PN-ABZ-283

Curriculum-Based Assessment: Linking Curriculum, Assessment and Learning in Developing Education Systems

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The eager faces of primary school pupils are turned towards the teacher as she uses colorful home-made puppets to introduce new vocabulary. The teacher embeds the new words in simple expressions that the children already know. The children become absorbed in the fun of making the puppets talk. Using the familiar words gives the children confidence and soon pupils enthusiastically take turns making the puppets talk using the new words.

Based on results from curriculum-based assessment, the teacher knows that there are too many unfamiliar words in the next unit in the textbook. She also knows that the children's reading comprehension is hampered by insufficient practice with even common expressions. In planning her lesson, she identified the words children had mastered and used these as a foundation for teaching the new words. Once the children have practiced the words orally, she will ask the fast learners to work together and write a story using the new words while she works with some of the other children with the basic reading skills they will need in the next unit.

This scenario is typical of what is beginning to happen in Ghanaian primary schools where the Improving Educational Quality (IEQ) Project has introduced curriculum-based assessment as the basis for selecting organizational and instructional interventions aimed at improving educational quality in the primary grades. Teachers, head teachers, Circuit Supervisors, and IEQ's institutional partner in Ghana, the Centre for Research on Improving the Quality of Primary Education in Ghana (CRIQPEG), are collaborating to ensure that all children succeed in school. Central to the intervention is curriculum-based assessment, an approach that links curriculum, assessment, and learning in order to help all children succeed.

Changing Needs in Developing Education Systems

There is an increasing realization among educators that the educational system is failing to meet the needs of many students, especially basic needs such as reading and writing. One of the most telling signs of this is the appalling number of students who "fail" in end-of-cycle national examinations. Failures and dropouts constitute a major source of educational wastage that unduly strains already tight

education budgets. More importantly, repeated failures and school dropouts deprive the country of the educated future citizenry who could contribute more fully to its social, political, and economic well-being, if they were given every opportunity to succeed.

In recent years, as access to schooling has increased, so too has the diversity of the population served in schools. In many instances, educational systems have not kept pace with this change. Curricula objectives that were established when only the brightest and the elite attended school have not been reevaluated. In the past, setting high standards served to restrict access to limited school places and an accelerated pace of learning was used to sort out those who couldn't measure up. Now, with universal primary education becoming a reality, rather than cast aside those who don't "measure up" or slow everyone down to a pace that inhibits fast learners, education systems need to recognize the diversity of student needs and adopt educational approaches that match curriculum, instruction, and learner.

Responding to These Changing Needs

To be effective, the education process should result in the highest levels of learning in the shortest possible time and with the least possible expense. As Windham (1990, p. 55) puts it, an efficient education is one that is characterized by the "maximization of effectiveness for a given level of cost or the minimization of costs for a given level of outputs." True productivity occurs when all children achieve. Schools need to provide the conditions that will enable all students to succeed and achieve their greatest potential. This requires among other things, that the school curricula need to be made more flexible, and assessment procedures need to be more success-oriented.

Learning is a complex process, maximized when students are actively engaged on a task that is neither too hard nor too easy. Ideally, a truly flexible curriculum would take full advantage of what students can do so that students can be guided successfully towards the attainment of progressively higher level cognitive objectives. Such a curriculum would allow students to progress through a logically and carefully sequenced learning continuum towards the acquisition of increasingly complex skills needed to function effectively in present-day society. Students would be motivated by instruction that is challenging but not so difficult as to be beyond reach.

Unfortunately, most school systems throughout the world have difficulty in moving away from the traditional lock-step approach in which all students at a particular grade level are expected to cover the same curriculum, regardless of whether the material is too difficult or the skills from prior years have gone unmastered. Resistance from educators seems to stem from a fear that modifying the curriculum for some students will lower educational standards overall. However, it is this inflexibility that leads to the very problem it seeks to avoid: children who can't keep up leave school and the country's illiteracy rate remains unchanged.

