A crucial challenge for education in the Pacific is to reformulate curricula and instruction to foster deep-level comprehension.

One mechanism for doing so is to increase the frequency of problem-solving in the curriculum. Ideally, the process of problem-solving is modelled for students by teachers themselves.

In recent years, a substantial amount of research evidence has built up which supports the idea that schooling often produces students who can give correct responses on cue, but who lack the kind of flexible and powerful thinking process we would call understanding. It appears that in many schools, tacit social exchange agreements often lead students and their teachers to accept what Gardner (1985) calls "correct answer compromises". If students are orderly and provide answers to questions posed by teachers, teachers in turn don't push too hard.

While a strong external examination system, such as is prevalent in the South Pacific, might have many positive features, one liability is the focusing of students' attention on obtaining a high mark at any cost. Preparation for examinations often involves detailed study of previous exams to ensure that essential knowledge is mastered. While such an approach is not bad in itself, it may lead to an orientation to learning that in the end is self-defeating. Much attention goes to mastering information in essentially, the same form in which it is learned. In the real examination, however, a shift in orientation could easily confound students, proving how tenuous their understanding is.

Every educator recognises the term rote learning, and most would look at it very negatively. Understanding is the opposite of mindless rote learning. In the domain of skills or processes, there is a comparable distinction that is equally important. This is the distinction between algorithmic knowledge and problem-solving. Essentially, algorithmic knowledge is any procedure that is guaranteed to work, even if applied mindlessly. In physics, for example, a rather standard problem can be worked out by algorithm so long as the problem does not differ too much from practice sets.

Problem-solving, however, is different. It entails an attempt to reach a goal when the way of doing so is not known beforehand. Problem-solving is ubiquitous in everyday living but is rather uncommon in formal education. This may be because algorithmic tasks are more orderly and certain, and are more likely to maintain a comfortable (especially for the teacher) classroom atmosphere. Problem-solving is much more risky, precisely because it involves uncertainty and perhaps anxiety. A prerequisite for problem-solving is that the problem situation is in some significant way new to students, otherwise a set algorithm can be applied. The capacity to deal with novelty ensures the flexibility of knowledge that leads to understanding. Students are forced to use what they know to move closer to a goal, step by step. Its essence is very close to the nature of intelligence: intelligence is in large measure the ability to deal successfully with novel problems (Sternberg, 1985). Certainly, as the pace of change in the Pacific increases, a capacity to deal with novel problems becomes more vital.

Problem-solving, unlike the use of set algorithms, admits no superficial thinking. A curriculum designed to foster understanding will avoid presenting tasks that can be solved purely by algorithm. Rather, important concepts, principles and relations should be presented and used in a variety of ways.
also be conveyed in a variety of symbol systems including, where appropriate, linguistic, numerical and pictorial forms. Teachers are best advised to set problems that call for combining knowledge in new ways. Most of all, activities need to have the open-ended character which is an essential feature of problem-solving.

Finally, teachers themselves need to embrace problem-solving and model it for the students.

Necessarily, teachers will begin with a sense of not knowing the "end from the beginning", but perhaps only what first steps to take. The process can be modelled as teachers verbalise their thoughts. The form of verbalisation might be something like, "Well, let's see. First, what are the key pieces of information? What are we trying to achieve?" According to this "self-talk" approach, explicit, verbalised procedures are eventually internalised by students.

When teachers solve problems with students, the traditional social order of the classroom is challenged.

A teacher might indeed make a mistake (errors are virtually guaranteed in problem-solving), or a student might see a relation before the teacher does. The teacher is placed in a more vulnerable position than normal. For a secure teacher these "risks for understanding" are worth their eventual pay-off in students' deeper understanding. "Correct answer compromises" will inevitably disappoint students and teacher, but teaching for understanding will ultimately yield the intangible and tangible rewards (including higher exam scores) that are the correlates of authentic education.

References

