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DIGITALIZED MODULES THROUGH KOTOBEE APPLICATION: A TEACHING INTERVENTION ON IMPROVING PUPILS' PERFORMANCE LEVEL IN SCIENCE SUBJECT

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ABSTRACT

Accessible lesson inputs serve as motivation and basis for grasping science concepts, especially in online classes. Pupils fail to review these teacher-given inputs in blended modular and synchronous settings. This study sought to determine the effectiveness of digitalizing modules through Kotobee Author and Reader application on pupils' performance level in science. Using a quantitative approach and a one-group pretest-posttest design, twenty-six (26) Grade 4 pupils of Jimenez Central School (JCS) enrolled in the school year 2020-2021 participated in the study The Division evaluated and validated Science quarterly assessment was used as the instrument for this study. Utilizing statistical tools such as Actual Mean, Hypothetical Mean, the z-test, and the t-test, the instrument's data were analyzed and interpreted. Results of the study showed the following: (1) the performance level of the pupils before the intervention did not meet expectations, (2) the performance level of the pupils after the intervention was satisfactory, and (3) there was an improvement in the pupils' performance level in science when Kotobee-digitalized modules were used. The researchers recommend the following: (1) teachers could conduct a follow-up study to improve pupils' academic performance level in other subject areas, (2) teachers could initiate a similar study on pupils from other grade levels, and (3) researchers could determine the perceptions of pupils, teachers and parents in the utilization of the Kotobee Author and Reader application.

Keywords: *academic performance, asynchronous activities, digitalized modules, Kotobee Author and Reader application, Learning Delivery Modalities*

Introduction

The COVID-19 pandemic, which has affected nearly 1.6 billion students in over 190 countries and continents, has caused the most widespread disruption of educational systems in history. School closures and other learning spaces have impacted 94% of students worldwide, with the figure rising to 99% in low- and middle-income countries (United Nations, 2020). The COVID-19 pandemic poses challenges for a variety of sectors, particularly those concerned with fundamental rights. Because schools and community learning centers are closed for in-person instruction, the physical separation and community quarantines imposed to contain COVID-19 have a significant impact on basic education.

As a result, the Department of Education issued DepEd Order No. 12, s. 2020, titled "Adoption of the Basic Education Learning Continuity Plan for School Year 2020-2021 in Light of Public Health Emergency COVID-19," which detailed the Department's Basic Education Learning Continuity Plan (BE-LCP), a collection of educational interventions addressing basic education. The department streamlined the K-12 Curriculum into the Most Essential Learning Competencies (MELCs), which will be taught through a variety of platforms and learning modalities. MELCs must be used by field implementers across the country for SY 2020-2021, and as needed thereafter (DO 12, s.2020). Because physical conduct in class is prohibited, the DepEd emphasized that learning opportunities for students may be provided through blended learning modalities.

In addition, the Basic Education Learning Continuity Plan included in DO No. 12, s.2020 listed the following learning delivery methods: blended distance learning, online distance learning, TV-based instruction, radio-based instruction, and modular distance learning. The Schools Division of Misamis Occidental sought to deliver instruction in an efficient and effective manner using appropriate online learning modalities in accordance with the requirements of the Learning Continuity Plan (LCP). However, in the context of the new norm of students studying independently, the situation presented a unique challenge to learner motivation because, in distance learning environments, there is typically no teacher present to guide and encourage the student in the learning process (Liu et al., 2017). As we move from the four walls of the classroom to the boundaries of remote learning reality, it is critical to investigate how technologically modified learning affects the delivery of high-quality education to students.

Based on the school survey, Jimenez Central School's Basic Education Learning Continuity Plan (JCS) revealed that 853 pupils selected modular learning, 26 pupils opted for online learning, and 31 SPED learners preferred home schooling. Jimenez Central School provided online classes (synchronous learning) and modular classes (asynchronous learning). With printed modules, teachers just handed out weekly lessons during module distribution for the pupils to accomplish at their convenient time and to be submitted back to the teacher-advisers during the set retrieval dates. This modality limited teacher’s provision of discussion on topics and minimized teacher assistance on supplemental multi-media aids and inputs such as audio-video clips related to the lessons.