Curriculum-Based Assessment

Curriculum-based assessment (CBA) can do much to minimize, if not eliminate failures and dropouts and thereby enhance the effectiveness of the education process in the schools. This is particularly important at the basic (primary) education level in developing countries

where a large percentage of the school-age population leave school after completing the first educational cycle. It is the responsibility of the primary education system to produce functionally literate graduates who are able to contribute positively to the social and economic well-being of the country.

CBA Defined

CBA is the practice of asking students to perform tasks that have been drawn directly from the curriculum and then using assessment results to adapt instruction to reflect the learners' needs. CBA provides a way of linking curriculum with learning, and in effect, adjusting instruction to fit the students (Gickling & Havertape, 1981; Hargis, 1987; Shinn, 1989; Shinn & Good, 1992). For example, students might be asked to read a passage from their textbook or compute the answers to mathematics problems sampled from their texts. Teachers using CBA can then modify instruction for those students who need extra help and those students who are ready to move on. Similarly, curriculum specialists or education officers who use CBA can gain useful insights for improving instruction (through teacher supervision and inservice training) and improving instructional support materials. In each of these instances, "direct observation and recording of a pupil's performance in the local curriculum [is used] as the basis for gathering data to make instructional decisions" (Deno, 1987, p. 41).

Curriculum-based measurement (Deno, 1985; Fuchs, Deno, & Mirkin, 1984), continuous curriculum measurement (Cohen & Spruill, 1990), criterion-referenced-curriculum-based assessment (Idol, Nevin, & Paolucci-Whitcomb, 1986), and continuous assessment (Pasigna, 1993) are just a few of the labels have been used to describe different models of CBA. Some models focus more specifically on the assessment process (e.g., Deno, 1985) while others combine assessment and intervention (Gickling & Havertape, 1982; Pasigna, 1993). What distinguishes CBA is that the specific tasks that students are asked to perform are drawn directly from the curriculum and the tasks are selected, administered and scored using standardized procedures.

How CBA is used depends on the questions that are being asked. Data derived from CBA can be used to generate individual, classroom, school, and district level profiles of pupil performance. These profiles have implications for instructional planning at all levels of the educational system. In addition, CBA data can be used in a norm-referenced manner where a specific student's score can be compared to a normative sample (Shinn, 1988) or in a criterion-referenced manner in which performance is linked to identified instructional domains with an associated interpretive metric (Shinn & Good, 1992).

In all CBA models, instructional decisions are based on information generated by an ongoing assessment of student performance on the curriculum. The primary goal is to guide the instructional decision-making process (Blankenship, 1985; Graden, Zins, & Curtis, 1988; Marston & Magnusson, 1985) so that instruction continues to be relevant to the students' instructional needs, thereby increasing the chances of successful learning.

How Can CBA Be Used?

CBA can help improve the quality and effectiveness of the education process. Figure 1 lists a few of the questions that CBA can be used to address. Below we describe how CBA can be

used to (a) create diagnostic profiles of individual students, (b) improve instruction, (c) monitor student progress, (d) evaluate educational programs, and (e) inform curriculum development and revision.

Creating and Using Diagnostic Profiles. Although diagnosis is commonly taken to mean the identification of a learning problem, diagnostic profiles in CBA focus more on each pupil's strengths. The goal in CBA is to determine precisely what students know and where they fall on a hierarchically ordered learning continuum. The basis for this continuum is the curriculum. CBA assumes that there is an underlying ordering in the curriculum such that the year 2 textbook builds on what was covered in year 1, and the year 3 textbook builds on what was covered in years 1 and 2, and so on. It follows that if a year 4 student can perform a task in the year 4 text (for example, reading a passage with fluency and comprehension), this student should have comparable or better success on similar tasks taken from lower level texts. Similarly, if a year 4 student is unable to perform the reading task, it is functionally useful to determine at what level the student can perform the task. Thus, rather than stopping the assessment at the point that the child fails, the examiner continues probing downward on the curriculum continuum to the point where the child succeeds. For some preliterate students this probing extends to finding out if the student has pre-reading skills such as letter identification. When the assessment is complete, it is possible to construct diagnostic profiles of individual students and groups of students. These profiles are relevant for instructional planning and decision making at all levels of the educational system from the classroom to national policy.

