




Understanding Attitudes Towards Blockchain-Based Assessment System: A Sentiment Analysis of Form Six Teachers' Views

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Article Info	ABSTRACT
<p>Article history: Received: 3 March 2023 Revised: 10 March 2023 Accepted: 27 March 2023 Published: 1 April 2023</p>	<p>Form six students are now using School Base Assessment (SBA) with paper projects to prepare for university-level learning. Although teachers are encouraged to use technology to enhance the learning process, their sentiment about using technology in educational assessment is still unknown. This study used Sentiment Analysis (SA) to analyze Form six teachers' opinions on using new technology to manage SBA. The study found that Microsoft Azure Machine Learning can effectively build SA models for data analytics based on teachers' opinions obtained from a Telegram group of form six teachers in Pahang. The results showed that most teachers have a neutral sentiment with a moderate amount of positive sentiment and some negative sentiment present. The overall sentiment is slightly positive, but "workload" is a prominent concern among Form six teachers when working with technology in their SBA process.</p>
<p>Keywords: Sentiment Analysis Digital Solution Pre-University Assessment Blockchain</p> <p></p>	

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INTRODUCTION

Form six is one of the pre-university programs in Malaysia, implemented within one and a half years for every intake, and students must take the *Sijil Tinggi Peperiksaan Malaysia* (STPM) exam at the end of this program to enter higher education institutions. STPM offers 23 subjects from the arts and science streams. In 2008, form six education was rebranded to align with the university system and includes lectures and tutorials. Form six serves as a transition from secondary to tertiary education and has been restructured to provide a different learning atmosphere and facilities from normal secondary schools, with changes to the image, infrastructure, administration, teaching and learning modes, as well as the curriculum.

Presently, form six education evolution is also influenced by the global bombardment of Information and Communication Technology (ICT). According to Nasir and Mohd Yunus (2017), students are encouraged to use Google and other search engines to find information. However, the integration of ICT tools could have both positive and negative effects. A related study found that students sometimes misuse the facilities by browsing irrelevant websites instead of finding information related to their topics (Tang & Tham, 2014). Nevertheless, access to information is crucial for self-directed learning (Nasir & Mohd Yunus, 2017).

The School Base Assessment (SBA) was implemented as part of the image rebranding and curriculum transformation in 2008 and 2013 respectively, for form six students. The aim was to ensure that the quality of education in Form Six is on par with other pre-university programs and to provide a university-like learning environment for the students. As part of this assessment, students are required to complete paper projects (PP) related to a given theme. To ensure the quality of work produced, teachers must guide their students continuously and validate their answers against the standards set by the Malaysian Examinations Syndicate (MPM). If a student's work does not meet the required standard, teachers must help them to make corrections until the work satisfies the rubric standard. (Majlis Peperiksaan Malaysia, 2012).

Among the procedures related to the SBA is the aspect of score and evidence management. It is the school's responsibility to follow the procedure where the score must be keyed in and sent via e-submission according to the method and period that has been set by MPM. While the evidence is stored in a safe place before it is disposed of under supervision within six months after the STPM exam results are released, the school also need to keep a copy of students' coursework score as a security backup. The management of this evidence is under the responsibility of the STPM School Coursework Committee and MPM has the right to request evidence at any time during that period, if necessary (Majlis Peperiksaan Malaysia, 2012). The evidence management and storage procedures used are termed by some researchers as outdated and no longer suitable for the current education practice (Han et al., 2018; Wang et al., 2019; Purnama et al., 2021).

The current form six SBA practice is highly centralized, which can lead to issues with trust, reliability, integrity, and manipulation (Acharya & Binu, 2018). Teachers also lack the necessary knowledge and skills to provide effective feedback on students' written work (Ravikumar Varatharaj, 2018). However, online assessment has the potential to accelerate the feedback process and encourage formative assessment in SBA implementation (Doğan et al., 2020). Therefore, educational assessments need to be conducted digitally and made securely available online to facilitate the access by relevant stakeholders. A proper and trustworthy assessment system could even further enhance students' learning experience and employability (Iyer et al., 2020). The aim of this paper is to investigate the sentiment of Form Six teachers regarding the use of a Blockchain-based Paper Project Assessment System (BCPPAS).

