Systematic literature review of Google Classroom assisted learning: Effects, strengths and challenges

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Article Info	ABSTRACT
	The contribution of technology in the delivery of content to students is undeniable. As a result of the Covid-19 pandemic that hit Malaysia since the beginning of 2020, the online learning is now a new norm in the learning environment. The Ministry of Education Malaysia (MOE) is currently in the process of strengthening the online delivery system in schools. A guideline was issued by the MOE to encourage online learning to be conducted. Google Classroom has become the digital platform of choice for educators in Malaysia. The use of this method is relatively new in the school learning environment. Although this method is often implemented at the tertiary level, the study of its use at the school level is still lacking. Accordingly, this systematic literature review analysis aimed to identify the effects, advantages and challenges of using Google Classroom in learning. Based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyzes (PRISMA), 23 articles were identified. The results showed that the implementation of Google Classroom had been identified to affect students in forming higher order thinking skills, student satisfaction and student engagement. The identified advantages of its use were paperless, ease of accessing learning content, ease of learning content management and ease of interaction. Meanwhile, implementation challenges were identified in terms of internet connection, expert reference, feedback period and stakeholders support. Based on the pattern of the previous findings, several future research suggestions and relevant parties involved were also discussed.

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INTRODUCTION

The use of the internet and gadgets is now common, especially among generation Z in Malaysia. Statistical evidence from the Department of Statistics Malaysia (2019) reported that the use of the internet, computers and mobile phones is increasing every year, especially among individuals aged 15 years and above. The majority of consumers in Malaysia are estimated to spend about one to four hours a day surfing the internet using smartphones and laptops (MCMC, 2018). Such use referred to social networks, obtaining information, downloading pictures, movies, videos or music, playing or downloading games, downloading software or applications and sending or receiving emails (Department of Statistics Malaysia, 2019). This situation indicated that the current generation has digital skills and required a different learning approach than previous generations. This statement is in line with the view of Chicca and Shellenbarger (2018) that students now needed different strategies such as being active, integrating technology, and using simple, fast and frequent interactions. The use of the latest technology integration in learning led to the effectiveness of teacher pedagogical methods (Beriswill et al., 2016; Mohd Paris & Saedah, 2016; Seuk et al., 2020).

The use of technology is seen to be able to connect students with the real life (Lustiana et al., 2020). Realizing the development of the current needs, the Ministry of Education Malaysia (MOE) called on the educators to practice online learning to improve the quality of learning (MOE, 2013). The Google Trend (2022) report showed that users of the Google Classroom learning management system in Malaysia are the highest in the world out of 64 countries, outperforming the United States, Hong Kong and Japan. The Google Classroom is increasingly popular and has become a leading choice as a medium of learning at the secondary and tertiary levels (Brown & Hocutt, 2015; Hallisey, 2017). Google Classroom is one of the learning management system applications that were launched in May 2014 by Google. Gross (2019) defined a learning management system as a computer software application for the purpose of management, documentation, reporting and delivery of learning courses or training programs. The same tone is also expressed by Wolfe and Cedillos (2015) and Rakhmatul et al. (2020) that learning management system is one of the e-learning platform that facilitated collaborative learning activities as a result of the development of existing electronic equipment. Therefore, the use of Google Classroom aims to manage learning materials and content delivery because this application can help facilitate the work of teachers and students through the online learning environment and support the collaborative learning environment.

