



UNIVERSITI PUTRA MALAYSIA

***EXPLORING THE UTILIZATION OF A DIFFERENTIATED ASSESSMENT
TOOL AMONG PRIMARY SCHOOL TEACHERS IN SABAH, MALAYSIA***

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By

CHRISTYE MAJUDDIN

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirements for the Degree of Master of Science**

February 2022

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

EXPLORING THE UTILIZATION OF A DIFFERENTIATED ASSESSMENT TOOL AMONG PRIMARY SCHOOL TEACHERS IN SABAH, MALAYSIA

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February 2022

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The 21st century classrooms have seen a broadening spectrum of students' diversity. To address the individual learning needs of the students, differentiated assessment is deemed as one of the best approaches since it informs differentiated instruction, and vice versa. Besides that, the implementation of the current school-based assessment (SBA) advocates personalized learning and the use of alternative assessment to curb the long-standing practice of the traditional way of assessing students. There are substantial number of studies that managed to highlight the importance of addressing students' diverse needs through the practice of differentiated assessment and the utilization of assessment tools that support differentiation. However, these studies did not emphasize on the principles of differentiated assessment when discussing on the tools used.

Therefore, this study aimed to explore the utilization of a differentiated assessment tool named PutraPacer among primary school teachers in Sabah. Framed by the Activity Theory, this study employed a qualitative research design with five primary school teachers as participants. The data were collected through observation, interviews, and document analysis and further analysis were carried out using Creswell's data analysis spiral and Saldaña's two-cycle coding methods. The findings that emerged suggest that the utilization of PutraPacer (i) promotes students to demonstrate their learning progress, (ii) allows students to engage in active learning, (iii) supports successful instructional planning, (iv) functions as a platform for personalized learning, (v) is convenient and time saving, (vi) fosters self-paced learning, (vii) catalyzes Education 4.0. In general, the findings revealed that the use of a differentiated assessment tool could address students' diverse needs in learning. The use of a differentiated assessment tool is also relevant in today's classroom since education now is moving towards digitalization, in line with the demand of the Fourth Industrial Revolution.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

MENEROKA PENGGUNAAN ALAT PENTAKSIRAN TERBEZA DI KALANGAN GURU SEKOLAH RENDAH DI SABAH, MALAYSIA

Oleh

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Bilik darjah abad ke-21 didapati terdiri daripada pelajar-pelajar yang mempunyai ciri-ciri dan keperluan pelbagai. Bagi memastikan setiap keperluan individu pelajar dipenuhi, pentaksiran terbeza adalah pendekatan terbaik yang boleh diambil oleh guru. Ini kerana maklumat yang diperolehi daripada pentaksiran terbeza dapat membantu guru menjalankan pengajaran terbeza, dan sebaliknya. Selain itu, sistem pentaksiran berasaskan sekolah (PBS) menyokong pembelajaran berasaskan individu dan amalan pentaksiran alternatif yang berupaya mengekang amalan pentaksiran konvensional. Terdapat banyak kajian yang telah membentangkan kepentingan pentaksiran terbeza dan penggunaan alat pentaksiran terbeza dalam usaha memenuhi keperluan pelajar dalam pelajaran. Walaubagaimanapun, kajian-kajian tersebut tidak memberikan fokus terhadap prinsip pentaksiran terbeza dalam penggunaan alat yang menyokong pentaksiran terbeza di bilik darjah.

Oleh itu, kajian ini dijalankan untuk meneroka penggunaan alat pentaksiran terbeza, "PutraPacer" di kalangan guru sekolah rendah di Sabah. Dengan menggunakan Teori Aktiviti sebagai kerangka konseptual, kajian ini merupakan satu kajian kualitatif di mana lima orang guru sekolah rendah telah mengambil bahagian. Data telah dikutip melalui pemerhatian, temuramah dan analisis dokumen. Seterusnya, data tersebut dianalisis menggunakan pendekatan lingkaran analisis data oleh Creswell dan dua kitaran pengkodan oleh Saldaña. Hasil kajian mendapati bahawa penggunaan PutraPacer (i) dapat menggalakkan pelajar untuk menunjukkan peningkatan dalam pembelajaran, (ii) boleh merangsang pelajar untuk melibatkan diri dalam pembelajaran aktif, (iii) dapat menyokong perancangan intruksional yang berjaya, (iv) dapat dijadikan pelantar untuk pembelajaran berasaskan individu, (v) adalah mudah dan menjimatkan masa, (vi) menggalakkan pembelajaran mandiri berdasarkan masa dan tempat yang ditentukan oleh pelajar sendiri, (vii) memangkin Pendidikan 4.0. Secara amnya, hasil dapatan menunjukkan bahawa penggunaan alat pentaksiran terbeza berpotensi menangani keperluan pembelajaran setiap pelajar. Penggunaan alat pentaksiran terbeza juga

didapati relevan dengan keperluan pendidikan semasa yang kini bergerak ke arah pendigitalan, selari dengan Revolusi Perindustrian 4.0.



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This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

BYOD	Bring Your Own Device
ESL	English as a Second Language
HOTS	Higher Order Thinking Skills
ICT	Information and Communications Technology
IR 4.0	Fourth Industrial Revolution
KSSR	Primary School Curriculum Standard
MCO	Movement Control Order
PISA	Program for International Student Assessment
SBA	School-based Assessment
SOP	Standard Operating Procedure
TIMSS	International Mathematics and Science Studies
UPM	Universiti Putra Malaysia
UPSR	Primary School Achievement Test
ZPD	Zone of Proximal Development

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The growing diversity in the 21st century classrooms pose a challenge to educators whereby more appropriate teaching approaches are expected to meet the needs of diverse learners. From primary to tertiary education, classrooms are full of students from varying backgrounds, who have unique learning needs and interests (Jackson & Evans, 2017). According to Gregory and Chapman (2013), the 21st century learners are diverse in terms of personalities, backgrounds, physical characteristics, cognitive abilities, learning preferences, experiences, and social development. To enable teachers to respond to the different needs of the students proactively, differentiation needs to be integrated into instruction and assessment (Tomlinson & Moon, 2013). Moreover, differentiation in the classroom encourages students' maximum growth and individual success (Tomlinson & Allan, 2000).

To gather information about each student's individual needs in learning, the use of differentiated assessment tools is imperative. The use of differentiated assessment tools could assist in demonstrating what students' needs to know and improve their ability to grasp new strategies and skills (Chapman & King, 2011; Kaur et al., 2018). Ali (2015) stated that students need varying opportunities to show their knowledge based on what they have learned. Among differentiated assessment tools that could be employed are quizzes, portfolios, graphic organisers, multimedia presentations, games, models, exhibits and maps. While there are many tools that could be utilized to employ differentiated assessment, Chapman and King (2011) recommended that teachers use their prior experience and expertise to choose the right tools that could accommodate students' need on a more advance and consequential level.

