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RESEARCH ARTICLE

The Prediction of Form Four Science Achievement with Online Learning and Student's Self-Efficacy

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ABSTRACT

Student's self-efficacy and online learning is believed to reflect the confidence to master the learning of science. Proportional stratified random sampling technique was applied to 300 respondents. Quantitative survey was conducted through data collection using a set of 57-item research questions and a 30-item Multiple Choice Question (MCQ) science test. The data was analysed using a statistical package for social science (SPSS) version 26.0. The value of alpha Cronbach reliability in online learning research questions a=0.890, self-efficacy a=0.917, and science achievement test a=0.774. Stepwise multiple regression test results indicated that online learning and student's self-efficacy contributed 14 percent of the student science achievement, [F (2,297) = 24.246, p<.05]. The regression coefficient showed that both the variables of online learning (β=0.343), and self-efficacy (β=0.315), made a positive contribution to the science achievement of Form Four students. These findings explain that students who are at a high level of online learning and have a high level of self-efficacy also have a higher level of science achievement. It is found in this study that the main predictors of student science achievement are online learning followed by self-efficacy.

Contribution/Originality: This study successfully produced information related to the prediction of Form Four science achievement with online learning and student's self-efficacy, which was able to unravel research questions related to the presence of significant influence of online learning and student's self-efficacy towards the form four students' science achievement at rural schools.

1. Introduction

The achievement and understanding of students on a topic are influenced by many factors. Among those factors include learning methods and student self-efficacy. The academic achievement of students is not influenced by learning techniques alone (Zamri & N Suriya, 2007). The success or failure of a student is also influenced by other factors,

including the student's self-efficacy. This statement clearly shows that these factors will have a positive or negative impact on student academic achievement.

In Malaysia, online learning began to be widely adopted by the education sector, whether private or public, after the Movement Control Order (MCO) was implemented by the government to curb the spread of the COVID-19 epidemic (Mohamad Idham, 2020). However, the implementation of online learning is faced with several constraints that may affect the effectiveness of this learning method in ensuring that students' academic achievement does not decline. BERNAMA (2020) states that the main issue faced by students in following this online learning is poor internet access in students' homes, especially those living in rural areas.

However, this online learning needs to be implemented by teachers to ensure that students do not fall behind in their studies. According to Mohamad Idham (2020) there are many types of online learning applications that teachers can use such as Blackboard, Edmodo, Google Classroom, and ClassDojo. Through this application, students can access learning materials anytime and anywhere if they have a device and good internet access. Online learning directly or in real time such as Zoom may be used as a second option by teachers to prevent students who do not have a device and poor internet access from falling behind in the lesson (BERNAMA, 2020).

Self-efficacy is a person's belief in his ability to perform a desired behaviour successfully (Bandura, 1997). A person's tendency to succeed in carrying out the tasks given to him is higher if he has high confidence to do the tasks given to him (Fadhilah, 2013). Cheema and Kitsantas (2014) stated that self-efficacy is one of the important determinants in improving student achievement. This statement is also supported by Olivier et al. (2019) who indicated that student self-efficacy will affect student academic achievement in a subject. This situation clearly shows that student self-efficacy is important in determining the student's academic achievement. Student self-efficacy helps increase the potential for progress in learning in the future (Hung, Huang, & Hwang, 2014).

1.1. Research Objective and Hypothesis

The objective of the research is to identify the influence of online learning and student's self-efficacy towards the form four science achievement at Kota Belud district. The null hypothesis of the research, Ho1: There is no significant influence of online learning and student's self-efficacy towards the form four science achievement at Kota Belud district.

