ON SOME PROBLEMS OF TEACHING APPLICATIONS OF MATHEMATICS

Dr. H.O. Pollak, director, Mathematics and
Statistics Research Centre, Bell Telephone
Laboratories, Murray Hill, New Jersey

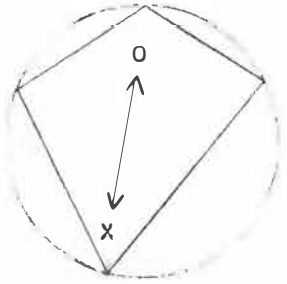
A report of a general meeting at the Annual Mathematics Conference, held in Red Deer - by Mary Beaton

Dr. Pollak examined some false folk theories about the applications of mathematics. He showed that practical applications are not limited to those involving classical analysis including calculus. On the contrary, all mathematics from elementary school level to the undergraduate level can be good applicable mathematics. He cited the application of probability to the study of population being at least as important as applications of calculus.

Another false folk theory is that mathematics can be applied only to classical physics. Although this application has had a two-thousand year record of tremendous success, over half of the applications to be found in the *Journal for the Society of Industrial and Applied Mathematics* are not in classical physics. Modern linear algebra can aid in the understanding of physical process. One should use the best mathematics available in applications. Linear algebra can indicate how accurate the pendulum formula for a grandfather's clock is if X is substituted for sin X. The clock would lose half a minute per day which is not good enough.

Dr. Pollak attacked another folk theorem, namely the idea that application problems will motivate pupils. He suggested to begin with a physical problem instead. Applications ought to be real, and the objective should be to find out how mathematics will help to understand the problem.

Also listed as a false folk theorem was the assumption that teaching with applications is a very different type of teaching. Dr. Pollak suggested that an example of letting studentsdiscover ideas for themselves could be a study of polygons in a circle. The class could first examine triangles and find that any triangle can be inscribed in a circle. After a study of quadrilaterals, it would become evident that some quadrilaterals can be inscribed in a circle whereas others cannot. The students could examine the sum of the opposite interior angles of an inscribed quadrilateral.



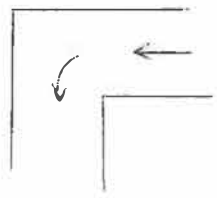
Let the students draw the diagonals; with some help, a few of the students may discover Ptolemy's theorem.

In the study of prime numbers, let the students consider whether or not they would want the number one to be prime. How do we use prime numbers? What about two? Should it be a prime?

Dr. Pollak suggested a method for helping elementary students to learn the multiplication facts. The child is asked to make up a problem whose answer is 14, then 15, and 16. When he is asked for a problem whose answer is 17, he is encouraged to analyze the difficulty in setting up such a problem. This approach can be a process of sowing seeds of understanding for later stages.

Dr. Pollak gave numerous examples of applications of mathematics in everyday life:

1. What is the largest two-dimensional object which can be taken around a square corner in a plane? This is an unsolved problem.



2. How should you rake up leaves - in parallel lines or towards a central point?

3. How large should a display counter in a five-and-ten store be?

4. How many items should be allowed in the express lane at a super market? It would be necessary to decide the purpose of the express lane. Is it to cut the waiting time of the customers? Is it to reduce the maximum wait? Is it because people refuse to wait longer than ten minutes? When you have decided the purpose of the express line, you then have a well-defined mathematics problem.

If mathematics is understood, it will be remembered better. Situations in the real world are never just like problems in a textbook. Students must know how to apply mathematics in a new situation. The purpose of mathematics is not to cover the subject but to uncover it.

MATHEMATICS COUNCIL, ATA

Table Officers, 1968-69

President	Murray R. Falk	#201, 600-First Street, NE, Calgary 61	263-7406 (res.) 272-2949 (school)
Vice-President	H. Riggs	7920-93 A Avenue, Edmonton	469-4197 (res.) 429-5621 (school)
Past President	A. Bruns	Box 850, Lacombe	782-3180 (res.) 782-3487 (school) 782-6272
Secretary	Mrs. B. Andersen	12 Hilton Avenue, NW, Calgary	289-8215 (res.) 288-7141 (school)
Treasurer	Edwin Olsen	Box 22, Eckville	746-2398 (res.) 746-2331 (school)