To embrace diversity among learners in Malaysian schools, the Ministry of Education has put forward student-centered and differentiated teaching in the primary and secondary schools' curricula as one of the eleven shifts outlined in the Malaysian Education Blueprint 2013-2025 (Ministry of Education, 2013). As part of the initiative, the Ministry of Education also advocates personalized learning through the enhancement of student learning experience which is possible by leveraging technology-enabled models (Ministry of Education, 2015). These statements prove that the Ministry of Education acknowledges the need for the education system to assimilate differentiation in the classroom. It is also apparent that the Ministry of Education endorses the usage of technology to support differentiated and personalized learning.

In parallel with the changes in curriculum, educational assessment system in Malaysia has undergone a series of improvisation in recent years. These changes are driven by the

need to change the heavily examination-oriented education system and students' weak performance in international large-scale assessments such as the Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Studies (TIMSS) which indicate that Malaysian students somewhat fail to apply knowledge beyond the academic contexts (Chin et al., 2019). The revamped assessment system which is known as school-based assessment (SBA) and currently in place, puts a greater emphasis on aspects such as higher order thinking skills (HOTS), critical thinking and innovativeness, among others (Abdullah et al., 2016).

The academic component of school-based assessment comprises school assessment and centralized assessment. School assessment can be carried out in the form of summative or formative while centralized assessment refers to summative assessment that is to be conducted at the end of a particular education level, under the authority of the Malaysian Examinations Syndicate (Malaysian Examinations Syndicate, 2014). The Ministry of Education describes the formative school assessment as classroom assessment and the Malaysian Examination Syndicate requires teachers to assess students using suitable instruments other than worksheets and written assignments. This includes demonstration, project, performance, case study, field study, and practical work (Chin et al., 2019). Teachers are given the responsibility and authority to choose the type of classroom assessment to be used, when and how to conduct it, with guidance from the Performance Standard document. The Performance Standards document helps teachers in planning their lessons and in assessing students as it presents reference to determine the level of students' acquisition of various learning standards (Ministry of Education, 2019a).

In consequence of the implementation of school-based assessment, the present curriculum offers more opportunities for teachers to practice formative assessment which includes differentiated assessment. With the authority given to teachers in choosing suitable assessments for their students, teachers could explore more alternative ways of assessing students. This is consistent with Hariharasudan and Kot (2018), who believed that the generation of students nowadays should be assessed differently because conventional platforms are not sufficient and are no longer relevant. In the era of Education 4.0, a term coined in response to the needs of the Industrial Revolution 4.0 (Aziz Hussin, 2018). Fisk (2017) suggested that learning should be more personalized and there should be more opportunities for students to be an independent learner. Students should also be assessed differently by using methods that are not conventional.

Previous research on alternative assessments in Malaysia provides an insight of initiatives taken by educators to break away from the conventional methods of assessing the students and provide more personalized learning experiences. The practices include making use of different types of assessment tools. Among them are the use of instruments such as portfolios, concept maps, online games, and rubrics (Alias & Osman, 2015; Ghani et al., 2017; Singh & Abdul Samad, 2012). Meanwhile, some other research on alternative assessment focused on the use of varying instructional strategies such as oral communication, presentation, and group work as a tool (Adnan et al., 2019; Chan & Sidhu, 2010).

1.2 Problem Statement

Addressing the needs of diverse learners is one of the main concerns in the education sector. Considering that Malaysian classrooms consist of mixed-ability students, the use of differentiation instruction in the classroom was highly recommended (Lavania & Nor, 2021). Similarly, the practice of differentiated assessment was advocated to ensure that learning needs of every student in a classroom is met (Noman & Kaur, 2014). The use of tools to support differentiation assessment in Malaysian classroom have shown that teachers strived to provide the best opportunities for their students to learn according to their own capabilities. Previous studies revealed that a specific programme called Plan J was used to set out different level of tasks based on differentiated student's abilities (Ministry of Education Malaysia, 2015). There are also reports of using graphic representation, discussion, observation, portfolios, presentation, and web-based game named Kahoot! as tools to conduct differentiated assessment (Hasim et al. 2018; Kaur et al., 2018; Sukri et al., 2020). However, these studies did not emphasise on the use of these tools in regards with the principles of differentiated assessment and how they could support differentiated learning.

Other than that, previous studies have reported the use of alternative assessment tools for classroom assessment. This is an effort to reduce the practice of standardized examination and address diversity among learners (Ministry of Education, 2015; Chin et al., 2019). While previous studies have revealed that teachers have used alternative assessment tools for classroom assessment (Alias & Osman, 2015; Ghani et al., 2017; Singh & Abdul Samad, 2012), there are studies that report on teachers who are still inclined to employ standardised assessment especially in the primary level (Mohamed & Abd Aziz, 2018). Some studies suggested that regardless of the tools used, classroom assessment in the current curriculum is challenging especially when dealing with a large class that consist of students with different levels of proficiency (Ghazali, 2017; Hasim et al., 2018; Lim & Chew, 2019; Samsudin et al., 2016; Sathasivam & Daniel, 2016). Hence, standardized assessment is still preferred over alternative assessment, which is more appropriate to address learners' diversity.

Since the current curriculum advocates personalised learning and leveraging technology to improve learning outcomes (Ministry of Education, 2015), there is a need to explore the utilization of a differentiated assessment tool. Therefore, primary schools in Sabah were chosen for this study since the Sabah state government is expediting digital transformation in all sectors (Hashim, 2022). By exploring the utilization of PutraPacer as a differentiated assessment tool, insights on how PutraPacer could support differentiated learning can be drawn. Besides, this study could provide an overview on how the utilization of PutraPacer for classroom assessment is relevant in a mixed-ability primary school classroom.

1.3 Research Objectives

This study aimed to investigate how primary school teachers in Sabah utilize an assessment tool that supports differentiation. In support of the implementation of the school-based assessment in the present curriculum, this study could shed light on the use of a differentiated assessment tool as an alternative way to assess primary school students in Sabah.

The objectives of this study are to:

- i) examine the utilization of a differentiated assessment tool among primary school teachers in Sabah;
- ii) investigate how a differentiated assessment tool supports differentiated learning and differentiated assessment in primary schools in Sabah;
- iii) explore how Sabah's primary school teachers perceive the application of a differentiated assessment tool for classroom assessment.

1.4 Research Questions

The research will be conducted to find out answers to these research questions:

- i) How do primary school teachers in Sabah utilize a differentiated assessment tool?
- ii) In what ways does a differentiated assessment tool support differentiated learning and differentiated assessment in primary schools in Sabah?
- iii) How do primary school teachers in Sabah perceive the application of a differentiated assessment tool for classroom assessment?

