the students and improvements in class discussions or other means of assessment were satisfying. This did not mean to say that some could point to issues with the school that disappointed them or the number of tasks they were asked to do outside the classroom.

**Teacher Support Materials**

Many of the teachers that I observed had been implementing Count Me In Too, Count Me Into Space or Counting-On programs. They generally commented favourably on the valuable theoretical background that these programs provided and how this assisted them to appreciate how students learn specific topics, to know how to teach certain topics, assess student development and prepare lessons that would benefit the students both individually and as a group. They particularly appreciated the wealth of lesson activities and ideas and, interestingly, the detailed lesson plans that were provided in the kits or illustrated on the videotapes.

In the overseas and interstate schools, the teachers did have some form of teacher’s guide that encouraged group activity, hands-on experiences, and some kind of written work for students to complete to consolidate their knowledge. A particular point of interest was that none of the materials encouraged long sets of exercises. There was plenty of variety and different examples of the concept being discussed. Lessons would build on and provide experiences relevant to the concept being developed over a number of days. Discussion of the conceptual ideas was expected through the activity in small groups and as a whole class with the teacher.

For some of the teachers, they continued to rely on their teacher education, previous experiences, and to build up their own resources by making up their own activities and games and written exercises. Often this was done as a team of teachers. Some activities were favourites. For example, one Year 5 teacher had groups make body skeletons out
of streamer paper by putting the paper around or along various parts of their body. However, the teacher allowed groups to decide whether they would make the skeleton full size or half size or some other ratio or fraction. This choice for the groups, plus allocation of different roles encouraged students’ ownership. The teacher had used this activity from Year 2 to Year 6 simplifying it to suit the grade. In this case, he was keen to have students making fractions of the full length. One teacher adapted the ‘find a partner’ activity across a range of classes, introducing new concepts like even and odd numbers, and having larger numbers. Another favourite activity for this teacher was the challenge game. This was adapted, for example, to recognising the number of dots on a die, to adding the dots on two dice, adding a numeral and dots, making a two digit number by multiplying the numeral by ten and adding the other die’s dots and so on. Another teacher had a variety of number jigsaws. These included the hundreds chart, a snakes and ladders board, and ten-frame numeral representations. Other favourite activities involved game boards with chance cards that were answered whenever certain squares were landed on. The cards were varied depending on the topic. Of course, bingo too was readily adapted to a range of topics and usually played in small groups with one of the students reading out the questions. One teacher commented that one particular kit was particularly useful because it supplied the materials. This gave the teacher a good start to collecting activities.

In Australian schools, the classrooms generally had a computer. However, during group activities this may or may not have been used. It seemed that a lack of appropriate software was a major hindrance to its use. Where teachers had software, a small group would work on the computers. The students were always working in pairs. Similarly calculators were rarely used, simply because the teachers did not know how to make the best use of them. Where teachers had observed, for example, the videotape Young Children Using Calculators, the teachers were more likely to use them. At other times they were used “when the textbook said it was a calculator activity or exercise.” However, in a number of the classrooms where teachers were using best practice, the calculator was available and students selected when they would use it. These same students usually told me that they would prefer to work out the calculation in their head.

**Student Engagement**

A most noticeable feature of all the classrooms that were visited, was the proportion of time and the proportion of students engaged in the class discussions, activities, and written work. This was particularly encouraging considering that three of the teachers told me they were given difficult classes because the principal needed the classes to improve in their behaviour. The key to success in some classes was an improvement in student literacy. Once students achieved a sense of satisfaction in being able to read and write, their interest in school improved. For some students, it was the encouragement to speak in the classroom that mattered.
Both the teachers and the students expected mathematics to be fun, hands-on, and challenging. Students were not expected to copy teachers’ examples but to take ownership of their learning. This was achieved by encouraging students to make or draw their own objects or shapes or sums.

Another aspect of the classroom was the expected behaviour of the students by the teacher and hence the students. The teachers did not tolerate slack students. This does not mean that they were impatient with slow learners or students with learning or behaviour problems. These teachers handled these students particularly well. Teachers used a variety of devices from a ‘singing crocodile’ that timed how long students had to pack up, ticks for good or poor behaviour on the board, much praise and enthusiasm for student participation and attempts, graded materials and activities, paired and group work, and plenty of work. Explanations about the activity procedures were clearly made so even open investigations were carefully explained. Games and activities were frequently repeated but often with slight changes that made it more difficult. This meant that knowing the rules allowed students to use or develop the concepts better. Similarly class routines were well established. Materials were well organised. In multigrade classrooms, the teacher required students to work on their materials without noise. This was achieved by careful explanation and the type of work selected for students to work on without teacher intervention.

Teacher experience and preparation were key to successful on-task behaviour. This was the case even when the teachers had only been teaching for two or three years. These teachers were reflective about their practice and had quickly developed strategies that worked. They were constantly aware of the need to adapt and improve in this area with different students.

**Student Interaction**

In all classrooms, there was extensive interaction. This was frequently with paired or group work and with whole class discussions. However, the classrooms were never disturbingly noisy, students spoke quietly except occasionally when excited. One teacher worked in a school environment where students were expected to work more as individuals but she had achieved some success with disruptive students and so had gained support from senior teachers. In other schools, some teachers were gradually convincing others of this approach. This was done mainly by team-teaching. At other times, team sharing preparation had achieved a similar result. The teachers realised that they needed to have good preparation for this to work. In one school mathematics was always after a recess so the teacher could get the mathematics equipment ready. This was particularly necessary for measurement lessons but also for many others where games, arithmetic materials, and papers and scissors, blocks and geoboards were required for space.
**School Environment**
Most but not all the teachers were part of a Year team that worked on ideas for lessons, shared the organising and preparation of materials, and occasionally had the opportunity to team teach. In one case, this was a common practice for the whole year in the school. In other cases, the facilitator of new Count Me In programs worked with the class teachers to introduce ideas. Others were able to work with support teachers of one kind or another. However, there were also classrooms where the teachers were more isolated in their work. Some regular school inservices were held in these schools but there was less opportunity for the teacher who was not so keen on mathematics to improve. Generally these teachers did not volunteer to be observed during school visits. It was noticeable that most of the schools had a strong collegiality among the staff. The hard work that the teachers put into the care and discipline of the classes often required this kind of support. Teachers were frequently backed up by introducing new challenging programs like debating. Casual staff were frequently teachers who regularly had work at the school. The support of the principal or senior executive in encouraging no one textbook, encouraging group work, the pilot projects and research, and new equipment was significant. When mathematics was on the agenda for the school, there was increased enthusiasm, risk-taking, and a sense of achievement for both the teachers and their students.

**Conclusion**
Classrooms and their school environment are key factors for the learning of mathematics. Enthusiastic and effective teachers of mathematics try out new ideas with sufficient support from professional development materials, from their own background experience in organising activities and developing sound classroom discussions, and from team teaching or other forms of reflective professional development. These teachers monitor the progress of their students and provide realistic lessons.