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## MOVING FROM PAPER-BASED TESTING (PBT) TO COMPUTER-BASED TESTING (CBT) FOR CLASSROOM USE: EXPLORING THE OPPORTUNITIES AND CHALLENGES

**Sandi Ferdiansyah**

University of 17 Agustus 1945 Banyuwangi, Indonesia

Corresponding e-mail: [sanjazzyn@yahoo.com](mailto:sanjazzyn@yahoo.com)

**Abstract:** From educational perspectives, the ability of teachers to design a computer-based test material is believed to become a critical element to develop a breakthrough particularly in educational assessment practices in this twenty first century era. In addition, the ability of the teachers to create the digital testing is also expected to revitalize the implementation of testing for educational purposes. Though technology mediated testing provides teachers with such huge opportunities, its application remains static since the shift from traditional mode of testing to computerized testing is absolutely challenging. To back up those compelling arguments, this paper attempts to discuss four tangible opportunities for teachers to self-create computer-based testing for classroom use such as 1) teacher-student engagement in virtual learning environment; 2) testing efficiency and practicality; 3) interactive exercise for measurement; and 4) maintenance of high level of scoring accuracy. The paper will also talk about the challenges the teachers might face while creating and implementing the e-testing, namely 1) affordance of technological tools; 2) teacher-student familiarity in computer mediated learning and testing; and 3) innovation in adamant teaching and learning situation. At the end of this chapter, brief guidelines on how to administer and implement CBT for classroom use are proposed. The significance of this chapter is finally addressed to the needs of capacity building of e-testing construction and implementation for educational purposes. Consequently, there is an expectation of growing awareness of the teachers and practitioners towards the current paradigm in teachers-made test using computer in the context of classroom settings and beyond.

**Keywords:** *Testing, computer-based test, opportunities and challenges*

### 1 INTRODUCTION

Pedagogically speaking, testing is inextricably intertwined with teaching and learning. While teaching and learning might be seen as a practice in which both teacher and students are mutually engaged in the process of sharing information, meaning making, and communicating ideas, testing is aimed at providing both parties an access of measurement and evaluation. The term - measurement is underpinned by Brown (2004) and Hughes (1992) that testing is generally defined as a method of measuring student's ability or competence. Furthermore, contemporary category of testing according to Newton (2007, p.163) includes a method of evaluating the social value of personal educational achievement. To support this, Jeltova et.al (2007, p.274) refer to Vygotsky's idea on zone of proximal development (ZPD) that testing as a dynamic field covers social, cognitive, and affective dimensions. Thus, through testing, teacher can discern both the

students' learning progress as well as achievement and to some extent value the students' engagement in social practices.

In the context of 21<sup>st</sup> century learning, the teachers are expected to facilitate the students towards the advancement of technology not only for the sake of teaching and learning but also for testing purposes. This is in line with Gibson (2008, p.11) who classifies the importance of incorporating technology in learning into three areas: 1) to create an awareness of technology; 2) to acquire appropriate conceptual, procedural and conditional (strategic) knowledge and skills; and 3) to develop technological capability. In other words, preparing the students with technology mediated learning and testing is useful because they are facing the future of mass technology that everything is almost computerized and digitally operated. Equipping the students with the capacity of handling technology mediated testing particularly will allow themselves to succeed especially in

employing digital media, developing problem solving skills in digital literacy, and more importantly undertaking the test. To clarify, Lafuente et.al (2014) conclude that digital media can be a powerful tool to help enhance testing practices by means that the students are not only able to use it for assisting learning but also testing.

The era of digital testing itself is gaining its popularity in the recent years as an alternative to paper-based testing (PBT). This is reasonable because both teachers and students live in the digital era – where most of them move from paper to screen, from the era of blackboard to LCD projector, printed books to e-books, and paper-based testing (PBT) to computer-based testing (CBT).

