Enrichment Materials

for Senior High School Mathematics Programs

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Reported by *Wayne J.P. Turley*, Calgary

Enrichment is *not* exclusively for our best students. To think so is a serious mistake. It is for *all* students. Certainly the personal rewards are not less real for average students than for brighter ones.

Enrichment is a function of the classroom teacher because the experts have not done their best to enrich the standard program and, more importantly, because mathematics is an active and personal kind of thing. Consequently, the classroom teacher is the only one who can prescribe what is appropriate to each student.

Enrichment stimulates creative thinking, fosters analytic thinking, helps the student explore beyond, could be recreation or may increase the practical aspects of mathematics.

The following criteria are essential for enrichment:

- Enrichment material should be appropriate to the students. This is often overlooked, but very important. It is also difficult to predict what will be of interest to the high school student.
- Enrichment material should be appropriate to the teacher.
- Enrichment should be appropriate to the teaching situation: the number of students, kinds of students, availability of a mathematics laboratory or library, and so on.
- Enrichment must be valid mathematics.

Here are some examples of specific items:

Paradoxes (for example, Zeno's). Rephrase them and have the students make the calculations, but do not let the answer come out too soon.

False proofs. These are excellent materials, highly motivating, but they must be critically examined by the student - for example, Euclid: all triangles are isosceles.

Historical topics. They represent something that appeals to the human interest aspect. Let's take, for example, the Archimedes approach to areas bounded by curves - there is an incredible amount of mathematics, and five good students would have a ball working on this.

Computers as enrichment. If accessible to the school, these provide an opportunity for students to learn how to write programs. If they are not accessible, then computers could be considered from a social science point of view, or the kinds of problems they cannot solve.

Games. It is the mathematical analysis of the game that is more important than the actual game - for instance, "Instant Insanity".

Number Theory. Casting out nines - *why* does it work? What would happen in other bases, such as, for example, base eight?

Topology. It is loaded with enrichment materials - the four-color problem, the Königsberg bridge problem, and other network problems.

Curve stitching. It is not just the pleasing designs that can be constructed, but rather what kinds of curves, for example, can be generated from straight lines, and why. This is the mathematics.

Probability. Testing reliability of samples is an important consideration for ordinary-life decision making (example: cigarette ads).

Music. Take the themes in any musical score and do geometrical transformations on them.

A View From the Bridge

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Reported by *Bob Hood*, Calgary

From the bridge, teachers could see students in the river of mathematics - some were having a hard time to stay afloat, some were treading water, some were swimming with the current, and some were making good progress swimming against the current. The teacher could stay on the bridge and shout orders to the swimmers, he could go down on the bank and get closer to the swimmers, or he could get right into the activities of the swimmers, trying to assist each according to his needs.

Chuck suggested that each one of his audience take a sheet of paper and fold it so that there were two equal parts (top to bottom or side to side), then fold it again so that each person had four equal parts. After each fold the number of equal parts was noted. Those who thought they could fold the paper seven times found that they had an impossible job. A record of the results was made as follows: