

# Teachers' acceptance of technology as predictors of the use of Google Classroom analytical learning

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## ABSTRACT

The upsurge in Malaysia's Industrial Revolution 4.0 (4IR) is in line with the changes in the global education environment. One of the latest approaches in the education field is learning analytics (LA). The use of LA in Google Classroom (GC) as the learning platform that measures, collects, analyses data and reports information about students to help teachers improve teaching and learning (T&L). This study aimed to determine the factors of teachers' technology acceptance as the predictor for use LA in GC among the teachers in secondary schools. It is done by observing 304 teachers in daily secondary schools in the Federal Territory of Kuala Lumpur. The research instrument used was online questionnaire using Google Form, which data were collected and analyses by using IBM SPSS Statistics Version 26.0. The findings from this study show that the use of GC, teachers' perceived usefulness and behavioral intention were the predictors that influenced the performance of LA in GC. This study hoped to provide a description and contribute a required alternative for the Ministry of Education (MOE) Malaysia and the schools in designing an effective strategy that can help teachers monitor the suitability of using LA in GC during teaching and learning.

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## 1. INTRODUCTION

The fourth industrial revolution (4IR) in Malaysia focuses on the mass analytical data to support the need for global education that is moving at a rapid pace [1]. To achieve the primary function of the future application landscape, Malaysia Ministry of Education (MOE) also took steps that aligned with the 4IR. MOE has the analytical ability that can be implemented through the centralized data warehouse of the ministry as the single resource of trusted information for adequate report preparation, analysis, and planning [2]. The use of learning analytics (LA) in the education field has increased and widened, corresponding to current education development [3]. LA is an approach that measures, collects, analyses, and reports information regarding students and contents to understand further and improve the environment and learning [4]. Furthermore, there are several primary purposes, including supporting the development of lifelong learning skills and strategies, preparing quick learning responses, and supporting quality teaching and learning based on data [5].

Nowadays, there is a large amount of data from teachers and students who access the system during online learning. The huge data of students, such as information, demographics, grades, and behaviors, can improve the learning strategies to fulfil the personal needs of students and are data-oriented [6], [7]. On the other hand, the students' performance also showed improvement with using LA [8]. In other words, LA has

the potential to contribute to the quality of teaching and learning by planning innovative and adaptive lessons tailored to the ability of the students [9]. The LA approach can also provide the teacher with a clear description of the student's progress throughout the teaching and learning process by analyzing the data [10]. LA helps teachers make decisions based on data to improve students' learning [10]–[12] and enhance teachers' methods of teaching and learning process [13]. The ability also lets teachers forecast the students' performance and allows teachers to identify students who are at risk in learning from the early start. By implementing LA, teachers can assist at-risk students with intervention programs and prevent them from being left out [14].

The MOE launched the digital learning platform Digital Educational Learning Initiative Malaysia (DELIMa) in June 2020. DELIMa is a platform that provides a learning management system as well as learning resources that can be used by teachers and students [15]. One of the applications included in DELIMa is Google Classroom (GC). In 2020, the COVID-19 pandemic required the education system to depend on technology. Schools in Malaysia are shifting to online learning and integrating GC into home learning [16]. Past researches found the positive acceptance of teachers towards the effectiveness of using GC during the teaching and learning process [17], [18]. The acceptance level of teachers towards the use of GC during teaching and learning was very high [16]. In the context of LA in GC, teachers use codes to allow students to join the class. Additionally, teachers can prepare and hand out assignments and teaching and learning materials to students that can be kept and arranged according to class in an organized way. Teachers can monitor the submitted assignments, provide student feedback, assess assignments, and manage grades [15], [19].