1.5 Significance of Study

This study could contribute to research and literature on differentiated assessment, a branch of alternative assessment that has not been explored in-depth especially in the context of Malaysian primary education. Besides that, this study could gain understandings of teachers' interpretation, knowledge, and application of differentiated assessment practice. This information could enrich the practice of alternative assessment among primary school teachers by offering another method of conducting an assessment that can address learners' diversity. Besides, the findings of this study could reveal how differentiated assessment fits in the new curriculum. With this information, teachers will have the confidence to carry out differentiated assessment as part of the classroom assessment. Other than that, the use of a differentiated assessment tool like PutraPacer, which is used in this study, could help lighten teachers' burden in a way that marking is done automatically, and students' results could be retrieved quickly. In addition, by using

PutraPacer for differentiated assessment, teachers could know at which level of proficiency their students are and with that information, proactive measures could be taken to improve the students' performance. For example, teachers could devise remedial tasks or enrichment activities according to the outcome of the differentiated assessment. On this account, this tool could be of significant help to teachers when assessing a large class with diverse learners.

This study will also benefit students whereby using differentiated assessment tool, students could have a more personalized learning experience. Students could learn anywhere, at any time and at their own pace. Personalized and self-paced learning are among the shifts in learning experience needed in the Education 4.0 initiative (World Economic Forum, 2020a). At the same time, with the ubiquity of web-based assessments, parents can easily check on their children's work and achievement through PutraPacer.

By acknowledging how teachers perceive the application of a differentiated assessment tool, the benefits, and barriers in its implementation among others, the Ministry of Education could recognize the need to support teachers in conducting assessment that is aligned with the school-based assessment policy. Apart from giving support in terms of training to improve teachers' competencies and skills, with the feedbacks from the teachers, the Ministry of Education could reinforce the practice of school-based assessment through the improved design of the current assessment system. The use of a web-based tool for differentiated assessment indirectly supports the Ministry of Education agenda to achieve a technology-driven society as advocated in Education 2030 Framework for Action (UNESCO, 2015). Finally, this study could also enlighten the stakeholders like policymakers, school leaders and parents about academic diversity and the different ways of assessing students. By knowing the importance and benefits of differentiated assessments, the stakeholders could support teachers in their efforts to practice differentiated assessments. Facilitating the teachers with sufficient teaching resources and creating ideal environments are among the ways that could result in a smoother and effective execution of differentiated assessments.

1.6 Scope and Limitation of Study

The scope of this study comprises teachers from two primary schools in Sabah. The teachers had employed differentiated assessment in their respective class using a web-based tool named PutraPacer. This study includes a preliminary stage where the teachers participated in a training session and were given personal guidance on how to use PutraPacer for differentiated assessment. This was followed by the process of creating test questions and finally conducting the assessment online. The findings of this study are based on the responses of five teachers and their respective students. Because this study is qualitative in nature and does not aim for generalization, the findings of this study can therefore only be applied to schools with almost similar characteristics. Nevertheless, the findings could provide insights on the employment of differentiated assessment in primary schools in Malaysia and that could further facilitate the successful implementation of school-based assessment.

Another limitation of this study was the nature of the observation made at the participating schools. In response to the Covid-19 pandemic crisis, schools in Malaysia have been adapting a new norm. A strict Covid-19 standard operating procedure (SOP) has been imposed at all schools nationwide. At the time of the study, not only did the school hours become shorter, but school visits were also restricted to communal areas like the administration office, staff room and school compound. Therefore, I could not observe how the teachers carried out blended learning activities in the classroom that was based on the utilization of differentiated assessment tool. Instead, the invaluable experience was shared by the teachers during the interviews.

1.7 Definition of Terms

The followings are the definitions of key terms used in the study:

i) Assessment

In the education context, assessment is defined as a process of collecting and discussing information from a variety of sources to develop an understanding of what students know, understand, and can do with their knowledge as a result of the educational experiences (Huba & Freed, 2000). The process involved in an assessment includes measuring students' achievement, defining students' performance, summarizing what students can do, and concluding what students could do (Nasri et al., 2010).

In this study, assessment refers to the process of gathering and reviewing information on what students know, understand, and can do, based on what they have learned through a differentiated assessment tool named PutraPacer. This process is bounded within the framework of the school-based assessment, a holistic form of assessment that is being implemented in the current Primary School Curriculum Standard.

ii) Differentiated assessment

The Education Standards Authority (2019) defined differentiated assessment as a type of assessment where teachers adjust and modify assessment activities for students by accommodating their different learning needs, and various learning styles and preferences. Differences between individual students such as current level of understanding and ability, prior learning experience, engagement and motivation towards learning, interests, and talents may be taken into consideration in differentiated assessment (Education Standards Authority, 2019).

In the context of this study, differentiated assessment refers to different levels of test questions that are conducted using a tool called PutraPacer. The employment of differentiated assessment provides opportunities for students to self-check their ability and complete an assessment based on their actual ability (Md. Khambari et al., 2021).

iii) Differentiated assessment tool

In general, assessment tools are defined as techniques or instruments that are used with the purpose of collecting data for several reasons such as skill acquisition of the student, evaluating and measuring the outcomes in terms of learning process, and educational needs (SerdarAsan & Işıklı, 2020). Differentiated assessment tools are assessment tools used to gather information about students' individual and unique needs. Their needs could be based on their i) knowledge base, ii) motivation, iii) emotions and desires, iv) multiple intelligences, v) prior experiences and background, vi) attitude towards the topic or subject, v) learning styles and modalities, and vi) abilities, interests and talents. Choosing the right differentiated assessment tools could provide a comprehensive picture of students' needs. The results obtained from employing differentiated assessment tools are used to “strategically tailor instructional plans, provide students with multiple ways to show their learning, keep them on the right track, and accelerate their learning journeys” (Chapman & King, 2011, p. 2).

In this study PutraPacer was used as a differentiated assessment tool. It is a web application developed by a group of researchers from the Faculty of Educational Studies and Faculty of Computer Sciences and Information Technology of Universiti Putra Malaysia, Malaysia. As PutraPacer is a web-based system, the implementation of differentiated assessment is faster than the traditional method of conducting differentiated assessment. PutraPacer provides differentiation and produces digital outputs which are important for data-driven decision.

Putrapacer is a universal assessment tool since it is customizable and can be used by anyone. To publish a set of questions, facilitators could simply fill in templates on PutraPacer based on the instructions provided in the training module. This smart system also offers choices for facilitators to create questions with different levels of difficulty, set time limit, include learning tips, and give students the opportunity to review and correct their answers. Besides that, PutraPacer can be used as a platform to allow students demonstrate what they know and understand. This can be done by uploading their answers in the forms of video and audio recording as well as in drawings (Md. Khambari et al., 2021).

iv) Utilization

In education technology, utilization refers to the use of technology in the teaching and learning practices for the purpose of enhancing students' performance (Ali et al., 2013; Mohamad, 2014). According to Azlim et al. (2015), the educational technology can be utilized from the planning phase until the assessment phase of a teaching and learning process. In this study, utilization refers to the effective use of PutraPacer to support differentiated learning and differentiated assessment among primary school students in Sabah.

v) Perception

Ward et al. (2015) concluded that ‘perception’ can be defined as one’s interpretation process about the world around him/her which can shape his/her mental representation of the environment. In this study, the participants’ perceptions about the application of a differentiated assessment tool for classroom assessment reflects their interpretation on the advantages and challenges of using PutraPacer for classroom assessment. Their perceptions were based on their understanding and experience in using PutraPacer.

