

# An Exploratory Study on PutraPacer as a Differentiated Assessment Tool for Learning

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**Abstract** The use of alternative assessment to curb the practice of standardized assessment in education in recent years has increased. Educators are challenged with the responsibility to address different needs of diverse learners and the dynamic nature of education that changes alongside rapid technology advancement. Realizing that changes in curriculum instruction and assessments are inevitable, educators attempt to improve their practices in alternative assessment. This includes emphasizing differentiation in assessment. Differentiated assessment makes it possible for educators to collect reliable data of students' achievement which in turn will be used to plan better strategies in instruction that could address students' different needs. However, to date, few papers have reported about differentiated assessments that have been carried out, especially in Malaysia. The aim of the present paper is to report on preliminary findings of the impact of PutraPacer as differentiated assessment tool on learning. This pilot study employs a qualitative research method with two undergraduate students and one lecturer as participants. The findings of this pilot study suggest that as a differentiated assessment tool, PutraPacer has supported differentiated learning and assessment among learners in the following ways: (i) reduces pressure in learning, and promotes individualised and self-directed learning experience, (ii) helps assessing students' understanding, (iii) captures students' different abilities, and (iv) provides platforms for students to justify responses.

**Keywords:** Alternative Assessment, Differentiated Assessment, Learners Diversity

## 1. Introduction

Differentiated assessment is one of the approaches to alternative assessment which advocates the practice of differentiation in assessment. Differentiation is “a philosophy that enables teachers to plan strategically in order to reach the needs of the diverse learners in classrooms today to achieve targeted standards” (Gregory & Chapman, 2013, p. 2). Differentiated assessment provides flexibility not only in the levels of knowledge acquisition, but also in skills development and types of assessments assumed by students (Varsavsky & Rayner, 2013). This attempt which addresses differences among learners is in line with the belief that learners are different in terms of background, characteristics, learning style, needs, preferences, interests, and abilities (Algozzine & Anderson, 2007; Kaur, Noman & Awang-Hashim, 2018; Lawrence-Brown, 2004; Tomlinson, 2001).

Education in the 21<sup>st</sup> century also sees a broadening spectrum of learners. This poses a challenge to educators where more appropriate teaching approaches are expected to meet the needs of diverse learners, and schools are proposed to be more reactive to cater to these diversities (Suprayogi, Valcke & Godwin, 2017; Tomlinson, 2015). Alongside these changes, Education 4.0, a term derived in response to the needs of Industrial Revolution 4.0 (IR 4.0) proved that changes in teaching methods are essential. Teaching and learning now are gradually transformed to more information-and technology-based, and leaning towards innovation (Anggraeni, 2018; Gulicheva, Lisin, Osipova & Khabdullin, 2017; Lawrence, Ching & Abdullah, 2019). One of the trends related to Education 4.0 discusses on how conventional platforms are no longer relevant and sufficient to assess students. Education 4.0 has transformed the traditional way of taking exams and it is about time that students are assessed differently (Fisk, 2017; Hariharasudan & Kot, 2018).

The Malaysian education system has paved the way for a better assessment through the latest reform of national assessment. Moving away from high-staked standardised examination, the Ministry of Education is now emphasizing assessment for learning, which is formative by nature. Teachers are also required to assess students using instruments other than written assignments and worksheets (Chin, Thien & Chew, 2019). Subsequently, this presents more opportunities for teachers to integrate differentiation in the classroom as “effective differentiation of instruction is inextricably bound to formative assessment” (Tomlinson & Moon, 2013, p.66). Previous research on alternative assessments in Malaysia show that formative assessments are already in practice. Among them are the use of learning tools such as rubrics, portfolios, online games, and concept maps (Alias & Osman, 2014; Ghani, Ibrahim, Yahaya & Surif, 2017; Swaran Singh & Abdul Samad, 2012). Other research focuses on instructional strategies like presentation, oral communication, and group work (Adnan, Mohd Sallem, Muda & Wan Abdullah, 2019; Chan & Sidhu, 2010).

However, based on the abovementioned research on alternative assessment, it is found that there is no generic, systematic and dedicated tools available yet for teachers and lecturers to employ differentiated assessment in mixed-ability classrooms in Malaysia. Therefore, this study attempts to study the impact of PutraPacer as a differentiated assessment tool for learning. PutraPacer is a web-based generic differentiated assessment tool for a mixed-ability classroom developed by researchers from Universiti Putra Malaysia (Md. Khambari, Wong & Mohd Norowi, 2019). This study is based on the following research question: (i) In what ways does PutraPacer support differentiated learning and differentiated assessment among learners?