## **2 MOVING FROM PBT TO CBT**

Dealing with testing media, it is very common that many teachers use paper and pen test mode for their testing activities. PBT has been widely used for many years and for many kinds of test design. However, the use of PBT according to Papadima-Sophocleous (2008), Davey (2011), and Bartlet (2002) has been proven to be less efficient, more expensive, less interactive, and does not represent the ‘real world’ task. Such issues, therefore, might become the main considerations for teachers to shift their testing practice from PBT to CBT.

Actually, teachers have a golden opportunity to integrate technology into a testing media as the procedures in designing and creating test mediated technology are quite similar to PBT. To support this, Meunier (1994) and Wang & Shin (2009) state that in terms of content and delivery sequence both PBT and CBT are identical except its mode. In PBT, the teachers can start on using computer and embark on applicable software to help design and create the test instrument instead of using paper and pen.

However, this paper is neither intended to compare PBT and CBT nor find which one is better. It tries to highlight the possibilities to move from PBT to CBT for the classroom use by looking into its opportunities and challenges.

## **3 OPPORTUNITIES**

This part explores the opportunities of using CBT for classroom use. Theoretical evidences are canvassed throughout the section.

### **3.1 Teacher–student engagement in virtual learning environment**

Administering CBT for classroom use offers teacher and students an opportunity to

interface with virtual learning environment. It means that digital testing strongly opens the boundaries of time and spaces as the test can be done anytime, either in the classroom setting or beyond. This is supported by New Zealand Qualification Authorities (NZQA) that digital assessment and testing provide real benefits for the students as well as the teachers, such as 1) the testing can be done whenever the student is ready; 2) the testing can be done through the medium the students are familiar with; and 3) the testing can be done whenever and wherever. In addition, for the teachers, technology mediated testing provides activities for the teachers themselves to learn how to redesign their test which is integrated with a variety of new technologies and applications that meet their testing aims and the needs of their test takers (Papadima-Sophocleous, 2008). Meanwhile, CBT offers the students the ability in facing virtual environment. Davey (2011) states that computer mediated testing enables the participants to have live interaction, accept responses through a variety of modes, and even automatically provide immediate score. By building of such interface between students and technology, it is expected that in the sociocultural context the students can value the emergence of virtual environment and engage in learning through the service of technology with positive attitude.

### **3.2 Testing efficiency and practicality**

The use of computer in designing ergonomic mode of testing ensures testing efficiency and practicality. Wang & Shin (2009, p. 1) argue that CBT gives abundant advantages over the PBT such as immediate scoring and reporting of results, more flexible test scheduling, the opportunity to include innovative item formats that are made possible by the use of technology, and reduced costs of test production, administration, and scoring. To support this, Noijons (1994) argues that the use of CBT provides six benefits in terms of time, routing, storage, psychometrics, multimedia, and standardization. The merits supplied by the advancement of computer system used for testing are undoubtedly satisfying. To conclude, Hamel & Caws (2010) states that efficiency, effectiveness, and satisfaction are the key concepts of usability in computer ergonomics.

### **3.3 Interactive exercise for measurement**

Comparing to PBT, CBT has features that enables the teacher to make the test more interactive. Through CBT, students are provided with interactive exercise for measurement. Papadima-Sophocleous (2008) argues that electronic tests can provide more variety in testing techniques, which can prove more interactive and authentic. New types of questions (e.g., point and click, drag and drop, and simulations) improve the test's ability to measure important skills. In addition, having digital testing fosters the students' motivation to learn new techniques in doing the test such as by typing word or sentence, clicking the items, and sorting, dragging, scrolling, or dropping the cursor for choosing the answer or answering the questions. In addition to this, Bartram (2002) states that CBT allows the teachers to create an innovation in testing by inserting multimodal display such as images, sounds or videos in the test content.

### **3.4 Maintenance of high level of scoring accuracy**

While the use of CBT assists the teacher with automatic scoring system, its accuracy in marking is definitely promising. Bachman (1995) argues that the use of computer in mediating language testing has given significant influence in maintaining the improvement of the qualities both of the test scores and the efficiency of test administration. Likely, Luecht & Sireci (2011) stipulates that the use of CBT is relatively efficient in terms of proportional improvement on the scoring precision and reduction in the test length. In contrast, through PBT, teachers mostly need much longer time in marking students' worksheets so that this overwhelming activity may cause errors and make the teachers extremely tired. Thus, the use of CBT can become a revolutionary change in testing and scoring for educational purposes.