1.8 Summary

The aim of this research is to explore the utilization of a differentiated assessment tool among primary school teachers in Sabah. This aim is driven by issues in the current assessment practices in schools in Malaysia where traditional assessment is still widely practiced although it is not the best approach to address diversity in learners especially in a large class size. While the current assessment system could curb the issue, teachers still find it challenging to implement school-based assessment as they have insufficient training, knowledge, and skills in deciding assessment method, preparing assessment tasks, and carrying out formative assessment. By exploring the utilization of a differentiated assessment tool among primary school teachers especially in Sabah, teachers could learn that formative assessment can be done in many other ways, and one of it is through differentiated assessment. This study can also promote differentiated learning through differentiated assessment, which is viewed as crucial in the 21st century diverse classroom. The next chapter will discuss more on past literature related to the current assessment practice in primary schools in Malaysia including the issues and challenges, and on differentiated assessment and its advantages.

REFERENCES

- Abdul Aziz, M.N, Mohd Yusoff, N., & Mohd Yaakob, M.F. (2020). Challenges in using authentic assessment in 21st century ESL classrooms. *International Journal of Evaluation and Research in Education*, 9(3), 759-768. <http://doi.org/10.11591/ijere.v9i3.20546>
- Abdul Halim, M. S. A., Hashim, H., & Yunus, M. M. (2020). Students' Motivation and Perceptions on ESL Lessons through Online Quiz-Games. *Journal of Education and E-Learning Research*, 7(3), 229-234. <https://doi.org/10.20448/journal.509.2020.73.229.234>
- Abdullah, A. T., Zain, M. Z. M., Nair, S. G., Abdullah, R., & Ismail, I. (2016). PISA: Malaysia's wake up call for a more balanced approach to educational delivery and attainment. In M.T. Lei, N.A. Razak, J.P. Keeves & I.G.N. Darmawan (Eds.), *What Can PISA 2012 Data Tell Us?* (pp. 1-15). Sense Publishers.
- Abdullah, N., Idris, N., Hamzah, M. S. G., & Sembak, S. (2015). Planning and implementation of school-based assessment (SBA) among teachers. *Procedia-Social and Behavioral Sciences*, 211, 247-254. <https://doi.org/10.1016/j.sbspro.2015.11.031>
- Adamson, B. (2014). Embedding assessment for learning. In R. Berry & B. Adamson (Eds.), *Assessment reform in education: Policy and practice* (pp. 197-204). Springer.
- Adnan, N.L., Mohd Sallem, N.R., Muda, R., & Wan Abdullah, W. K. (2019). Is current formative assessment still relevant in turning students into deep learners? *TEM Journal*, 8(1), 298–304. <https://doi.org/10.18421/TEM81-41>
- Agar, M. H. (1980). *The professional stranger: An informal introduction to ethnography*. Academic Press.
- Aggrey, E., Kuo, R., Chang, M., & Kinshuk. (2017). Online Test System to Reduce Teachers' Workload for Item and Test Preparation. In Popescu E. et al. (Eds.), *Innovations in Smart Learning. Lecture Notes in Educational Technology* (pp. 215-219). Springer. https://doi.org/10.1007/978-981-10-2419-1_29
- Aguayo, C. (2016). Activity theory and online community education for sustainability: When systems meet reality. In D. S. P. Gedera & P. J. Williams (Eds.), *Activity Theory in Education* (pp.139–151). Sense Publishers.
- AlHashmi, B., & Elyas, T. (2018). Investigating the effect of differentiated instruction in light of the Ehrman & Leaver construct on grammar learning. *Arab World English Journal*, 9 (3), 145-162.
- Ali, H. I. H. (2015). Toward differentiated assessment in a public college in Oman. *English Language Teaching*, 8(12), 27. <https://doi.org/10.5539/elt.v8n12p27>

- Ali, G., Haolader, F.A., & Muhammad, K. (2013). The Role of ICT to Make Teaching-Learning Effective in Higher Institutions of Learning in Uganda. *International Journal of Innovative Research in Science, Engineering and Technology*, 2(8), 4061–4073.
- Alias, A., & Osman, K. (2015). Assessing oral communication skills in Science: A rubric development. *Asia Pacific Journal of Educators and Education*, 30, 107-122. Retrieved from [http://eprints.usm.my/34769/1/APJEE_30_Art_7_\(105_-_122\).pdf](http://eprints.usm.my/34769/1/APJEE_30_Art_7_(105_-_122).pdf)
- Alruwais, N., Wills, G., & Wald, M. (2018). Advantages and challenges of using e-assessment. *International Journal of Information and Education Technology*, 8(1), 34-37. <https://doi.org/10.18178/ijiet.2018.8.1.1008>
- Arumugham, K.S. (2019). Teachers' understanding towards portfolio assessment: A case study among Malaysian primary school teachers. *Problems of Education in the 21st Century*, 77(6), 695-704. <https://doi.org/10.33225/pec/19.77.695>
- Aziz Hussin, A. (2018). Education 4.0 Made Simple: Ideas For Teaching. *International Journal of Education and Literacy Studies*, 6(3), 92. <https://doi.org/10.7575/aiac.ijels.v.6n.3p.92>
- Azlim, M., Amran, M., & Rusli, M. R. (2015). Utilization of educational technology to enhance teaching practices: Case study of community college in Malaysia. *Procedia-Social and Behavioral Sciences*, 195, 1793-1797.
- Bazeley, P. (2013). *Qualitative data analysis: Practical strategies*. Sage.
- Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, 5(1), 7-74. <https://doi.org/10.1080/0969595980050102>
- Blackwell, L. S., Trzensniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development*, 78, 246–263.
- Bourke, R., & McGee, A. (2012). The challenge of change: Using activity theory to understand a cultural innovation. *Journal of Educational change*, 13(2), 217-233.
- Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative research journal*, 9(2), 27-40.
- Bowyer, J., & Chambers, L. (2017). Evaluating blended learning: Bringing the elements together. *Research Matters: A Cambridge Assessment Publication*, 23, 17-26.
- Brimjoin, K. (2005). Differentiation and high-stakes testing: An oxymoron? *Theory Into Practice*, 44(3), 254-261. https://doi.org/10.1207/s15430421tip4403_10