The Google Classroom application in Malaysia had been officially introduced since July 1, 2019 following the implementation of 1Bestari Phase 2 (MOE, 2019). The ministry is currently working to strengthen the online delivery system in schools. Online learning is a new norm in the learning environment in Malaysia, especially at the school level, mainly after the transmission of Covid-19. As a result, the MOE has issued a learning guideline in schools regarding the need for social distancing (MOE, 2020). One such approach suggested teachers diversify learning methods, which include online learning. However, when consumers are given a new technology, there are several factors influencing the decision of how and when the technology will be used such as performance expectations, business expectations, social influence and convenience (Venkatesh et al., 2003). Indeed, there are challenges that need to be addressed in order for this to be fully implemented. Since Google Classroom was launched, some researchers have tried to identify the acceptance of Google Classroom, but previous studies are focused on students at the institute of higher learning (Al-maroof & Al-emran, 2018; Amadin et al., 2018; Jakkaew & Hemrungrote, 2017; Palma-Ruiz et al., 2019), while Iftakhar (2016) examined the acceptance among teachers. However, until now, research on the use of Google Classroom at the school level in the context of Malaysia by the local researchers is still low. Differences in maturity between school students and higher education students in using digital learning mediums certainly require a different approach.

Therefore, this systematic literature review aims to identify the effects, advantages and challenges of using Google Classroom in today's learning environment. Based on the views of Higgins et al. (2011) systematic literature review aims to find and synthesize relevant research comprehensively, using orderly, transparent and replicable procedures at every step in the process. The next sub-topic will describe the research methodology based on PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyzes) in order to identify related articles. Next, the article will be analyzed using a qualitative approach to obtain sub-themes of learning effects, advantages and challenges of using Google Classroom. In addition, the implications for the stakeholders and the suggestions for further study are also discussed.

METHODOLOGY

The database of this study involved three main sources namely Scopus, Web of Science (WoS) and Wiley Online Library. The databases were selected because they contained articles that are peer reviewed and trusted. The Scopus Database to date contains a total of 81 million curated documents articles covering agricultural and biological sciences, arts and humanities, biochemistry, genetics and molecular biology, business, management and accounting, chemical engineering, chemistry, computer science, decision science, dentistry and so on. WoS, on the other hand, contains more than 24 000 articles in the fields of science, social sciences, arts, and humanities (supporting 254 disciplines). The Wiley Online Library contains over 1,600 journals ranging from agriculture, social sciences, science and mathematics, law, medicine, engineering and psychology. All three databases are available through the university library subscriptions.

Article Search Strategies

The systematic literature review process is based on PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses). PRISMA method was selected because it has the strength of systematic method to select quality articles and meet the relevant criteria. The importance of systematic literature is to systematically summarize existing research, identify research gaps, support practices and policies, and identify new research efforts (Burgers et al., 2019). The process of obtaining this study articles was divided into four phases, namely identification, screening, eligibility and analysis. The entire screening and search procedure was illustrated in Figure 1.

The first phase is identifying some similar keywords used in past research to obtain articles from the database. Keyword selection is based on the terms that were used in the previous studies. Once the keywords are identified, the relevant article was searched using the keywords shown in Table 1. These keyword searches used several search techniques: a) Boolean search techniques such as "OR" and "AND"; b) truncation techniques such as the use of the "*" sign); and c) phrase search techniques on search words (with a " " sign) can increase the accuracy than similar words in non-phrase search (without quotation marks). Based on the search techniques used, a total of 93 articles were obtained from the identified databases.

Table 1: The Use of Keywords and Systematic Search Methods

Database	Keywords Used
Scopus	TITLE-ABS-KEY (("online learning" OR "e-learning" OR "distance learning" OR "virtual learning" OR "mobile learning" OR "learning management system") AND ("Google Classroom") AND ("school"))
Web of Science	TS = (("online learning" OR "e-learning" OR "distance learning" OR "virtual learning" OR "mobile learning" OR "learning management system") AND ("Google Classroom") AND ("school"))
Wiley Online Library	(("online learning" OR "e-learning" OR "distance learning" OR "virtual learning" OR "mobile learning" OR "learning management system") AND ("Google Classroom") AND ("school"))

In the screening phase, some articles that did not meet the set criteria were identified and removed from the shortlisted articles. At this stage a total of 47 articles were removed because they did not meet the set criteria. Some inclusive and exclusion criteria such as document type, language, time period and article index were considered in order to ensure that the articles involved were accurate as shown in Table 2. Articles that did not meet the criteria were not included in the shortlisted articles.