LITERATURE REVIEW

The benefits of blockchain technology (BCT) have become well-documented in educational contexts. Since its benefits are undisputed, the discrete role of education researchers around the world to support the benefits of the BCT has gained superiority over recent years. This can be seen in the development of the literature study of BCT in education since 2017 and increased drastically thru the years 2022. They point out the benefits as well as challenges in adopting and implementing blockchain technology in education and its role in promoting trusty relationships between educational institutions, especially in the context of the post-stage of educational assessment (Alammary et al., 2019; Ramos & Queiroz, 2022).

In general, most studies related to the readiness of blockchain adoption in education seem restricted to identifying blockchain benefits and its challenges; and how blockchain provides better management of students' evidence (Iyer et al., 2020; Shankar et al., 2021). Some are highly focused on blockchain adoption at the HEI level especially on developing a model of certificate management prototype (Arenas & Fernandez, 2018; Han et al., 2018; Shawon et al., 2021; Turkanović et al., 2018). In general, most previous works paid much attention to the "post stage" of educational assessment activities such as recording and sharing certificates, diplomas, and grades between institutions to protect the "results" of learning. In Malaysia, blockchain-based smart learning environment system focusing on student work assessment like Education Rain Classroom in China has not been studied (Ullah et al., 2021; Zhu & Cao, 2021). Furthermore, studies on potential factors that influence educators' readiness to adopt the technology are still in the infancy stage, especially in regard to the "during" assessment level (Alammary et al., 2019; Tsai et al., 2022).

Considering the ability of technology to enhance the institutional image (Khoa et al., 2020), the form six program should not ignore the benefits of seeking effective ways to promote blended learning and enhance the quality of the program through technology adoption in teaching and learning practice. Form six image enhancement program thru rebranding (2008) and curriculum transformation (2012) have failed to attract more SPM leavers to choose form six as their next education destination (MPM Annual Report, 2005-2020). Perceived Image (PI) has been found to have a very strong direct impact on technology readiness studies (Alam, 2020; Carter & Belanger, 2004; Kango et al., 2021; Rahi et al., 2020) and indirect impact thru PI and Perceived Ease of Use (PEOU) (Izuagbe et al., 2019). However, most of those studies are emphasized the PI on the profit-oriented organization. Thus, their findings could not be generalized since the context of public schools and profit-oriented institutions are totally different.

The curriculum transformation has included SBA and comes with an improvement in teachers' autonomy to empower teachers in assessing students' paper project. It also encourages Assessment for Learning (AFL) practice and enhances students' soft skills which require teachers to have greater control and decision-making power over their assessment practice (İpek, 2017; Isa et al., 2021; Ravikumar Varatharaj, 2018; Somasundaram, 2016; Tehrani & Mansor, 2012; Ulas & Aksu, 2015; Wang & Hu, 2022). It was hoping by the 3rd wave of PPPM (2021-2025), form six teachers and students will have greater say in students' activities and this method will be cultured in all pre-university programs (Malaysia Education Blueprint, 2013). TA is positively associated with students' reading achievement and reading enjoyment (Wang & Hu, 2022), but it is unclear if the teachers' autonomy could affect teachers' technology readiness to improve student writing skills in completing their paper project.

Furthermore, while teachers are knowledgeable about the SBA and its implementation procedures, they have been unsuccessful in maintaining student engagement and promoting meaningful learning due to limited autonomy (Ravikumar Varatharaj, 2018). However, the high level of teachers' autonomy does not necessarily guarantee that teacher will practice their autonomy confidently, especially when dealing with a highly sensitive environment like an educational assessment (Isa et al., 2021). It is still required to use an evaluation rubric by MPM to ensure standardization of the paper project assessment in this SBA implementation, along with increased teachers' autonomy. While central offices may take steps to manage and organize instruction, it is crucial to avoid undermining the role of teachers' autonomy, as doing so could demotivate teachers and hamper their effectiveness (Lyle & Peurach, 2022). If teachers have a strong sense of autonomy, the BCPPAS may be desired due to the lack of clear direction in the current teachers' autonomy practice. In other words, when the direction of the current teachers' autonomy practice is unclear, teachers may prefer the BCPPAS if they feel they have more control over the evaluation process.