- Bromley, M. (2019, April 10). *Strategies for effective differentiation in your classroom: Part 1*. SecEd. <https://www.sec-ed.co.uk/knowledge-bank/strategies-for-effective-differentiation-in-your-classroom-part-1/>
- Brown, G. (2004). Teachers' conceptions of assessment: Implications for policy and professional development. *Assessment in Education: Policy, Principles and Practice*, 11(3), 301-318.
- Brown, S., Race, P., & Smith, B. (2005). *500 Tips on Assessment*. London: Routledge.
- Buhagiar, M. A. (2007). Classroom assessment within the alternative assessment paradigm: revisiting the territory. *The Curriculum Journal*, 18(1), 39-56. <https://doi.org/10.1080/09585170701292174>
- Butler, R. (1995). Motivational informational functions and consequences of children's attention to peers' work. *Journal of Educational Psychology*, 87, 347-360.
- Campbell, D. (2000). Authentic assessment and authentic standards. *Phi Delta Kappan*, 81(5), 405.
- Chaiklin, S. (2003). The zone of proximal development in Vygotsky's theory of learning and school instruction. In A. Kozulin, B. Gindis, V. S. Ageyev, & S. M. Miller (Eds.), *Vygotsky's educational theory in cultural context* (pp. 39-64). Cambridge University Press.
- Chan, Y. F., & Sidhu, G. K. (2010). Authentic assessment and pedagogical strategies in higher education. *Journal of Social Sciences*, 6(2), 153-161. <https://doi.org/10.3844/jssp.2010.153.161>
- Chan, T. W., Looi, C. K., Chen, W., Wong, L. H., Chang, B., Liao, C. C. Y., Cheng, H., Chen, Z. H., Liu, C.C., Kong, S.C., Jeong, H., Mason, J., So, H. J., Murthy, S., Yu, F. Y., Wong, S.L., King, R. B., Gu, X., Wang, M., ... Ogata, H. (2018). Interest-driven creator theory: towards a theory of learning design for Asia in the twenty-first century. *Journal of Computers in Education*, 5, 435-461. <https://doi.org/10.1007/s40692-018-0122-0>
- Chapman, C., & King, R. (2011). *Differentiated assessment strategies: One tool doesn't fit all*. Sage.
- Charmaz, K. (2014). *Constructing grounded theory (2nd ed.)*. Sage.
- Chenail, R.J. (2011). Interviewing the Investigator: strategies for addressing instrumentation and researcher bias concerns in qualitative research. *The Qualitative Report* 16(1), 255-262.
- Chiam, C.C., & Tan, J.J.H. (2019). Higher Education 4.0: The possibilities and challenges. *Journal of Social Sciences and Humanities*, 5(2), 81-85. <http://www.aiscience.org/journal/jssh>

- Chin, H., Thien, L. M., & Chew, C. M. (2019). The reforms of national assessments in Malaysian education system. *Journal of Nusantara Studies*, 4(1), 93–111. <http://dx.doi.org/10.24200/jonus.vol4iss1pp93-111>
- Cirit, N.C. (2014). *Perceptions of ELT pre-service teachers toward alternative assessment via Web 2.0 tools: A case study at a Turkish state university*. [Unpublished master dissertation, Middle East Technical University]. <http://etd.lib.metu.edu.tr/upload/12617638/index.pdf>.
- Cooper, J. T., Hirn, R. G., & Scott, T. M. (2015) Teacher as change agent: Considering instructional practice to prevent student failure, preventing school failure. *Alternative Education for Children and Youth*, 59(1),1-4.
- Creswell, J.W. (2012). *Educational research : planning, conducting, and evaluating quantitative and qualitative research (4th ed.)*. Pearson Education, Inc.
- Creswell, J.W., & Poth, C.N. (2018). *Qualitative inquiry & research design: Choosing among five approaches (Fourth edition)*. Sage.
- Cridland, E.K., Jones, S.C., Caputi, P., & Magee, C.A. (2015). Qualitative research with families living with autism spectrum disorder: recommendations for conducting semistructured interviews. *Journal of Intellectual & Developmental Disability* 40(1), 78–91. <https://doi.org/10.3109/13668250.2014.964191>
- Cross, P. K. (1998). Classroom research: Implementing the scholarship of teaching. *New Directions for Teaching and Learning*, 75, 5-12.
- Davis, B. G. (2009). *Tools for teaching*. John Wiley & Sons.
- Department of Statistics. (2019). *Laporan Sosioekonomi Negeri Sabah 2019*. https://www.dosm.gov.my/v1/uploads/files/1_Articles_By_Themes/National%20Accounts/GDPbyState/2020/Laporan_Sosioekonomi_Sabah_2019.pdf
- Diwan, P. (2017, August 6). *Is Education 4.0 an imperative for success of 4th Industrial Revolution?* Medium. <https://pdiwan.medium.com/is-education-4-0-an-imperative-for-success-of-4th-industrial-revolution-50c31451e8a4>
- Dreer, B., Dietrich, J., & Kracke, B. (2017). From in-service teacher development to school improvement: factors of learning transfer in teacher education. *Teacher Development*, 21(2), 208-224.
- Eames, C. (2016). Exploring teacher pedagogical content knowledge (PCK) development using CoRes (Content Representations). In D. S. P. Gedera & P. J. Williams (Eds.), *Activity Theory in Education* (pp.169-181). Sense Publishers.
- Education Standards Authority. (2019). *Differentiated Assessment*. <https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/understanding-the-curriculum/assessment/differentiated-assessment>

- Emerson, R. M., Fretz, R. I., & Shaw, L. L. (2011). *Writing ethnographic fieldnotes (2nd ed.)*. University of Chicago Press.
- Engeström, Y. (2001). *Expansive learning at work: Toward an activity theoretical reconceptualization*. *Journal of Education and Work*, 14(1), 133–156. <https://doi.org/10.1080/13639080020028747>.
- Fisk, P. (2017). *Education 4.0 ... the future of learning will be dramatically different, in school and throughout life*. Gamechangers. <https://www.thegeniusworks.com/2017/01/future-education-young-everyone-taught-together/>
- Fleer, M. 2010. *Early learning and development – Cultural-Historical concepts in play*. Cambridge: University Press.
- Fraenkel, J. R., Wallen, N. E., & Hyun, H.H. (2012). *How to design and evaluate research in education (8th ed.)*. The McGraw-Hill Companies, Inc.
- Garba, S. A., Byabazaire, Y., & Busthami, A. H. (2015). Toward the use of 21st century teaching-learning approaches: The trend of development in Malaysian schools within the context of Asia Pacific. *International Journal of Emerging Technologies in Learning*, 10(4).
- García, G. E., & Pearson, P. D. (1994). Chapter 8: Assessment and diversity. *Review of Research in Education*, 20(1), 337–391. <https://doi.org/10.3102/0091732X020001337>
- Garrison, D.R., & Kanuka, H. (2004). Blended learning: uncovering its transformative potential in higher education. *The Internet and Higher Education*, 7(2), 95–105. <https://doi.org/10.1016/j.iheduc.2004.02.001>
- Ghani, I. B. A., Ibrahim, N. H., Yahaya, N. A., & Surif, J. (2017). Enhancing students' HOTS in laboratory educational activity by using concept map as an alternative assessment tool. *Chemistry Education Research and Practice*, 18(4), 849–874. <https://doi.org/10.1039/c7rp00120g>
- Ghazali, N. H. C. M. (2017). The implementation of School-Based Assessment system in Malaysia: A study of teacher perceptions. *Geografia-Malaysian Journal of Society and Space*, 12(9).
- Gregory, G. H., & Chapman, C. (2013). *Differentiated instructional strategies: One size doesn't fit all (3rd.)*. Corwin Press.
- Hallinger, P., & Lu, J. (2014). Modelling the effects of principal leadership and school capacity on teacher professional learning in Hong Kong primary schools. *School Leadership & Management*, 34(5), 481-501.