Improving Instruction. Effectiveness of student learning has been shown to be closely related to academic learning time (Denham & Lieberman, 1980; Levin & Lockheed, 1993). When instruction is too easy, students become bored and assignments are not taken seriously. When instruction is too difficult and students do not have the necessary prerequisite skills, they become frustrated and discouraged. Academic learning time occurs when the student is motivated by a task that is appropriately challenging. Thus, it is critically important to identify what skills each student possesses and to use instruction to progressively build upon this foundation (Block, 1971; Hargis, 1987; Popham & Baker, 1970).

CBA techniques enable teachers to maintain diagnostic profiles of the students in their class and to build instruction around student strengths. Using available textbooks and instructional materials, teachers prepare for each unit by identifying the skills their students will need for the new lesson to be appropriately challenging. To do this, the teacher (or the teacher guide) analyzes the learning task and identifies prerequisite skills or knowledge (such as needed oral and/or written vocabulary or underlying numerical concepts). For efficient instruction, the new unit should build on what the students already know, with only a small proportion of the unit introducing new concepts (Gickling & Armstrong, 1978; Kameenui & Simmons, 1990). When CBA indicates that students don't have the prerequisite skills, the teacher breaks the task into sub-tasks and introduces needed skills or knowledge in the context of what the students already know. For example, prior to starting a new unit, the teacher introduces a few of the new words and with the students constructs sentences using the new words and already mastered words. After this preliminary learning, the students can approach the new unit with greater likelihood of success.

In every classroom there are slow, average and fast learners. CBA facilitates adapting instruction to accommodate individual differences. Frequent classroom level CBA alerts teachers to those students who are learning at a different pace than the others. Then, on the

basis of the individual diagnostic profiles, the teacher can design or select appropriate remedial or enrichment activities.

Monitoring Student Progress. Educational leaders, policy makers, and donor agency representatives frequently ask, "How do you know the educational system is working for all children? Are children learning more today than in the past?" Nationally administered criterion-referenced testing programs have attempted to address these questions. However, until children are literate, these group administered tests do not tend to be very useful. Large numbers of primary school children can't read well enough to make sense of the exams and what is expected of them. Plus, by the end of the primary school cycle, it is often too late. Children who haven't learned to read are demoralized and available instruction is targeted for those students who can read.

One advantage of CBA is that children can be tested individually and they don't need to be literate. The assessment process can be individualized such that each child is placed on a continuum from having minimal pre-reading skills to being a fluent reader of upper grade level reading passages. Using CBA it is possible to determine what percentage of children at each level have mastered pre-reading skills and reading skills. The same is true for writing and numeracy. That is, what percentage of the children can write their name or perform addition problems using coins or pebbles, and so on. Without information on the skills leading to functional numeracy and literacy, it is difficult to evaluate whether available instruction and instructional materials are appropriate. It is also difficult to determine when and where the process breaks down. End of cycle testing tells educators only the extent to which the system did or didn't work whereas frequent mid-cycle testing allows educators to monitor student progress and intervene before it is too late. No one should have to wait until a child has completed six years of school to find out that the child can't read or compute.

Evaluate Educational Programs. Using CBA to evaluate educational programs and reform efforts is a natural extension of monitoring student progress. With CBA techniques, the performance of participants in a new or experimental program can be compared with that of comparable non-participants. In addition, CBA is ideal for monitoring the on-going growth of individual students. Unlike more traditional standardized tests in which frequent administration is not appropriate, CBA results are enhanced by frequent use. With repeated measurement, the reliability of CBA scores increases and the instructional advantage of regular feedback is realized.