Network and communication technology like BCPPAS is expected to guarantee the fluency of the e-assessment process. It generally includes the following phases: issuing test papers, participating in the examination, submitting answer papers, scoring the papers, and publishing the scores (Zhu & Cao, 2021). In Malaysia, Frog-VLE and DELIMa provided by the government are examples of the online platform to encourage technology-based assessment in education. However, traditional online assessment is not drawbacks-free and have to face challenges like data security, teachers' readiness, time consumption, and skill and accuracy issue (Doğan et al., 2020; Jani et al., 2018; Mahat et al., 2021; Maslan et al., 2020; Rasheed et al., 2020; Shalatska et al., 2020). This is unfortunate because, in the context of AFL, form six students are

found to be highly ready to use technology in their learning. They demonstrated positive perceptions and believed that technology assisted their learning process as they have been exposed to technology for at least three to four years since ICT is integrated into the secondary schools' curriculum (Suliman et al., 2018).

Form six students also had adequate facilities to enable them to use technology for learning and are very efficient in the use of modern devices such as smartphones to access information from the Internet (Nasir & Mohd Yunus, 2017). The ease of use and expected benefits of using technology have improved because form six students have been exposed to the technology since their young age (Md Sari & Yin Yin, 2021). These enable students, teachers, school administration, supervisors and any parties related to students' assessment to access students' projects ubiquitously (Saha et al., 2022). Furthermore, form six students are already classified as highly self-directed learners which becomes the most significant construct to explain their mobile learning readiness and they can control and put their own initiative in terms of determining their learning strategies (Kankok et al., 2020, 2021).

However, form six students received less support from teachers to use technology in learning assessment as teachers do not apply technological elements in face-to-face teaching and tend to use traditional teaching approaches because of low pedagogical technology knowledge (Elpisah & Bin-Tahir, 2019; Mahat et al., 2019; Md Sari & Yin Yin, 2021; Rasheed et al., 2020). BCPPAS cannot be effectively adopted if there is no high level of commitment from both teachers and students. While teachers are fighting to understand how to implement online assessment in line with the teaching and learning process (Yusof@Jusoh & Othman, 2019), the use of mobile devices among form six students on the other side, especially smartphones and laptop is very common. This is because of their overexposure to mobile devices but unfortunately, the influence of teachers in using technology in assessing students' learning is still insufficient (Kankok et al., 2020).

As a result, their technological usage is more for entertainment rather than for educational purposes (Suliman et al., 2018). In this context, most researchers agree that teachers play an important role to re-align this situation as form six students are seeking teachers' usage support to ease them in using technology in their learning assessment (Md Sari & Yin Yin, 2021; Suliman et al., 2018). However, teachers' main challenges are their low readiness and negative perception of using technology for instruction (Jani et al., 2018; Mansor et al., 2019; Maslan et al., 2020; Rasheed et al., 2020; Samsudin et al., 2014). Based on sentiment mining conducted, form six teachers refused to assess students' work using an online assessment system if the system cannot guarantee the data security (DS) of assessment information. A lack of DS in Blockchain readiness could negatively impact the teachers' readiness to adopt Blockchain technology in their assessment practice. Thus, the data security (DS) of online assessment should draw enough attention, especially in the matter of technology that promotes ubiquity.

Form six PP supervising is a process to ensure the consistency of SBA implementation with the established guidelines. The appointed supervisors are responsible to ensure that SBA is implemented according to the procedures that have been set by MPM (Majlis Peperiksaan Malaysia, 2012). This means that several parties are involved in form six SBA practice, namely school administration, teachers, students, supervisor and MPM. Thus, in the context of this study, perceived ubiquity (PUB) is worth exploring. PUB represents the notion that technology can be accessed at any time from anywhere, and it is considered the major benefit of BCPPAS in comparison to both traditional and online assessments (Bdiwi, 2017; Kankok et al., 2021; Saha et al., 2022). If ubiquity is ensured, BCPPAS users need not face any spatial or time-related limitations and form six teachers and students could maintain a sustainable engagement (Doğan et al., 2020; Omar & Phung, 2019). However, previous studies tend to investigate the impact of ubiquity and data security on usefulness alone but the impact of those variables on the technology's ease of use is still scarce (Saha et al., 2022).