Table 2: Selection of Criteria

Criteria	Inclusive	Exception
Document type	Article	Non-indexed journals, chapters in books, conference proceedings
Language	English, Malay	Not English (except Malay)
Duration	2018-2022	<2018
Index	Social Science (Education)	Not Social Science (Education)

Next at the eligibility stage, the article would be carefully reviewed. If there were multiple overlapping articles in the database, the article would be removed. Of the 46 articles, 10 articles were the same article. Therefore this article was removed from the shortlisted articles. Finally in the analysis stage, only shortlisted articles would be analyzed to get the themes identified. After passing the identification, screening and eligibility stages, a total of 24 articles had been identified. However, there was one article that did not have full access. Researchers had been trying to get help from the library officers and sending emails to the writers. At this analysis stage, 23 articles were identified for the qualitative analysis using the thematic analysis. According to Nowell et al. (2017) this method has advantages such as bringing rich data collected by researchers in the data collection phase and providing a logical research structure. The first step was to collect data descriptively to answer research questions. Once the data were obtained, the researchers reviewed the data repeatedly to identify related themes and sub-themes. The codes identified allowed researchers to categorize the data to form the desired themes. Researchers had identified the themes of Google Classroom learning impact, benefits of use and implementation challenges.
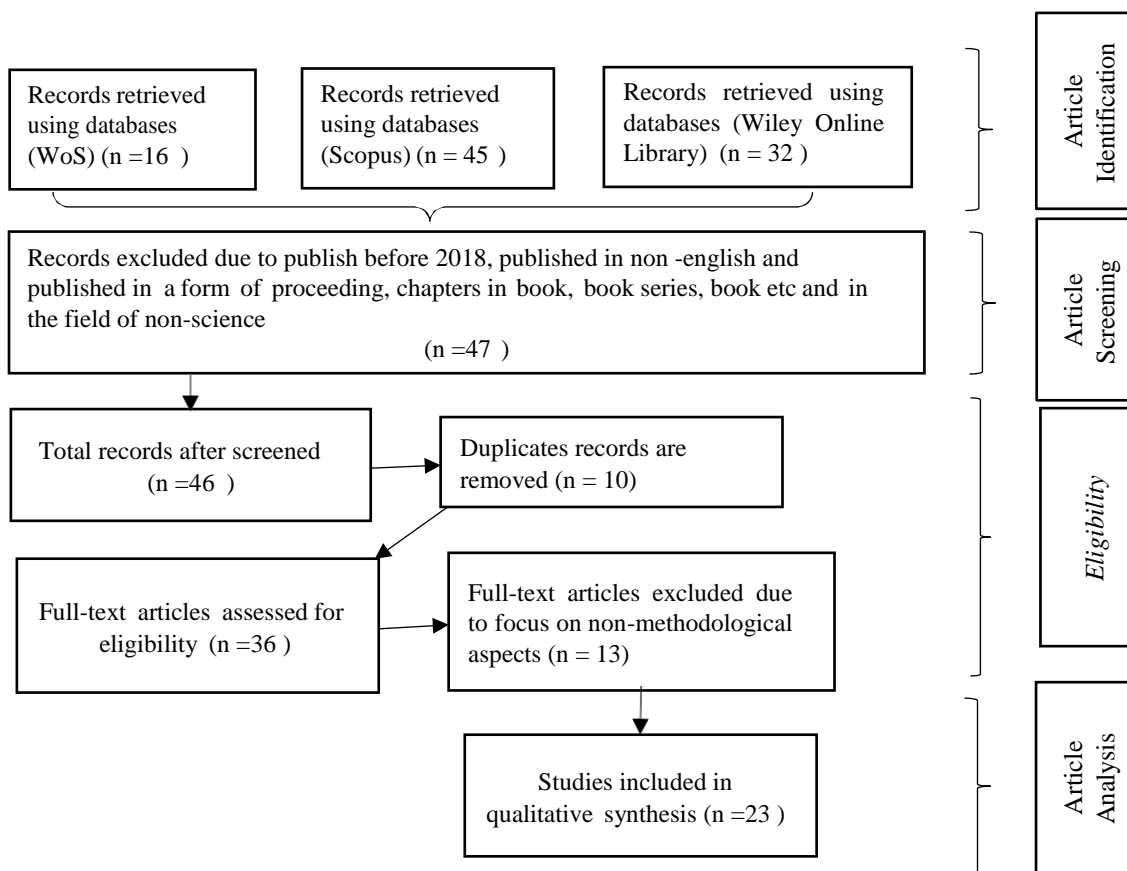
Figure 1: PRISMA Flow Chart (Modified from Moher et al., 2009)