Research related to the use of LA in education is progressing rapidly following the current needs during teaching and learning. However, there is limited implementation of LA in schools. Research linked to LA at the school level needs to be expanded [11], [20]–[22] to understand and enhance circumstances and learning [4] and the recorded data will be analyzed to observe the pattern and relationship, subsequently providing feedback for an effective teaching and learning process to give education opportunities according to the needs and abilities of students [21]. A large amount of students' data, such as information, demographic, grades, and behaviors, can improve the learning strategies to fulfil the personal needs of students and are data-oriented [6], [7]. Similarly, there is still not much research related to LA in Malaysia, and it needs to be developed more [23]. Before implementing LA in schools, many aspects need to be taken into consideration, such as the acceptance of the new technology by the school community [18], the privacy of students' data, and the worries of parents regarding the implementation of LA in schools [11], [24].

Teachers have problems related to acceptance, low competence, and lack of time in using LA in teaching and learning [25], [26]. Teachers lose interest using technology during teaching and learning in addition to the shortage of training and lack of skills in handling and applying it [10], [27]–[29]. This raises questions on whether LA is used in GC digital platform, DELIMa, practiced by teachers during teaching and learning in the Malaysian education system. Therefore, research regarding LA through the GC needs to be done, it can assist teachers in understanding the students' comprehension during online learning. It is the teachers' responsibility to find different approaches for students. Hence, research regarding the implementation of LA in GC in Malaysia needs to be examined and strategies need to be planned for the future of the education.

Besides that, this is due to a lack of knowledge and expertise as well as low data literacy skills in analyzing data among teachers [8], [24], [21]. Therefore, the need to identify the level of knowledge and competence of teachers is very critical so that existing data can be used as a useful material. This becomes the focus to develop the education system by using AP strategies and methods that are available today. A study on teachers' and students' perceptions of the use of LA shows that they are still not convinced of the need for LA [30]. In general, teachers and students have different perceptions which in part teachers and students do not support LA at all. They think that LA can threaten their privacy or can give a feeling of stress, control and creates prejudice [24]. Meanwhile, teachers sometimes find it difficult to relate information from LA reports to strong interventions, partly depending on the level teaching experience [31]. Therefore, in the study of teachers' acceptance of the use of LA it is important to get an idea of how far teachers understand and accept the use of LA in their learning and facilitation process.

This study focuses on teachers' perceived usefulness, teachers' perceived ease of use and teachers' behavioral intention toward use LA in GC. Past research showed various findings and effects regarding the use of LA from multiple aspects. Among them, research by Rienties *et al.* [32] showed a significant positive relationship between the perceived usefulness and perceived ease of use of the LA implementation approach. A study by Herodotou *et al.* [9] discovered that when lecturers use the forecast from LA, students' progress can be influenced, and the implementation of LA can affect learning, forecasting, detecting at-risk students, and making interventions. Additionally, a study by Mavroudi [33], focuses on the usability perception of four critical aspects, which are real-time feedback, forecast for at-risk students, suggestions for learning activities, and suggestions for student groups which are social learning cases. A study by Basaran and Daganni [34] found a relationship between behavioral intention and the use of LA. This shows that when students have the intention to use LA, they display positive behavior toward technology. Moreover, lecturers' perception of the factors

that influence actual behavioral intention toward the LA approach during teaching is affected by individual differences whereby lecturers have different learning beliefs and experiences, and perceptions [29]. The findings from past and current studies provide significant benefits and describe the implementation of LA in schools. The objective of this study is to determine the predictor factor influencing the use of learning analytics in Google Classroom among teachers in daily secondary schools in the Federal Territory of Kuala Lumpur.

## 2. RESEARCH METHOD

This study implements the correlation design towards teachers in daily secondary schools in the Federal Territory of Kuala Lumpur that are registered and uses GC (DELIMa). A total of 304 teachers were selected randomly as the research respondents. Data were collected using the online questionnaire using Google Forms. The questionnaire is built based on independent variables (use of GC, teachers' perceived usefulness, teachers' perceived ease of use, teachers' behavior intention) and dependent variables (use of LA in GC). Three experts in the field of science computer and educational technology have verified the validity of the questionnaire to make sure the items measure all the variables.

