The Mathematics Curriculum and the Learner

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Teachers, principals, and supervisors seemingly emphasize the use of a single or multiple series textbook to provide major sequential learnings for pupils in the mathematics curriculum. Reasons given for a textbook-centred mathematics curriculum include:

1. The teacher cannot develop his/her own creative units of study in each busy day of teaching. A reputable textbook with a relevant accompanying manual may do a good job of assisting teachers to select vital objectives, learning activities, and appraisal techniques for pupils within the framework of teaching-learning situations.

2. Developers and writers of reputable mathematics texts have spent much time and money in their completed product. Sequential learnings may then be provided when content is presented to learners in the order contained in the adopted mathematics textbook.

3. The use of reputable mathematics texts has stood the test of time. These texts have been used for decades, and with needed revisions may be relied upon to provide significant learnings for pupils.

4. With today's emphasis on the basics, content within a reputable mathematics text might well provide essential learnings for pupils.

The Psychology of Teaching and Learning

Teachers, principals, and supervisors need to test their hypotheses on methods of teaching and learning against recommended criteria from the psychology of education. Which criteria in the educational psychology arena, based upon research findings, might assist pupils to achieve optimally if followed by educators in the school setting?

1. Pupils need to experience interesting learning activities to achieve desired ends. Effort put forth by pupils in the mathematics curriculum may then be sustained due to perceived interest.

2. Purpose needs to be developed in each unit of study. When purpose is involved in learning, learners accept reasons for participating in each activity and experience.

3. Meaning must be attached to that which is being learned. If pupils perceive meaning pertaining to facts, concepts, and generalizations being emphasized in each unit of study, they will better understand what is being learned. Learnings acquired meaningfully will also be retained for a longer period of time compared to content gained in a non-meaningful manner.

4. Adequate provision must be made for pupils with diverse capacities and achievement levels. Each pupil, then, is guided to achieve optimal development pertaining to understandings, skills, and attitudinal objectives in the mathematics curriculum.

Theories of Learning and the Mathematics Curriculum

Teachers, principals, and supervisors need to analyze and ultimately implement that which is desirable from the diverse theories of learning in the educational psychology arena. Implementing a theory or several theories may well assist in providing interesting, purposeful, and meaningful learnings to provide for individual differences in the mathematics curriculum.

Programmed learning emphasizes that pupils progress in very small sequential steps. Thus, for example, a pupil may view an illustration in a programmed textbook, read a sentence or more, and respond to a completion item or question. Immediately thereafter, a pupil may check the correctness of his/her response against the correct answer as given by the programmer. If the response was correct, reinforcement in learning is then in evidence. If the response was incorrect, the learner should carefully notice the correct answer and thus be ready for the next linear item in learning. This procedure may be followed again and again in programmed methods of teaching.

Assumptions inherent in programmed learning to guide optimal achievement of each pupil include the following:

1. Each pupil will be achieving at his/her optimal rate in learning regardless of the rate of progress of others in the class setting.
2. A pupil knows the right answer to a previous programmed item before approaching the next sequential step of learning. As a result, incorrect responses are not practiced.
3. The breadth of content covered in each sequential step of learning is small in scope. Otherwise, a learner may not be able to acquire needed subject matter in a specific interval of learning.
4. Specific items of content covered within the framework of programmed learning are generally field-tested and written so that pupils individually will make few or no errors in achieving sequential learnings.
5. Independently, each pupil may read, view a related illustration, respond and check his/her own response before attending to the next sequential item. The teacher, of course, gives assistance as needed.

Teachers, principals, and supervisors, in analyzing and appraising programmed learning, may ultimately wish to implement some or all of the above listed tenets.

Measurably stated objectives in the mathematics curriculum have become quite popular both inside and outside the framework of state and district approaches to accountability. Objectives in ongoing units of study in mathematics, such as the following, sound familiar:

- The pupil will correctly solve nine out of 10 word problems on page 70 in the adopted mathematics textbook.
- The pupil will correctly add 14 out of 15 problems, each containing three two-digit addends.
- The pupil will correctly multiply five of six problems, each factor having three digits.

The teacher generally determines which specific ends pupils are to achieve in each unit of mathematics study when measurably stated objectives are utilized in the instructional sequence. The teacher may also choose learning activities for learners to attain the desired ends. Ultimately, each pupil's progress is measured in terms of having attained the predetermined ordered measurable objective.

Assumptions inherent in utilizing measurably stated objectives in the mathematics curriculum include the following:

1. The teacher generally is in the best position, academically and educationally, to select objectives, learning activities, and appraisal techniques for pupils.

2. What is vital to learn by pupils is measurable.

3. Essential or basic learnings for pupils can be identified with considerable certainty in the mathematics curriculum.

4. Teachers need to be accountable in terms of relevant learnings acquired by pupils in the mathematics curriculum; pupil success in attaining precise ends may also reveal proficiency in teaching.

Humanism as a psychology of teaching and learning has also had strong supporters in education. Humanists believe that pupils with teacher guidance need to have ample opportunities to choose objectives as well as learning activities. Learning centers in the school-class setting may well assist in fulfilling these needs. Each pupil may choose which specific task to work on at any of several learning centers. The pupil then sequentially chooses activities and experiences in the mathematics curriculum. If a pupil is not actively involved in choosing and pursuing goals, the teacher is there as a stimulator and guide to assist. There are diverse choices which may be made by pupils in the mathematics curriculum, including the use of:

- programmed learning and measurably stated objectives;

- reputable mathematics textbooks to acquire sequential learnings;

- laboratory means of learning in the mathematics curriculum;

- activity-centred methods stressing projects and learning by doing approaches.

Assumptions involved in humanism as a psychology of learning to aid pupils in achieving optimally in mathematics include the following:

1. Within a flexible framework, the pupil is in the best position to determine what is vital to learn, as well as the sequence in learning. The psychological rather than a logical curriculum is then in evidence.

2. The learning environment becomes increasingly humane, as pupils are actively involved in determining the ends and means of learning. A teacher or programmer determining the curriculum in selecting measurably stated objectives, activities to attain these ends, and appraisal techniques would be frowned upon by humanists.

3. Trust and confidence between educators and pupils needs to be in evidence in the school-class environment. Thus, pupils may be choosers of their own experiences and destinies.