

## **A New Assessment Approach in Mathematics Classrooms in Saudi Arabia**

Manahel Alafaleq and Lianghuo Fan  
*University of Southampton, UK*

Assessment is an essential process for gathering information about students' learning and achievement. This process should be integrated with learning and teaching to establish ways for teachers to understand their students' learning and make informed decision about their instruction. In this paper, our focus is on a new approach to mathematics assessment in Saudi Arabia, which has been implemented recently. The new assessment approach is essentially a criterion-referenced assessment which aims to support students' learning rather than measuring their progress solely. It is employed more as part of the students' learning process. We explain why the new assessment approach is introduced, what it is, and how teachers deal with it. Moreover, we also discuss the challenges and implications of implementing new assessment approaches to mathematics teachers, educators and policy makers.

**Keywords: criterion-referenced assessment; continuous assessment; students' learning; primary schools**

### **Introduction**

Over the last two decades, educational researchers and policy makers in many countries have increasingly realised the need to improve the way assessment is conducted in classrooms because most of the traditional assessment methods usually depend on written tests which are inadequate to enhance students' knowledge, educational process and social aims (e.g., see NCTM, 1995; Black & Wiliam, 1998). To overcome the inadequacies of the traditional assessment methods and reform assessment practice, many educational researchers have expanded the principles of assessment, and they have worked on reforming assessment tools to achieve the desired goals from education. In this sense, assessment in mathematics has to be conducted through different techniques in classrooms, for example, using portfolios, journal writing, project assessment, oral presentation, student self-assessment and performance assessment (e.g., see Black, 1993; Fan, 2011).

According to *Assessment Standards for School Mathematics* issued by the National Council of Teachers of Mathematics (NCTM), assessment is "the process of gathering evidence about a student's knowledge of, ability to use, and disposition toward mathematics and of making inferences from that evidence for a variety of purposes" (NCTM, 1995: 3). Regarding this concept, many studies claim that a transfer or shift from using norm-referenced assessment to criterion-referenced assessment and from written tests to continuous assessment is necessary in order to boost students' learning and to help the teachers improve their performance (Berenson and Carter, 1995; Boud, 2000).

In Saudi Arabia, assessing students' learning is a very high concern of education policy makers, particularly in the subject of mathematics with the intention to improve students' performance in mathematics. Many aspects of education in Saudi Arabia, for example: the national curriculum, classroom instruction and textbooks,

have been improved alongside improvements in assessment to make the rationale for introducing new assessment stronger than ever before.

The shift in focus from norm-referenced assessment to criterion-referenced assessment was introduced in primary schools, after many stages of reform and improvement starting from 2000. The basic principle of criterion-referenced assessment is that teachers should teach students what they want their students to achieve and the grade is assigned based on students' standards of performance (Falchikov, 2005). The new assessment policy was completed and introduced in 2007. This paper provides an overview of the new assessment approach in mathematics classroom, which is called mathematics continuous assessment, emphasising assessing students' learning of mathematics through their performance on tasks. In addition, the paper also introduces some initial research work focusing on the challenges facing teachers implementing the new assessment approach.

### **Why was the new assessment approach introduced?**

Traditionally, using classroom written tests, which usually takes place at the end of the term, was the only assessment used in Saudi primary schools, to measure students' achievements in order to award certification after each year. A norm-referenced assessment makes judgments about students and expresses students' grades in rank order, and grading based on norm-referenced assessment tends to emphasise competition among students rather than students' improvement (Torrance and Pryor, 1998). By doing so, young students have suffered by spending hours preparing for the annual tests. In addition, no one can deny the level of anxiety caused by traditional tests (Huberty, 2009); therefore, the student's grade does not always indicate his/her academic achievement. In traditional assessment, teachers assess students through a time-limited paper and pencil test. Accordingly, this form of assessment is to grade students' learning results (Fan, 2011), while the new concept of assessment in school classrooms goes beyond this purpose.

The main criticism of traditional tests is that they do not provide teachers with adequate feedback about their students' progression and hence, the performance of teachers and students remains stable at a superficial or manipulated level. Many educators have criticised examining students' knowledge by using traditional tests, because those tests often encourage teachers to 'teach to the test' rather than optimising students' learning. This affects the quality of education and students' learning. Moreover, students' ability to answer test questions in a limited time does not always reflect their strengths (Harris & Bell, 1994; Falchikov, 2005). As Harlen (2000) pointed out:

Children have a role in assessment for this purpose since it is, after all, the children who do the learning. No one else can really change their ideas or develop their skills. Thus, the more they are involved in knowing what they should be trying to do, the more likely it is that their motivation and effort are enlisted in advancing their learning (P.112).