RESULTS AND DISCUSSION

From the results of the thematic analysis, some identified terms were formed. The following is a table which showed the result from the analysis of the selected articles and identified themes. Table 3 showed the analysis table based on the themes that had been identified in order to answer the research questions in this article. Based on the findings of the study, 23 articles had been identified. The implementation of Google Classroom had been identified as having an impact on students such as developing higher order thinking skills, student satisfaction and student engagement. Advantages of its uses were paperless, ease of accessing learning content, ease of managing learning content and ease of interaction. Meanwhile, the challenges identified were internet connection, expert references, feedback period, and stakeholder support. Researchers had found that studies on the use of Google Classroom still lacked the attention of local and foreign researchers. Of the total researches, the majority of articles focused more on teachers (n = 12) as a study sample. Moreover, the majority of previous researches used a quantitative research approach (n =11). However, there were also empirical studies that used a qualitative (n = 6) and mixed method approach (n=6).

Table 3: Summary of Learning Impact, Advantages and Challenges of Google Classroom Learning Management System Implementation

No	Method	Sample	Effects of GC Learning						Advantages of GC			Challenges of GC				
			KWG	KPS	PLB	LIT	SAW	SRG	KA	INT	PGS	MB	INT	RP	SP	TC
Barrett & Liu (2019)	QL	S				x		x		x		x				
Beardsley et al. (2021)	MX	T				x			x	x				x		
Gouseti (2021)	QL	T				x									x	
Hu et al. (2021)	MX	T				x				x		x			x	x
Lee (2021)	MX	S		x						x	x					
McKim et al. (2021)	QL	T												x	x	x
Krstic & Radulovic (2021)	QN	S	x			x			x	x						
Abuzant et al. (2021)	QL	S & T		x							x					
Adi Badiozaman et al. (2020)	MX	T												x		x
Atmojo et al. (2020)	QN	S	x				x	x								
Callaghan (2021)	QN	S							x	x				x	x	
Herwin et al. (2021)	QL	T							x	x	x					
Martin (2021)	MX	S & T	x						x	x	x		x			
Masharova et al. (2020)	QN	S	x							x						
Mithhar et al. (2021)	MX	S					x			x						
Pratama (2021)	QN	S														x
Putranta et al. (2021)	QL	T							x				x			x
Vlachogianni & Tselios (2021)	QN	T		x									x			
Zamora-Antuñano et al. (2022)	QN	T									x		x			
Aleksandra et al. (2020)	QN	S				x			x			x				
Mollov & Stoitsov (2020)	QN	S & T	x		x	x				x						
Al-Alami et al. (2021)	QN	S							x	x		x				x

| Almasseri & AlHojailan (2019) | QN | S | x |

Effects of learning	Advantages of Google Classroom	Challenges of Google Classroom
KGW= Achievement	KA= Ease of Access	MB= Feedback Period
KPS= Student Satisfaction	PGS= Learning Management	NT= Internet connection
PLB= Student Engagement	INT= Ease of Interaction	RP= Expert Reference
LIT= Literacy Digital		SP= Stakeholders' support
SAW= Self Awareness		TC= Technical Issues
SRG= Self Regulation		

x= Research; QN=Quantitative; QL=Qualitative; MX=Mixed Method; S=Students; T=Teachers; GC=Google Classroom