To measure the use of GC (DELIMa), researchers developed 16 items that refer to the most used application by teachers in GC. Then, the use of LA in GC item refers to the purpose of using LA in GC, which is to assess the behaviors as well as the learning styles of students, monitor the social activities of students, improve the resources and tools for learning, plan the individual learning for students, forecast the progress of students and provide a description on the learning activities of students. Six items were used to refer to the purpose of using LA in GC during teaching and learning based on the learning analytics functional taxonomy [35]. The item of teachers' perceived ease of use and teachers' perceived usefulness is adapted from the original instrument [36]. Teachers' perceived usefulness refers to the extent to which they feel the implementation of LA is beneficial for them in teaching and learning. Meanwhile, teachers' perceived ease of use refers to the extent to which teachers consider the implementation of LA is easy to use and learn for teaching and learning. Furthermore, teachers' behavioral intentions adapted from the original instrument by Venkatesh *et al.* [37] and the researchers develop them to fit the need of the research. These items refer to the teachers' desire or intention to use LA in GC as an approach method to assist them during teaching and learning. A pilot study was done online on 35 teachers in the GC (DELIMa) portal. The Cronbach's alpha value for the GC implementation variable (0.943), teachers' perception of usability (0.723), teachers' perception of usefulness (0.728), and teachers' behavioral intention (0.907). Hence, the research instrument can be accepted and is reliable [38].

## 3. RESULTS AND DISCUSSION

The descriptive analysis shown in Table 1, indicated the mean and the standard deviation (SD) for each variable. The study's finding shows that the overall mean for the use of LA is 3.45 (SD=0.782), and the use of LA in GC is 3.31 (SD=0.720) which indicated that teachers still cannot expertly master the implementation of GC and LA in GC. Next, the overall mean for the teachers' perceived usefulness is 3.27 (SD=0.382). This shows that the use of LA in GC can benefit teachers during the implementation of teaching and learning. The overall mean of the dimension of respondents' perceived ease of use is 3.21 (SD=0.353). This proves that respondents consider the LA in GC technology easy to use and learn. The overall mean of respondents' behavioral intention is 3.40 (SD=0.590). This shows that the respondents have the desire or intent to use LA in GC as an approach in teaching and learning. This finding is in line with previous studies [5], [9], [10], [12], [14], [21]. AP helps teachers a lot in improving the teaching and learning of teachers and students.

Table 1. Mean and standard deviation of each variable

Variables	Mean	SD
Use of GC	3.45	0.782
Use of LA in GC	3.31	0.720
Teachers' perceived usefulness	3.27	0.382
Teachers' perceived ease of use	3.21	0.353
Teachers' behavioral intention	3.40	0.590

A Pearson correlation analysis is done to determine the relationship between each variable and the use of LA in GC. The Pearson correlation analysis shows a strong positive significant relationship between the use of GC and LA in GC ( $r=0.739^{**}$ ,  $p=0.01$ ). This indicates that the use of GC could enhance the use of LA in GC. Next, the analysis shows a moderately positive significant relationship between teachers' perceived usefulness with the use of LA in GC ( $r=0.594^{**}$ ,  $p=0.01$ ). This shows a need in education for continuous use of LA in GC. A more structured exposure to teachers regarding LA in GC may improve the teachers' perceived

usefulness. Teachers need to know the characteristics and information in the LA in GC to increase their understanding of LA in GC. Studies of this kind related to the relationship between the perceived usefulness and the use of technology [32], [39]. The Pearson correlation analysis shows a moderately positive significant relationship between teachers' perceived ease of use and the use of LA in GC ( $r=0.400^{**}$ ,  $p=0.01$ ). This shows that teachers who consider if the use of LA in GC is easy to use will use LA more consistently in the future. In addition, the Pearson correlation test analysis shows a moderately positive significant relationship between teachers' behavioral intention and the use of LA in GC ( $r=0.571^{**}$ ,  $p=0.01$ ). This describes how implementing LA in GC can shape teachers' behavioral intentions. This finding is in line with previous studies [34]. The users that aware of the use of technology and meet their needs are willing to adopt the technology.