Improving educational quality and students' abilities to learn were the main aim of the Ministry of Education in Saudi Arabia (Ministry of Education, 2007). Moreover, there is a strong need to solve essential issues like students' and teachers' low performance particularly in mathematics. According to the mathematics curriculum, a major aim of mathematics education in Saudi Arabia is to develop students' higher-order thinking and communication skills (Ministry of Education, 2007). Thus, policy makers in the Ministry have realised the need and importance of

improving students' learning through adopting a new assessment approach in classroom. They have introduced continuous assessment, which is based on the process of describing, collecting, and interpreting information about students' learning.

### **What is the new assessment approach?**

According to the education policy makers, assessment should be viewed as a dynamic relationship between students and teachers in order to support students' learning. To meet this desire the Ministry of Education established continuous assessment in primary schools. This assessment involves different classroom exercises to gather information about the students. Continuous assessment is defined as an assessment approach which should describe the range of sources and methods that teachers use to gather and interpret information about learners; and this information is then used to help teachers understand their learners and to plan their classes (Airasian, 1991). According to Heywood (2000), the term coursework or continuous assessment is formative assessment because the grades are fed back to the students after their work.

The system of continuous assessment enables teachers to assess students in a variety of ways over time. It means that teachers will know more about their students' learning, so they can provide students with suitable feedback based on their performance (Ministry of Education, 2007).

Moreover, assessing students through a set of specific criteria can help parents to understand, measure and support their children's learning (Salvia, Ysseldyke and Bolt, 2007). Hence, they will have a fuller picture about what kind of progress has been achieved.

### **The continuous assessment format**

In order to help teachers make the judgments about students' achievement they are expected to implement continuous assessment, which is based on a set of criteria that have been defined and determined by educators in the Ministry of Education. The grades are supposed to reflect students' achievement based on pre-determined criteria. The set of criteria have been based on the knowledge that we want students to master, by specifying the knowledge and skills at each grade level in primary school (Ministry of Education, 2007).

The curriculum skills were categorised into core skills and non-core skills. In other words, students have to pass the core skills in one grade level in order to progress to the next grade level. Creating the assessment criteria means that all students in Saudi Arabia are assessed using the same criteria, which suggests that measuring students' performance ought to be more consistent and reliable.

Under the new assessment approach, schools teachers will use rubrics to assess their students. Rubrics are a set of criteria or scoring guides that describe students' levels of performance or understanding. Rubrics are authentic assessment tools to evaluate students' academic performance (Stevens and Levi, 2005). Working through rubrics provides a more effective reflection of what students know and can do, and sets out the skills that must be mastered. Rubrics also provide teachers and students with goals for further progress and reduce students' and parents' complaints about achieved grades. (Montgomery, 2002).

### How can teachers deal with this assessment?

Teachers will use the achievement criteria to make judgments about the students' learning. They draw on assessment data that they have collected during the term. Their judgments about the students' learning and formal reporting about students' learning are sources of feedback to students and their parents.

Table 1 below shows a sample of the rubrics used by teachers to assess students. The example is taken from the second grade (there are six grades in primary schools in Saudi Arabia).

Table 1: A Sample of the rubrics to assess students in Saudi Arabia mathematics classrooms.

Skills	Criteria	Assessment tools
Solving simple problems, involving multiplication and division	<ol style="list-style-type: none"> <li>1. Use repeated addition, arrays, and counting in steps to do multiplication.</li> <li>2. Use repeated subtraction, equal sharing, and forming equal groups with remainders to do division.</li> <li>3. Know multiplication facts for 2 to 10.</li> </ol>	
Recognising triangle shape.	<ol style="list-style-type: none"> <li>1. Identify triangle shape.</li> <li>2. Give examples of triangles that can be found in our world.</li> <li>3. Draw a triangle.</li> </ol>	

Regarding the above table teachers need to follow the criteria, in this case, when a student fails to pass one of the previous criteria, he/she cannot pass that skill. Teachers involve using a variety of tools such as observation, short tests and discussions for gathering information about students' learning performance. Generally, students will get marks according to the following basis (Ministry of Education, 2007):

- Students who mastered all the core skills will get score 1.
- Students who mastered 66% of the core skills will get score 2.
- Students who mastered 33% of the core skills plus all non-core skills will get score 3.
- Students who are not able to achieve the above will get score 4, and if this is the case, then they will not be able to progress to the next grade level.

