

Effects of Online Discussion Board on Students' Academic Performance in Science

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Abstract— This study examined the effects of Online Discussion Board (ODB) on Grade 8 students' academic performance in learning science in one public school in Bukidnon, Philippines during the pandemic. Quasi-experimental design was utilized with one group exposed to ODB and another to a non-ODB approach. A teacher made test with a reliability of .90 was used to assess the performance through pretest and posttest. Results revealed that both groups did not meet the expectations during the pretest and posttest. However, there was an increase in the mean percentage score of students who were taught using ODB. Moreover, students exposed to online discussion board had a mean percentage score of 53.67 ($SD=18.64$) while those exposed in non-online discussion board had a mean of 44.75 ($SD=11.19$). The F -value is equal to 134.250 ($p<0.01$) between groups indicating highly significant difference. Students exposed to ODB performed much better compared to ODB. Online Discussion Board may be utilized by science teachers to enhance students' performance.

Keywords— Online Discussion Board, academic performance, science students.

I. INTRODUCTION

Science education is perceived to be of great significance because of its link to technology and industry-leading to modernization, economic growth and development. The K to 12 curriculum envisions the development of scientific and functional literacy among students that will enable them to become active participants in the decision-making in the modern community and become a quality and competitive source of manpower for nation-building. The ability to deal with science-related issues, explain scientific phenomena, evaluate and design scientific inquiry and interpret data and evidence are among the skills needed for the attainment of scientific literacy (Department of Education, 2013). However, the result of the 2018 Program for International Student Assessment (PISA) revealed that Philippines obtained an average scientific literacy score of 357 points which is significantly lower than the average score of all participating countries. Filipino students' proficiency level is within level 1a which means that students are only able to use basic content and technical knowledge to recognize or identify explanations of simple scientific phenomenon compared to other participating countries which is proficiency level 3. Additionally, the majority of the junior high school students were either at Level 1b (35.49%) or Level 1a (35.20%) respectively (Cordon, 2020). Similarly, the result of the National Achievement Test (NAT) for Grades 6 and 10 for the school year 2018 of which Quezon National High School in

Quezon, Bukidnon was among the selected participants revealed that science registered a mean percentage score (MPS) of 44.59% which is way far below the acceptable mean of 75 in all learning areas which significantly implies a tremendous challenge to further the quality of the basic education in the country today (DepEd, 2019).

Science particularly chemistry is perceived to be one of the most difficult subjects for students to learn because of its highly conceptual and abstract concepts that require a higher level of thinking skills which have drawn negative impacts and opinions among the students labeling it as boring and burdensome and is one of the most hated subjects in high school level (Arances et al, 2014). When students are bored, their attention may be drifted away from the discussion which may create a gap in students' academic performance. Teachers, therefore, have to vary their strategies and approaches in teaching science lessons to counter such assertions and develop among the students their valuable insights towards the subject (Bondoc, 2016).

The government has already made significant steps in improving the quality of education in the country by making every effort to provide various actions to improve students' scientific literacy. However, the sudden shift into distance learning modality brought about by the COVID-19 pandemic has led to more strains in the educational system. The use of printed self-learning modules (SLMs) as the most preferred learning method in most of the public schools in the Philippines has contributed to even more challenges including student's difficulty in following the instructions in the modules, late submission answer sheets of which sometimes are blank or insufficient which definitely imply lack of mastery of the lessons (Dangle & Sumaoang, 2020).

On the other hand, online learning platforms are regarded to be the most innovative means in distance learning since it has the ability to facilitate various interactive and remote activities and transmit a wide range of content to a connected learning community. Online discussion board (ODB) is one of the strategies for delivering online learning which involves exchanging opinions, generating ideas, and testing ideas carried out through digital technology as a medium where the learning process can be done anytime, anywhere and in any situation, without bounded by space and time (Halimah, 2020). A well-designed discussion board activity will be useful in discussing key concepts which will allow students to become actively engaged in the learning process (Blackmon, 2012). While several studies have been conducted on the use

of this online learning platform, there were only few in terms of its capability to be used as an online learning tool for science education specifically in discussing abstract concepts in chemistry.

II. METHOD

The study utilized a quasi-experimental research design to examine students' academic performance in learning science. This involved two heterogeneous sections of Grade 8 science classes with 34 students per section as respondents of the study. Both groups received the same content of the lessons however, the implementation varies as one group was exposed to online discussion board while the other group was exposed to non-online discussion board. A validated questionnaire consisting of 60 items was utilized to test the performance of the students. The academic performance based on the K to 12 Grading System stipulated in DepED Order No. 8 series of 2015 was made as basis of the ratings. A pretest was given to the students to determine their level of academic performance in Grade 8 Science before the implementation of Online Discussion Board (ODB) and Non-Online Discussion Board (non-ODB). The same test and questionnaire were administered after the implementation of the innovation to ascertain and analyse correspondingly the significant differences in the level of students' academic performance. The implementation was divided into five stages patterned on Salmon (2011) model of teaching and learning online namely: Access and Motivation Stage, Online Socialization Stage, Information Exchange Stage, Knowledge Construction Stage and Review and Development stage.

The collected data was categorized, tabulated, summarized and analysed. Descriptive statistics such as the mean, mean percentage score (MPS) and standard deviation were employed to determine the level of students' academic performance when exposed to ODB and those exposed to non-ODB.