The study uses regression analysis to determine the predictor factor that influences LA in GC among the teachers of daily secondary schools. Table 2 shows the value for  $R$ ,  $R^2$ , and  $R^2$  displacement and the standard random assumption used to explain the regression model toward the implementation of LA in GC. The multiple correlation coefficient ( $R$ ) value is 0.781, which is the standard for the predictor quality in the LA used in GC. Additionally, to explain the variance value of dependent variables in the linear regression model, the research discovers that the  $R^2$  value is 0.610, and the displacement value of  $R^2$  is 0.605. In this study, the  $R^2$  value refers to the regression value of four independent variables contributing to 60.5% of variance toward the use of LA in GC.

Meanwhile, Table 3 shows the ANOVA regression analysis used to determine the significant value of the variables in the study. Results from the analysis show that the  $F$  value (4,299)=116.841,  $p=0.000<0.05$ , and this model shows a significant level of  $p<0.00$ . This clearly shows a significant linear relationship between independent variables with the use of LA in GC.

Table 2. Regression model

Model	$R$	$R^2$	$R^2$ displacement	Std. random assumption
b.	0.781 <sup>a</sup>	0.610	0.605	0.452

Note:  $a$ =dependent variable, implementation of LA in GC;  $b$ =Constant, teachers' perceived usefulness, teachers' perceived ease of use, and teachers' behavioral intention

Table 3. ANOVA regression analysis

Model	Sum of squares	df	Squares	F	Sig.
Regression	95.670	4	23.918	116.841	0.000
Residual	61.206	299	0.205		
Total	156.876	303			

Note:  $a$ =dependent variable, implementation of LA in GC;  $b$ =Constant, teachers' perceived usefulness, teachers' perceived ease of use, and teachers' behavioral intention

Table 4 shows the detailed assumption model for the coefficients for each variable. Research shows that the predictor variables that contribute to the use of LA in GC based on the Beta value are the use of GC ( $\beta=0.556$ ), teachers' perceived usefulness ( $\beta=0.221$ ), and teachers' behavioral intention ( $\beta=0.163$ ). This shows that the use of GC contributes 55.6% of the variance, teachers' perceived usefulness contributes 22.1%, and behavioral intention contributes 16.3% to the use of LA in GC.

Table 4. Assumption model for coefficients

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	Beta	SE	Beta		
Constant	-0.082	0.253		-0.324	0.746
Use of GC	0.511	0.041	0.556	12.410	0.000
Teachers' perceived usefulness	0.416	0.109	0.221	3.805	0.000
Teachers' perceived ease of use	-0.125	0.102	-0.062	-1.233	0.219
Teachers' behavioral intention	0.198	0.063	0.163	3.159	0.002

Results from the study show that the use of GC is the most significant predictor factor, contributing to 55.6% of the use of LA in GC. Research findings clearly show the use of GC is a crucial factor in contributing to the use of LA in GC. This describes that teachers who implement GC indirectly will use LA in GC to assist them in teaching and learning. Teachers use GC data to see students' participation, submit assignments, analyze, and provide feedback to students [17]–[19], [39]. Therefore, the MOE, in particular, should ensure the use of GC in schools is periodically monitored. This approach may help teachers and students to improve the school's progress and ensure teachers can integrate LA in GC as one of the online teaching methods.

