CLASSROOM ASSESSMENT SYSTEM FOR TEACHING AND LEARNING (CASTLe)

Noraini Idris, Ph.D
Faculty of Education
University of Malaya

Loh Sau Cheong, Ph.D
Department of Educational Psychology and Counseling
Faculty of Education
University of Malaya

Norjoharuddeen Bin Mohd Nor
Department of Mathematics and Science Education
Faculty of Education
University of Malaya

Rashidah Hassan
Wan Rohaya Wan Yusoff
Hamidah Samsudin
Mohd. Yusof Saad

As Malaysia prepares to join the developed world in the new millennium, Malaysians must be able to face the challenges of this changing, progressive, and globalized world. Education in Malaysia therefore has to incorporate the latest trends to meet these needs. Novel methods of measurement are crucial to ensure continued development of quality education. Traditional assessments focusing on paper and pencil tests have very much ignored learners' ability to inquire, interact and achieve scientific understanding. Therefore, a flexible and individualized school-based assessment is essential.

In Malaysia, the assessment system is part of a national strategy for improving the quality of education. It is one of the most important components of the education system because the development of basic education is based on systematic assessment and the analysis of the input, process and output of the assessment. The assessment system of Malaysia is also challenged to rise up to the changes in the education system in Malaysia.

One of the components of the assessment system in Malaysia is classroom assessment. The shift toward increased understanding of the link between learning and assessment has resulted in an appreciation of the role of classroom assessment in enhancing student learning and achievement. For teachers to make teaching and learning more meaningful and interactive, they need to conduct continuous classroom assessment.

Statement of Problem

Teachers and administrators are under great pressure to devote more and more time to prepare students to do well on tests. As a consequence, narrowly focused tests that emphasize recall have led to a similar narrowing of the curriculum and a lack of emphasis on higher order thinking skills. These shortcomings of traditional testing methods have led teachers to teach to the tests by providing daily skill instruction in formats that closely resemble tests. This negative backwash of traditional testing has led to the use of instructional practices that are both ineffective and potentially detrimental due to a reliance on outmoded theories of learning and instruction.

The limitations of the present assessment system do not allow for the evolution of the education system and therefore the assessment system must change. It is believed that all learners have different styles and rates of learning. Hence, given sufficient time and provided with the right opportunities, all learners can become successful. Integration of technology as a tool to facilitate assessment will create a climate where assessment can be provided for each student virtually on demand basis

Consequently, in 2004, University of Malaya together with the Malaysia Examination Syndicate had designed a new assessment system for teaching and learning. The Classroom Assessment System for Teaching and Learning (CASTLe) was born!

Significance of the Study

CASTLe is a new school-based assessment system on CD that provides accurate, holistic and on-going feedback of students' cognitive, affective and psychomotor development. This flexible and personalized computer-based assessment system ensures quality teaching and learning, generates reports and informs parents regarding their children's learning. Because CASTLe allows students to progress and improve in their work as they are constantly aware of their performance, evaluation can be made as frequently as possible. Thus students can be motivated to perform well in learning. The reports and comments are printed for parental review which in turn helps the parents to develop strategies to encourage and improve their children's learning.

CASTLe was designed with the expectation that students' achievement and attitude towards learning will improve when teachers start to use it as part of their classroom assessment. The use of CASTLe would not only encourage teachers to conduct classroom based assessment but to also report the continuous performance of each student according to the three domains of learning: the cognitive, affective and psychomotor. The feedback provided by the report will allow students to monitor their progress in learning so that they can make continuous improvement. The report will be given to parents who can thus monitor their child's performance and progress continuously so that they will be able to provide support in their children's learning.

Objectives of the Study

The major purpose of this study was to examine the effectiveness of the computer-based classroom assessment system in enhancing the achievement and attitude of students in Form One and Form Two. Specifically the objectives of the study were:

1. To identify the difference in achievement between Form One experimental and control groups according to subjects, namely Mathematics, Science, Malay language, and English language
2. To identify the difference in achievement between Form Two experimental and control groups according to subjects, namely Mathematics, Science, Malay language, and English language
3. To identify the difference in attitude between Form One experimental and control groups according to subjects, namely Mathematics, Science, Malay language, and English language
4. To identify the difference in attitude between Form Two experimental and control groups according to subjects, namely Mathematics, Science, Malay language, and English language
5. To examine the feedback on the usage of the computer-based classroom assessment system on teaching and learning from teachers
6. To investigate the opinions of parents on the reporting system from the computer-based classroom assessment system.

Research Questions

To achieve these objectives, the study was designed to answer the following research questions:

1. Is there any significant difference in achievement between Form One experimental and control groups according to the subjects of Mathematics, Science, Malay language and English language?