In the Grade 4-Diamond class, Online Distance Learning (ODL) was the pupils’ preferred learning method. Since this is the first time that the school will offer ODL classes, synchronous set-up has its limitations in terms of power supply and internet or signal stability. There is a need to provide supplemental offline inputs for learners to cater synchronous online inconveniences. The researchers thus saw the need and relevance to see how accessible

offline platforms will further improve pupils' academic performance in online distance learning. In this light, the researchers wanted to assess the effectiveness of the Kotobee Author and Reader application in enhancing the performance level of the Grade 4 pupils of Jimenez Central School in Science.

Conceptual Framework and the Process

In new normal education, digitalized modules in e-book format serves as an integral part in distance learning. In addition to accessible modules offline, instructional videos and audio clips are also made accessible through mobile as well as handheld devices. Learners can literally study through their mobile devices from the very first activity of understanding lessons, viewing attached videos and audios, obtaining digital learning modules, accessing other supplemental materials, as well as taking quizzes and other offline assessments.

With the continuous development of increasingly sophisticated smartphone technologies, it is important for DepEd to continuously improve its distance learning system. Kotobee Author for teachers is a user-friendly application in digitalizing modules, which includes attached texts, images, audio clips, instructional videos and assessment. This entails a continuous training-workshop for teachers in navigating through this application and eventually getting mastery in converting modules to digital format. On the other hand, the Kotobee Reader for learners is a downloadable application installed on their Android phones to access modules offline and answer the quizzes right after. Parents and guardians were given an orientation on the installation and utilization of this application.

Currently, in the context of the fourth industrial revolution, products of technology are utilized in all fields. In the field of education, more teaching-supporting software and applications are being developed, including e-books. E-books are documents that can provide students with information and instructions in the form of multimedia in a flexible and efficient manner, thereby enhancing and supporting learning. The study described the process of using Kotobee Author and Reader applications to create e-book content and offline technological activities to teach integrated Science topics with the goal of fostering students' self-learning skills in a distance learning environment.

The class adviser, who is also the DepEd-trained school Information and Communication Technology (ICT) teacher, downloaded and installed Kotobee Author for Windows on laptop. The Kotobee Author is an Interactive E-Book creation and digital publishing software. Once fully installed, modules are then digitalized through this process:

Book Layout. Choose reflowing text as book layout format since this gives excellent visibility on the learners' mobiles, with support for font-size adjustments.

Book Details. Provide lesson title and teacher's name under book title and author. Encode the sources of publisher and rights. Provide information inside the description box.

Content. Similar to Microsoft Word, Kotobee's content area contains the lesson's specifics. The instructor could also copy from the source, the softcopy of the module, and then paste the content into the content area. Modify font types, sizes, and colors for the convenience of learners. Insert supplementary electronic materials such as high-definition images, audio clips, videos, and links with options for adjusting size, width and height, brightness, and other areas. Add appropriate lessons and chapters for subjects with multiple topics.

E-quiz. Provide mastery tests or drills by adding sets of questions and scoring options. Quizzes could be presented on varied methods: true or false, multiple choice (single answer),

multiple choice (multiple answers), open-ended questions, and drag and drop. Formatting preferences are also available. Learners are informed of their scores after taking the quiz, and given re-attempt options.

The teacher-adviser requested parents and guardians of the pupils for a class orientation and installment of the Kotobee Reader application on their respective gadgets and mobiles. Parents are trained on how to operate the application on the provided e-books on the presentation of the lesson title, the discussion of the lessons or content and the demonstration in taking drills through e-quizzes. Scored tests are provided by the teacher through Google form links.

The next page presents the schematic paradigm showing the process on how the researchers measured effectiveness of the Kotobee Author and Reader application in enhancing the performance level of the Grade 4 pupils of Jimenez Central School in Science. The participants were given the quarterly assessment serving as pre-test which determined their performance level in attending online classes without the utilization of the Kotobee application. The same quarterly assessment served as posttest was then given to the participants after a period of two months. From the result of the pre-test and posttest, the researcher determined the effectiveness of the Kotobee Author and Reader application on the performance level in science of the participants. The Kotobee Author and Reader application served as the independent variable.