- Hariharasudan, A., & Kot, S. (2018). A scoping review on Digital English and Education 4.0 for Industry 4.0. *Social Sciences*, 7(11), 227. <https://doi.org/10.3390/socsci7110227>
- Hashim, M.I. (2022, January 30). *Leading Sabah's Digital Transformation*. Daily Express. <https://ksti.sabah.gov.my/ms/news/daily-express-leading-sabahs-digital-transformation>
- Hasim, Z., Di, S., & Barnard, R. (2018). Eliciting teachers' understanding and their reported practices on school-based formative assessment: *Methodological challenges*. *Indonesian Journal off Applied Linguistics*, 8(1), 158-166. <http://ejournal.upi.edu/index.php/IJAL/article/view/11476>
- Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyzes relating to achievement. New York, NY: Routledge. Hattie, J., & Timperley, H. (2007). *The power of feedback*. *Review of Educational Research*, 77, 81–112. <https://doi.10.3102%2F003465430298487>.
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77, 81–112. <https://doi.org/10.3102%2F003465430298487>
- Hoogland, K., & Tout, D. (2018). Computer-based assessment of mathematics into the twenty-first century: pressures and tensions. *ZDM: The International Journal on Mathematics Education*, 50(4), 675-686. <https://doi.org/10.1007/s11858-018-0944-2>
- Huba, M. E., & Freed, J. E. (2000). *Learner-centered assessment on college campuses: Shifting the focus from teaching to learning*. Allyn and Bacon.
- Ismail, M. I. H., & Aziz, A. B. A. (2019). TS25 Schoolteachers' perceptions of differentiated learning in diverse ESL classrooms. *Journal of Education and Social Sciences*, 13(1), 95-107
- Jackson, N., & Evans, L. (2017). Self-reflections on differentiation: Understanding how we teach in higher education. *Networks: An Online Journal for Teacher Research*, 19(1), Article 5. <https://files.eric.ed.gov/fulltext/EJ1152402.pdf>
- Jamian, R., Zainal Abidin, N. H., & Arsad, R. (2020). Analisis deskriptif bagi penggunaan aplikasi Quizizz ke atas guru dalam penilaian prestasi murid bagi subjek matematik. *Mathematical Sciences and Informatics Journal (MIJ)*, 1(2), 87-97.
- John, M. (2018). *Assessment Reform in Malaysia: Policy into Practice in Primary Schools*. [Doctoral dissertation, University of Stirling]. STORRE: Stirling Online Research Repository. <http://hdl.handle.net/1893/29915>
- John-Steiner, V., & Mahn, H. (1996). Sociocultural approaches to learning and development: A Vygotskian framework. *Educational Psychologist*, 31, 191–206.

- Kaur, A., Noman, M., & Awang-Hashim, R. (2018). Exploring and evaluating differentiated assessment practices of in-service teachers for components of differentiation. *Teaching Education*, 30(2), 160–176. <https://doi.org/10.1080/10476210.2018.1455084>
- Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of advanced nursing*, 72(12), 2954–2965.
- Khalil, F. A., & Awang, M. I. (2016). Isu kesediaan guru dalam amalan melaksanakan Pentaksiran Berasaskan Sekolah. *Journal of Social Science*, 2, 1-7.
- Kibar, P. N., Gündüz, A. Y., & Akkoyunlu, B. (2019). Implementing bring your own device (BYOD) model in flipped learning: Advantages and challenges. *Technology, Knowledge and Learning*, 25, 465–478. <https://doi.org/10.1007/s10758-019-09427-4>
- Krauss, S.E., Hamzah, A., Omar, Z., Suandi, T., Ismail I.A., & Zahari, M.Z. (2009). Preliminary investigation and interview guide development for studying how Malaysian farmers form their mental models of farming. *The Qualitative Report* 14(2), 245–260.
- Lai, C.L., & Hwang, G.J. (2016). A self-regulated flipped classroom approach to improving students' learning performance in a mathematics course. *Computers & Education*, 100, 126–140. <https://doi.org/10.1016/j.compedu.2016.05.006>
- Lavania, M., & Nor, F. M. (2021). Factors influencing the implementation of differentiated instruction in English language instruction in rural and urban secondary schools of Johor Bahru. *Creative Education*, 12, 1235–1246. <https://doi.org/10.4236/ce.2021.126093>
- Lawrence, R., Ching, L. F., & Abdullah, H. (2019). Strengths and weaknesses of Education 4.0 in the higher education institution. *International Journal of Innovative Technology and Exploring Engineering*, 9 (2S3), 511–519. <https://doi.org/10.35940/ijitee.b1122.1292s319>
- Leithwood, K., & Sun, J. (2012). The nature and effects of transformational school leadership: A meta-analytic review of unpublished research. *Educational Administration Quarterly*, 48(3), 387–423.
- Letina, A. (2015). Primjena tradicionalnih i alternativnih oblika vrednovanja učeničkih postignuća u nastavi prirode i društva. [Application of traditional and alternative assessment in science and social studies teaching]. *Croatian Journal of Education*, 17(1), 137–152. <https://doi.org/10.15516/cje.v17i0.1496>
- Li, J. (2016). The interactions between emotion, cognition, and action in the activity of assessing undergraduates' written work. In D. S. P. Gedera & P. J. Williams (Eds.), *Activity Theory in Education* (pp.107-119). Sense Publishers.

