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Issues And Practices Of School-Based Testing, And Future Challenges In Innovative Technological Assessment, In Singapore

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Abstract

School-based testing is an integral part of the teaching and learning process, and it provides teachers with vital information about students' learning progress. What are the current practices in school testing in Singapore, and what are some of the issues arising therefrom? Do conventional testing practices measure up to the needs of recent changes in Singapore education, in the areas of IT, Thinking, Project Work, and the "School Excellence Model"? What are some innovations in educational assessment that may be more compatible with these changes? How can computer technology support and enhance these innovative assessments? This paper will first examine the assessment system in Singapore education, and discuss some issues related to current testing practices. In the light of recent changes in education, the need for a rethink on these practices is proposed. The paper will then explore some innovations in educational assessment that may bring about a more meaningful assessment of student capabilities and potentials in learning. A place for technology in educational assessment will also be discussed.

An Overview Of The Assessment Framework In Singapore Education

The Singapore education system provides a 10- or 11-year general education – 6 years in the primary school and 4 or 5 years in secondary schools. Based on meritocracy, the progression paths for students in the structured education system are guided on course by a rigorous and comprehensive assessment framework consisting of both national examinations and school-based testing. Undoubtedly, assessment is an integral part of the teaching-learning process as it provides teachers with vital information about students' learning progress. McCormack and Jones (1998) view assessment as any mechanism involving information gathering that can be used to improve instruction and learning. At the school level, two categories of testing - continual assessments (CAs) and semestral assessments (SAs) – form the basis of ascertaining students' learning progress through their school years and into different courses of study. That is, the class or course of study that students are posted to will depend on their performance on these school-based assessments.

The CAs are typically considered as a form of formative evaluation. These assessments are used primarily to ascertain how well or otherwise a unit of learning has taken place, and to assist teachers in the pacing of the content of their lessons and to design and implement remedial strategies when needed. On the other hand, the SAs, which are held twice a year and at the end of each semester, are considered as a form of summative evaluation of the students' learning during the semester. To ensure that students are consistent in their learning effort, schools typically use the following weightings for CAs and SAs (see Table 1) for assessing their overall performance in each subject area.

Table 1: Weightings for CAs and SAs

	CAs	SAs	Total
Semester 1	15%	25%	40%
Semester 2	15%	45%	60%
Total	30%	70%	100%

MOE, Principals' Handbook, Aug 1997

This paper will first examine some current practices of school-based testing and discuss the issues arising therefrom. In the light of recent changes in Singapore education, it will next explore some innovations in educational assessment, possibly with technology enhancement that may bring about a more meaningful assessment of student capabilities and

potentials in learning.

Data Collection and Analysis

Data collected from 12 local secondary schools by trainee teachers form the basis of this evaluation on current status of school-based testing practices. The methods of data collection include observations, interviews and survey questionnaires, and the participants of the interviews and surveys were classroom teachers and heads of departments. Both qualitative and quantitative data reflected in the trainee teachers' assignment reports were analyzed. A summary of the findings is shown in Table 2 (see Appendix).

Current Assessment Practices In Schools

Three main findings could be discerned from the data analyzed. They are as follows:

1. Written tests are the predominant mode of testing.

The method of school-based testing remains conventional. Schools typically used written tests, that is, the paper-administered mode and these assessments are often driven by the requirements of national examinations.

2. Heavy assessment workload of teachers.

Every school year, teachers implement a full cycle of assessments consisting of CAs and SAs to ascertain students' learning progress and achievement. That is, they have to perform numerous assessment tasks such as constructing test papers, administering tests to students, marking test answer scripts, giving test feedback to students, and making test reports. The tedium of managing these tasks, which are often done manually, from start to finish, and the high frequency of testing contribute to the heavy demands on teachers' time and effort.

3. Lacking in software applications for assessment purposes

Overall, schools have adequate IT infrastructure and computer hardware facilities but generally lack comprehensive software applications for assessment purposes. Only basic or standard applications are used in most schools. For instance, there is the Student Management System – an application provided by the Ministry under its School Link Project – for entering students' test scores from the CAs and SAs, and for computing the weightings of these assessments to make test reports for individual students. Also, each school has an optical mark reader but there is much variance amongst schools in terms of its usage.

Some Pertinent Issues

Education in the 21st century faces many new challenges – that of globalization, technological advances, and an explosive growth of information. These challenges are even more significant for Singapore as she moves into a knowledge-based entrepreneurial economy with people as her only natural resource.

