Developmental and Remedial Approaches in Mathematics Instruction

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There are two approaches in mathematics instruction, referred to as *developmental* and *remediation*, that are significant in instructional settings. These approaches need to be clarified and implemented to improve teaching and learning. A developmentally appropriate mathematics curriculum begins at the learner's current level of achievement; this point represents a starting place for instructional purposes. The chosen objectives for teaching and learning need to be challenging yet achievable.

Some students achieve at a slower rate than others in the same class. A student's failure to achieve requires the teacher to determine where the learner's understanding becomes incomplete. From that point on, new learning opportunities must be presented to the student.

A Developmental Mathematics Curriculum

A developmental mathematics program is carefully designed so that students' differences are adequately provided for in the classroom. Each student is assisted to achieve as optimally as possible. The objectives are challenging, but attainable. Balance among objectives is stressed in that knowledge, skills, and attitudinal ends of instruction are emphasized.

Knowledge objectives must

- stress salient structural ideas and supporting facts. There are key subject matter objectives that all students need to secure. Understanding basic facts, place value, regrouping and renaming, fractions and decimals, area, number systems, volume, and commutative, associative and distributive properties are important subjects that all learners in mathematics need to understand;
- contain higher levels of cognition, such as analytical and creative thinking;
- include problem solving situations, either contrived or real. Thus, important word problems may be written by the teacher as well as by students. Word problems might also come from basal series of textbooks. Actual experiences in number use need to be encouraged by the teacher. Students need to apply, both in school and in society, what has been learned;
- encourage project development with the use of pupil purpose, planning, doing and evaluating in its endeavours; and
- develop logical thinking in mathematics.

Skills outcomes for student achievement in mathematics should include

- accuracy in computation;
- neatness and legibility in written work;
- reading for comprehension and meaning;
- identification of unknown words through phonics, syllabication and/or context; and
- development and use of graphs, charts and tables.

Attitudinal outcomes must emphasize

- appreciating mathematics for its own sake, as well as for its practicality;
- completing assignments on time;
- asking for assistance when it is needed;
- assisting others in committee and small-group endeavours;
- volunteering to do additional work in mathematics; and
- working up to one's optimal ability level (National Council Teachers of Mathematics 1989).

Objectives provide goals for students to achieve. Teacher-written assessments may be formative if they assist students to achieve end-of-unit objectives, or if they result in students achieving No Child Left Behind (NCLB) mandated objectives. Teacher-written objectives are summative if the mathematics unit has been completed and the teacher is evaluating the quality of the unit to determine what changes, if any, should be made for future teaching of that unit. Thorough planning of mathematics units helps to ensure success in teaching, higher student achievement and learner attainment of relevant ends of instruction (Ediger and Rao 2003).

A Remedial Mathematics Curriculum

Remedial work is necessary when specific objectives have not been achieved by students. These deficiencies must be identified carefully. Quality ordering or sequencing of objectives is important. The student-learning sequence may have been interrupted due to the students' lack of attention in class, or the teacher may not have explained a mathematics process carefully. Whatever the cause, the teacher must now plan instruction to diagnose and remedy the involved difficulties. If, for example, a student did not understand regrouping in addition, then the teacher needs to plan and implement remedial instruction. Thus, the teacher may use a place-value chart to indicate the 1s, 10s, and 100s columns, with congruent slips of construction paper used to represent those columns. Regrouping must occur in addition if there are ten or more strips in any one column. Thus, ten strips in the 1s column may be replaced with one paper strip to represent one 10 in the 10s column. This may be explained clearly with the use of a deductive procedure. Alternatively, the teacher may raise vital questions leading students to the correct response through induction. By examining students' written work or oral answers, the teacher may assist in correcting student deficiencies. Thus, improved sequencing should be inherent in student achievement (Kennedy and Tripps 1991).

The mathematics teacher who follows selected guidelines in teaching, whether they are developmental or remedial, will facilitate student achievement of objectives. The following guidelines must be followed by mathematics teachers:

- Students need to be actively engaged in learning; interest is a powerful factor to consider in learning.
- Students need to attach meaning to ongoing learning in mathematics; understanding of subject matter is vital in the curriculum.
- Students must experience quality sequencing in ongoing lessons.
- Students should achieve adequate background learning to benefit from an ensuing lesson.
- Students must perceive purpose in learning. Thus, there are inherent reasons accepted by the learner for achieving objectives of instruction (Ediger 2005).

The qualified mathematics teacher is well prepared in subject-matter knowledge to teach students. The undergraduate and graduate programs taken at an accredited institution have prepared the teacher to be highly proficient in mathematics. An in-depth, demanding set of courses taken in mathematics has assisted the teacher to acquire vital facts, concepts and generalizations.

A second dimension of teaching mathematics is quality pedagogy. Courses in pedagogy taken at an accredited university must develop teacher efficiency in the instructional arena; teachers need to be well trained in planning daily lessons and units of instruction. The total university curriculum in teacher education needs to result in highly competent teaching in the public schools.

Teachers must continue growing and achieving in teaching mathematics. The beginning teacher needs quality assistance from a mentor who is interested in assisting the neophytes to teach well and treats them as equals in a democratic atmosphere. Inservice growth should be provided along the way. Activities such as workshops, courses taken at universities, independent studies, action research conducted in school and attendance at professional conferences should help develop the professional mathematics teacher. Observational visits and follow-up conferences with the mathematics supervisor in clinical settings should further enhance teaching skills and abilities (Cavanagh and Samuels 2006).

Closing

Mathematics teachers need to experience a quality program of teacher education at the undergraduate and graduate levels. The teacher of mathematics must possess confidence to teach well. Good teacher preparation, together with inservice education, will certainly assist in improving mathematics instruction. A good teacher teaches well so that learners might achieve their potential; when they don't, remedial work is necessary.

References

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