- Lim, C.S., & Chew, C.M. (2019). Implementation of School-Based Assessment (SBA) in Malaysian primary Mathematics curriculum: Issues and challenges. In: Vistro-Yu, C. & Toh, T. (Eds.), *School Mathematics Curricula. Mathematics Education – An Asian Perspective* (pp. 189-205). Springer. https://doi.org/10.1007/978-981-13-6312-2_10
- Lim, T. M. B. A., Wong, D. L. Z., & Md Yunus, M. (2020). Enhancing year four primary students' sentence construction skills using Powerpuzz with Quizizz. In S. S. Ibrahim, & M. Ahmad (Eds.), *Changing lives in brilliant ways* (pp. 1-8). MNMF Publisher. <http://www.mnfpublisher.com/changing-lives-in-brilliant-ways-series-2.html>
- Lin, J. W., & Lai, Y. C. (2019). User acceptance model of computer-based assessment: moderating effect and intention-behaviour effect. *Australasian Journal of Educational Technology*, 35(1).
- Loh, C. Y. R., & Teo, T. C. (2017). Understanding Asian students learning styles, cultural influence and learning strategies. *Journal of Education & Social Policy*, 7(1), 194-210.
- Malaysian Examination Syndicate. (2014). *Surat pekeliling Lembaga Peperiksaan bil.1/2014: Penambahbaikan pentaksiran berasaskan sekolah (PBS)* [Examination Syndicate circular no.1/2014: Refinement of school-based assessment (SBA)] (Ref. No: KP.LP.003.07.12(81))
- Maxwell, J. A. (2013). *Qualitative research design: An interactive approach (3rd ed.)*. Sage.
- Md. Khambari, M. N., Wong, S. L., Mohd Norowi, N., Rahmat, R.W.O.K, Jantan, A.H., Tengku Kamaldeen, T.F., & Majuddin, C. (2021). PutraPacer: Alat “Penaksiran Terbeza” (Differentiated assessment) bagi pembelajaran dengan pelajar pelbagai keupayaan. In M.Z. Abdul Rani & N.A. Man (Eds.), *Penyelidikan dan inovasi dalam pengajaran dan pembelajaran* (pp.106-110). Pusat Pembangunan Akademik (CADE), Universiti Putra Malaysia.
- Merriam, S.B., & Tisdell, E.J. (2016). *Qualitative research: A guide to design and implementation*. Jossey-Bass.
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A sourcebook of new methods* (3rd ed.). Sage.
- Ministry of Education. (2013). *Malaysia Education Blueprint 2013-2025 (Preschool to post-secondary education)*. Ministry of Education Malaysia.
- Ministry of Education. (2015). *Malaysia Education Blueprint 2015-2025: Higher Education*. Kementerian Pendidikan Malaysia.

- Ministry of Education. (2018). *Garis panduan pelaksanaan dasar murid membawa peranti peribadi ke sekolah Kementerian Pendidikan Malaysia* [Guidelines for the implementation of policy on students bringing own device to schools under the Ministry of Education] (Ref. No: KPM.100-1/7/2 Jld. 5(3)
- Ministry of Education. (2019a). *Pentaksiran Bilik Darjah (PBD)*. <https://www.moe.gov.my/en/soalan-lazim-menu/kurikulum/kurikulum>
- Ministry of Education. (2019b). *Pelaporan Pentaksiran Sekolah Rendah*. <https://www.moe.gov.my/en/muat-turun/laporan-dan-statistik/lp/3056-pelaporan-pentaksiran-sekolah-rendah-2019/file>
- Mohamad, S. N. M. (2014). *Model for Online Teaching Tools Based on Interpersonal, Visual and Verbal Intelligence*. Universiti Teknikal Malaysia Melaka.
- Mohamed, M., & Abd Aziz, M. S. (2018). Juxtaposing the primary school assessment concepts and practices in Singapore and Malaysia. *International Journal of Engineering & Technology*, 7(3.21), 552-556.
- Mohd Jalani, N. A., & Hashim, H. (2020). Quizziz: ESL perceptions in rural school. *International Journal of Scientific and Research Publications*, 10(3), 23-27. <http://dx.doi.org/10.29322/IJSRP.10.03.2020.p9904>
- Moon, R. T., Brighton, C. M., & Tomlinson, C. A. (2020). *Using Differentiated Classroom Assessment to Enhance Student Learning* [eBook edition]. Routledge.
- Mudin, V.F. (2019). *An Investigation into English Teachers' Understandings and Practices of Formative Assessment in the Malaysian Primary ESL Classroom: Three Case Studies*. [Doctoral dissertation, University of East Anglia]. <https://core.ac.uk/download/pdf/328760633.pdf>
- Mwalongo, A. I. (2016). Using Activity Theory to understand student teacher perceptions of effective ways for promoting critical thinking through asynchronous discussion forums. In D. S. P. Gedera & P. J. Williams (Eds.), *Activity Theory in Education* (pp.19-34). Sense Publishers.
- Mwanza, D. (2001). Changing Tools, Changing Attitudes: Effects of introducing an CSCL system to promote learning at work. In *First European Conference on Computer-Supported Collaborative Learning*. March (pp. 22-24).
- Nasab, F.G. (2015). Alternative versus traditional assessment. *Journal of Applied Linguistics and Language Research*, 2(6), 165-178.
- Nasri, N., Roslan, S. N., Sekuan, M. I., Bakar, K. A., & Puteh, S. N. (2010). Teachers' perception on alternative assessment. *Procedia - Social and Behavioral Sciences*, 7(C), 37-42. <https://doi.org/10.1016/j.sbspro.2010.10.006>

- Newstead, S. E., & Findlay, K. (1997). Some problems with using examination performance as a measure of teaching ability. *Psychology Teaching Review*, 6, 23-30.
- Ng, B. (2018). The neuroscience of growth mindset and intrinsic motivation. *Brain Sciences*, 8(2). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5836039/>
- Noble, H., & Smith, J. (2015). Issues of validity and reliability in qualitative research. *Evidence-based nursing*, 18(2), 34-35.
- Noman, M., & Kaur, A. (2014). Differentiated assessment: a new paradigm in assessment practices for diverse learners. *International Journal of Education and Applied Sciences*, 1(4), 167-174.
- Patton, M.Q. (2015). *Qualitative research & evaluation methods: integrating theory and practice (4th ed.)*. SAGE Publications, Inc.
- Penuel, W. R., & Shepard, L. A. (2016). Assessment and teaching. In D. H. Gitomer & C. A. Bell (Eds.), *Handbook of research on teaching* (pp. 787-850). AERA.
- Pike, K. L. (1954). *Language in relation to a unified theory of the structure of human behavior: Volume 1*. Summer Institute of Linguistics.
- Popham, W. J. (2007). All about accountability / The lowdown on learning progressions. *Educational Leadership*, 64, 83-84.
- Postholm, M. B. (2015). Methodologies in Cultural-Historical Activity Theory: The example of school-based development. *Educational Research*, 57(1), 43-58.
- Prime Minister's Department. (2021). Malaysian Digital Economy Blueprint. <https://www.epu.gov.my/sites/default/files/2021-02/malaysia-digital-economy-blueprint.pdf>
- Ridgway, J., McCusker, S., & Pead, D. (2004). *Literature review of e-assessment*. Futurelab.
- Robinson, J., Myran, S., Strauss, R. & Reed, E. (2014). *The impact of an alternative professional development model on teacher practices in formative assessment and student learning*. *Teacher Development*, 18(2), 141-162.
- Roediger III, H. L., Putnam, A. L., & Smith, M. A. (2011). Ten benefits of testing and their applications to educational practice. *Psychology of Learning and Motivation*, 55, 1-36. <https://doi.org/10.1016/B978-0-12-387691-1.00001-6>
- Ryan, A., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal*, 38, 437-460. <http://doi.10.3102%2F00028312038002437>.