Informing Curriculum Development and Revision. A carefully thought out, well sequenced curriculum provides an excellent basis for assessment instruments that are a fair and accurate measure of student performance at any stage of the learning process. However, by their very nature, curriculum-based assessment instruments can only be as effective as the curriculum on which they are based (Shinn & Good, 1992). If there are gaps in the learning continuum or if the organization of the curriculum is flawed and students are expected to learn subject matter in a non-sequential manner, these deficiencies will become evident in the assessment process. When this occurs it is often because some critical prerequisites or enabling objectives have not been incorporated in the curriculum or they come at a point beyond when they are first needed. This kind of information is extremely useful to curriculum developers and specialists as they review the national curriculum and corresponding textbooks for the next cycle of revision. In the interim, supplemental materials or training may be warranted.

CBA Applications in Developing Countries

A number of countries are developing or have developed educational programs that make use of CBA. These include Ghana, Swaziland, and Liberia in Africa, and the Philippines, Indonesia, and Thailand in the southeast Asian region. The projects in Africa have received funding from the US government through the United States Agency for International Development (USAID), while Canada's International Development Research Centre (IDRC) provided funding for the southeast Asian projects. Brief highlights of these programs are presented below.

Ghana. Among those who are just embarking on CBA programs is the Improving Educational Quality (IEQ) Project in Ghana, through the Centre for Research on Improving the Quality of Primary Education in Ghana (CRIQPEG) based at the University of Cape Coast. CBA instruments were developed, pilot tested, and administered to over 1000 primary school children in 14 schools. Classroom, grade level, and school profiles of pupil performance in reading, writing, and oral language proficiency were prepared and shared with educators at all levels of the education system. Now, using CBA technology, CRIQPEG is collaborating with the teachers and education officers from 7 schools in two regions of Ghana to improve English language learning. *For more information, contact Dr. Beatrice Okyere, Coordinator, CRIQPEG, University of Cape Coast, Cape Coast, Ghana.*

Swaziland. The Continuous Assessment (CA) Program, a comprehensive system-wide CBA application in Swaziland (Pasigna, 1993), is being implemented in the first, second, and third grade classes in all primary schools throughout the country and will be in the fourth grade as well beginning in the Fall of 1994. The program currently focuses on English and Mathematics. Vertical expansion to the upper grades and horizontal expansion to other subject areas will be undertaken in subsequent years, with the Ministry taking full responsibility for all development, training, and implementation activities after the external funding from USAID ceases in 1996.

The main components of CA are testing (curriculum-based assessment) and remediation/enrichment. The CBA takes the form of criterion-referenced tests based on behaviorally-stated instructional objectives reflected in the national curriculum for the primary grades. Lesson and unit tests (informal and formal) are prepared by each teacher; tests administered at the end of each school term are prepared by the CA Unit of the Ministry of Education's National Curriculum Centre with inputs from teachers representing each grade level. The CA Unit also develops sample remedial and enrichment materials that are distributed to the teachers for use as such and to serve as models for other materials the teachers themselves prepare for their own classes. All test results are used for diagnostic purposes. For those children who seem to be learning at a faster rate than the others, the teacher designs or selects appropriate and challenging enrichment activities. For those whose diagnostic profiles indicate learning problems, the teacher plans appropriate and timely remediation that draws on what the students know as the basis for further instructional support. *For more information, contact Mrs. Concilia Munro, Continuous Assessment Coordinator, National Curriculum Centre, care of Dr. Phil Christensen, EPMT Project, Room 613, Ministry of Education, P.O. Box 750, Mbabane, Swaziland.*

Liberia. CBA is an integral part of a complete instructional system developed for Liberia under the Ministry of Education's Improved Efficiency of Learning (IEL) Project (later referred to as the Primary Educational Project or PEP) which was launched in 1979 with funding from USAID. In this program, CBA was used to support instructional planning

and for program evaluation (Kelly, 1984). Throughout the 1980's, IEL/PEP was being disseminated nationwide, with approximately 2,000 teachers already trained in its implementation by 1989. Plans were to continue training until the program was in place in all primary schools throughout the country. However the civil unrest that has continued since then has made this impossible. Recent information from the Liberian Ministry of Education under the transition government indicates that there is resolve to continue the program. *For further information on Liberia's IEL/PEP program, contact Mrs. Janice Vani, Deputy Minister for Primary Education, Ministry of Education, Liberia. You may also contact USAID or the Institute for International Research in Arlington, VA.*