2. Is there any significant difference in achievement between Form Two experimental and control groups according to the subject of Mathematics, Science, Malay language and English language?
3. Is there any significant difference in attitude between Form One experimental and control groups according to the subjects of Mathematics, Science, Malay language and English language?
4. Is there any significant difference in attitude between Form Two experimental and control groups according to the subject of Mathematics, Science, Malay language and English language?
5. What is the teachers' perception towards the usage of computer-based classroom assessment system?
6. What is the opinion of parents on the reporting system of computer-based classroom assessment system?

Methodology

Research Design

To answer these research questions, a quasi-experimental research was designed. The design in this study consists of one experimental group and one control group. In this study, subjects from the experimental group and the control group were both pretested and posttested with the Attitude Test and the Achievement Test. Subjects from the experimental group received continuous assessments from the subject teacher whilst the control group did not receive any treatment. Instead, they followed the normal classroom learning. Both the posttest scores of the experimental group and the non-treatment control group were compared to see if there is any significant difference between them.

Sample and Location of the Study

The research involved 1408 Form One students in the experimental group and 1413 students in the control group for the subject of Mathematics. For the Form Two mathematics, 1274 students were in the experimental group and 1282 students were in the control group. For Science, 982 Form One students were in the experimental group and 1413 students were in the control group. For the Form Two Science, 1269 students were in the experimental group and 1279 students were in the control group. For Malay language, 1202 Form One students were in the experimental group and 1202 students were in the control group. For the Form Two Malay language, 927 students were in the experimental group and 929 students were in the control group. For English language, 968 Form One students were in the experimental group and 1971 students were in the control group. For the Form Two English language, 1260 students were in the experimental group and 1266 students were in the control group.

This research was conducted in the school setting from thirteen states and two federal territories in Malaysia. A total of 163 secondary schools were chosen for that purpose. The research panel consisted of Form One and Form Two teachers who taught core subjects, namely English language, Malay language, Mathematics and Science. Prior to the actual data collection, these teachers were trained in workshops on the steps of conducting assessment using CASTLe. After the workshop, the teachers were each provided with a CD-ROM containing the CASTLe software. These teachers had helped to conduct the classroom assessment for learning in their respective classrooms.

Instruments of the Study

The instruments used in this study were the respective Form One's and Form Two's: Attitude Test, English language Achievement Test, Malay language Achievement Test, Mathematics Achievement Test, Science Achievement Test. The content for all the instruments were based on the Integrated Curriculum for Secondary Schools (KBSM) syllabus.

Duration of the Study

The total duration for data collection in the respective schools was 12 weeks, starting from 21st June 2004 until 4th September 2004 for Zone 3 (Sarawak, Sabah and Federal Territory of Labuan) and from 28th June 2004 until 11th September 2004 for both Zone 1 and 2 (states in Peninsular Malaysia). The Attitude Test and Achievement Test were administered to the participants before and after the data collection per se.

Data Collection Procedure

Teachers who had committed to this study were from the chosen secondary schools. These teachers first administered the Attitude Test and the Achievement Test to the students from the experimental groups. At the same time, the control groups were also assessed by the control group teachers with the same Attitude Test and Achievement Test.

The experimental groups then underwent the daily assessments within the stipulated duration, either for 40 minutes (one period) or 80 minutes (double period) depending on the pre-set timetable of the classes concerned. The teachers from the experimental groups taught the particular subject, either English language, Malay language, Mathematics or Science to the experimental groups by following the original syllabus. In the process of teaching, the teachers concerned incorporated assessments into the teaching process by observing how each student performed in the class within the stipulated time frame. The aspects to be observed were based on the cognitive, affective and psychomotor domains.

In the experimental groups, the teachers concerned taught the lessons for 10 weeks based on the given topics which were in accordance to the syllabus. The teachers were to key in the assessment report, preferably three times a week, or one complete class each week. By merely clicking buttons in the program, the teachers were able to assess their students daily using the new CASTLe system whenever the students were given tasks such as group activities, discussions or even when they sat for their tests. The reports were saved daily in the computer as well as into the CD.

The control groups were taught the same topics and the same syllabus as were the experimental groups but the students were not assessed using the new CASTLe system. However, the control groups were posttested with the same tests as administered in the pretests. The experiment was completed in October 2004. The data were analyzed quantitatively by using *t*-test and One-way Analysis of Variance.

Findings

The study found that there is significant difference between the achievement of students who were assessed and provided feedback continuously by their teachers using CASTLe compared to students who were not, in the subjects of Mathematics, Science, Malay language, and English language.

There were significant main effects of CASTLe on Form One students' achievement in Mathematics, Science, Malay language and English language at $p<.05$.

Table 1
Form One Students' Achievement in Mathematics, Science, Malay Language and English Language

Subject	Control		Experimental		F
	Adjusted Mean	*SD*	Adjusted Mean	*SD*	
Mathematics	22.19	6.14	28.04	6.03	29.01
Science	21.37	6.18	28.32	6.03	28.72
Malay language	21.37	6.18	29.98	6.34	37.12
English language	22.32	6.21	28.17	6.14	27.38

There were significant main effects of CASTLe on Form Two students' achievement in Mathematics, Science, Malay language and English language at $p<.05$.