In the education context, trust in new technology is crucial for its successful adoption. First-hand contact with blockchain-based assessment requires teachers' trust in the first place. In this sense, it should be noted that trust towards BCPPAS is more accurately referred to users' initial trust (INT), given that the majority of teachers had no experience with BCT (Hira et al., 2022; T. Zhang et al., 2020). The INT develops the desire to rely on variables that influence teachers to accept the risk and uncertainty associated with technology adoption (Lewicki et al., 2006). Form six teachers' concern about assessment privacy may cause a delay in

technology uptake and diffusion, particularly for online assessment as it will be directly involved with assessment information. Therefore, initial trust in BCPPAS may play a vital role in their readiness.

The generalizability of the degree of previous research related to INT on new technology readiness is still limited. INT studies are mostly framed in banking contexts like financial robo-advisors, biobank services, m-payment, e-banking and internet banking (Hannoun et al., 2021; Kimiagari & Baei, 2022; Nourallah et al., 2022; Rahi et al., 2020; Saha et al., 2022); and automotive context (Li et al., 2022; T. Zhang et al., 2020). On the contrary, other contexts such as education are explored less and the latest one is by Ooge et al., (2022) who investigated the impact of e-learning explanation interfaces on INT among higher school students. However, the experimental study has limitations that affect the generalizability of results. The authors realize that the sample of 37 participants, which was further divided over three research groups is relatively small. Farooq et al., (2021), on the other hand, were having a problem comparing their findings related to INT on password manager readiness with other studies. They have to compare findings with previous trust studies instead of the INT study as they think their topic was among the first in the field. Additionally, INT has been established as a significant mediating role in predicting usage readiness to use BCT (Jena, 2022; Saha et al., 2022).

However, in the context of SBA implementation in general, studies found that teachers are not ready at the first place because of high difficulty levels and lack of resources (Dube-Xaba & Xulu, 2020; Jani et al., 2018; Mansor et al., 2019; Samsudin et al., 2014). The low readiness level resulting in teachers tend to have a higher level of workload (Mansor et al., 2019; Samsudin et al., 2014; Yusof@Jusoh & Othman, 2019). Specifically, at the SPTM level, teachers' workload has evidenced through heavy teachers' tasks in research, colloquium, documentation and preparation (Tang & Tham, 2014). This can lead to burnout and increased stress for teachers, negatively affecting their well-being and potentially impacting the quality of education they provide to their students. Therefore, providing teachers with the necessary resources, training, and support can reduce their workload and improve their readiness to implement SBA.

Luckily, most of the latest studies have empirically evidenced that technology adoption in education could reduce teachers' WL (Andersen et al., 2022; Awang et al., 2018; Min, 2019; Roberts, 2016). However, although teachers who suffer heavier workload show a higher tendency to use technology in their teaching which positively affects their frequency of technology usage, the usage for the purpose to reduce WL in examination and evaluation task are recorded among the lowest mean (Awang et al., 2018; Min, 2019). Andersen et al., (2022) in their qualitative study found that human-centered AI (HCAI) was capable to reduce teachers' WL but it was perceived by pupils' views. Additionally, the generalizability of most of the previous research which found that technology and SBA negatively affect WL is low because of their qualitative nature (Barker et al., 2008; Lajane et al., 2020; Mansor et al., 2019; Tang & Tham, 2014).

While there are several studies that investigated the potential and effectiveness of the use of technology in assessment, particularly in simplifying form six teachers' tasks to manage SBA (Awang et al., 2018; Ming, 2005; Roberts, 2016), enhancing students' soft skills (Noor Lela Ahmad et al., 2017) and developing learning motivation among students (Tian, 2022), there is a higher percentage of the BCT projects fail or should never have started in the first place. This failure is due to various reasons such as the hesitance of the institution toward blockchain adoption, the lack of realizing the potential value blockchain can add, and the organization's readiness for adoption (Alzahrani, 2021). Therefore, the teacher's sentiment about a new technology draws crucial attention. The use of particular technology for teaching has been found to be the main teachers' challenge (Rasheed et al., 2020). The success of the blockchain projects depends on internal and external factors, such as the skills to build blockchain solutions and the fixability of the regulations set by MOE surrounding the BCPPAS. Educational institutions should consider various internal and external factors to ensure successful blockchain adoption. Having a mechanism that facilitates the teachers' readiness for transformative adoption is required to identify the most important factors impacting successful blockchain readiness, assess their readiness to adopt blockchain, and the point where corrective actions are needed. Then, it will be easy to achieve the successful adoption of secure digitized assessments on a large scale.

