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Research Article

Development and Evaluation of E–Learning Materials with Kotobee Application in Physical Science for Grade 11 Students

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ABSTRACT

This study aimed to develop and evaluate e-learning materials with Kotobee Application in Physical Science as an aid for modular distance learning for Grade 11 students in selected junior and senior public high schools of the City Schools Division of Antipolo during the SY 2021-2022. Descriptive research design was used in this study. It utilized a questionnaire-checklist adopted from the Learning Resources Management and Development System of the Department of Education with some modifications to determine the acceptability of the developed learning materials in terms of content quality, instructional quality, and technical quality. Twenty science experts and 60 science teachers from different schools in Antipolo were requested to evaluate and validate the materials with respect to the aforesaid variables. The results revealed that the Science experts and teachers evaluated the developed learning materials as Very Satisfactory in terms of the said aspects. Consequently, it was found out that there was no significant difference on the evaluation of the two groups of respondents. The suggestions of the evaluators for the improvement of the material were: a) include instructional videos; b) enhance the presentations of the pictures to catch the learner's interest; c) make sure to give a copy of key to corrections for the teacher's reference; and d) conduct an orientation among the teachers and students for the familiarity of the application; e) target the affective aspect of the learners by including the reflection part which allows them to express their feelings towards answering the activities using the developed e-learning materials.

Keywords: *e-Learning Materials, Kotobee Application, Physical Science*

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Introduction

Education is an essential avenue of one's life. It may serve as a foundation in molding the 21st century learners by providing them knowledge and skills to be locally and globally competitive individuals. It may be along life's process, hierarchically structured, chronologically graded education system or any organized educational activities outside the established formal system.

In the Philippine educational landscape, the government has been making different programs in order to meet the needs of the people when it comes to education. Having those programs help the government to uplift the setting of education in the Philippines. It has always been strongly predicted that education is a pillar of national development and a primary avenue for social and economic transformation.

However, the country and the world at large are currently facing a global health crisis which put everyone's life at risk and led to great alterations in the system of all the sectors in the government. Undoubtedly, Covid-19 pandemic brought a big impact and paved the way to the birth of the so-called "new normal".

In the field of education, the effects of the unseen enemy are very evident. Elsewhere in the world, schools are starting to reopen for students with social distancing regimes to keep infection rates down. Some offer distance learning and home-schooling as alternatives in the traditional face-to-face classroom interactions.

At present, the Department of Education (DepEd) is continuously braving the battle in education as its response and commitment in ensuring that education will continue considering the health, safety, and well-being of the learners, parents, teachers, and personnel amidst Covid-19. Likewise, the department encourages various engagements with the academic community to fully assist each school in the preparation of the opening of classes on October 5, 2020 and to ensure that the learning delivery modalities to be implemented will be effective.

A concerted effort in the department gave birth to a bigger framework known as the Learning Continuity Plan, that will serve as the guiding principles of the whole K12 Educational System. To ensure the health, safety, and well-being of the learners, teachers, and personnel in time of COVID-19, the department crafted the School Learning Continuity Plan (SLCP); thus, finding ways for education to continue amidst the crisis for the upcoming school year.

It was explained in DepEd Order No. 012 series of 2020, Adoption of the Basic Education Learning Continuity Plan for School Year 2020-2021 in light of the Covid-19 Public Health Emergency, paragraph 3 letter B that: "The BE-LCP ensures learning continuity through K-12 curriculum adjustments, alignment of learning materials, deployment of multiple learning delivery modalities, provision of corresponding training for teachers and school leaders, proper orientation of parents or guardians of learners". Because of the modification in the educational community due to the health crisis, BE-LCP serves as a package of education interventions that will address the challenges brought about by Covid-19.