2. Literature Review

2.1. Online Learning

At the end of 2019, the world was shocked by the discovery of a new type of virus, the Corona Virus or better known as COVID-19 in Wuhan, China. The World Health Organization (WHO) declared a pandemic situation in January 2020 due to the spread of the COVID-19 epidemic (Ehwan, 2020). By the declaration of this epidemic, all countries have closed all sectors including the education sector. The closure of the education sector caused all schools and higher education centers to be closed to break the chain of transmission of this dangerous epidemic. As a result, the face-to-face teaching and learning process had to be stopped during the Movement Control Order (MCO) period. The closure of schools and institutions of higher education has forced all teaching and

learning activities to be conducted online. In Malaysia, the Malaysian Ministry of Education has issued guidelines for the implementation of teaching and learning online during the MCO starting April 1, 2020, which uses learning site applications such as Google Classroom so that students do not fall behind in their studies (Nor Hidayati, 2020).

In the context of this study, online learning is the only way that can be used by teachers in secondary schools to prevent students from falling behind in their studies. Sharing learning materials on Google Classroom, Schoology, Edmodo, and so on makes it easier for students to review learning. In addition, the exposure of online learning methods to students will also cause students to be more adept at accessing other online learning materials to help their understanding of the topics taught by the teacher. This situation will strengthen the students' existing knowledge.

A survey conducted by Siti Balqis and Muniroh (2020) found that the readiness of students in online learning is at a satisfactory rate. However, there are a few students who are not fully prepared to accept the online learning process due to poor internet access and physical and mental unpreparedness. The readiness of students to face online learning is something that needs to be paid attention to because they are the focus of educational knowledge to be delivered**.** Without student participation, the learning outcomes to be achieved cannot be delivered properly.

According to Limbong (2020), the implementation of online learning shows a negative relationship only to first-year students while a positive relationship can be seen in the achievements of second-year, third-year students and more senior students. This situation shows that senior students can more easily adapt to learning new norms. In addition, he also found that male students showed a slightly higher achievement increase than female students. This situation shows that male students are more creative and more adaptable to online learning than female students. In another study conducted by Firat (2016), it was found that online learning does not affect the academic achievement of students. Research data shows that there is no significant relationship between student academic achievement and the frequency with which students log into the online learning system (Firat, 2016).

2.2. Self-efficacy

Student self-efficacy also plays an important role in student academic achievement. According to Cheema and Kitsantas (2014), self-efficacy is seen as an important determinant in student academic achievement. Student self-efficacy is the confidence that students have in their ability to organize and perform the actions required to learn and master the given task at a satisfactory level (Schunk & Mullen, 2012).

In the context of science education, various components of self-efficacy are explored to obtain information to address science-related issues. This self-efficacy component is divided into two main dimensions; the group that imparts knowledge is the teacher, and the group that receives knowledge is the student (Noraida & Siti Mistima, 2021). Students who are the final product of an educational investment need attention to form positive self-efficacy. Attitude and interest in science can be improved through student self-efficacy. While teachers also play a role in shaping student's self-efficacy. Indirectly, teachers' teaching self-efficacy also needs to be considered.

So far, the study of self-efficacy on students' academic achievement in science subjects is still very little conducted, especially in Malaysia. Most of the studies conducted related to self-efficacy are conducted abroad and focus on student achievement in Mathematics subjects (Cheema & Kitsantas, 2014; Hung, Huang & Hwang, 2014), science subjects (Gao et al., 2020) as well as STEM education. This situation shows that there is a lack of research on self-efficacy in Malaysia. Therefore, the researcher wants to conduct a study related to student self-efficacy on student academic achievement in science subjects.

According to Bandura (1977), self-efficacy is an individual's expectation that he has behaved as required to produce or achieve a certain result. Self-efficacy is also meant as confidence in an ability to organize and implement the cognitive, behavioural, and social skills necessary to achieve success in a task (Jerusalem & Hessling, 2009). This theory states that highly motivated behaviour refers to a conscious cognitive process, involving the ability to anticipate goals and rewards, judgment, evaluation, and decision-making (Wan Hanum Suraya & Jamal Nordin, 2019). Bandura (1997) also stated that this theory explains the individual's level of confidence in the ability to perform certain tasks.