To analyse the significant difference on the level of students' academic performance, Analysis of Covariance (ANCOVA) was employed. Pre-test scores served as covariate to eliminate its possible effects in the group.

III. RESULTS AND DISCUSSION

As presented in Table 1, students in both ODB and non-ODB groups were not able to perform well in the pretest. As shown, non-ODB had an overall mean percentage score of 38.48 which is higher than the 34.75 garnered by the ODB group. All the students did not meet the expectations prior to the implementation of the Online Discussion Board.

It can be inferred from the data obtained in the pretest that students have little knowledge of the concepts specified before the introduction of the innovation despite the spiral progression of the curriculum. The result of the pretest could also be anchored on one of the findings of Dangle and Sumaoang, (2020) and Baticulon, (2021) that most students are having difficulty in adjusting to the new learning modality specifically with self-studying and difficulty following the instructions in the modules which basically leads to poor academic performance.

TABLE 1. Students' academic performance in the pre-test of ODB and non-ODB group.

Transmuted Grades	ODB		Non-ODB		Descriptive Interpretation
	N	%	N	%	
90 – 100	0	0	0	0	Outstanding (O)
85 – 89	0	0	0	0	Very Satisfactory (VS)
80 – 84	0	0	0	0	Satisfactory (S)
75 – 79	0	0	0	0	Fairly Satisfactory (FS)
74 – below	34	100	34	100	Did Not Meet Expectations (DNME)
TOTAL	34	100	34	100	
Overall MPS	34.75		38.48		DNME

Meanwhile, Table 2 presents the level of academic performance of students in their pre-test, frequency and percentage of scores when exposed to ODB and those exposed to non-ODB. Results reveal that four (4) or 11.76% of the students exposed to ODB obtained a very satisfactory performance; six (6) or 17.65% had a satisfactory performance; five (5) or 14.71% are fairly satisfactory and 19 or 55.88% did not meet expectations. On the other hand, only two (2) or 5.88% of students exposed to non-ODB gained satisfactory performance while 32 or 94.12% of the students did not meet expectations. Overall, while both groups still did not meet expectations, there is an increase in the MPS of both groups with the ODB group garnering a higher MPS compared to the non-ODB group.

On the posttest, it is observed that both groups increased in the mean percentage score but unlike the pretest, the ODB group had the higher MPS during the posttest. This conforms to the study of Halimah (2020) which states that the use of technology for online discussion method is one of the quality indicators that promotes effective learning during the pandemic period.

TABLE 2. Students' academic performance in the post-test when exposed to ODB and those in non-ODB

Transmuted Grades	ODB		Non-ODB		Descriptive Interpretation
	N	%	N	%	
90 – 100	0	0	0	0	Outstanding (O)
85 – 89	4	11.76	0	0	Very Satisfactory (VS)
80 – 84	6	17.65	2	5.71	Satisfactory (S)
75 – 79	5	14.71	0	0	Fairly Satisfactory (FS)
74 – below	19	55.88	32	94.29	Did Not Meet Expectations (DNME)
TOTAL	34	100	34	100	
Overall MPS	53.68		44.75		DNME

Also, the result is most likely similar to Camus (2016) which states that students gained significantly higher grades when she investigated the effects of using an online discussion tool on students' participation, learning and overall course performance. Although both groups still "did not meet expectations", the better scores garnered by the students exposed to ODB shows the potential of the strategy to enhance learning as supplement to the modules.

Table 3 presents the analysis of covariance (ANCOVA) on students' academic performance exposed to ODB and those exposed to ODB. The findings revealed that students exposed

to online discussion board had a mean percentage score of 53.67 (SD=18.64) while those exposed in non-online discussion board had a mean of 44.75 (SD=11.19). The F-value is equal to 134.250 ($p < 0.01$) between groups indicating highly significant difference.

TABLE 3. Analysis of Covariance (ANCOVA) on students' academic performance

Group	N	(MPS)	SD
ODB	34	53.67	18.64
Non-ODB	34	44.75	11.19
TOTAL	68	49.22	15.91

Source	SS	df	MS	F-value	Sig.
Model	180512.748 ^a	3	60170.916	3389.415	.000**
Pre-test	14451.146	1	14451.146	814.030	.000**
Group	4766.564	2	2383.282	134.250	.000**
Error	1153.919	65	17.753		
Total	181666.667	68			

The findings is also similar to Sobejana (2016) and Halimah, (2020), students' exposure to educational technology relates to higher academic performance. The use of digital technology can also be used as a medium for online discussion during pandemic time which could significantly affect the effectiveness of learning.

IV. CONCLUSION

Students level of academic performance in the pre-test when exposed to ODB and those to non-ODB mostly did not meet expectations. However, improvements can be observed after the introduction of the intervention as expressed in the post test scores of both groups. Although generally it indicates not meeting the expected performance but those students exposed to ODB performed better than those in non-ODB. The students' academic performance was significantly different between ODB and non-ODB group, thus, it can be noted that ODB can be used to improve students' interaction and communication as well as higher order thinking skills through their participation in the discussion. Given that a considerable improvement in the level of academic performance in Grade 8 science is observed when students

were exposed to online discussion board (ODB), perhaps educators and curriculum implementers might put into consideration the possibility of integrating the aforementioned intervention to the existing learning pedagogy regardless of the grade level and subject matter. Teachers may explore the use of online digital platforms as an avenue for online discussion board to commence as well as to enhance communication between the students to express their ideas freely and become more actively engaged in the teaching and learning process.

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