## **4 CHALLENGES**

The use of CBT is believed to be promising though, its implementation for classroom use remains rare. To explore the issues, the section below discusses the common

challenges that emerge in using CBT in the classroom settings.

### **4.1 Affordance of technological tools**

Technology is always presumed to become an expensive thing that not many students, teachers, even institution can afford to invest. Consequently, the limited availability of the technological resources cannot maximize the needs in facilitating the students for educational context. One of major challenges that may encounter the implementation of CBT in classroom use is the availability of technological tools such as computer or hardware while testing a large group of students Bartram (2002). The lack of facilities will absolutely make CBT impossible to be implemented in the classroom for the need of testing practices. In addition, Noijons (1994) states that building such infrastructure such as providing computers for a number of students is very expensive and the rapid change of the testing software might be questionable for investment. Frankly speaking, this budgeting issue inevitably entails policy maker domain.

### **4.2 Teacher-students familiarity in computer mediated learning and testing**

A technical aspect that can create the gap in implementing CBT for classroom use is that both teacher and students may not familiar with such a digital testing practice. Noijons (1994) argues that teachers sometimes encounter three problems in adapting computer software for their classroom practice, they are 1) it is found out that they are difficult to find computer program that meet the needs of their testing purposes; 2) they need to spend their own budget buying a particular program; and 3) they experience time pressure in terms of mastering and implementing CBT. This typical problem is also experienced by students. In general, according to Shelby-Caffey et.al (2014) the students may have less interest in technology because they are not provided with the knowledge 'know how' and its access. Therefore, in the context of testing purposes, the students who do not have any ideas what to do with the instructions provided and the

knowledge how to do computer-mediated testing will lead them to the failure.

### 4.3 Innovation in adamant teaching and learning situation

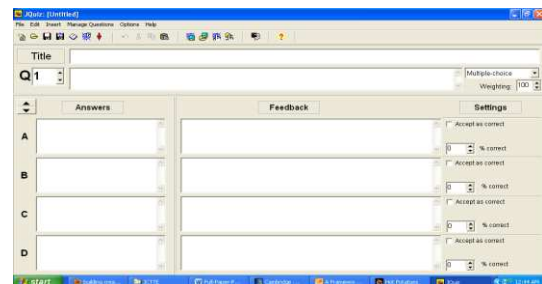
Being innovative teachers in the 21<sup>st</sup> century teaching and learning is obviously necessary. However, it requires creative thoughts and efforts to create technological innovation. Kenning (2007, p.6) argues that ‘technological innovations do not simply appear out of the blue, but are the outcome of the endeavors of human beings who designed them with certain uses in mind and some ideas of their effects on society and on individual lives’. In other words, the teachers absolutely need to explore their creativity and continue their struggle to create innovation using technology. In addition to this, Ferguson (2011, p.177) states that creative endeavor is not an easy process, it requires trust and bravery and determination from creators and from those who seek to support and guide them. Thus, when the teachers or students feel comfortable and enjoy implementing PBT in their classroom, innovation will be difficult to happen in such adamant teaching and learning situation.