- Saldaña, J. (2009). *The coding manual for qualitative researchers*. SAGE.
- Sardareh, S.A. (2016). Formative feedback in a Malaysian primary school ESL context. *The Malaysian Online Journal of Educational Science*, 4(1), 1-8. <https://files.eric.ed.gov/fulltext/EJ1088642.pdf>
- Samsudin N., Rengasamy P., Jizat J.E.M., Jalil N.A., & Wahid H.A. (2016). Teachers' readiness, understanding, and workload in implementing school-based assessment. In: Spector J., Ifenthaler D., Sampson D. & Isaias P. (Eds.), *Competencies in Teaching, Learning and Educational Leadership in the Digital Age* (pp. 137-148). Springer. https://doi.org/10.1007/978-3-319-30295-9_8
- Sangmeister, J. (2017). Commercial competence: Comparing test results of paper-and-pencil versus computer-based assessments. *Empirical Research in Vocational Education and Training*, 9(1), 1-19.
- Sathasivam, R.V., & Daniel, E.G.S. (2016). Tale of two science teachers' formative assessment practices in a similar school environment. *Asia-Pacific Forum on Science Learning and Teaching*, 17(2), Article 12.
- SerdarAsan, Ş., & Işıklı, E. (Eds.). (2020). *Engineering education trends in the digital era*. IGI Global.
- Sidhu, G.K., Kaur, S. & Lee, J.C. (2018). CEFR-aligned school-based assessment in the Malaysian primary ESL classroom. *Indonesian Journal of Applied Linguistics*, 8(2), 452-463. <http://ejournal.upi.edu/index.php/IJAL/article/view/13311>
- Siegle, D., McCoach, D. B., & Roberts, A. (2017). Why I believe I achieve determines whether I achieve. *High Ability Studies*, 28, 59-72. <https://doi.10.1080/13598139.2017.1302873>.
- Singh, C.K.S., & Abdul Samad, A. (2012). The use of portfolio as an assessment tool in the Malaysian L2 classroom. *International Journal of English Language Education*, 1(1), 94-108. <https://doi.org/10.5296/ijelev.v1i1.2851>
- Singh, C.K.S., Rengasamy, K., Singh, T.S.M., Ong, E.T., Md Yunus, M., Rahmayanti, H., & Ichsan, I.Z. (2020). a review of research on the effectiveness of using Kahoot! to enhance students' motivation to learn English. *Palarch's Journal Of Archaeology Of Egypt/Egyptology*, 17(6).
- Song, Y., & Wen, Y. (2017). Integrating various apps on BYOD (Bring Your Own Device) into seamless inquiry-based learning to enhance primary students' Science learning. *J Sci Educ Technol*, 27, 165-176. <https://doi.org/10.1007/s10956-017-9715-z>
- Smith, T., Brumskill, R., Johnson, A., & Zimmer, T. (2018). The impact of teacher language on students' mindsets and statistics performance. *Social Psychology of Education*, 21, 775-786. <https://doi.10.1007/s11218-018-9444-z>.

- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory (2nd ed.)*. Sage.
- Sukri, S. I. A., Yunus, M. M., Sevakumaran, D., Rajeswari Chandara Kumaran, N. M., & Badusah, J. (2020). Kahoot! Does Wonders: English Articles. *International Journal of Academic Research in Progressive Education And Development*, 9(1), 360–371. <http://dx.doi.org/10.6007/IJARPED/v9-i1/7166>
- Suja, K. (2020). Ubiquitous mode of learning: The need of the hour. *International Journal of Development Research*, 10(7), 38592-38594. <https://doi.org/10.37118/ijdr.19490.07.2020>
- Suprayogi, M. N., Valcke, M., & Godwin, R. (2017). Teachers and their implementation of differentiated instruction in the classroom. *Teaching and Teacher Education*, 67, 291–301. <https://doi.org/10.1016/j.tate.2017.06.020>
- Thai, N. T. T., De Wever, B., & Valcke, M. (2020). Feedback: an important key in the online environment of a flipped classroom setting. *Interactive Learning Environments*, 1-14.
- Tomlinson, C.A. , & Allan, S.D. (2000). *Leadership for differentiating schools & classrooms*. Association for Supervision and Curriculum Development.
- Tomlinson, C. A., & Moon, T. R. (2013). *Assessment and student success in a differentiated classroom*. Association for Supervision and Curriculum Development.
- UNESCO. (2015). *Education 2030 Framework for Action*. http://uis.unesco.org/sites/default/files/documents/education-2030-incheon-framework-for-action-implementation-of-sdg4-2016-en_2.pdf
- UNESCO Institute of Statistics. (n.d.) *Basic computer skills*. <http://uis.unesco.org/en/glossary-term/basic-computer-skills>
- Varatharaj, R. (2018). Assessment in the 21st century classroom: The need for teacher autonomy. *International Journal of Research an Innovation in Social Science (IJRISS)*, 2(6), 105-109.
- Varsavsky, C., & Rayner, G. (2013). Strategies that challenge: Exploring the use of differentiated assessment to challenge high-achieving students in large enrolment undergraduate cohorts. *Assessment and Evaluation in Higher Education*, 38(7), 789–802. <https://doi.org/10.1080/02602938.2012.714739>
- Vismedia Team. (2021, October 25). *What is an immersive experience?* <https://vismedia.agency/insights/content-tech/what-is-an-immersive-experience/#:~:text=An%20immersive%20experience%20pulls%20a,deliver%20unforgettable%20and%20engaging%20worlds.>

- Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Harvard University Press.
- Walker, M. L. A., & Chui, Y. L. (2012). Contrasting effects of instructional leadership practices on student learning in a high accountability context. *Journal of Educational Administration*, 50(5), 586 – 611.
- Ward, M.O., Grinstein, G., & Keim, D. (2015). *Interactive Data Visualization: Foundations, Techniques, and Applications, Second Edition (2nd ed.)*. A K Peters/CRC Press. <https://doi.org/10.1201/b18379>
- Willis, J. (2010). The current impact of neuroscience on teaching and learning. In D. Sousa (Ed.), *Mind brain, and education* (47–67). Bloomington, IN: Solution Tree.
- Wilson, D. M., & Narasuman, S. (2020). Investigating Teachers' Implementation and Strategies on Higher Order Thinking Skills in School Based Assessment Instruments. *Asian Journal of University Education*, 16(1), 70-84. <https://doi.org/10.24191/ajue.v16i1.8991>
- World Economic Forum. (2020a). *Schools of the Future: Defining New Models of Education for the Fourth Industrial Revolution*. http://www3.weforum.org/docs/WEF_Schools_of_the_Future_Report_2019.pdf
- World Economic Forum. (2020b). *The Future of Jobs Report 2020*. http://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf
- Yin, R.K. (2016). *Qualitative research from start to finish (2nd ed.)*. The Guildford Press.
- Yin, R.K. (2018). *Case study research and applications : design and methods (6th ed.)*. SAGE Publications, Inc.
- Yunus, M. M., & Azman, M. A. (2019). Memory stay or stray? : Irregular verbs learning using Kahoot! . *Arab World English Journal (AWEJ) Special Issue on CALL* (5), 206-219. <https://dx.doi.org/10.24093/awej/call5.15>
- Zamri, N. B. M., & Hamzah, M. I. B. (2019). Teachers' competency in implementation of classroom assessment in learning. *Creative Education*, 10, 2939-2946.