Country of Study

The majority of the empirical studies had been conducted by Asian countries. Indonesia recorded the highest number of publications n = 5 and followed by Serbia (n=2) and Greece (n = 2). Malaysia, Palestin, Australia, Canada, Mecixo, Bulgaria, Jordan, Taiwan, Saudi Arabia, Spain, Hong Kong, Russia and Korea each published an article. Figure 2 showed the worldwide study tabulation.

Figure 2: Worldwide Study Tabulation
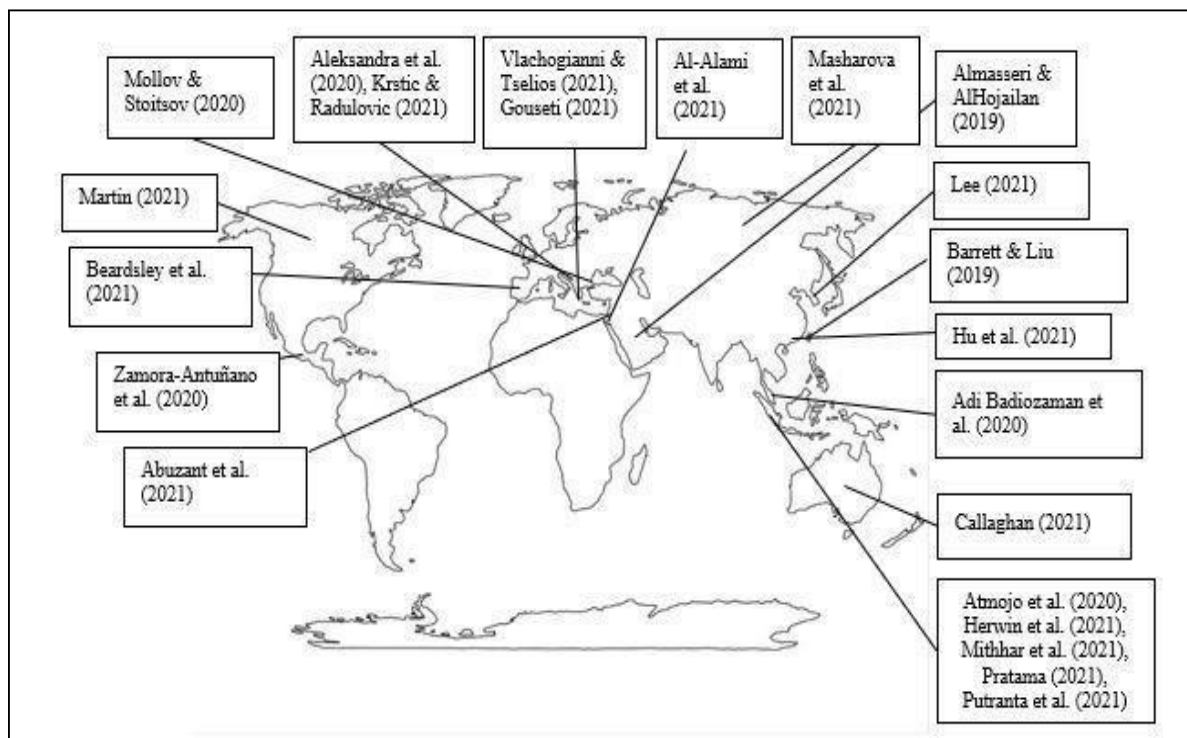
The Effects of Google Classroom Usage