## 2. Literature Review

Researchers have criticized the practice of standardized assessment due to its impracticality and disadvantages to students, parents and teachers (Nasri, Roslan, Sekuan, Bakar & Puteh, 2010; Zitlow & Kohn, 2001). Teaching methodology is affected by standardized assessment so much so that learning is focused on exam preparation practices (Wall, 1996). This unfortunately promotes rote memorization among students who subsequently becomes surface learners with weak reasoning power (Newstead & Findlay, 1997; Black & Wiliam, 1998). With limited format and simpler forms of questions, standardized assessment hinders students’ application of higher levels of knowledge. Moreover, it is also challenging for them to truly demonstrate what they have learned, the learning process involved and where the learning happened (Letina, 2015). According to Tomlinson, standardized assessment “are not designed to address variance in readiness, interest, or learning profile” (Tomlinson & Moon, 2013, p.76). This shows that standardized assessment is incapable to cater to learners’ diverse and individual needs (Noman & Kaur, 2014; Tomlinson, 2015).

McNamara (2001) defines alternative assessment as a step to do away with standardized assessment by replacing it with a more refined performance-based assessment. Alternative assessment supports higher-order thinking and problem-solving abilities among students which is essential in developing skills needed in the 21<sup>st</sup> century (Burke, 2005; Alias & Osman, 2015). Janisch, Liu & Akrofi (2007) assert that alternative assessment has the potential to evoke students’ autonomy in learning. This notion is further supported by Gozuyesil and Tanriseven (2017) who believe that through alternative assessment, students can explore their own ideas to self-evaluate their own learning styles. Hence, flexible, and meaningful experiences are achieved. Alternative assessment has made it possible for teachers to get information about students’ strengths and weaknesses because they are manifested over time (Swaran Singh & Abdul Samad, 2012). Likewise, Mohtar (2010) agrees that through alternative assessment, information on student progress and achievement are more valid and reliable. Therefore, it is imperative for educators to have good knowledge about alternative assessment methods and the fundamental theory underlying it (Janisch et al. 2007).

Kingore (2004) points out that differentiation is implemented in the classroom on the ground that students have different background knowledge and ability. Instead of casting students in the same mould as if they are alike, teachers can practise differentiation by responding accordingly to the needs of their students based on their different learning profiles, interests, and readiness. In order to reach out

to diverse learners, Noman and Kaur (2014) imply that differentiation in assessment is as important as differentiation in instruction especially in terms of informed learning. As differentiated assessment is normally formative in nature, authentic data of students' achievement can be collected and used by teachers to plan better strategies in instruction (Koshy, 2013). Besides learning flexibility and types of measurement undertaken by students, Varsavsky and Rayner (2013) claim that through differentiated assessment, students also have the autonomy of choosing how to develop their skills based on their talents and learning styles. Apparently, this view is relevant to the idea that intelligence is not a fixed trait and all students learn at their own pace (Presseisen, Smey-Richman & Beyer, 1992).

### **3. Theoretical Framework**

Vygotsky's sociocultural theory is fundamental in foregrounding the concept of differentiation. This theory proposes that teachers will be able to take advantage of students' ability and give them individual opportunity to participate and learn based on certain social and cultural contexts (Kaur, Noman & Awang-Hashim, 2018; Tomlinson, 1999). Vygotsky suggests that learning happens within the Zone of Proximal Development (ZPD). Within the ZPD, learning is also believed to happen "on a novice-to-expert continuum that builds over time rather than being constrained by a specific set of grade-level standards" (Tomlinson & Moon, 2013, p.72). In ZPD, scaffolding supports learning, and this enables a student to accomplish tasks that are initially beyond his or her capability (Wood, Bruner & Ross, 1976). Scaffolding also helps develop students' abilities by increasing the complexity levels of a task (Shabani, Khatib & Ebadi, 2010) and reveal students' hidden potential (Ajideh & Nourdad, 2012).