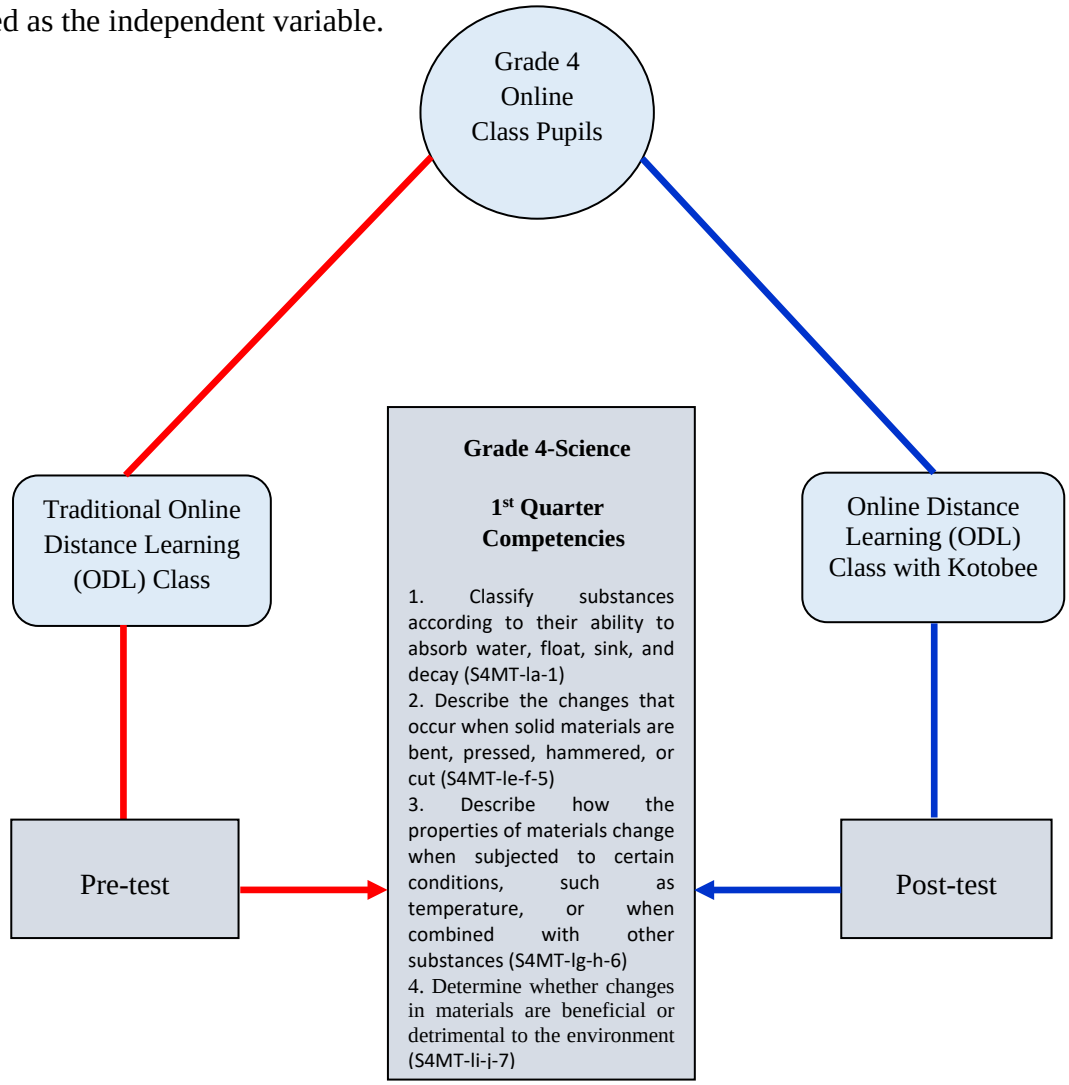

Figure 1: *Schematic Diagram of the Study*

Methods and Materials

This study employed the pre-post experimental research design. The researcher used the one-group pretest-posttest design, involving three steps: (1) giving a pretest to measure the dependent variable; (2) applying the intervention to the target respondents; (3) administering a posttest, again measuring the identified dependent variable. A comparison of the pretest and posttest scores evaluated differences linked to the application of the intervention (King et al, 2015). The pre-post experimental research design is set to meet the needs of a significantly diversed group of respondents (Glanz, 2015). Respondents were not randomly assigned since the target population, Grade 4 - Diamond enrolled pupils are limited and pre-determined.

