Math kits- New format

Our math lab kits have grown in size and popularity so that a single K-XII kit is too massive to be practical. We have divided our kits into three groups: elementary, junior high and senior high, as stated in the information letter from Stu McCormick, Coordinator of Math Laboratory Kits. When you experiment with the sample materials, consider what you want added so that we can update the kit for our next circulation. One item that will not appear in the kits before next fall is material for use in teaching metric measurements.

We are gathering material and ideas for evaluation now so that what will be included will be valuable to MCATA members and other teachers at all grade levels. What is in your repertoire that is valuable for others? What do you need to evaluate before you purchase? Your participation is the only way MCATA members may truly work together to improve the teaching of mathematics in our schools. Your executive is working to make the kits worthwhile, but our success depends on your assistance and active participation.

Mathematics Canada

As announced in the August issue of *Science Forum*, the Science Council of Canada has agreed to finance a one-year study of the mathematical sciences in Canada. In addition to the traditional disciplines of pure and applied mathematics, the mathematical sciences include such fields as mathematical statistics, computer science, actuarial science, and operations research. The initiative for the study comes from the Canadian Mathematical Congress, and the study itself will be supervised by a joint committee whose members have been appointed by: The Canadian Mathematical Congress, The Canadian Information Processing Society, The Canadian Operational Research Society, The Canadian Institute of Actuaries, The Statistical Science Association of Canada, The American Statistical Association (District 11).

Surprisingly little attention has been given to the mathematical sciences in Canada. Although the need for long-range policy planning in this area seems obvious, the Lamontagne Report (entitled "A Science Policy for Canada") scarcely mentions mathematics at all. The present study will be breaking new ground in attempting to provide an overall view of the role of mathematics in Canadian science, education, government, and industry. The specific objectives of the study are:

1. To establish what kinds of mathematics are currently used in Canada and to what extent. Also to suggest areas of mathematics which are not being studied or used to the extent which would be desirable.

2. To describe and evaluate the various possible types of research in the mathematical sciences.

3. To estimate present and future manpower supplies and needs at various levels of mathematical competence.

4. To examine current objectives and methods of training in mathematical activities and to suggest possible improvements at the undergraduate and graduate levels.

5. To recommend methods by which significant real problem areas amenable to mathematical treatment can be identified and publicized on a systematic and continuing basis.

The Impact of Mathematics on Society

Mathematics has always played an important part in human civilization and in human thought, but its influence has never been so pervasive as it is today. Until the 20th century, the impact of mathematics on everyday life was immediate and easily understandable, involving down-to-earth applications of arithmetic, algebra, and geometry. Now, however, increasingly abstract and powerful mathematical techniques have come to be used in many subtle and indirect ways. Modern engineering developments, based on sophisticated mathematical theories, have led to the creation of present-day communications networks, nuclear weapons, aerospace technology, and electronic computers. Within the last 30 years, statistical procedures have come to play a dominant role in quality control, government planning, psychological testing, agricultural research, and in all of the experimental sciences. During the same period of time, advanced mathematical methods - which were once the exclusive domain of the physical sciences - have become increasingly important in economics, sociology, the biological and medical sciences, business, and even linguistics. More recently, mathematical modelling and computer simulation techniques have become major tools for decision making.

Problems in Communications

This remarkable expansion in the range of mathematical applications has created many problems in communication and coordination. For the most part, students are not acquiring an adequate understanding of how mathematics is being used in the modern world, and as a result their mathematical education seems curiously irrelevant to many of them. Users of mathematics in science, government, and industry often feel that professional mathematicians are unable or unwilling to respond to their needs. Meanwhile, mathematicians have all they can do to keep abreast of developments in their own field. The astonishing rate at which the mathematical literature is growing makes it increasingly difficult to assimilate and retrieve new information. Indeed, it is often difficult for mathematical researchers to grasp the motivation or significance of some of the problems being dealt with in the literature. Thus, the explosion of mathematical knowledge has created a serious communication problem within the mathematical community itself, particularly since it has given rise to a large number of more or less independent mathematical disciplines.