According to Crim, Kennedy, and Thornton (2013), Tomlinson's (1999) model of differentiation highlights the importance of identifying and creating space for multiple intelligence in order to stimulate students' individual interests and learning profiles. Gardner's (1983) multiple intelligence theory asserts that people process the world and prove their strengths in multiple ways and the construct of intelligence can be achieved with a non-conventional method (Crim et al., 2013). Gardner (1999) identified eight dimensions of intelligence namely bodily kinaesthetic intelligence, linguistic intelligence, logical-mathematical intelligence, musical intelligence, naturalistic intelligence, interpersonal intelligence, intrapersonal intelligence, and visual spatial intelligence. In the context of assessment, Gardner (1992) strongly believes that assessments that fail to address vast differences among individuals are outdated and teacher training should focus on individual differences.

### **4. PutraPacer**

PutraPacer is a systematic web-based tool designed and developed by a group of researchers from the Faculty of Educational Studies and the Faculty of Computer Science and Information Technology of Universiti Putra Malaysia (UPM). PutraPacer provides tiered levels of assessments that are appropriate for students with different learning abilities, interests, and level of preparedness. PutraPacer incorporates the elements of differentiated instruction, where students can learn according to their abilities and given the opportunities to get appropriate education in general education classrooms (Lawrence-Brown, 2004). By using PutraPacer, instructors could create tiered levels of assessments according to level of difficulties. For example, easy, medium, and hard. This function helps low to middle ability learners to engage with their learning instead of memorizing the information which may ease the pressure on learning (Llewellyn, 2003). Meanwhile, advanced learners will have the opportunities to engage in a more challenging task. According to Dikli (2003), this will provide a much accurate insight of students' skills and abilities and reflects instructors' pedagogical strategies.

PutraPacer also enables students to demonstrate what they have learned, according to their ability. This feature is deemed useful to be embedded in PutraPacer as alternative assessment promotes students' comprehension and accomplishment rather than testing students on what they remember (Caliskan & Kasikci, 2010). Instructors could create questions that prompts students to present their answer in various forms like audio recording, video recording or mind maps. The development and

employment of PutraPacer will increase awareness of alternative assessment among instructors in UPM. Thus, supporting UPM's effort to promote alternative assessment practice and the implementation of smart campus (Md. Khambari, Wong & Mohd Norowi, 2019).

## **5. Methodology**

As this study is exploratory in nature and attempts to gain an initial insight on the first prototype of PutraPacer, a qualitative instrumental case study approach was employed. This was done to ensure that an in-depth exploration on participants' perception can be carried out at a micro-level (Yin, 2014). Furthermore, this pilot study was bounded within instructors and students at a faculty in UPM, and carried out within a certain time frame, which warrants for an instrumental case study as suggested by Merriam and Tisdell (2016).

In this study, a course instructor who volunteered to employ PutraPacer and two of her undergraduate students were the participants. The course instructor is an expert in Human-Computer Interaction and has more than 5 years of teaching experience. Their participation is meaningful to this research in such ways that they gave an insight on how can the tool support differentiated learning and differentiated assessment, and indirectly, help the researchers to identify bugs and fixes that can be done before PutraPacer can be carried out to a larger sample group for further data collection. Prior to data collection, the course instructor participant was recruited through a series of intensive workshop trainings on how to utilize PutraPacer for differentiated assessment. In terms of data collection, a non-participatory observation was conducted during a revision assessment session carried out by the course instructor in a multimedia laboratory. The observation focused on how students responded to assessment questions on PutraPacer. After the session was over, the course instructor and two volunteering students were interviewed in separate sessions to elicit their feedback on their experience with the tool. Each interview lasted for about 40 minutes.

A constant comparative method was employed for data analysis to maintain both the emic perspectives of the participants, and the etic perspectives of the theory and researchers (Charmaz, 2014). In the First Cycle, interview transcripts and field notes from the observations were read and re-read to increase the researchers' familiarity with the data. The data were then coded using Descriptive Coding and In Vivo Coding with memos (Saldaña, 2009). Among codes derived from Descriptive Coding are 'test ability', 'self-correction', and 'demonstrate understanding'. Meanwhile, through In Vivo Coding, codes such as 'more individual', 'relax and happy', and 'own pace' were retrieved from the data. Further, using Pattern Coding with memos-on-memos in the Second Cycle, major themes from the data were developed. Data that emerged from these cycles were then sorted and themed accordingly (Saldaña, 2009). Major categories resulted from the Second Cycle are 'positive emotions', 'individual experience', 'demonstrate understanding', 'scaffolding', 'self-directed learning', 'different abilities', and 'multiple learning styles'. After reviewing the major categories, the data analysis were finalized by regrouping the categories and form another coherent themes which are discussed in the following section.