## 4 BRIEF GUIDELINES IN ADMINISTERING & IMPLEMENTING CBT

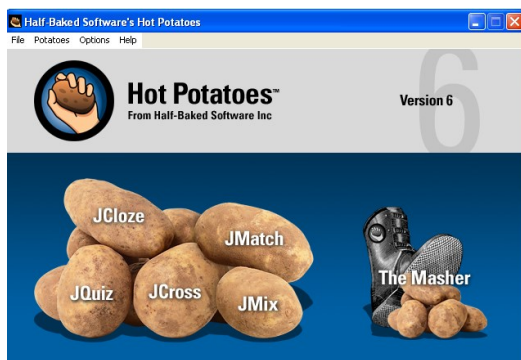
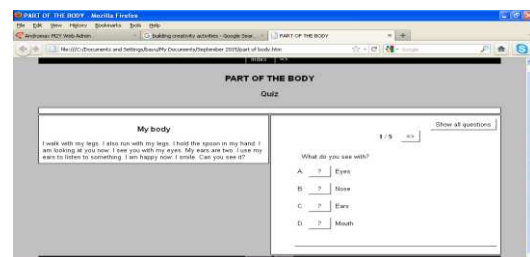
To provide practical considerations on how to use CBT for classroom purposes, the following brief guidelines are outlined to assist teachers how to start administering CBT using simple and applicable applications.

1. Finding computer software or application either online or offline that is suitable with the teachers’ knowledge and capacity in running the program and meets the target of the test. In the process of selecting the program, the teachers are encouraged to try it out. The model below is **Hot Potatoes** version 6 which can be downloaded for free at <https://hotpot.uvic.ca/>

2. Framing the table of specification in which the level of competency and learning indicators are set up which is important to maintain the objective of the test. In addition, the teachers can select suitable type of the test design that matches its objective. To date, Dolan et.al (2010) state that the table of specification gives the teachers three benefits: 1) to be the medium for the teachers to examine the potential constructs of the test; 2) to be the frame for the teachers to select the content of the items that best corresponds to the topic; and 3) to be the guidance how the test might achieve the dimensions of knowledge, skills, and abilities
3. Developing bank of the test items in which they are tailored and selected based on their difficulty level to at least create construct validity of the test. It is also important for the teachers to make the instruction of each type of exercise clear so that the students will not experience confusing when taking CBT. Afterwards, the teachers can begin transmitting the items in the columns or spaces provided.



4. Testing the pre-published form of the CBT that the teachers have made. It is used to check and review whether it works well or not.
5. Saving its final form and publishing the CBT. At the end of the stage, the teachers can save the complete published CBT and start to be delivered.





Meanwhile, the following considerations can be used by the teachers in implementing the CBT. The implementations in this section are proposed for both classroom setting and beyond.

1. Facilitating the students on how to do the CBT by giving them a short training. This is to avoid what Bahcman (1995) has concerned about students' performance for not being familiar towards the test equipment such as computer in testing. As the types of the question vary from one type to another, the knowledge and skills of doing the test either by typing, clicking, or dragging the answer needs to be introduced too.
2. Delivering the test in the classroom if possible. If the facilities are not adequate for the whole students, the teachers can split the class. It is also possible for the teachers to deliver the test online using particular social media that the students can do the test at home. Later, they are required to send it back to the teachers for scoring report.
3. Scoring the students' work. Since the scoring can automatically be done, the teachers can directly get the students' score if they do it in the class or computer laboratory. But, if the students do it beyond the class, they can send their CBTs via e-mail or social media. This is not only making testing and scoring delivery through online medium easy but also leading to economic cost savings (Noyes & Garland, 2008).

## 5 CONCLUSION AND RECOMMENDATION

This paper is grounded in the ideas how CBT is possible to be implemented for educational uses. The theoretical foundation reviewed in this paper is provided to support current perspective and trend in using technology for testing purposes. From exploration of both the opportunities and challenges highlighted in this paper, it can be concluded that using and implementing CBT for classroom purposes is worth trying as an alternative to PBT. Since the procedures of creating CBT is similar to PBT, the teachers need to consider the capacity building of content knowledge of technology and technical guidance for the students prior to taking CBT.

Regarding to needs of CBT development for educational purposes, there are three recommendations addressed to follow up the ideas, they are; 1) the teachers can consider the use of CBT for their testing practices in or out of classroom settings; 2) future researchers are encouraged to conduct research related to the implementation of CBT to provide ample empirical evidence in computer mediated testing; and 3) stakeholders or school policy makers can start to concern about the integration of technology in the curriculum for the purpose of either teaching, learning or testing.

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