In a study conducted by Affandi Yusoff et al. (2020), they found that students' self-efficacy was at a high level. This may be due to the high level of motivation they experience is also high (Affandi Yusoff et al., 2020). In a study conducted by Wan Hanum Suraya and Jamal Nordin (2019), it was found that the level of self-efficacy of students is at a low level. This may be due to the selection of respondents consisting of students who obtained encouraging and less encouraging achievements in their PMR achievements before the study was conducted.

The level of self-efficacy of students based on gender does not show a significant difference. There is no gender group among students that stands out for self-efficacy (Affandi Yusoff et al., 2020). Self-efficacy is seen as an important determinant of student academic achievement (Cheema & Kitsantas, 2014). In a study conducted by Gao et al. (2020), they found that student self-efficacy affects student academic achievement. One of the important findings of this study is that student self-efficacy in science is significantly and positively associated with student science achievement (Gao et al., 2020).

2.3. Science Achievement

Academic achievement represents performance results that show the extent to which a person has achieved specific goals that are the focus of activities in the teaching environment, particularly in schools, colleges, and universities (Doménech-Betoret et al., 2017). Student academic achievement can also be defined as a significant demonstration of understanding, concepts, skills, ideas, and knowledge by a person (Tuckman, 2018). It refers to how students manage their learning and how they face or complete the different tasks given to them by the teacher.

Academic achievement in this study refers to the achievement of Form Four Science. Starting in 2017, the Secondary School Standard Curriculum (KSSM) was implemented in stages to replace the Secondary School Integrated Curriculum (KBSM). KSSM was enacted to meet the new policy requirements under the Malaysian Education Plan (PPPM) 2013-2015 so that the quality of the curriculum implemented in secondary schools is comparable to international standards (Malaysian Ministry of Education, 2018).

According to the Malaysian Ministry of Education (2020), Malaysia's achievement in Science for TIMMS 2019 shows a decline compared to TIMSS 2015. However, the average science score for TIMSS 2019 is better than the average science score for TIMSS 2011. The average score of Malaysian students in Science for TIMSS 2019 is 460. This score is lower than TIMSS 2015 with a difference of 11 points, but higher than the achievement in TIMSS 2011 with a difference of 34 points.

3. Research Methodology

3.1. Research Design

Mohamad Azri and Crispina (2019) think that research design is classified as how the most impactful method is used by a researcher to obtain information that should meet the needs of the research through the most minimal resources. In the context of this study, the researcher used a quantitative research design which is a descriptive inferential type of cross-sectional survey to explain a phenomenon that is happening. Research in the form of a survey can also be classified as a branch of descriptive research (Mohamad Azri & Crispina, 2019). Based on the term quantitative, quantitative research is associated with numerical data and precision. It is based on a positivist inquiry research method where research is conducted through correlational studies and numerical data collected and analysed with statistical tests. Through quantitative research, the research problem is stated in the form of a hypothesis (Rasyidah, 2013). This study is in the form of a relationship between the independent variable which is online learning and student self-efficacy against the dependent variable which is the science achievement of Form Four students. For obtaining information, questionnaire methods and scientific evaluation questions are used to facilitate the collection of information and data from the respondents involved.

3.2. Sample

One of the important aspects in determining the population and sample size of a study is to touch on the question of representation and adequacy (Sidek, 2000). In this regard, the question that is often raised is related to the amount of sampling which is said to be sufficient for a certain population. Thus, the population of this study is a total of 1256 fourth-grade science students in nine secondary schools in Kota Belud District, Sabah.

In the context of this study, the researcher has ensured that all procedures related to the determination of the number of samples have been carried out correctly and follow the procedure precisely to be able to predict the population indicators of this study. Therefore, the sample size of this study was set at 300 students to represent the population of fourth grade science students in Kota Belud district, Sabah. The determination is based on Table 1.