To adhere with these aspirations and goals of the education sector in the country, San Isidro National High School included in its LCP the learning modality of best-fit as per consolidated and evaluated data on the Learner's Enrolment and Survey Form. Based from its result, the learners' most preferred modalities are online distance learning (ODL) and modular distance learning (MDL). More so, it was reflected on the data that most of the learners who had chosen MDL may experience challenges in their self-paced learning environment. Some of these limitations are difficulty in independent learning, lack of assistance from family members, and conflicts with other household activities. In view of the abovementioned reasons, the researcher opts to conduct this study to develop and evaluate an e-learning material utilizing the Kotobee application that would aid the students as they have self-learning modules.

Kotobee is an ultimate digital publishing platform for education and training. It gives the users the keys to create rich interactive content that runs in different formats or even in one's very own branded app. Also, using it allows other users like students to access the content online or offline depending on their capacity

and availability of the means. In this new normal of scheme in education, Kotobee would be of great aid to help learners especially those who preferred modular distance learning.

Consequently, learning materials, in any form, have a significant effect on the performance of every learner. As aids in educational processes, these play vital roles in the progress of one's learning and in the achievement of all the learning goals. To address the needs and interests of the 21st century learners, the researcher believes that it is imperative to develop learning materials which will facilitate acquiring knowledge, skills and values/attitudes that come along with the transition in the new normal scheme in education.

Because of these reasons, the researcher opted to conduct this study to develop and evaluate e-learning materials utilizing Kotobee Application in Physical Science as an aid for modular distance learning for Grade 11 students in selected junior and senior public high schools of the City Schools Division of Antipolo.

Also, it aimed to identify the topics in Physical Science for the first quarter that could be subject of development of e-learning materials using Kotobee based on the perceptions of selected Science Teachers. More so, it sought for the evaluation and validation of Science experts and teachers with regard to the developed learning materials. Furthermore, this study wanted to determine the comments and suggestions of the evaluators and validators for the improvement of the developed e-learning materials using Kotobee Application.

Methods

This study focused on the development and evaluation of e-learning materials with Kotobee Application in Physical Science as an aid for modular distance learning for Grade 11 students. It was conducted in ten junior and senior high schools in the City Schools Division Office of Antipolo during the school year 2021 – 2022.

The e-learning material focused on the topics in Physical Science – First Quarter based on the perceptions of selected Science Teachers that were deemed suitable for the use of Kotobee applications for Grade 11 students. In addition, the study was based on most essential learning competencies (MELCs) and self-learning modules issued by the Department of Education Region IV-A CALABARZON Regional Office.

Using the PIVOT- 4A Budget of Work and PIVOT-4A SLMs, the researcher developed a e-learning material that would help the learners to cope with modular distance learning targeting the competencies included in MELCs.

In addition, the researcher used the descriptive research design utilizing the adopted and modified questionnaire-checklist form the Learning Resources Management and Development System of the Department of Education to determine the acceptability of the developed e-learning materials in terms of content quality, instructional quality, and technical quality.

Twenty science experts and 60 science teachers from different schools in Antipolo were requested to evaluate and validate the e-learning materials with respect to the aforesaid variables. Science experts are those who are Master Teachers in Science and who are teaching in Junior and Senior High School. Whereas, Science teachers are those who major in Science and who are teaching in Junior and Senior High Schools. The suggestions of the respondents were also determined using the same instrument.

Results and Discussion

Table 1. Preferred Physical Science – First Quarter Topics for Grade 11 Student Identified by the Science Teacher Respondents that could be Developed into e-Learning Materials utilizing Kotobee Application

	Topics in Physical Science – First Quarter for Grade 11 Learners	Frequency	Rank
1.	Atomic Number led to the Synthesis of New Elements in Laboratory	5.46	1
2.	Formation of Heavy Elements	5.77	2
3.	Polarity of Molecules	5.92	3
4.	Polarity of Molecules and Its Properties	6.31	4