The use of Google Classroom in learning is able to support students' high order thinking skills (Priyaadharshini et al., 2018; Sulisworo et al., 2020). Having high order thinking skills mean that students are able to achieve the cognitive level of applying, analyzing and synthesizing based on Bloom's taxonomy hierarchy (Krathwohl et al., 1973). These skills can be developed through

collaborative learning (Baumgardner, 2015; Khoo et al., 2020; Laisema & Wannapiroon, 2014). Google Classroom provides a discussion space that allows students to share information, ask questions and interact actively. Passive students are seemed to be unable to stand out in class, but through some stimulation, the passive students can engage in collaborative learning (Siti Hajar et al., 2015). So each group of students has an equal opportunity to be actively involved. This approach supports the goal of the 21st century learning to produce students whom are able to apply the knowledge and skills in new situations, think critically, understand new ideas, analyze information, communicate, collaborate, solve problems and so on (Makaramani, 2015).

The level of user satisfaction can predict the continuous long-term use of Google Classroom (Hamidi & Jahanshaheefard, 2018; Valentin, 2020). Student satisfaction using Google Classroom is reported to be high (Inoue & Pengnate, 2018). Aspects of satisfaction are different from the perceptions of teachers and students. The results of the study proved that the benefits and quality of services are the largest contributors that influenced the satisfaction of teachers (Almarashdeh, 2016). Whereas, satisfaction from student perception referred to the aspects of course instructions, content, assessment, and scheduling (Hew et al., 2019). The initial user survey of Google Classroom stated that users are satisfied with the services offered and suggested that the use of this application be continued in the future (Khalil, 2018; Murtikusuma et al., 2019; Quigley & Herro, 2016; Ventayen et al., 2018). This means that early users had a positive perception of Google Classroom-assisted learning and benefited from their use.

The Google Classroom application is also used as a blended learning medium (Hariri & Said, 2020; Ni, 2020). This is because Google Classroom-assisted learning is not tied to the time and place (Iftakhar, 2019; Fauzan & Ariffin, 2019). Therefore, students have the opportunity to access learning content at any time according to their suitability and convenience. Even if the teacher is not in the classroom, the delivery of learning contents can still be carried out as usual. Compared to the conventional method, students are more tied to a specific time and place because they required physical attendance. Active student involvement encouraged students to engage in using Google Classroom to carry out learning activities. Sedlacek and Sedova (2020) and Xu et al. (2020) defined involvement as behavioral as well as cognitive and emotional aspects. Measurement of student behavioral involvement based on number of comments, frequency of log in, usage rate based on time duration of use is easier to measure than other aspects (Wang, 2017). Conventional learning methods involving students' physical presence can easily assess students' emotional involvement based on facial expressions and body language. This advantage is not available in online learning if students turn off the video and audio display during the video conference session.

Advantages of Using Google Classroom

Users only need to register and create an account using only an email address. This method reduced the cost of paper and printed materials as all materials are obtained and sent by downloading and uploading from the Google Classroom (Norshafrinawati & Haruzuan, 2020; Rahmad et al., 2019). For example, the drill questions distribution, teachers can use the Google Form application and distribute it to all students through an email account or a specific link. Student marks will be generated automatically after the students have finished answering. There are various options for student assignments available to suit the learning objectives such as quizzes, multiple choice questions or short essay answers. Compared to conventional methods, teachers need to allocate a certain amount of time and cost to photocopy papers in order to prepare questions before distributing them to the students. The method now makes it easy for teachers to create and organize assignments quickly, provide feedback efficiently, and communicate with their classes easily (Nizal et al., 2016). This learning approach supports the practice of green technology in an effort to preserve environmental sustainability. In general, this practice is often applied in industrial organizations in order to preserve the environment sustainably. This practice should be encouraged by all parties, especially the ministry of education in order to educate students on saving and avoiding wasting of resources (Arasinah et al., 2017; Priyaadharshini & Vinayaga Sundaram, 2018). It indirectly supports the green skills practices in schools.