Table 1: Krejcie and Morgan (1970) Table

N	***S***	***N***	***S***	***N***	***S***
10	10	220	140	1200	291
15	14	230	144	**1300**	**297**
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310

35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Source: Krejcie and Morgan (1970)

3.3. Instrument

There are two ways to obtain or provide research instruments, namely either administering existing and used instruments or administering newly developed instruments by the researcher himself or others (Noraini, 2010). In this study, the researcher used the online learning questionnaire and self-efficacy that had been built by the previous researchers. The science questions were developed by the researcher based on the Form Four science syllabus for chapters one to three. The researcher selected an online learning questionnaire instrument by Noraffandy and Ling (2011) which contains 36 items and consists of four parts. In this study, the researcher modified the questionnaire items in several sections to suit the context of the study. The modified questionnaire items went through a process of facial validation and content validation from the experts involved after permission was granted. This questionnaire uses a five-point Likert scale, namely Strongly Disagree (1), Disagree (2), Uncertain (3), Agree (4) and Strongly Agree (5). For the aspect of student self-efficacy, the researcher used the questionnaire instrument The Self-Efficacy Questionnaire for Online Learning (SeQoL) by Shen et. al. (2013) which has been modified by Chia et al. (2020). This questionnaire contains six sections consisting of 25 items. The researcher has translated each item in this questionnaire into Malay to adapt to the context of this study. This questionnaire has gone through a process of facial validation and content validation from the experts involved. Shen et al. (2013) used an 11-point Likert scale where 0 represents 'cannot do' and 10 represents 'very confidence can do' (Chia et al., 2020). In this study, researchers used a 5-point Likert scale after receiving recommendations from experts. This is because the 11-point Likert scale is not suitable for secondary school students. The original instrument for the Self-Efficacy Questionnaire for Online Learning (SeQoL) was built in English. The researcher has translated the instrument into Malay using the

Google Translate application and revised it using the Cambridge Dictionary (2019) to ensure that the translation is easy to understand and has correct grammar. The set of questions will be given to all the respondents involved in this study. This test is built to assess students' Science achievements. The items in this test are based on the Form Four Science syllabus (KSSM). 30 questions that have been constructed by the researchers in this study using four (Knowledge, Understanding, Application, and Analysis) of the six difficulty levels of Bloom's Taxonomy which involve the level of knowledge, comprehension, application, and analysis.

3.4. Instrument Validation

In this study, the instruments used were questionnaires and achievement tests. Therefore, the validity of this research instrument refers to the validity of the face and the validity of the content. The validity of the face and the validity of the content can only be determined by a person who specializes in the construction of such instruments. Therefore, before the set of questions is distributed to students, the researcher will consult the lecturers and science teachers to review and evaluate the questionnaire items and assessment questions that will be used and have been constructed by the researcher. In this way, the researcher will be able to make modifications to the items based on the comments given by the lecturers and science teachers so that the validity of this research instrument can be improved. In addition, the modification of this item also aims to ensure that all test content targets are covered equally. According to De Vellis (1991), facial validity is done to ensure the clarity of the item, the questions asked, sufficient response time, and most importantly the item measures what should be measured (Mohamad Azri & Crispina, 2019). Facial legitimacy is to see the tone of the language, and the fluency of the sentences and have a clear, easy-to-understand, and accurate meaning. Therefore, the instrument for this study has been given to two experts, consisting of a senior lecturer at UMS and an experienced science teacher to provide feedback on the suitability of constructs and items, translation aspects, use of words, sentences, language and see possible errors that need to be corrected. Next, the two experts verify the content of each questionnaire and science question to be able to measure the aspect of the study. Content validity refers to the extent to which a constructed instrument can measure what is appropriate and to be measured. The validity of the content is based on the extent to which a measurement can indicate a specific and expected summary of the content domain (Carmines & Zeller, 1991). The validity of the content was determined through a panel of experts in the field of construction who made comparisons with the research objectives. The researcher has referred to two experts with extensive experience, especially in the field of educational research.