A number of changes have been recently introduced into the Singapore education system. Starting from a vision of "Thinking Schools, Learning Nation" which gears education to the needs of the 21st century, a paradigm shift in education has been made - from an efficiency-driven education to one that is ability-driven. Several initiatives are now being implemented and these include the "IT Masterplan" to use information technology in schools (1997); the "School Excellence Model" to re-align the way of appraising students and schools (1999) and the "Project Work Initiative" to provide students with an integrated learning experience (1999). In the light of these recent changes, pertinent questions are raised about current assessments and their practices. Are the assessment practices still relevant? And do they measure up to the new challenges? Specifically, the question is:- Are current assessments in schools measuring outdated skills and with outdated testing technologies? The following discussion highlights some shortcomings in schools' assessment practices, and the issues arising therefrom.

1. The initiatives introduced into schools aim at preparing students for the future workforce. New skills like that of computer skills, team collaboration, critical and creative thinking, oral communication and independent learning are some of the desirable skills for a knowledge-based entrepreneurial economy. A written test may not be an appropriate mode for assessing some of these skills. The question is what other 'new' testing techniques/ approaches hold promise for a meaningful assessment of student learning. There is thus an urgent need for more innovative and appropriate ways of assessing students in these 'new' skills, and these could either be new techniques or new ways to use old techniques of testing.
2. Assessment involves information gathering of student learning that can be used to improve instruction and learning, but schools lack a dynamic system that can help teachers pull information together for the purpose of tracking or profiling student talents, abilities or problems in learning, and guide them in instructional decision-making about what instruction is suited for which students.
3. Advances in computer technology have made a significant impact on many aspects of lives such as in work and play, but the uptake of computers in education has progressed at a more cautious pace. The question is whether computers, with its capability for organizing and managing information, could be harnessed for more efficient and better assessments.
4. Assessment of student learning will become more complex in the near future with new testing techniques or approaches, more advanced use of technology, and greater parental expectations of education. In addition, there is a trend towards higher accountability of teachers in the instructional process. The question is whether teachers are equipped with more advanced know-how and skills in assessing student learning and achievement. They would also need these updated or new skills just to keep up with the demands of their job.

Rethinking Assessments For Singapore Schools

Good assessments are those that are focused on students and their learning. In her book "Testing for Learning" Mitchell (1992) argued for new methods of assessing performance, and asserted that their use can have a dramatic impact on teaching style and student achievement. Rather than just the traditional written tests, teachers will need a number of different ways for assessing both the product and process of student learning.

Technology Applications For Assessments

R&D in computer applications over the last two decades has first applied the technology to 'mechanise' repetitive assessment task in the scoring of tests, but since then further advances in testing technologies have been made. In their prediction of an evolution of innovative technological assessments, Bunderson, Inouye and Oslon (1989) identified four generations of testing via computers: computerized testing (CT), computer adaptive testing (CAT), continuous measurement (CM), and intelligent measurement (IM). But what are some viable testing technologies that schools can adopt for implementation? The following are some ideas.

1. Computerized Testing

At the National Institute of Education (NIE), a prototype test system for Computerized English Language that is capable of administering any number of language tests to any number of students at any time has been developed (Seow, A; Chew, L.C. & Luo, G.Z, 2001). There are 9 available test-item formats for use. These include formats for grammar discrete, vocabulary discrete, comprehension MCQ, grammar cloze, editing for spelling, punctuation and grammar, comprehension cloze, synthesis and transformation. Besides computer-administered tests, the system has accompanying capabilities for item banking, test construction, immediate test scoring and test reporting. The system was pilot-tested in a local primary school on 1 November 2001 to gauge its efficiency, and there was overall positive feedback from the principal, teachers and students. The feasibility of CATs for school assessments is deemed to be demonstrated.

2. Computer Adaptive Testing

In computer-adaptive testing, the computer's unique capabilities will be harnessed to develop and present tests that can adapt to the test taker's ability as the tests proceed. That is, the test taker is given a question, and if answered correctly, the test moves on to more difficult questions. Incorrect responses generate less difficult questions. Information is stored on the computer and the score reflects the skill level he or she has achieved. At the NIE, a

doctoral research study (Chew, 1998) has developed CATs for biology and validated the testing technology in a local school. The CATs also incorporated performance feedback to test takers during the testing session.

3. Web-Based Assessments

There is a current trend towards web-based learning and management systems. With delivery capabilities of the Web, it is possible to provide web-based test administration. Assessment methods include 1) on-line quizzes to measure what students have learned and 2) peer evaluations to measure students' contributions to the course such as discussion forums, resource learning materials and so on (Wu, 1998).

