AN EXPERIMENT IN LEARNING TECHNIQUES

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In the everyday presentation of lessons to their classes, teachers have often encountered the following difficulties.

1. Certain students tend to sit back, take no part in the lesson, and turn off their minds. Trying to involve them in the work by questioning them makes it virtually impossible to maintain a smooth continuity in the general questioning. For some students this withdrawal is not an entirely voluntary process but rather a protective device dictated by their shyness. They simply do not wish to stand up in front of the entire class and expose themselves to imagined, but for them quite real, humiliations. As well, many of the girls often wish to avoid appearing too "brainy" in front of their male classmates.

2. It is often impossible to properly answer a question posed by a student when the question is "off the track" of the lesson. To stop, and fully satisfy the questioner, would interrupt the flow of the lesson and leave the remainder of the class waiting with nothing to do.

The above difficulties are due, in part, to the static nature of the average classroom seating arrangement, wherein each student is largely isolated from his fellows. In an effort to overcome this situation in my Grade IX, X, and XIII mathematics classes, the ordinary desks have been removed from my classroom and replaced by six 4' x 2½' tables. These were arranged about the room in an irregular U-shape around an overhead projector. Students were then assigned to each table so that the average mark of the five or six people at any table was approximately 63. Of course, this distribution was entirely arbitrary. An alternate arrangement would have been to place the best students at one table, then the next best at another, and so on down the line. This latter approach would require a very large supply of programs suitable to the various table-levels. However, it would represent perhaps the ultimate arrangement, and would be, in effect, an ungraded classroom, with students at different tables doing different work, each at their own level of achievement.

At each table a captain is selected, who, in most cases, is the most able student at that table. The function of the captain is to oversee and guide the work of the others, and to answer as many of their questions as possible. It is the duty of everyone at a table to see that no one sits back and loafs, and to continuously check and compare each other's work. So many of the formerly shy and reticent students have really blossomed under this approach and have helped each other to an amazing degree. At one table the captain, every day, has been individually tutoring the slowest student at that table, a boy with a language problem who would never have asked a question under other circumstances. His work has shown a terrific improvement, and at the same time he is learning to communicate with others. There is a great deal more noise than normally, but most of the talk concerns mathematics.

More than one type of lesson is possible with this seating arrangement. From time to time, when the need dictates, the whole class stops and a short Socratic lesson can be presented to overcome a particular difficulty or to introduce a specific point. However, I spend most of our class time circulating around the room, sitting down at each table in turn, and discussing problems, as necessary, with one, two, three, four or all the people at the table. In this manner, I am regularly communicating, in a quiet, non-embarrassing way, with the students who are actually having the problems. In doing this, I believe I have come to know my students so much better than previously, and I feel that much more than before my students sense that I am a person with whom they are going to be able to learn - to explore and discover things together - and that I am personally interested in their problems and difficulties.

The method I use to create this circulating time is to prepare beforehand an overhead transparency projectual containing sufficient directional instructions to outline my lesson. The class then simply proceeds on their own to carry out the instructions given. As well, circulating time can be created by having students come up to the overhead to present and discuss their solutions to problems or to work out illustrative examples with the help of the rest of the class.

I should like to point out here to teachers not familiar with this approach that our experience indicates a world of difference between students' blackboard work and their work with an overhead projector. All to often working at the blackboard means taking one's notebook to the board, copying out a solution in absolute silence, with writing arm in a tiring and unfamiliar position, back to the class, body blocking off most of the solution, with the rest of the class paying little if any attention.

Working at the overhead is totally different. The student brings up no notebook, faces the class, writes in a normal, comfortable position, with all eyes following the step-by-step unfolding of the solution. The student may wish to obtain help from others and feels free to do so. Often a spirited dialogue develops, with continual comments from the class and a running discussion with the student doing the work.

This is a real learning situation, an involvement dialogue which is often not possible between teachers and students. We have found that many of the shyer students now actually want to go up and engage the class in this way - confident that the class will help them, that the teacher will not interfere and spotlight their difficulties, and that they will be able, in a constructive atmosphere, to really learn something. How amazing it is to hear them fighting over which one will go up and present the next solution! Another benefit of this approach is that even after a solution is finished, the plastic sheet containing the solution can be taken around the room for further reference or deeper inspection. This is just not possible with a blackboard solution. Furthermore, the students can be provided with plastic sheets and marker pens to take home overnight to more extensively prepare a particularly complex problem or illustrative example.

Another approach ideally suited to this kind of seating arrangement is the experimental lesson. So far this year, the students have performed a variation of Buffon's needle experiment to approximate the value of pi, have flipped three coins simultaneously to determine the probabilities of various upface combinations, and taken physical models of prisms, pyramids, cubes, parallelipipeds, and by actual measurement have calculated their total surface areas. In each case, follow-up reading is prescribed, and each table submits their results and conclusions. Many of the lead-ins to these experiments have arisen from our once-a-week "free" period wherein the students are free to play with dice, coins, and a roulette wheel, to read any book on mathematics from our classroom library, to go unsupervised to our school library to peruse their books on mathematics, to watch mathematics filmstrips of their own choice from the selection we have available, or to work on their mathematics project for that term. Every available inch of space in the classroom is filled with models they have built, curves they have stitched, and such other items as they have been interested in making. During the free period I bring a radio into the room and provide them with enjoyable music. After all, why shouldn't our classrooms be pleasant, stimulating, and enjoyable places in which to be and learn?

Reprinted, with permission, from
The Bulletin, published by the Ontario
Secondary Teachers' Federation,
December, 1968, pp.493, 494.

STATIC AND TRIANGLES

Brian Prior
President of CJHMCATA

The Calgary Public School Junior High Regional Mathematics Council (good grief!) held an open meeting on February 27, at which teachers were invited to make a set of aids. Those who were interested in this session met in a classroom where Lorne Sampson, the originator of the aids, demonstrated the use and construction. Following a short discussion, the group moved to the industrial arts shop to mark out and cut the raw material - a 4' x 2' x 1" sheet of expanded styrofoam.

To math teachers who also teach science, we can heartily recommend styrofoam dust as a material readily charged with static. Brushing has little effect.