3.5. Instrument Reliability

In this study, Alpha Cronbach was used to test the internal consistency of the study instrument, namely the evaluation question. A test is said to have high reliability if the same test is given a second time in a certain period but still gets the same result as the first time (Chua, 2006). According to Noraini (2010), the range of the trust index is between zero (α=0) to 1 (α=1). The higher the value of a, the higher the reliability of the instrument. The level of reliability is expressed as high, medium, or low because to date there is no globally agreed definition. Noraini, (2010) stated that an alpha index of 0.7 and above is good, while an alpha index value of 0.6 and above is an acceptable value. The results of the reliability test found that the reliability values of the study items used

involved three study instruments, namely online learning, self-efficacy, and form four science tests, all had good and acceptable reliability values. Online learning instruments α=0.890, student self-efficacy instruments α=0.917, and student science achievement instruments α=0.774. All three instruments in the pilot study showed good reliability values and could be applied in real studies. According to Bond and Fox (2007), reliability values above the α=0.70 level are good and acceptable. The data obtained will be analysed using the Statistical Package for Social Science (SPSS) software version 26.0. Regression test analysis, on the other hand, is used to identify changes in two or more factors (independent variables) that contribute to changes in a dependent variable (Chua, 2006).

4. Research Result

Multiple regression analysis (Stepwise) was used by the researchers to identify the contribution of online learning and self-efficacy (independent variable) which is a predictor in determining the science achievement (dependent variable) of form four students in the Kota Belud district. In addition, multiple regression analysis was also conducted to test the six hypotheses of the study, namely: $H_0 1$ There is no influence of online learning and self-efficacy on the Science achievement of Form Four students in Kota Belud District.

Table 2 shows that the R Square value of .053 (Model 1) shows that the change in the variable based on the science achievement of form four students is due to the independent variable of online learning. The R Square value of .140 (Model 2) shows that 14 percent of the change in the variables based on the science achievement of Form Four students is due to the combination of the two independent variables, namely online learning and student's self-efficacy.

Table 2: Multiple Regression Summary Models

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.231a	.053	.050	3.37959
2	.375b	.140	.135	3.22610

a. Predictors: (Constant), Online Learning
b. Predictors: (Constant), Online Learning, Self-efficacy

Table 3 shows the ANOVA test results for Model 1 and Model 2 Multiple Regression. The ANOVA results in Model 1 show that the regression model containing the independent variable of online learning is significant [F (1,298) =16.822, p<.05]. Meanwhile, the results of the ANOVA test in Model 2 show that the regression model containing two independent variables, namely online learning and self-efficacy, is also significant [F (2,297) =24.246, p<.05].

The results of the multiple regression analysis as shown in Table 3 and Table 4 show that both the independent variables of online learning and self-efficacy can significantly explain 14 percent of the variance in the variables based on the science achievement of form four students, [F (2,297) =24.246, p<.05]. The regression coefficient showed that both the variables of online learning (β=0.343), and self-efficacy (β=0.315), made a positive contribution to the science achievement of Form Four students. These findings explain that students who are at a high level of online learning and have a high level of self-efficacy also have a higher level of science achievement. Therefore, the null

hypothesis ($H_0$1) which states that there is no influence of online learning and self-efficacy on the science achievement of form four students in the Kota Belud district is rejected. Generally, the overall contribution of the two variables, namely online learning, and self-efficacy, is significant to the science achievement of form four students in the Kota Belud district and can be formed through the regression equation as follows: Y=14.13 + 4.18X1 + 2.08X2 where; Y = Form Four Students' Science Achievement; X1 = Online learning; X2 = Self-Efficacy.