4. Collaborative Project Assessments Using ICTs

Collaborative projects require students to perform tasks that include collaborative problem-solving, gathering and analyzing data, and synthesizing information. Information and communication technologies (ICT) like the electronic mail, discussion forums, video conferencing, short message service (SMS) and the latest multimedia service (MMS) allow students to work on collaborative projects with other students, or mentors and experts who are at different physical sites. Both product and process of collaborative project work are deemed important to assess. Technology makes it possible to assess student's progress throughout the testing activity. An example is the eduTOOLS, a prototype computer application to provide teachers and students with a suite of web-based tools and resources for collaborative project work that was piloted in three local schools (Chew, L.C. Ng, S. L., & Sim, W. C., 2001).

Future Challenges

Singapore is in an information and digital age, and it is inevitable that the processes of education there will need to accommodate the growing reliance on information and communication technology. Teaching and learning processes will change, and the assessment process will have to follow suit. Data collected of 12 local schools show that assessment practices may be outdated, and there is an urgent need to explore new and innovative techniques for assessing pupil learning. And technology will have to play a significant part in the assessment process.

Under the IT Masterplan, schools in Singapore are equipped with the necessary IT infrastructure and computer hardware facilities. Two technology trends hold promise for school assessments. One is a trend towards greater broadband access and the other is that of pervasive computing in which a variety of devices for information and communications have impacted the masses. There is thus viability for a widespread implementation of computerized testing, computer-adaptive testing, web-based assessments, or collaborative project work assessments in Singapore schools. The benefits of using these technology-enhanced assessment methods are well documented. These are 1) saving time in test construction and distribution of tests, 2) reducing turnaround time of test scoring and test feedback, 3) reducing resource needed such as paper for printing paper-administered tests, 4) keeping records of test scores, 5) increasing convenience of collecting assessments or assignments, 6) increasing ease with which assessment data can be used for item or test analysis, tracking and profiling of pupil talents/abilities/ learning problems. In short, these innovations can improve the assessment process. However, there are challenges in the transformation of local schools' testing practices, from a conventional paper-administered testing to technology-enhanced assessments. Most important is a change of mind-set about school testing of all involved - students, teachers, school administrators, and parents.

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Appendix

Table 2. A Summary Of Findings On The Assessment Practices Of 12 Local Secondary Schools and The Extent Of Computer Technology Use For Assessment Purposes

Sch	Method of data collection	No. of participants	School's IT Infrastructure And Computer Hardware & Software Facilities	Salient Information About The School's Assessment Practices And The Extent Of Computer Technology Use For Assessment Purposes
A	Interview	3	<ul style="list-style-type: none"> Phase 3 of IT Implementation Adequate IT infrastructure; 3 computer labs; 1 LCD projector in every classroom; but not all of these are in good working condition and resources are not capitalized on sufficiently. 	<p>"Through my interviews with teachers, I noticed a uniform incognizance of the existence of software used for assessment purposes"</p> <p>"Teachers do have their own personal systems of collecting and storing questions"</p>
B	Survey questionnaire	4	<ul style="list-style-type: none"> Phase 2 of IT Implementation Lacking in IT infrastructure, both hardware and software 	<p>"Even though the school has a resource bank or database on the school network server (under the folder "Teachers Sharing"), most teachers rarely utilize this because it is just a compilation of past-year papers; there is no facility where questions are arranged topically, so it is used only for reference, not as a tool to generate items."</p> <p>"Teachers have not conducted tests online before. A teacher commented that reliability is very crucial for online testing as any breakdown/disruption in hardware/software would be difficult to handle. As such it could be seen that teachers still prefer to use the paper-pen medium in conducting tests."</p> <p>"Teachers seem to be loaded with enormous amounts of work, whose work could have been lightened with the use of better and faster computers, especially in the use for assessment purposes. On the whole, I think there is room for transforming the 'assessment culture' in this school into something more efficient and more effective"</p>
C	Interview	1	<ul style="list-style-type: none"> Phase 3 of IT Implementation 3 computer labs; 1 science lab with 20 laptops; Teacher Resource Room with 7 internet access PCs, scanners, & 1 OMR; a teacher:laptop ratio of 2:1 	<p>"The teacher (interviewed) reiterated that the school's IT competence, both in hardware and application of software, is still under utilized"</p>