There is widespread recognition that all is not well. Recent budgetary cuts, declining student enrollments, and the so-called "Ph.D. crisis" have brought the situation in the universities close to the crisis point. Obviously something will have to be done soon, for better or for worse. Many mathematicians fear that the cultural values of mathematics are in danger of being sacrificed for the sake of short-range utilitarian goals. Many see a need too for greater diversification of mathematical activities, with more emphasis on the interfaces between mathematics and other fields of human endeavor. This would involve new attitudes and approaches in teaching mathematics, more cooperation with mathematicians in government and industry, and greater opportunities for interdisciplinary studies. At present there is little incentive to pursue such goals, since they are not encouraged or rewarded on a systematic basis.

Participation in the Study

The mathematics study will investigate possible mechanisms for dealing with these and similar problems. In fact, the actual process of the study may be of greater importance than any written report which will result, according to the study director, Prof. John Coleman, who is also Head of Mathematics at Queen's University. He and his assistant, Dr. Gordon Edwards, are urging practitioners and users of mathematics to participate actively in the study - not only by formulating their views in briefs and letter, but by engaging in a genuine dialogue with their colleagues on the present and future state of the mathematical sciences in Canada. Study groups are being set up for this purpose within universities and colleges, professional mathematical societies, and teachers' associations. These study groups will provide a unique opportunity for people of different professional backgrounds to exchange information and ideas on a wide variety of specific topics related to the aims of the study. For example:

A. Undergraduate mathematical education:

- changing needs: the purpose of a mathematical education
- student involvement: active vs. passive learning
- specialization and fragmentation of subject matter
- the question of "relevance" in mathematics

B. The role of the professional societies:

- who speaks for the mathematical community?
- the need for public education
- the question of social responsibility
- a national voice for mathematicians?

C. Elementary and secondary school mathematics:

- education for life or for university?
- the new math: victory or catastrophe?
- math as an aspect of human culture
- must math always be taught as a skill?

D. The future of mathematical research:

- new directions in fundamental and applied research
- funding of mathematical research
- rationalization of mathematical research
- alternatives to research

E. The role of the technical schools and community colleges:

- mathematical training or mathematical education?
- adult and continuing education
- mathematicians for industry and government?
- liaison with the universities

F. The mathematical Ph.D.:

- must research be "original" to be valuable?
- the mathematical scholar: "breadth" vs. "depth"
- "teacher training" for the Ph. D.?
- the effects of formula financing

G. The mathematician in industry and government:

- solving unformulated problems
- communicating with non-mathematicians
- narrow technician or versatile performer
- "selling" mathematical ideas

Coleman and Edwards feel that the kind of interaction that may take place in these local study groups will do more to help shape policy decisions in the mathematical sciences than any written report could possibly do.

Data Collection

But policies cannot be formulated in a vacuum. The mathematics study will have to provide reasonably accurate information on how the mathematical sciences are being used (or abused) in Canada, what the distribution of the mathematical labor force is and how it is changing, what the strengths and weaknesses of Canadian educational policies in the mathematical sciences are, and - most elusive of all - what the future holds. A variety of techniques are being employed to assemble the required information:

1. Questionnaires are being distributed to all those who graduated in the mathematical sciences from Canadian universities in 1960, 1965, 1970, 1971, 1972, and 1973, to find out where they are now, what kind of work they are doing, and how relevant their mathematical education has proven to be.

2. A number of mathematically intensive industries and government departments are being asked to provide detailed information on what use they are currently making of the mathematical sciences and what their manpower needs are in this area. Because of limitations of time and resources, this estimate of manpower needs cannot be regarded as definitive. However, it will provide a useful framework in which to interpret the statistics resulting from the very ambitious study of Highly Qualified Manpower currently being undertaken by Statistics Canada for the Ministry of State for Science and Technology. Data from the HQM Study should be available by Fall 1974.

3. In order to have some basis for speculation about possible changes in manpower needs for the mathematical sciences, estimates are being sought from various levels of management in industry and government regarding the extent to which the mathematical sciences are likely to be used in their organizations in the future.

4. All members of university mathematics departments and professional mathematical societies are being asked to provide information on their current activities and attitudes in relation to their own mathematical education. It is hoped that this exercise will arouse them to a more probing assessment of current university courses in the mathematical sciences, in addition to providing some useful information on professional characteristics.

5. In order to round out the picture and add some flesh and blood to the cold statistics, Coleman and Edwards are visiting universities, trade schools, and community colleges, faculties and departments of education, government offices, industries, and professional societies, in order to gain some first-hand impressions of the changing role of the mathematical sciences in each of these kinds of institutions.