In addition, the assessment of each student's skills is conducted regularly during the term until the teacher can make a judgment about the student. In this sense, there is no limit on the number of assessments in each skill during a school term (Ministry of Education, 2007).

## Challenges and implications

The focus of the implementation process of this new assessment has been based on helping teachers understand the difference between continuous assessment and traditional written tests.

It has taken a long time and effort to train teachers on how to deal with this type of assessment and persuade them of its value. One of the major challenges is the large class sizes in most Saudi schools. In fact, the average class size in Saudi Arabian schools is approximately 45. Thus, many teachers failed to observe the progress of all students and provide them with the right feedback to improve their academic achievement.

To investigate challenges that teachers face in implementing the new assessment approach, the first author of this paper interviewed six primary school mathematics teachers from different schools, within teaching experience between 5 and 14 years. The six teachers were selected randomly from about 200 mathematics teachers in 44 primary schools in Al-hofuf city, Eastern region of Saudi Arabia. We asked them the following five questions:

1. What is the aim of continuous assessment?
2. How can assessment improve students' learning?
3. How can teachers deal with this assessment?
4. Other than tests, how do teachers assess students' learning?
5. What the challenges is after implementing it?

The interviews with the teachers revealed that not all the teachers who were involved could provide adequate answers about the aims of this new assessment approach, and they do not know the purposes behind implementing it. They said the new assessment policy is not clear enough to provide teachers with the important information that will enable them to implement this assessment in classrooms.

I would say I do not know the purpose of implementing a new approach to assess students. I think using tests is more reliable than using different tools to mark students (Nora, nine years experience).

I can say assessment cannot improve students' academic achievement. We use assessment process to mark and grade our students by testing them what do they know (Maha, fourteen years experience).

I thought the new policy needs to clarify some concepts like core skills and non-core skills and the curriculum skills divided into core and non-core. I say providing students with unlimited chances to pass the core skills is not a good idea, it is very difficult for teachers to implement it with 40 students or more (Maryam, eleven years experience).

Most of teachers have superficial knowledge about this assessment method and could not deal with the assessment results.

Um yeah, I know the aim of country's assessment is using many tools to assess students, but I believe in using paper and pencil tests in mathematics because it is difficult to use other tools in mathematics (Sara, twelve years experience).

Yeah. I can say that using rubrics is helpful for me as a teacher most of the time. However, some criteria are written in a very difficult way, in which case I cannot follow them (Reem, seven years experience)

Moreover, students in primary schools do not know how they are assessed and what kind of criteria have been used to assess them, which resulted in the lack of students' higher performance.

The interviews also found that dividing skills into core and non-core skills leads students to concentrate on the core skills and disregard the non-core skills. In addition, most teachers said they would rely on tests as the main tool to assess their students in mathematics, because it is very difficult to use other assessment tools with

a large number of core skills, which might affect the efficiency of continuous assessment. In addition, it is also difficult for teachers to follow the new assessment instructions, and most of them reported difficulty in finding time to implement the policy, because of class size and a lesson time of just 45 minutes.

The first author of this paper also interviewed two mathematics educators in the Ministry of Education. They were asked the following two main questions:

1. What are the challenges and issues in implementing the new assessment approach?
2. What are the negatives aspects, if any?

The interviews revealed that many issues were reported or surfaced after implementing the new assessment approach in primary schools from the mathematics educators' perspectives. Some skills are complicated and there is no clear demarcation that they are core skills or non-core skills, and thus assessing students will be very difficult.

One of the most important objectives in mathematics learning in Saudi Arabia classrooms is to develop students' higher order thinking. However, the new assessment policy is mainly based on the core skills, and in order for the students to progress to the next grade level, they need to master these core skills at the lower grade level as required in the new assessment criteria. In fact, most of the core skills involve lower order thinking skills. This leads teachers and students to ignore the higher order thinking skills, which cause students' low performance in mathematics. The interview also revealed that the outcomes of classroom instruction in primary schools fell after implementing this assessment reform because of this variety of issues, so further improvement of the reform is needed.