Users must first have a Gmail account to allow them to create a Google Classroom account. There are estimated about 1.5 billion active Google account users worldwide (Clement, 2018). In addition to teachers and students, guardians can also monitor their children's school work with the new Google Classroom feature. When the teachers invite parents to a Google Classroom account, they can view daily and weekly summaries of what students had accomplished as well as viewing the class announcements. Virtual storage of documents with 15GB capacity in Google Drive is also secure. The advantages of Google Classroom are described as being able to compete with the face display offered by other applications such as Facebook (Jordan & Duckett, 2018) as well as being able to replace the use of Moodle applications (Myska & Samková, 2017). Users can gain access either through computers or mobile devices (Palma-Ruiz et al., 2019). The use of this application is able to solve the lack of resource problem such as classroom constraints and the number of computers. Furthermore, this application has Android and iOS software support (Subandi et al., 2018).

The app offers web services that allow teachers to provide virtual classroom space, learning materials and communicate with students easily (Hart Davis, 2018; Mohd Hassan et al., 2020). Subject teachers will create class group accounts, invite students via email accounts or use unique codes to be distributed to the target students. Only group members can access learning materials, while instructors control the number of members. Several teachers can collaboratively build materials and monitor student learning activities together. Community members usually consist of students in the same class. Various separate applications are combined to build an online community network. In addition, some dominant applications are often used in the classroom such as emails, videos, documents, presentation slides, attachment of practice questions and so on are also available in Google Classroom. This is because, the application has Google support network such as Google Forms, Google Docs, Google Slides, Google Sheets and so on for the purpose of collaborative learning (Norshafrinawati & Haruzuan, 2020; Zheng et al., 2015).

The Google Classroom creates a collaborative learning environment that supports teacher-student interaction and can increase student engagement (Heggart & Yoo, 2018; Khalil, 2018; Priyaadharshini & Vinayaga Sundaram, 2018). Google Classroom are capable to provide a safe learning environment outside the classroom compared to the conventional methods. In Indonesia, the use of Google Classroom in a blended learning or hybrid environment is reported to be effective based on student test results, student activity observations and student feedback (Murtikusuma et al., 2017; Solihati & Mulyono, 2017). The key to online learning success according to Song et al. (2019) is the quality of active user participation and active interaction. The use of Google Classroom helps digital users interact collaboratively in real time across online platforms, making better teacher-student and student-teacher interactions (Subandi et al., 2018). When students submit assignments, teachers review the content of each assignment and provide students with immediate constructive feedback and evaluate their performance. In addition, teachers can invite colleagues or other guests to view the display on the app. The Google Classroom can be used for a variety of courses at any educational institution and is very easy to manage. Teachers can present material that is not delivered during the face-to-face learning in class and have the discussions and with students.

Challenges of Google Classroom Implementation

The effectiveness of an information delivery needs to be supported by two-ways communication (Bezverhny et al., 2020). Good communication encourages a positive learning environment which in turn creates a friendly relationship between teachers and students (Claessens et al., 2016). Similarly, Google Classroom-assisted learning requires two-ways communication support between teachers and students. However, based on the past experience of Google Classroom users, the feedback period becomes one of the challenges if the learning is not implemented in the allotted time (Hidayat et al., 2019; Zakaria et al., 2020). Sometimes, the learning is not implemented directly between students and teachers. Then students leave questions and comments in the discussion column in the hope that the

message will be read by the teacher and given them feedback. Too many comments without a detailed review can cause student questions to be overlooked by the instructor. Even worse, if the teachers failed to provide feedback, this will cause students to feel frustrated. Subject teachers need to be aware of this situation by informing students via email before the online learning session is conducted.