METHODOLOGY

This sentiment analysis used a quantitative approach. Based on Figure 1, the current study was carried out in three phases. Form six teachers' sentiments on BCPAS are collected in Phase 1 from a Telegram group of form six teachers in Pahang. The group is joined by 442 teachers and this study have successfully extracted 51 sentiments from the group. Telegram application is becoming popular in education because it has several features that facilitate student-teacher engagement in an online virtual classroom. Teachers use the apps as one of the learning platforms to facilitate online learning (Jnr Gyane, 2021). The feedback obtained is exported to Microsoft Excel to execute the process of converting forms into structured data according to the needs for a quantitative approach. This stage was important as it helped to assist in revealing hidden data which then became more meaningful and insightful patterns (Abdul et al., 2021). This process is called Text Preprocessing (Feldman, 2007) and the steps are as follows:

1. **Case Folding** – the step of changing all the letters in the document to lowercase. Only the letters ‘a through ‘z’ are accepted. Characters other than letters are omitted and considered delimiters (Feldman, 2007).
2. **Tokenization** – a process of breaking down a stream of texts into words, phrases, and symbols which came to be known as tokens (Verma et al., 2014). Tokenization has become very important for text analysis since quantitative results depended on tokens that consisted of text components (Abdul et al., 2021).
3. **Removing Stop Words** – Stop words are words that have no meaning but they are useful in a language to help put sentences together. They are usually the most popular words, such as “the,” “and,” and “a” (Feldman, 2007). For natural language processing, these words can add noise in a similar way that punctuation can.
4. **Stemming** – Applying stemming to texts reduces the number of words to a single “stem” of a word. This is another way of reducing noise in text data. This process transformed words into a common form that would allow the computer to identify duplicate words with a similar meaning and then removed one of the words (X. Zhang & Guo, 2020).