Furthermore, teachers' perceived usefulness is also an essential factor contributing 22.1% to use LA in GC. This shows that implementing LA in GC benefits teachers and can help them during teaching and learning. This also indicates that the use of LA in GC brings impact and is helpful to teachers in delivering knowledge. In other words, teachers feel that the use of LA in GC can make the workload more effective as it can help them plan, prepare and organize the learning methods to fit the needs of students and improve the learning progress and school's achievement at once. Moreover, teachers gave feedback that the use of LA in GC is easy to use, learning becomes more controlled, saves time, supports the critical aspects of teaching, and improves the work quality of teachers. This study is in line with [9], [32], [33], [39]. Teachers should look for opportunities to improve their competence and ability related to LA in GC. Teachers should take the initiative to increase their knowledge and skills by joining webinars or workshops regarding LA. Teachers' behavioral intention is the predictor factor contributing 16.3% to implementing LA in GC. This shows that teachers have the intention to use LA in GC during teaching and learning. Teachers also want to learn about the data analysis technique using LA in GC to analyze students' progress deeply. Teachers encourage their colleagues to use LA to create a positive learning environment. This is supported by previous researchers regarding teachers' behavioral intention [33], [34]. In past studies, teachers intend to continuously use LA during teaching and learning. However, teachers' intention is limited due to factors preventing them from implementing LA [29].

Based on the research results, the use of GC, teachers' perceived usefulness, and teachers' behavioral intention are the predictor factors that influence the use of LA in GC. Past studies predict the factors that influence the use of AP [13], [29], [30]. The study by Ameloot and Schellens [30] found five factors that influence the willingness to use AP, namely culture, data management expertise, data analysis expertise, communication, and policy application and training. The results of this study clearly show that the use of GC is one of the important factors that contribute to the use of AP GC. This gives the impression that teachers who use GC indirectly will use AP GC to help their teaching and learning. Teachers use data from GC to see student engagement, submit assignments, analyze, and provide feedback to students. Also, this illustrates that AP GC technology is useful and beneficial to teachers and can help teachers in class. Therefore, the Ministry of Education needs to ensure that the use of GC in schools is regularly monitored. This approach can help teachers and students to improve school performance and ensure that teachers can integrate various online teaching methods. To further improve the existing research, some suggestions can be considered to create research with better impacts. This study only includes population use and sample among the teachers in daily secondary schools in the Federal Territory of Kuala Lumpur. This may disturb the generalization of the research findings. Therefore, this study could use a broader population and sample that may be expanded to other states, regardless of rural areas or urban areas, as well as including primary school teachers.

Additionally, this research uses the quantitative method using the online questionnaire instrument. It is recommended for future research to use the qualitative method such as experiments to observe the effectiveness before and after use LA in GC. Next, qualitative research through interviews is also suggested to get detailed opinions from teachers regarding LA in GC. The study may also combine quantitative and qualitative methods to obtain more accurate findings. Further study in the future may add other variables which can influence the use of LA in GC. Furthermore, the research scope may be expanded by studying the use of LA using other learning platforms.

The results from this research are hoped to give meaningful impacts, descriptions, and helpful information for all related parties. The results of this study can provide guidance and contributions to stakeholders regarding the use of LA in GC and its implementation in schools. The findings of this study can be used as a guide in planning the use of LA among school students. In addition, it can give implications for the Ministry of Education to give an overview of the use of LA in GC among teachers in Kuala Lumpur. In other words, MOE can improve the quality and improve the existing learning portal which is DELIMA as well as the use of LA in GC. Ministry of Education also needs to ensure that programs, training, and support services related to LA in GC are widely disseminated to teachers to improve teachers' knowledge and skills.

#### 4. CONCLUSION

This paper describes the use of GC, teachers' perceived usefulness and behavioral intention were the predictors that influenced the performance of LA through the use of a digital learning platform, GC. In relation to that, the findings of this study are a starting point for future studies to examine in more detail the use of LA in GC so that this analytical approach is used more widely by education citizens and its implementation in schools increases. This study hoped to provide a description and contribute a required alternative for the Ministry of Education Malaysia, the schools, and related parties in designing an effective strategy that can help teachers monitor the suitability of using learning analytics in GC during teaching and learning. Lastly, it is expected that this research could provide a guide so that more research regarding LA using the GC learning portal according to the current technology needs can be conducted.


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