Moreover, the mathematics educators interviewed highlighted the issue of ambiguity in the new assessment policy; in some places, the assessment policy did not help teachers to understand this assessment accurately. Some teachers cannot set good questions to assess students' skills or they just set simple questions in order to record a high pass for their students. In addition, using numbers from 1 to 4 to record or label students' academic achievements does not really show the individual differences among students or reveal their abilities.

### **Concluding remarks**

Meeting students' needs is a both challenging and complex work for teachers and schools. Students' performance and academic achievement depend on many factors; one of them is how students are assessed. Moreover, the assessment of what students know and can do is an essential process, which can help improve teachers' teaching and students' learning.

According to Nitko and Brookhart (2007), teachers need to change assessment tools regularly because using only tests will make it difficult to implement continuous assessment. From our discussion above, we can see that, on the one hand, there have been positive influences of the new assessment that can be observed in the Saudi Arabian classrooms; but on the other hand, the implementation of the new assessment approach also faced many challenges that need to be addressed.

More specifically, the assessment policy makers need to clarify this policy so it is easier for teachers to understand and to implement in classrooms. The educational system in Saudi Arabia really needs this new approach towards assessment but at the same time, there is a need to be aware of the challenges and issues in implementing it,

which affect students' learning. This assessment needs to be more reliable so parents and students will trust its results.

One of the important needs for both researchers in mathematics education and policy makers is to look for solutions to improve the whole process, and determine the skills based on the curriculum goals rather than relying on the objectives that are listed in the textbooks.

Finally, the success in introducing and implementing continuous assessment depends on many aspects. As reported earlier, teachers need to realise the aim of continuous assessment, and we believe that relevant professional training is provided for teachers so they are able to use the assessment results for improving education in schools.

## References

- Airasian, P.W. (1991) *Classroom assessment*. New York. McGraw-Hill.
- Berenson, S. & Carter, G. (1995) Changing assessment practices in science and mathematics. *School Science and Mathematics*, 95(4), 182-185.
- Black, P. J. (1993) Formative and summative assessment by teachers. *Studies in Science Education*, 21, 49-97.
- Black, P. & Wiliam, D. (1998) Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, 80(2), 139-148.
- Boud, D. (2000) Sustainable assessment: Rethinking assessment for the learning society. *Studies in Continuing Education*, 22(2), 151-167.
- Falchikov, N. (2005) *Improving assessment through student involvement: Practical solutions for aiding learning in higher and further education*. New York, NY: Routledge.
- Fan, L. (2011) *Performance Assessment in Mathematics: Concepts, Methods, and Examples from Research and Practice in Singapore Classrooms*. Singapore: Pearson.
- Hanna, G.S. & Dettmer, P.A. (2004) *Assessment for effective teaching: Using context-adaptive planning*. Boston, MA: Pearson A&B.
- Harlen, W. (2000) *Teaching, learning and assessing science 5-12* (3rd edn). London: Paul Chapman publishing.
- Harris, D. & Bell, C. (1994) *Evaluating and assessing for learning* (2nd revised edn). London: Kogan Page Ltd.
- Heywood, J. (2000) *Assessment in higher education: Student learning, Teaching, Programmes and Institutions*. London: Jessica Kingsley Ltd.
- Huberty, T. (2009) Test and performance anxiety. *Principal Leadership*, 10(1), 12-16.
- Ministry of Education (2007) *Continuous assessment guidelines*. Saudi Arabia: Assessment Department.
- Montgomery, K. (2002) Authentic tasks and rubrics: Going beyond traditional assessments in college teaching. *College Teaching*, 50(1), 34-39.
- National Council of Teachers of Mathematics (1995) *Assessment standards for school mathematics*. Reston, VA: The author.
- Nitko, A.J. & Brookhart, S.M. (2007) *Educational Assessment of Students* (5th edn). New Jersey: Pearson Education.
- Salvia, J., Ysseldyke, J. & Bolt, S. (2007) *Assessment: In Special and Inclusive Education*. (10th edn). New York: Houghton Mifflin Company.
- Stevens, D.D., & Levi, A.J. (2005) *Introduction to rubrics: An assessment tool to save grading time, convey effective feedback, and promote student learning*. Sterling, VA: Stylus.
- Torrance, H. & Pryor, J. (1998) *Investigative formative assessment: teaching, learning and assessment in the classroom*. Buckingham: Open University Press.