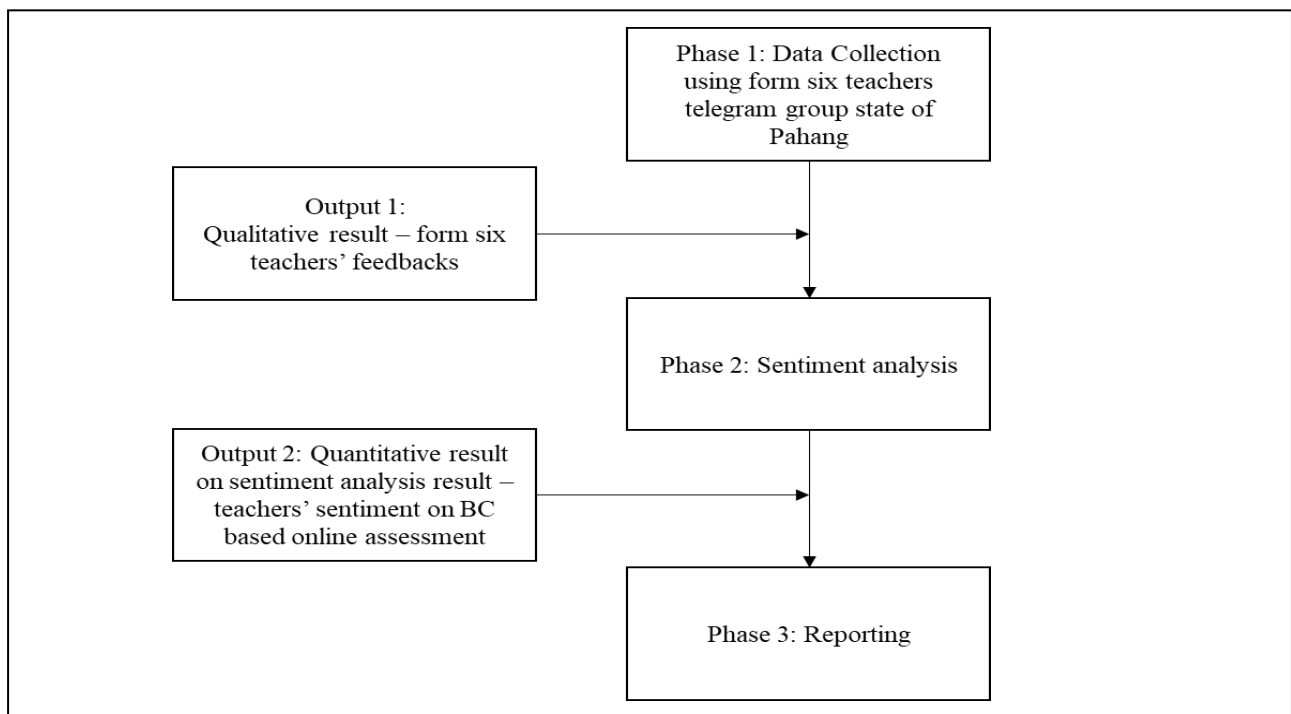


Figure 1: Exploratory Research Method to Obtain Form Six Teachers' Feedback on BCPAS

Data obtained in Phase 1 were analyzed in Phase 2. Feedback from Telegram conversations was then recorded and transcribed in Excel format. Microsoft Excel's add-in application, Azure is utilized to predict form six

cloud generated a list of 76 words, and the most frequent words are "workload", "confidential", "compatibility", "useful", "internet", and "coverage", which appear more than 10 times each. "Workload" appears 17 times, indicating that it is a prominent theme in the study context. This may suggest that the text is about work-related issues, such as managing a heavy workload. This is consistent with previous studies, which noticed that technology should come with the hope to reduce teachers' WL (Andersen et al., 2022; Awang et al., 2018; Min, 2019; Roberts, 2016).

"Confidential" appears 14 times, which suggests that the text deals with sensitive information that needs to be protected. "Compatibility" and "useful" both appear 13 times, which indicates that the text may be discussing technology-related topics. "Compatibility" may suggest that the text is about software or hardware that needs to be compatible with other systems. "Useful" suggests that the text may be offering advice or tips on how to use technology effectively. Therefore, it is highly recommended that future research could apply the Technology Acceptance Model (Davis, 1989) and extended Diffusion of Innovation Theory (Moore & Benbasat, 1991) to investigate the teachers' readiness to use BCPPAS. "Internet" and "coverage" both appear 12 times, which suggests that the text may be discussing internet-related topics, such as internet connectivity, speed, and coverage. Word cloud analysis can help to provide a quick overview of the most frequent themes and topics in a text, which can be useful for further analysis and understanding of the text.

Overall, word cloud analysis can be a useful tool for gaining insights into the most prominent words in a text. However, it should be noted that word cloud analysis has its limitations. For instance, it does not take into account the context in which the words are used, and it may not provide insights into the relationships between the words (Harfoushi et al., 2018). Therefore, it is important to use word cloud analysis in combination with other methods of text analysis to gain a more comprehensive understanding of the text.

CONCLUSION AND RECOMMENDATION

The purpose of this paper is to examine form six teachers' sentiments on the use of the BCPPAS. The sentiment expressed in the result is largely neutral, with an average positive score of 0.79 and an average negative score of 0.18, resulting in a slightly positive overall sentiment of 0.46. The word cloud analysis suggests that the text is likely discussing work-related issues, with "workload" being a prominent theme, as well as technology-related topics such as compatibility and usefulness, and internet-related topics such as coverage and connectivity. Word cloud analysis can be a useful tool for gaining insights into the most frequent themes and topics in a text but should be used in combination with other methods of text analysis to gain a more comprehensive understanding of the text.

As for future research, it may be useful to combine sentiment analysis with other types of text analysis, such as topic modeling, to gain a deeper understanding of the form six teachers' readiness to use BCPPAS. Additionally, exploring the limitations of sentiment analysis and word cloud analysis and developing new techniques to overcome these limitations can also be an area for future research. Based on the sentiment analysis and word cloud analysis, it can be recommended that further in-depth studies should be conducted to gain a deeper understanding of the teachers' workload, especially on how BCPPAS could reduce teachers' workload.

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