BACK

ALTERNATIVE ASSESSMENT MODEL

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Abstract
The Vienna International School has been using the TI-92 with select classes in the secondary school, particularly in grades 6 - 10. Our class sizes range from 15 - 25 in these grades. A model for learning and reinforcing manipulative skills through the use of group work will be presented, including the assessment of these skills. Potential difficulties in group work situations, such as varying language and technical skills and diversity of mathematics abilities and backgrounds, will be discussed with particular attention to using these differences to maximize skill acquisition. In addition, a model for using the TI-92 as a self-assessment tool will be presented.

What a student learns (assessment) depends very much on how a student learns it (curriculum). New forms of assessment will dictate new curricula, or at least create a new emphasis within existing curricula. We all know that the most expedient way to effect changes in curricula is to change assessment. As Bert Waits says, the only thing that a student is ultimately interested in is "will it be on the test". Although as educators we profess certain ideologies that supercede what is merely tested, as time constraints of fulfilling syllabus requirements start to weigh heavily upon us, we also begin to develop the "will it be on the test" syndrome which dictates our teaching and revision work. Recognizing, however, that in a perfect world assessment should be the by-product of curriculum, we at the Vienna International School decided to begin the enormous task of rewriting our curricula with a view toward integration of hand-held technologies. So three years ago when we ran our TI-92 experiment in our grades 9 and 10, we purposely chose classes without restrictions of external exams to ensure

some flexibility. We realized immediately that the introduction of CAS also produced an added variable to the already existing ones of mathematical ability, motivation, background, and command of instructional language, namely that of technical skill. In our classes, technical motivation and skill were very much split along gender lines, i.e., the girls used the TI-92 only under direct instruction, and the boys used it obssessively. As a way of tackling all of the above mentioned variables, we decided to engage the students in a great deal of group work and, furthermore, to use group work for assessment purposes.

Our initial group work had as its goal to introduce students to the keystrokes of the TI-92 within a particular topic. In my class, there were 5 groups of 5 students each. In each group we made sure there was at least one strong math student and one strong "technician". Each group received the same worksheet, for example, simplifying algebraic fractions. It was the responsibility of the math "expert" to make sure that the students understood the underlying structures, and the "technician" to ensure that each student knew which buttons to push. By way of added motivation in their respective duties, a student from each group was selected randomly and had to present the solution to a particular problem. This student was then assessed by the teacher, and each student in his/her group received this grade. As Bert Waits says, there is nothing that influences the actions of a student greater than assessment, and so the average confidence and competence of working on the TI-92 increased. After the initial group work to introduce a topic, we progressed to intermediate group work where each group received different worksheets on the same topic but with an emphasis on applications. A task of similar difficulty was selected for presentation, and the group was again

assessed in the way described above. In advanced group work, a problem in mathematical modeling was set to all groups, and each group had to present an aspect of the problem. This time, each group was able to assess the presenting group. The marks were averaged along with the teacher's assessment.

There were many observed benefits to this form of group work. Not only did the technical competencies improve, but overall math achievement improved as well. As we all know, there is no better way to ensure one's understanding of a concept than to have to explain it to others. In addition, communication skills steadily improved. The social integration of new and ESL students was accelerated. Students became less teacher dependent as they assumed more responsibility for each other's learning. They became conversant in the language of math. Through the assessment discussions, they became more cognizant of assessment procedures and guidelines, and developed a more realistic approach to their own self-assessment.

Although group work was initially undertaken to cope with all the competency differences within the class, its validation as a form of assessment became apparent. Assessment in the real world of work is multi-faceted. We are assessed not only on the command of our particular area, but on our ability to communicate this through a particular medium. Our ability to work with colleagues is important, as well as how we present ourselves personally. Through group work we were able to help students develop their skills in all the above areas.

Through group work we also discovered areas to introduce students to the notion of self-assessment while engaging at the same time in some cross-curricular activities. In using the TI-92 as a pedagogical tool, it sometimes renders expressions not immediately recognizable as equivalent to those

obtained using paper and pencil. For example, in solving one of the equations of motions, $v^2 = u^2 + 2as$, for a the student would obtain the following result by hand, $a = \frac{v^2 - u^2}{2s}$. Using theTI-92 the student obtains $a = \frac{-(u^2 - v^2)}{2s}$. For a beginning Algebra student, the equivalence of these two expressions may not be immediately obvious. However, when revisiting this topic in a later grade or in Physics class it provides an opportunity for self-assessment, namely the student must determine whether the two expressions are equivalent by explaining how one is obtained from the other. Another more interesting example is to solve the above expression for u. By hand, the student obtains: $u = \sqrt{v^2 - 2as}$. Using the TI-92, we get:

$$u = -\sqrt{-(2as - v^2)} \text{ and } 2as - v^2 \le 0 \text{ or } u = \sqrt{-(2as - v^2)} \text{ and } 2as - v^2 \le 0.$$

Again, the student must determine if the solutions are equivalent, and explain.This also serves to develop communication skills in the language of mathematics. Following these exercises in math class whereby students rearrange formulas and assess their own successes, application problems are then given in Physics class.

For the award of a final grade, conventional tests weighed 50% of their final mark, group work 20%, classwork and homework 20%, and self-assessment 10%. These weights can be varied to better reflect the ability of a particular class to cope with the alternative assessment forms.