The researchers used the same pretest and posttest instrument, just differently arranged according to item sequence. This is a 40-item teacher-made test, adapted from the standardized Self-Instructional Module (SIM) to measure the pupils' performance for the 1st quarter. This was provided through Google form link. Tables of specifications were checked by the master teacher in the identified grade level.

To determine the effectiveness of Kotobee-digitalized modules in the performance of Grade 4 – Diamond pupils in science. Quantitative data were analyzed to determine the effectiveness of this intervention. The data gathered were interpreted using the following statistical tools:

Weighted Mean. This was used to describe the performance of the Grade 4 online class pupils during the pretest and posttest.

Z – test. This was used to determine the significant difference between the Hypothetical Mean (HM) score and the Actual Mean (AM) of the students who got the correct answers on the pretest and posttest. The Hypothetical Mean (HM) or the level of expectation was set at 75%. The 75 Hypothetical Mean (HM) is based on the respondents' scores rather than their actual grades as determined by the institution where the current study was conducted.

t- test. This was used to determine the significant difference between pretest performance and posttest performance of the Grade 4 online class pupils.

All statistics values were set at 0.05 level of significance (α).

To draw out the responses of the participants on each item, a 5-point Likert scale was used in the study in accordance with the Department of Education's Form 138 (School Report Card) with the description and item scale indicated below:

Description	5-item		40-item	
Outstanding	4.26	5	36	40
Very Satisfactory	3.51	4.25	31	35
Satisfactory	2.76	3.5	26	30
Fairly Satisfactory	2.01	2.75	16	25
Did Not Meet Expectations	below	2	below	15

Discussion of Results

Table 1 presents the pretest performance of the Grade 4 pupils in online class. There were four (4) competencies included in the investigation namely; Classify substances according to their ability to absorb water, float, sink, and decay; Describe the changes that occur when solid materials are bent, pressed, hammered, or cut; Describe how the properties of materials change when subjected to certain conditions, such as temperature, or when combined with other substances; and Determine whether changes in materials are beneficial or detrimental to the environment.

The level of expectation (HM) was set at 75 percent of the total number of items in each of the competencies. The t computed z test value of -32.52 did not exceed the critical value of 1.645 at having 25 Degrees of Freedom (df) which implies that it is not significant at 95 percent confidence level (α).

The table further discussed that the group under competency weeks 1, 2 and week 6 obtained "very satisfactory" performance based on the Actual Mean (AM)s of 3.60, 3.36 and 3.76 having 3.69, 1.48 and 3.25 Standard Deviation respectively. This denotes that the competencies discussed in these weeks only involved information recall and have been familiar and relevant with the pupils' environmental background and personal experiences.

However, the group has "did not meet expectations" performance on the competency for week 7: describe changes in properties of materials when exposed to certain conditions such as temperature or when mixed with other materials obtaining Actual Mean (AM)s of 3.60 having 3.69 Standard Deviation respectively. This implies that pupils' scores may have been affected on the limited discussion time given by the teacher during the actual online classes. Pupils have no access on the supplemental materials such as images, audio clips and videos presented during real-time discussion in online classes.