Next, the challenge of using Google Classroom is that it requires a good and stable internet connection (Abazi-Bexheti et al., 2018; Dash, 2019; Hidayat et al., 2019; Memon et al., 2019; Suliswero et al., 2020; Zakaria et al., 2020). Internet access in the city is seemed to not be a problem but it is a challenge for users in the rural areas (Correa & Pavez, 2016). Kumar et al. (2020) found that students need to purchase their own internet data to enable them to access online learning materials. This will burden the students who do not have sufficient financial resources. An unstable internet connection will make it difficult for students to access accounts, upload and download learning materials. It is more frustrating if students do not get important notifications. Teachers also need to first identify existing internet access capabilities and adequate infrastructure before implementing instruction methods using Google Classroom. School internet access needs to be upgraded. Therefore, the role of the MOE is to study the internet access capabilities for students and teachers. In addition, the role of local leaders in upgrading community centers and public libraries with stable internet access for public use should be given attention.

Czaja et al. (2006) and Correa and Pavez (2016) found that older educators faced difficulty in using technological applications despite having content expertise. This is because this group needs the support of others to help them translate learning content digitally. Alenezi (2018) stressed that there are several things that will hinder the use of learning management system (LMS) such as inadequate technical support, negative attitude towards technology and inadequate training. Therefore, the need to appoint a technical expert teacher as a mentor to the subject teachers in the event of technical problems should be considered. Intensive and periodic training should be implemented from time to time, especially among the novice as well as the senior teachers. School administrators can create a digital social community that used social communication mediums such as Telegram and WhatsApp to make it easier for the teachers to interact with the experts. Although students are now known as the digital generation because of their technological literacy skills, Tay et al. (2017) and Vonderwell and Savery (2004) suggested that students should also be given early technological exposure and training before the teachers use them in class. This is to ensure that students have the technological skills and feel that it is user-friendly (Ghavifekr & Rosdy, 2015).

In addition, the effectiveness of the implementation of technology-assisted learning requires the support of the stakeholders (Alenezi, 2018; Tay et al., 2017; Zakaria et al., 2020). Among the stakeholders that have been identified are the Board of Inspectors, State Education Department, District Education Office, State Educational Technology Division, Teacher Curriculum Center, Principals, Headmasters and all teachers. Administrators such as the State Education Department, District Education Office and technology officers of the State Educational Technology Division should encourage and instill a positive perception of the Google Classroom among educators. Meanwhile, MOE as a policy maker should provide strategic planning or online learning guidelines for Google Classroom. Principals and Headmasters play a role at the school level to promote the use of Google Classroom in various activities outside the learning purposes such as association club activities, in-service training and committee meetings. Finally, the role of the private sector in carrying out social responsibilities by providing affordable internet data plans to the students and the rural communities.

CONCLUSION AND RECOMMENDATION

In conclusion, Google Classroom is one of the alternative mediums for educators to improve the quality of the existing teaching. This move is an innovation to the existing teaching strategies that meet the needs of 21st century pedagogy. Based on the analysis, the previous study mostly focused on the adult students in higher education institution. Most past researchers used a quantitative rather than qualitative approach. This study is limited to three databases only. The number of articles involved is eight articles that had been screened. Research into the use of Google Classroom should be explored in more depth. Researchers have found many gaps that require further researches. Among the aspects that should be given attention are the usage studies at the primary, secondary and pre-university levels. In addition to the cognitive aspects, it is suggested that the learning effects from the affective and social aspects are also studied empirically. The majority of the existing studies used quantitative approaches such as survey design, therefore it is suggested that the further studies used other designs such as experimental and action research designs in order to evaluate the effectiveness of its use, while longitudinal studies should also be conducted to evaluate the effects of its use over a long period of time. In addition, the researcher suggested that future studies used qualitative approaches such as interview methods, observations and document analysis to obtain in-depth information. The implication of this finding is not only for the policy makers, teachers and students, but also for the students majoring in education. Today's education graduates need to be equipped with the new millennial pedagogical approaches in order to successfully face new educational challenges.

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