Overview of Change—Or a Look at the Forest Before We Can't See It for the Trees

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The development of the mathematics curriculum in North America has been closely associated with the changing views of transfer of learning. In the half century before 1900, the theory of mental discipline held sway and it was accepted that transfer took place more or less automatically. Mathematics was of the sequential type and, generally, all high school students were required to take it without regard to what practical use it might be put.[2] At this time it was usual for subject-matter specialists to determine the content of the mathematics curriculum.

In the first decades of the twentieth century, we see a reaction against overemphasis on factual knowledge and also the theory of mental discipline being discredited. The emphasis on specific transfer as opposed to general transfer, the ascendency of pragmatic philosophy, the stimulus–response psychology, and the increased proportion of the population in our secondary schools all led to more emphasis being put on skills and specific information in mathematics. In the twenties and thirties, the stress was on social adjustment and training for democracy—"preparing the well-informed citizen."[3]

As the first half of the century comes to a close, we see the gap between the subject-matter specialist and the educationalist at its widest and the scholars at the forefront of knowledge starting to demand a voice in designing school curricula. Another facet of the development of mathematics that deserves mentioning is the emphasis in the forties on classes for the less gifted and in the fifties on classes for the gifted.[3]

Finally we come to the big turning point in the development of the mathematics curriculum in the mid-fifties. Here we see the results of the reaction to the extremes of progressive education, the stimulus–response psychology, the overemphasis on skills and specific information, the overemphasis on the social and the utilitarian aspect of education, the extreme negative views on transfer. The following quotation illustrates the changing view on transfer:

> Virtually all the evidence of the last two decades on the nature of learning and transfer has indicated that, while the original theory of formal discipline was poorly stated in terms of the training of the faculties, it is a fact that massive general transfer can be achieved by appropriate learning.[1, p 6]

The changes in ideas of transfer and the Gestalt psychology gave the reformers the psychological grounds for their movement. Bruner says

> What may be emerging as a mark of our generation is a widespread renewal of concern for the quality and intellectual aims of education—but without the abandonment of the ideal that education should serve as a means of training well-balanced citizens for democracy.[1, p 1]

With this movement we see the subject-matter specialist moving back into the picture.

> Curriculum programs such as SMSG and UICSM sprang from the dissatisfaction of the subject specialists with the preparation being given for their discipline in the schools.[4, pp 187–92]

Although this turning point seems to have taken place suddenly about 1954, the proponents of the need for radical change in emphasis were actively campaigning long before this. Professor Cecil B Read, of Wichita University, lists quotations all taken from articles written between 1917 and 1932, registering the same complaints as voiced by the "revolutionists" of the fifties.[7, pp 181–86] Why did these people suddenly

become the authorities in the field of curriculum building? First, the gap between what was taught in schools and what was known in the field became acute because of the explosion of knowledge. Second, the shortage of scientists and mathematicians came to the public's attention with the first Sputnik. With the millions of dollars poured into the cause by the American government, the reformers were away. A number of professional groups attacking the problem of producing a new mathematics curriculum were set up. The three most influential groups are

- the Commission on Mathematics of the College Entrance Examination Board (usually referred to as the Commission on Mathematics),
- the University of Illinois Committee of School Mathematics, headed by Professor Max Berberman (abbreviated UICSM) and
- the School Mathematics Study Group headed by Professor Edward G Gegle at Stanford (abbreviated SMSG).

These groups are made up of professional mathematicians, professional educators, psychologists and, usually, practising teachers. It is hard to overemphasize the impact that these three groups have made not only on mathematics curriculum but in the whole spectra of the school curriculum building.[1, p 70] One cannot discuss recent mathematics curriculum change without referring to these groups.

In conclusion, and at the risk of oversimplification, one might infer from this brief survey that the development of the mathematics curriculum in North America since the turn of the century has been a series of actions and reactions. If one is to extrapolate from this, we would expect a reaction to the modern approach to curriculum building as exemplified by Bruner, and the workers in the specific subject matter fields, to be discernible. In the case of mathematics this reaction is not only discernible, but is well established with a substantial following. C Stanley Ogilvy, Hamilton College, Clinton, New York, writes

> After 20 years of propaganda in favor of the introduction of new mathematics, we can now discuss the beginning of a swing in the other direction. In almost every new issue of the *Mathematics Teacher* and the *American Mathematics Monthly* we find one or two articles cautioning us to move ahead slowly, to guard against discarding good and valuable material merely, to make room for something new for the take.[6]

And, from a statement signed by 64 mathematicians in the United States and Canada,

> Mathematicians, reacting to the dominance of education by professional educators who may have stressed pedagogy at the expense of content, may now stress content at the expense of pedagogy and be equally ineffective. Mathematicians may unconsciously assume that all young people should like what present day mathematicians like or that the only students worth cultivating are those who might become professional mathematicians.[5]

Could there be a little bit of truth in the statement that, in education, if you're old-fashioned long enough, you'll be modern!

References

(1) Bruner, J S. *The Process of Education*. Harvard University Press: 1960.

(2) Butler, C H and Wren, F L. *The Teaching of Secondary Mathematics*. McGraw-Hill Book Company, Inc: 1960. Chapter I.

(3) Harris, Chester W. "Mathematics." *Encyclopedia of Educational Research*, Brett-MacMillan, Ltd: 1960.

(4) Hughes, Phillip. "Decisions and Curriculum Design." *Educational Theory* 12: July 1962.

(5) *Ontario Mathematics Gazette*, Bulletin 1, No 2 (October 1962) p S, "On the Mathematics Curriculum of the High School."

(6) Ogilvy, Stanley C, "Second Thoughts on Modernizing the Curriculum." *The Mathematics Teacher*: November 1960.

(7) Read, Cecil B, "What's Wrong with Mathematics." *School Science and Mathematics* Vol LVIII, No 509: March 1958.

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