Different Perspectives

If a problem is viewed from several different perspectives, a more realistic and balanced overview will likely result. For this reason, it is hoped that each study group will go out of its way to solicit the views of others who have a professional interest in mathematics. For example, any study on undergraduate mathematical education should involve some contact with users of mathematics in other university departments as well as employers of mathematicians outside the university.

Consensus not Necessary

It is always satisfying to arrive at a consensus. In most cases, however, a consensus cannot be expected to emerge from the kind of study group envisaged here. It will be far more valuable at this stage if the various conflicting views are given full and complete exposure, so that the range of possible alternatives is clearly appreciated by everyone. A great deal of time can be wasted in trying to force a consensus which simply isn't there.

On The Teaching Of Mathematics In Schools

1. Are students learning how to use mathematics effectively in their everyday life, for example, managing finances wisely, understanding graphs, recognizing extortionate interest rates, spotting fallacious numerical arguments, following simple mathematical explanations, and such?
2. Are students acquiring an understanding of the role that mathematics plays in contemporary society, such as uses and abuses of statistics, computers, mathematical modelling, simulation techniques?
3. To what extent is mathematics presented as an enriching aspect of human culture in such areas as an historically evolving discipline, as one of the great languages of man, as it relates to philosophy, art, and science?
4. Are students becoming "mathematically literate" in the sense that they recognize the utility of abstraction and are not afraid of symbols? In other words, are they able and/or willing to pick up a well-written math book and learn the contents themselves?
5. What have been the effects (positive and negative) of the "New Math"? Are students more self-confident, are they less competent in basic skills, do they regard math as "abstraction for the sake of abstraction"?
6. Is teacher training (including in-service training) adequate to the needs of mathematics teachers? Some comments on the relevance or irrelevance of various aspects of university math education would be welcome here.
7. Is there sufficient communication and cooperation between primary school, secondary school, and university teachers? Specific suggestions for improving the situation would be appreciated.
8. What are the chief obstacles (administrative, pedagogical, financial) to improving the quality of mathematics education at the pre-university level?
9. Should mathematics always be taught as a skill to be mastered, or should certain topics be presented in a more descriptive way in order to acquaint students with important mathematical aspects of modern thought and modern society? (Refer to questions 2 and 3 above.)

Conclusion

Individuals or groups concerned with the future of the mathematical sciences in Canada are urged to make their views known by writing letters, submitting briefs, or participating in study groups. For further information, contact Dr. A.J. Coleman (Study Director) or Dr. G. Edwards (Assistant Study Director) at the following address:

The Mathematics Study
c/o Science Council of Canada
150 Kent Street
Ottawa, Ontario
K1P 5P4

The preceding material is printed for information primarily. However, you may react by corresponding with The Math Study. I am sure late reactions will be useful, although MCATA cannot now act as a group.

Is new 'New Math' next?

Reprinted from *EDUCATION U.S.A.*, September 24, 1973

Does the "newest math" equal the new math plus the old math minus the rote? There is no doubt that the teaching of math has become a major concern - again - and educators are hopeful that a new reform movement will produce a compromise along these lines rather than a swing back to traditional math. The new math, which began as a reform in 1958, is now being strongly criticized for its emphasis on learning concepts rather than on computation or application of math principles. It was recently panned severely in a new book, *Why Johnny Can't Add,* by New York University math professor Morris Kline. It lost its biggest supporter with the phasing out of the School Mathematics Study Group last year. And it hasn't fared at all well in standard acheivement tests.

Educators and mathematicians, however, refuse to describe the current concern as a duel between the "old" and the "new". There is no groundswell against the new math, says Gorden Cawelti, executive secretary of the Association for Supervision and Curriculum Development, "just an examination of its excesses". The objective of the new math, in his opinion, "was to get the roteness out of math teaching and try to remove the blocks that kept students from liking it". James Gates, executive secretary of the National Council of Teachers of Mathematics, predicts that math teaching in the future will emphasize the application of math to everyday problems, "but I hope we don't go too far with the application and overdo it". California, where the new math is used in all grades, now has a legislative committee investigating why its students' math achievement test scores have dropped over the past four years. The legislature has mandated that additional emphasis be given to computation skills in the next textbook adoptions. However, Jack Price, a former math teacher and now assistant superintendent for curriculum in the San Diego, Calif., schools, hopes the pendulum doesn't swing back too far, "although it probably is good that it's moving back a little." His district, as well as many others in the state, has produced supplemental units to improve computational skills, which the achievement tests emphasize.