Siano & Potane's study of employing interactive e-books to boost students' academic progress supported the current findings. Digital versions of Self-Learning Modules (SLMs) using the Kotobee program were found to produce considerable academic success among learners in their study. Technology integration in the classroom is not only a wonderful concept for the digital world, but it is also a requirement to stay up with the new normal in education. It turns classes into engaging learning experiences that help students retain information and improve comprehension (Hoai &Giang, 2020)

Table 1

Pre-test Performance of the Pupils Before the Intervention

Topics	Items	HM	AM	SD	Z	D
Classify substances according to their ability to absorb water, float, sink, and decay (S4MT-la-1).	5	3.75	3.60	3.69	-2.81	Very Satisfactory
Classify substances according to their ability to absorb water, float, sink, and decay (S4MT-la-1).	5	3.75	3.36	1.48	-8.91	Very Satisfactory
Describe the changes that occur when solid materials are bent, pressed, hammered, or cut (S4MT-	5	3.75	2.72	1.19	-11.52	Fairly Satisfactory

le-f-5).						
Describe the changes that occur when solid materials are bent, pressed, hammered, or cut (S4MT-le-f-5).	5	3.75	2.48	2.51	-5.08	Fairly Satisfactory
Describe how the properties of materials change when subjected to certain conditions, such as temperature, or when combined with other substances (S4MT-lg-h-6).	5	3.75	3.28	2.56	-4.20	Satisfactory
Describe how the properties of materials change when subjected to certain conditions, such as temperature, or when combined with other substances (S4MT-lg-h-6).)	5	3.75	3.76	3.25	-3.43	Very Good
Determine whether changes in materials are beneficial or detrimental to the environment (S4MT-li-j-7)	5	3.75	1.76	1.30	-8.87	Did Not Meet Expectations
Determine whether changes in materials are beneficial or detrimental to the environment (S4MT-li-j-7)	5	3.75	2.88	1.52	-6.42	Satisfactory
TOTAL	**40**	**30.00**	**15.44**	**11.43**	**-32.52**	**Did Not Meet Expectations**

Legend:

HM	Hypothetical Mean	d.f	Degrees of Freedom
AM	Actual Mean	c.v	Critical Value
SD	Standard Deviation	D	Description

Performance Level of Pupils After the Intervention

Table 2 reveals the posttest performance of the Grade 4 pupils in online class with Kotobee application. Similar to the pretest, there were also 4 competencies in the posttest. The same level of expectation Hypothetical Mean (HM) of 75 percent was set in each topic. It is evident in the table that the pupils performance in the posttest obtained Actual Mean (AM)s of 3.40, 2.88, 2.64, 3.68, 3.20, 3.52, and 4.00 respectively, on the competencies, 1, 2, 3, and 4, which were generally described as “Satisfactory performance. These findings imply that the pupils in the posttest performance have learned the competencies during the conduct of the lesson employing the Kotobee application.

The data also showed that the competency week 3 performance was "satisfactory" based on the Actual Mean (AM) of 2.64, compared to the pretest performance, which was only rated as "Did Not Meet the Expectations." Furthermore, after a two-month exposure to the Kotobee intervention, the competences in weeks 4, 5, 7, and 8 performed "Very

satisfactorily." This indicates that their posttest result outperformed the pretest. The results showed that using the Kotobee program as a supplement to online classes improved pupils' performance in the posttest.

This also means that following the intervention, the pupils' academic performance in the class nearly reached the top of the mastery and academic success table. This suggests that the Kotobee software's features may have helped pupils increase their posttest scores. Pupils now have access to extra materials such as photographs, audio clips, and videos that are shown during online class discussions in real time. This indicates that the intervention improved the pupils' science performance significantly.

This research study highlighted the potential of Kotobee application. The use of offline digital software as a supplement to traditional teaching methods aids in the visual comprehension of scientific principles (Espina, 2021). Teaching practices and learning outcomes improve when online learning is combined with asynchronous technologies. These offline characteristics change the way people learn, how they learn, what they learn, and how they teach (Maheshwari et al, 2021).