## **6. Findings and discussions**

Data analysis of the impact of PutraPacer as a differentiated assessment tool on learning revealed the following themes: 1) PutraPacer reduces pressure in learning, and promotes individualised and self-directed learning experience, 2) PutraPacer helps assessing students' understanding, 3) PutraPacer captures students' different abilities, and 4) PutraPacer provides platforms for students to justify responses. To facilitate the data presentation and safeguard the participants at the same time,

pseudonyms are used in the subsequent sections.

### *6.1 Reduces pressure in learning, and promotes individualised and self-directed learning experience*

Both students, namely Ali and Rina, and their course instructor, Nor, expressed that the use of PutraPacer reduced the pressure in learning, especially when it is used for assessment. While Ali and Rina both showed positive feedback based on their experience answering quiz questions on PutraPacer, Nor showed excitement for learning to use PutraPacer to conduct a quiz for the first time. Nor also could see that her students were relaxed and happy during the quiz mainly because their scores would not influence their Cumulative Grade Points Average (CGPA).

*It felt good. It felt very natural and intuitive for the most part (Ali).*

*I actually really enjoyed the experience because, well to compare with my previous experience with PutraBlast quiz, I prefer PutraPacer more because it's easier, it's very user friendly and I really like the design of it (Rina).*

*I felt excited because it is something new...So, when I tell them there will be no marks, they won't be assessed on this, I think students tend to be more relaxed and happy when they are approached to do the questions or the quizzes (Nor).*

*Their marks or their scores and CGPA is not on the line. So, learning is more than just trying to get the highest scores, but learning is trying to improve one's understanding or comprehension on the subject (Nor).*

Based on observation, the researcher agrees that the quiz session was conducted in a relaxed and somewhat casual manner. Most questions posed by students during the quiz were about the technical settings of PutraPacer. The session went about smoothly. During the discussion that happened after all students submitted the answers, it was interesting to see students joking around saying that the quiz was like playing an online game because they need to achieve a certain score to be able to proceed to a higher level. This finding is in congruent with Hashemian (2011) who demonstrates that without pressure, students are more aware of the learning process, feel contented with their improvement and will attempt to continue the process and sometimes leads to creativity. Isen, Daubman and Nowicki (1987) also suggest that positive affects facilitate in creative problem-solving which is one of the skills essential for the 21<sup>st</sup> century learners (Burke, 2005; Alias & Osman, 2015).

As a first-year undergraduate student, Rina who had experience doing assessments in written and digital forms before, believed that PutraPacer is different in a way that it offers individualised learning experience. Nor who has about 17 years of teaching experience also thinks likewise.

*...it's more individual and you can test your ability to know how much you know about the subject (Rina).*

*So, I think that is how PutraPacer may have impacted students' learning, in a sense that they understand that it's their own pace, it is a very individualistic experience and they are not being constantly judged or assessed (Nor).*

Ali (2015) reported that one of the objectives of differentiated assessment is to individualised learning. Individualised learning enables students to complete a task given at their own pace and move further in their learning by attempting to do better than their personal current level of ability (Ajideh & Nourdad, 2012). Based on the researcher's experience as a teacher, these attributes helps to diminish students' need to compete with fellow classmates where oftentimes students complete a task for the sake of getting ahead of their classmates without understanding what the real learning objectives of the

given task are.

Rina and Nor also find that students can take initiative to learn from their mistakes and relearn, without the help of others. This could be made possible by checking the correct answers which are displayed right after getting the results. Students can also retake the same quiz and improve their answers at every attempt they made.

*It challenges you to correct yourself and make you remember what your mistakes before and learn from it (Rina).*

*If they get it wrong, they will have the chance to relearn or fix whatever is wrong (Nor).*

Some students manage to answer all the questions sooner than their other friends. The researcher saw that these students took the opportunity to check the correct answers which were displayed automatically after they have submitted the quiz. A few students managed to detect discrepancies in the given answers. This has led to a further discussion with the lecturer. According to Li and Burke (2010), “adults learn best when they are actively engaged in the learning process and self-direct their own learning goals and activities” (p.1). The researcher believes that self-directed learning is a trait of an autonomous learner. As a differentiated assessment tool, PutraPacer therefore has the potential to support students to become autonomous learners, in line with the study done by Janisch et al. (2007).