D	Survey questionnaire	10	<ul style="list-style-type: none"> Phase 3 of IT Implementation 5 computer labs; every classroom equipped with an LCD and several network points. 	<p>"In conclusion, the school has enough facilities, except the software, to assist teacher in educational assessment with computers"</p> <p>"From the results of the survey, the lack of software support in the school may have prevented teachers from using the computers for the educational assessments. There may also be a need to make known to some teachers the possibility to conduct assessments using computers."</p>
E	Observation & Interview	Not stated	<ul style="list-style-type: none"> Phase 3 of IT Implementation 4 computer labs; 3 IT-resource rooms; Trs' Workstation with 5 desktop computers, 1 scanner, 1 OMR 	<p>With adequate IT facilities, the school seemed to be on the right path towards achieving the goals of IT Masterplan. However, the extent of computer use for assessment purposes was not fully utilized, much to my disappointment. In fact, all staff interviewed are not aware of any commercial software or tools that could be used for the purpose of assessment.</p>
F	Survey questionnaire & Interview	8	<ul style="list-style-type: none"> Phase 2 of IT Implementation 1 OMR; other facilities are not stated 	<p>"The teachers whom I interviewed revealed that they do not use the analysis function of the OMR and do not look into the summary of the number of students who have answered a test item correctly. They are only interested in the overall score. They do not see the purpose or necessity to do individual test item analysis."</p>
G	Survey questionnaire	7	<ul style="list-style-type: none"> Phase 3 of IT Implementation Well-equipped with up-to-date hardware & software facilities; 1 OMR with Winscore application; applications used by trs are MSWord, PhotoPaint, MSExcel, MathsType 	<p>"The survey results showed that most teachers are using computers to create assessment papers. They edit and assemble the questions; some even scan pictures or store the questions into a database. The applications they use to create test papers are mainly MSWord, PhotoPaint and Math Type. None of the teachers surveyed are using online testing as the hardware and software are not ready for online testing purposes. But most of them intend to carry out online testing in the future."</p>
H	Survey questionnaire	25	<ul style="list-style-type: none"> Phase 2 of IT Implementation Available facilities are not specifically mentioned. 	<p>"Teachers in this school did not really make use of the computer applications for assessment purposes. Despite of the fact that approx. 80% of them are aware of these applications, none of the teachers have used these applications to make the process of assessment less time consuming and more professional. This could be due to the fact that very few of them were exposed to the know-how of these applications. Besides, the heavy workload of the teachers could also be one of the reasons why they shy away from such activities."</p>
I	Observation	NA	<ul style="list-style-type: none"> Phase 3 of IT Implementation 4 computer labs; 2 IT Resource Rms; 6 PCs located on every floor of the 4-storey building; PCs in the Library & Staff Work Room; 1 OMR 	<p>"It is interesting to note that Singapore schools are seriously gearing up for this type of computerized testing so that the goals of the IT Masterplan will be achieved in a shortest possible time. Though there are some setbacks, the teachers and school administrators are putting in their best efforts to help provide a conducive and positive learning environment for the students"</p>
J	Observation	NA	<ul style="list-style-type: none"> New School – in the process of setting up infrastructure & facilities under Phase 3 of IT Implementation 	<p>"The task of consolidation of test results was coordinated my co-operating teacher. She has used her self-taught Microsoft Access and Excel programming skills to compile test results for the whole school. It is a remarkable feat, but I wondered if every new school should be reinventing the wheel. There are commercial sofware package to do this."</p>
K	Observation	NA	<ul style="list-style-type: none"> Phase 2 of IT Implementation 3 computer labs, a PC & LCD projector in every classroom for teaching purpose; 1 OMR 	<p>"The school is testing the use of a software, Specturm System for reporting students' test results."</p> <p>"As far as I know, the teachers here do not use computers for testing. From my observation, the teachers and students especially those from the normal stream, are very interested in activities involving the use of computers. They can come up with very innovative and good projects in their Computer Application lessons. With this, using computerized test may make testing less threatening for them It may arouse their interest and motivate them to learn while doing the test."</p>
L	Survey questionnaire	7	<ul style="list-style-type: none"> Phase 3 of IT Implementation 1 OMR; other facilities are mentioned specifically. 	<p>"Results of this survey indicated that all department heads do know about item banking and have their own approach in setting up an item bank. The Chinese mother tongue department has created an tem bank, in collaboration with a few schools in the school cluster, using an authoring software and in collaboration."</p> <p>"Basically all departments still use the standard approach such as MSWord to audit the questions, cut & paste approach and taking the assessment in hardcopy. The test administration is done manually."</p>

Notes: (Information obtained from the IT Handbook for Schools, MOE, 1999)

IT Masterplan Implementation Milestones

2002: 2:1 pupil-computer ratio in schools with 30% IT-based curriculum time

2000: Core training for teachers in every school will be completed

1999: About 250 (Phase 3) schools to come on-stream

1998: About 90 (Phase 2) schools to come on-stream

1997: 22 (Phase 1) Demonstration schools to integrate IT into curriculum