Table 3: ANOVA Model 1 and Model 2 Multiple Regression Test Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	192.140	1	192.140	16.822	.000[b]
	Residual	3403.647	298	11.422		
	Total	3595.787	299			
2	Regression	504.698	2	252.349	24.246	.000[c]
	Residual	3091.088	297	10.408		
	Total	3595.787	299			

a. Dependent Variable: Science Achievement
b. Predictors: (Constant), Online Learning
c. Predictors: (Constant), Online Learning, Self-efficacy

Table 4: Coefficients Model 1 and Model 2 Multiple Regression Results

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	11.734	2.436		4.817	.000
	Online Learning	2.815	.686	.231	4.102	.000
2	(Constant)	14.134	2.366		5.973	.000
	Online Learning	4.177	.701	.343	5.961	.000
	Self-efficacy	-2.076	.379	-.315	-5.480	.000

a. Dependent Variable: Science Achievement

The conclusion of the regression equation shows that online learning and self-efficacy have a significant correlation and impact and predictor on the science achievement of Form Four students in the district of Kota Belud, Sabah. It was found that the main predictor of Form Four student's science achievement was online learning followed by self-efficacy. This means that the null hypothesis ($H_0$1) is rejected because the variables of online learning and self-efficacy affect the science achievement of Form Four students in the Kota Belud district.

5. Discussion

The results of simple regression analysis confirmed that online learning and students' self-efficacy had a significant correlation and impact and predictor on the science achievement of form four students in the district of Kota Belud, Sabah. A study conducted by Limbong (2020) support the findings of this study where he found that the use of online learning methods during the COVID-19 epidemic had a positive impact on the improvement in student's academic achievement. The findings of this study are also in line with the findings of Gursul and Keser (2009) which found that the achievement scores for the group that used online learning were higher compared to the achievement

scores of the group of students who used the face-to-face learning method. Learning using digital games in e-books for practice is also seen to be able to attract students' attention to achieve better achievement compared to other students (Hung et al., 2014). However, the findings of this study are in line with the findings of a study by Han and Shin (2016) where they found that the use of a Learning Management System (LMS) as one of the online learning methods has a weak influence on students' academic achievement. LMS is an online learning site that allows students to access any learning materials available on the site at any time. This situation may cause a few students to not pay attention or forget to access the learning materials, causing them to fall behind in their studies. However, the findings of Kim et al. (2019) are not in line with the findings of this study where they found that online learning does not directly affect students' academic achievement. According to Olivier et al. (2019), students' academic achievement is also influenced by their self-efficacy in a subject and this will contribute to their achievement in the future. The findings of this study are in line with the findings of a study by Olivier et al. (2019) which found that self-efficacy affects students' academic achievement which will provide the expected results for students' academic development. This is because a student's self-efficacy will affect their self-confidence and motivation to strive more to achieve academic excellence. Students' self-efficacy will also affect the potential for future learning progress (Hung et al., 2014). The findings of this study are fully supported by Maslow's Hierarchy of Needs theory which states that an individual usually tends to make judgments about himself based on the impressions and treatment of those around him. Students' desire to engage in online learning and their self-efficacy are influenced by the individual as well as the atmosphere around them. If students are surrounded by individuals and a positive atmosphere, it will undoubtedly meet their need to learn in a calm and helpful state in their learning process.

6. Conclusions

The results of the study prove that online learning and students' self-efficacy have indirectly influenced the science achievement of form four students in the Kota Belud district. The findings of this study are expected to have useful implications for stakeholders such as the Ministry of Education Malaysia (MOE), State Education Departments (SED), District Education Offices (DEO), and every school nationwide. The combination of online learning and students' self-efficacy is important in ensuring that students' science achievement remains at a satisfactory level, especially during this COVID-19 pandemic season. The researcher suggested that the MOE, SED, DEO, and schools should plan for school improvement programs that involve efforts to improve aspects of online learning and efforts to stimulate students' self-efficacy so that student's academic achievement in science subjects can be further improved.

Ethics Approval and Consent to Participate

The researchers used the research ethics provided by the Research Ethics Committee of Universiti Malaysia Sabah. All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional research committee. Permission was obtained from the Malaysian Ministry of Education, Sabah Education Department, District Education Office, and the school principals involved in the study. Informed consent was obtained from all the participants.

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Conflict of Interest

The authors reported no conflicts of interest for this work and declared that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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