Table 2

Posttest Performance of the Pupils After the Intervention

Topics	Items	HM	AM	SD	Z	D
Classify substances according to their ability to absorb water, float, sink, and decay (S4MT-la-1).	5	3.75	3.04	3.25	-4.60	Satisfactory
Classify substances according to their ability to absorb water, float, sink, and decay (S4MT-la-1).	5	3.75	2.88	2.15	-6.77	Satisfactory
Describe the changes that occur when solid materials are bent, pressed, hammered, or cut (S4MT-le-f-5).	5	3.75	2.64	2.58	-5.56	Satisfactory
Describe the changes that occur when solid materials are bent, pressed, hammered, or cut (S4MT-le-f-5).	5	3.75	3.60	1.61	-8.78	Very Satisfactory
Describe how the properties of materials change when subjected to certain conditions, such as temperature, or when combined with other substances (S4MT-lg-h-6).	5	3.75	3.68	1.91	-7.60	Very Satisfactory
Describe how the properties of materials change when subjected to certain conditions, such as temperature, or when combined with other substances (S4MT-lg-h-6).)	5	3.75	3.20	2.00	-7.58	Satisfactory
Determine whether changes in materials are beneficial or	5	3.75	3.52	2.29	-6.80	Very Satisfactory

detrimental to the environment (S4MT-li-j-7)						
Determine whether changes in materials are beneficial or detrimental to the environment (S4MT-li-j-7)	5	3.75	4.00	3.00	-	Very Satisfactory
TOTAL	**40**	**30.00**	**26.56**	**11.51**	**-33.31**	**Satisfactory**

Legend:

HM	Hypothetical Mean	d.f	Degrees of Freedom
AM	Actual Mean	c.v	Critical Value
SD	Standard Deviation	D	Description

T-test Comparison Between the Performance Levels of Pupils Before and After the Intervention

Table 3 depicts the t-test table comparing the pretest and posttest performance of the pupils. It shows that the posttest scores were slightly higher with a mean score of 37.15 as compared to the pretest which obtained a 33.35 mean score. Therefore, the pupils performed better after the intervention compared to their performance prior to the intervention. Also, scores in the posttest are less dispersed from the mean, having 11.51 Standard Deviation (SD), than the scores from the pretest, having 11.43 SD. The results clearly suggest that the pupils needed reinforcement so that their performance level will increase towards very satisfactory or even outstanding ratings. Therefore, the null hypothesis was rejected. Hence, there was significant difference between the level of pupil performance before and after the intervention.

It signifies that pupils gained a better comprehension of Science after being exposed to digital versions of Self-Learning Material (SLM) through the Kotobee intervention. It was obvious that pupils who were exposed to the Kotobee software's extra features had a sufficient level of achievement. Pupils improve their understanding of science topics and concepts by using an offline mode widget, video lectures, and interactive surveys. The findings suggest that using Kotobee as an offline extra input in Online Distance Learning (ODL) improves child performance in Science.

Offline applications are software and tools designed to help pupils learn more effectively (Hoai & Giang, 2020). These are tools that allow pupils to quickly access multimedia content, thereby aiding and boosting learning. By using Kotobee software to teach integrated science concepts, students' capacity for self-learning is enhanced (Deligiannis et al, 2019).

Table 3

T-test Comparison of the Before and After Performance

Group	N	Mean	t-value	d.f.	p-value	Decision
Pretest	26	33.35	-10.850	26.0	0.001	Ho rejected
Posttest	26	37.15				

$\alpha = 0.05$

Conclusion and Recommendations

This study contributed to the existing researches of distance teaching and learning on the significant impact of digitalized modules on academic performance of learners. The results revealed that Kotobee-digitalized modules contributed significantly in improving the performance level of Grade 4 pupils in Science.

Based on the conclusion, the following recommendations were made:

1. Conduct a follow-up study to track student achievement data in other subject areas, particularly core subjects such as English and mathematics, both before and after the Kotobee intervention. This will determine the impact digital module intervention has on student achievement before and after intervention.
2. Conduct a similar study with a different target population, such as students in different grade levels. Additional research is required to determine whether the results of this study can be applied to other situations.
3. Determine the perceptions of pupils, teachers and parents on the utilization of the Kotobee application in improving pupils' academic performance. This will identify insights from the stakeholders involved on which areas to sustain and improve on the said intervention.
4. Demonstrate lessons using the Kotobee Author and Reader application in Classroom Observation and School Learning Action Cell sessions.
5. Design a training or seminar-workshop for master teachers and teachers where hands-on demonstration strategies on digitalized modules will be applied.

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