Philippines. A complete delivery system, Project IMPACT (Instructional Management by Parents, Community, and Teachers) was developed in the Philippines in the mid-seventies to address problems of poor educational quality in the southeast Asian region (Flores, 1981; IDRC, 1981; Nichols, 1980). This system, which was based on existing national curricula for the primary grades, included specially designed instructional materials (Impact modules) and on-going CBA. An external evaluation of the IMPACT project showed that achievement levels of IMPACT students were comparable to or superior to those of pupils in conventional schools--at half the cost of the traditional system (McMaster, 1978). This finding attracted international recognition for the project and encouraged other developing countries (e.g., Thailand, Liberia, Jamaica, Bangladesh, etc.) to adapt some of the IMPACT concepts and technologies in educational projects they launched to improve their own educational systems. *For further information on the Philippines' IMPACT system, contact the Regional Center for Innovations and Technology (INNOTECH) in Quezon City, Philippines or the IDRC in Ottawa, Canada. Another resource for learning about this project is Dr. Aida Pasigna, Institute for International Research, Arlington, VA.*

Indonesia. The PAMONG (**P**endidikan **A**nak oleh **M**asyarakat, **O**rang tua **M**urid **d**an **G**uro) Project, also launched in the mid-seventies, was the Indonesian version of the Philippines' IMPACT project (IDRC, 1981; Nichols, 1980). Like its sister project, PAMONG developed an alternative delivery system for primary education which included complete sets of specially designed instructional materials (Pamong modules) and corresponding assessment instruments to measure achievement on each instructional objective in the national curriculum. By 1989, according to the Subdirectorate of Primary School Development, all 27 provinces in the country had "Pamong primary schools" or "SD Pamong" which refers to schools using the Pamong modules and tests. *Further information may be obtained from the Ministry of Education's Directorate of Primary Education in Jakarta and from the Center for Research and Development for Self-Motivated Learning Systems (Puslithanjari) at the Universitas Sebelas Maret in Surakarta.*

Thailand. Thailand's Reduced Instructional Time (RIT) Project, includes an instructional system developed for the country's small primary schools which makes use of self-contained instructional booklets and (curriculum-based) tests (Project RIT, 1984). According to the Office of the National Primary Education Commission, as of 1989, approximately one-third of the 32,000 plus primary schools in the country were using RIT materials. Interviews with teachers and principals of a sample of these small schools invariably identified the "built-in" tests and testing procedures among the most important features that helped increase instructional effectiveness in their schools (Pasigna, 1991). *Further information may be obtained from the Office of the National Primary Education Commission in Bangkok, Thailand and from the Regional Center for Innovation and Technology (INNOTECH) in Diliman, Quezon City, Philippines.*

Frequently Asked Questions

Will using CBA slow down the pace for everyone?

Recent studies suggest that the pace of instruction is slow now (CRIQPEG, 1993). Frequently in developing countries when students don't have the prerequisite skills to approach the reading passages in the assigned texts with reasonable success, teachers compensate by spending more time on the units in the beginning of the textbook and fail to cover large segments of the assigned curriculum. This accelerates a cycle whereby even the brighter students begin each new year without having acquired the skills covered in previous texts. An advantage of CBA is that it informs teachers regarding which students are ready to move on and which students need remediation.

What if the available textbooks and instructional materials are too hard but they are at the level the educators think is appropriate?

Often there is a discrepancy between educational goals (as defined in syllabi and instructional materials) and realistic standards. If this discrepancy is not severe, CBA makes it possible to bridge the gap instructionally. However, sometimes the gap between what children know and what they need to know to be successful on a curriculum unit is too great to be bridged by preparatory activities and review. When this occurs, the question comes back to one of efficiency--if materials are too hard, children become frustrated and less willing to persevere. Cooperation between curriculum specialists, education officers, and teachers may be needed to realign the curriculum expectations with realistic standards. Teachers who adapt instruction for those students who need remediation (or enrichment) will need to be supported. Supplementary self-paced remediation and enrichment materials may be needed and teachers not penalized when the exercise books of some children show that they are working on skills that are outside the prescribed timeline.