Table 2
Form Two Students' Achievement in Mathematics, Science, Malay Language and English Language

Subject	Control		Experimental		F
	Adjusted Mean	*SD*	Adjusted Mean	*SD*	
Mathematics	23.36	6.28	29.14	6.14	34.27
Science	22.17	6.28	29.93	6.23	28.17
Malay language	21.31	6.18	29.57	6.13	35.15
English language	23.31	6.28	29.14	6.23	35.17

There were significant main effects of CASTLe on Form One students' attitude in Mathematics, Science, Malay language and English language at $p<.05$.

Table 3
Form One Students' Attitude in Mathematics, Science, Malay Language and English Language

Subject	Control		Experimental		*t*
	Mean	*SD*	Mean	*SD*	
Mathematics	3.01	0.81	3.35	0.79	2.31
Science	3.17	0.94	3.58	0.93	1.32
Malay language	3.22	0.71	3.73	0.67	2.15
English language	3.69	0.75	4.03	0.67	2.59

There were significant main effects of CASTLe on Form Two students' attitude in Mathematics, Science, Malay language and English language at $p<.05$.
Form Two students' attitude in Mathematics, Science, Malay language and English language.

Table 4
Form Two Students' Attitude in Mathematics, Science, Malay Language and English Language

Subject	Control		Experimental		*t*
	Mean	*SD*	Mean	*SD*	
Mathematics	3.28	0.77	4.01	0.78	2.32
Science	3.17	0.87	3.78	0.93	1.53
Malay language	3.69	0.78	4.03	0.67	1.59
English language	3.21	0.87	3.60	0.93	2.16

The results of this study show that teachers are more observant and familiar with each student after starting to use CASTLe, thus enhancing teacher-student rapport. They are able to detect the weaknesses and strengths of each student; they could understand and attend to the students better. Hence, each student strives to perform better. The teachers too, had improved in instructional method by devising interesting activities and tasks to elicit active class participation. The results also show significant differences in performance between experimental and control groups.

Recommendations for Further Research

A number of recommendations are suggested for possible further research and development as a follow up of this study.

Every secondary school in the country should be provided with the CASTLe software. Science, mathematics, English and Malay language teachers in these schools should be instructed to use CASTLe to continuously assess their students and provide feedback to their students using this assessment system. Every school should also be provided with a guidebook containing examples of the use of CASTLe in assessing student learning in science, mathematics, English and Malay language. Every teacher should be provided with training on how to assess students using CASTLe.

For every state in the country, a school should be selected as a model school for the implementation of CASTLe. Mathematics, Science, Malay language and English language teachers in this school will be trained by the researchers and will work closely with the researchers in using CASTLe to conduct continuous assessment of student learning. At the state level, the State Education Departments will identify one model school from each district and the teachers from these schools will be trained by the teachers from the state's model school. Teachers from other schools in the district will be trained by the teachers from the district's model school.

The CASTLe software should be adapted such that it can be accessed on-line from a server based in the school. Teachers could record the result of their assessment on-line and the report can be accessed by the students, other teachers and parents on-line. By taking CASTLe on-line, the assessment result will be more accessible to many stakeholders.

Discussion and Conclusion

Although most teachers know the 'what' and 'how' of assessment for learning, practising it requires a paradigm shift from 'assessment of learning' to 'assessment for learning' in the teachers, and to do this requires a leap of faith, courage and ambition. Teachers must have the

belief that changing their own way of teaching will enable them to change students' learning. In other words, teachers must be guided to see that assessment and teaching are not different activities; assessment is part of the teaching activities.

Some teachers might hold the belief that day-to-day assessment is weak as there is no consistency in performing it. This would not be so, if, in assessing the students formatively in the classroom, teachers are encouraged to work towards fairness to every student in the class by paying attention to what we know about factors in assessment and their administration and scoring (Gipps & Murphy, 1994).

Torrance and Pryor (1998) maintained that while there was a long debate about the formative potential of classroom assessment, attempts had been made to raise the level of validity in assessment. The incorporation of coursework which could be monitored by teachers and improved by the students upon receiving teacher feedback was introduced. This placed value on the process of assessment as much as the product. It emphasized teacher-student dialogue in order to discuss strengths and weaknesses and to negotiate learning targets and outcomes.

In a nutshell, CASTLe has generated great impact in society. It provides usable and holistic information regarding learner performance and encourages teachers to vary their teaching approaches. Thus, it ensures quality in education and helps to realize the aspirations of the National Philosophy of Education. This system thus not only promotes learning but also improves teaching.

References

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Note: This research has won the following awards:

1. *Gold Medal, 33rd International Exhibitions of Inventions, New Techniques and Products, Geneva 2005*
2. *Silver Medal, Expo on Research and Innovation 2004 University of Malaya*
3. *Bronze Medal, Expo on Science, Technology & Innovation 2004, Malaysia*