## 6.2 Assessment of student’s understanding

Rina and Nor agree that PutraPacer helps assessing student’s understanding on topic or a subject. Nor believes that information about students’ level of understanding can help identify issues where students are struggling with.

*... you can test your ability to know how much you know about the subject (Rina).*

*So, I think that’s one way that may improve or impact me as an instructor, to be able to understand where students stand or their level of understanding, because right now it’s really hard. Right now, only after a test that you can tell this thing...these students are struggling, they are failing Test 1. By that time, it will be a bit too late. So, I think with PutraPacer, you can detect this issue earlier on (Nor).*

By getting information on students’ level of understanding, a teacher could reassess his or her method of teaching. Consequently, the teacher can improve or make adjustment to the teaching method so that the learning outcomes will be aligned with students’ needs and according to their level of understanding. Findings in studies by (Swaran Singh & Abdul Samad, 2012) and Mohtar (2010) agree that reliable information of student’s progress including their weaknesses and strengths, can be retrieved through alternative assessments.

## 6.3 Captures students’ different abilities

PutraPacer enables students to be aware of their own ability. The quiz conducted in this pilot study is taxonomy-based which allocated three levels of difficulties. Ali and Rina were aware of this key feature and its purpose. The course instructor finds that by knowing each of the student’s ability, she could learn the demography of her class especially in terms of learning abilities.

*From my thoughts, it seems to allow different types of people to be able to engage with the same quiz whereas a usual quiz, we have both hard and easy questions at once*

*which isn't really suited for people who aren't as advance (Ali).*

*We can know which level we are at (Rina).*

*...lecturers can set different levels based on the difficulty of the questions. I think that's how it will be able to show the different abilities that the students have... the lecturers can see how many of their students can understand and how vastly distributed the learning abilities are among the students (Nor).*

PutraPacer could capture students' different abilities by deliberately setting a quiz or a test to taxonomy based. As claimed by Varsavsky and Rayner (2013), by offering flexibility in levels of knowledge attainment, differentiated assessment could address differences among students. Based on each student's different ability, teachers can plan a lesson or an assessment which offers the students the opportunity to show what they know, what they understand and what they can do. Tomlinson and Moon (2013) defined this method as 'differentiation through product'.

#### *6.4 Provides a platform for students to justify responses*

In PutraPacer, the attachment function added at each answer box allows students to attach their justification for their responses, in the form of text, audio, and visuals. Nor figured that through this function, learning can be more interactive for the students especially when conveying their opinion through their answer. This is exemplified in the excerpt below:

*... students can provide audio or video input to justify their work, or actually defend their answer or support their answer...they (students) also understand that learning is not just one way coming from the lecturer and they have to answer and that's all the interaction that they get, but it can be more interaction where they can voice out their opinions or they can maybe rectify something which they feel is not right (Nor).*

However, this feature was not implemented in the first round of pilot test due to time constraint on the course instructor's end. Nevertheless, she strongly believed that one of PutraPacer distinctive features is providing a platform for students to be more expressive on their opinion, and she was looking forward to making good use of this feature in the future. This feature could provide the best opportunity for each student to demonstrate his or her learning. This is consistent with Ali (2015) who suggested that differentiated assessment should take multiple intelligence into consideration as well as students' learning and thinking styles.

## **7. Conclusion**

Overall, the findings from the pilot study suggested that PutraPacer has supported differentiated learning and differentiated assessment in some meaningful ways. Although this study is small scaled, it offers meaningful findings to help improve the tool and shed new light on the implementation of a web-based differentiated assessment in education in Malaysia. More conclusive studies that are quantitative or qualitative in nature are needed to establish PutraPacer as a practical and operational differentiated assessment tool that can be used across all levels of education. It is also important to point out that based on the preliminary findings, the participants feedbacks are noticeably positive. This could be due to the excitement of using PutraPacer for assessment for the first time. The researcher believes that there is a need to think of ways to preserve the novelty of this tool so that users will be drawn to keep using PutraPacer and reap its benefits to enhance their learning experience as well as practice of alternative

assessment.

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