Why not use commercially available standardized tests? Don't published tests have better validity?

Validity is situation specific. The particular use of the test (not the test itself) is what is validated (Moss, 1992). Commercially available tests don't reflect local curriculum (Good & Salvia, 1988) and only rarely have these instruments been validated for uses outside of the countries in which they were developed. By contrast, CBA is directly related to the goals and objectives of the local curriculum. Content validity for local decision-making is virtually assured. Also, with CBA there is less potential for bias: children are tested on materials that are available to them, not learning that is extraneous to the classroom.

How can I learn more about CBA for use in my system?

The Improving Educational Quality Project is preparing two documents that provide more details about the mechanics of using CBA technology. One of these publications focuses on the approach that is being implemented in Ghana (Curriculum Based Assessment in Ghana: Assessment => Feedback => Improvement). The other publication, Guidelines for Implementing Curriculum-Based Assessment, is more generic and provides specifics about how to use CBA for a variety of purposes. In addition, you may wish to contact the sites described above or to refer to references cited in this paper.

Summary

Greater educational access means greater diversity in schools. A shift towards universal education has meant that the range of skills and abilities found in today's classrooms is greater than ever before. The new challenge confronting policy makers and leaders in the educational community is to insure that the education system--the teachers, education officers, curriculum, policies, etc.--is ready for this diversity. Otherwise, some children will be shortchanged. Either the slower learners will be left behind or the faster learners will be under challenged. For all children to receive the high quality of education that will prepare them to be productive in a rapidly changing world, instruction and instructional materials will need to be matched to the learner. Meeting the challenge of diversity requires decisions about educational policy and the allocation of scarce resources that will make the difference between stagnation and growth.

Curriculum-based assessment (CBA) prepares educators to meet this challenge effectively. By linking curriculum, assessment, and learning, CBA makes it possible to address critical questions faced by educators at all levels of the educational system: What skills has this child mastered? What review will be needed for the children in this classroom to be able to read the passage successfully? Are there prerequisite skills that have been left out of the curriculum sequence? and so on. CBA can (and should) be carried out by teachers and local educators as an integral part of instruction and supervision. In addition, results of CBA are directly relevant to instructional design, curriculum planning and revision, evaluation, and policy. Finally, and most importantly, CBA focuses and builds on student strengths making it possible for all children to succeed.

WHAT CAN CBA DO FOR YOU?

Below are some of the questions that CBA can be used to address:

Policy maker:

=> Is all or part of the education system working?
=> Can more students read and compute today than last year?
=> Is the reform making an impact on student learning?
=> Should we print more textbooks or supplement existing supplies with instructional support materials?
=> How can teacher training be more effective?

Evaluator or Assessment Specialist:

=> When students are not yet able to read, how do I know what they have learned?
=> How do I measure student learning when there are no commercially available tests that are appropriate?
=> Can students who "fail" paper and pencil math tests do "real world" math (for example, transacting a sale)?
=> When students "fail" paper and pencil tests, how do I know how to intervene?

Curriculum Specialist:

=> Can pupils read the textbooks and use them effectively?
=> Are existing textbooks sequenced properly?
=> What is needed to make textbooks more useful?
=> What would make teacher guides more helpful?

District or Local Education Officer:

=> In the schools or classrooms I oversee, are the children learning efficiently?
=> How can teacher supervision become more productive?
=> Are the lessons the teachers prepare appropriate for the students in their classrooms?
=> Is teacher supervision improving student learning?
=> What do teachers need to become better teachers?

Teacher:

=> What are the children learning from my instruction?
=> Which students need extra help and exactly what help do they need?
=> Which students are ready for more advanced material?
=> How can I modify my instruction to make the learning process more efficient?

How you use CBA depends on the questions you are asking.

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