	Topics in Physical Science – First Quarter for Grade 11 Learners	Frequency	Rank
5.	Types of Intermolecular Forces	6.62	5
6.	Effects of Intermolecular Forces on Properties of Substances	7.23	6
7.	Collision Theory and the Rate of Chemical Reaction	7.31	7
8.	Active Ingredient(s) of Cleaning Products Used at Home	8.08	8
9.	Biological Macromolecules	8.15	9
10.	How Energy is Produced and Managed	8.38	10
11.	Use of the Other Ingredients in Cleaning Agents	8.54	11
12.	Catalyst	8.69	12
13.	Limiting Reactants and the Number of Products Formed	9.00	13

As shown in the table, there were thirteen identified topics in the first quarter of Physical Science in Grade 11. From these 13, the teacher-respondents have identified the top ten (10) topics as perceived by the 15 Science teachers of San Isidro National High School which were suitable for the development of e-learning materials with Kotobee applications. These are the following: Rank 1: Atomic Number led to the Synthesis of New Elements in the Laboratory; Rank 2: Formation of Heavy Elements; Rank 3: Polarity of Molecules; Rank 4: Polarity of Molecules and Its Properties; Rank 5: General Types of Intermolecular Forces; Rank 6: Effects of Intermolecular Forces on Properties of Substances; Rank 7: Collision Theory and the Rate of Chemical Reaction; Rank 8: Active Ingredient(s) of Cleaning Products Used at Home; Rank 9: Biological Macromolecules; and Rank 10: How Energy is Produced and Managed. The last three in rank, Use of the Other Ingredients in Cleaning Agents, Catalyst, and Limiting Reactants and the Number of Products Formed were not included in the developed e-learning materials.

Table 2. Respondents' Evaluations on the Developed e-Learning Materials utilizing Kotobee Application as to Content Quality

	A. Content Quality	Respondents			
		Experts		Teachers	
		WM	VI	WM	VI
1.	Content is consistent with topics/skills found in the DepEd Learning Competencies for the subject and grade/year level it was intended. grade/year level it was intended.	4.00	VS	4.00	VS
2.	Concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives.	3.90	VS	4.00	VS
3.	Content is accurate.	3.65	VS	3.65	VS
4.	Content is up-to-date.	3.70	VS	3.62	VS
5.	Content is logically developed and organized.	3.80	VS	3.72	VS
6.	Content is free from cultural, gender, racial, or ethnic bias.	3.75	VS	3.63	VS
7.	Content stimulates and promotes critical thinking.	3.80	VS	3.72	VS
8.	Content is relevant to real-life situations.	3.80	VS	3.73	VS
9.	Language (including vocabulary) is appropriate to the target user level.	3.70	VS	3.60	VS
10.	Content promotes positive values that support formative growth.	3.70	VS	3.68	VS
	Overall Weighted Mean	**3.78**	**VS**	**3.74**	**VS**
	Standard Deviation	**0.33**		**0.34**	

It can be seen on the table that the Science experts and teachers evaluated the developed e-learning materials utilizing Kotobee Application in terms of content quality as Very Satisfactory as reflected in the overall weighted mean of 3.74 and 3.78 and standard deviation of 0.34 and 0.33 respectively. Based on the results, both groups of respondents agreed that the content of the developed e-learning materials utilizing Kotobee Application is consistent with topics in the DepEd learning competencies, accurate, up-to date, logically developed and organized, free from cultural, gender, racial or ethnic bias, stimulates and promotes critical thinking, relevant to real-life situations, promotes positive values, has concepts that contribute to the mastery of the identified learning objectives, and uses language that is appropriate to the user level.

This implies that the content of the e-learning materials is aligned with the topics found in prescribed learning competencies, supports the achievement of learning objectives, presents correct and up-to date information, has clear and well-organized presentation of content, promotes higher order thinking skills, and allows the users to connect the concepts to the real-world scenarios. In similar manner, the developed e-learning activities transferred the learning activities in a digital format using Kotobee Application.

Table 3. Respondents' Evaluations on the Developed e-Learning Materials utilizing Kotobee Application as to Instructional Quality

A. Instructional Quality	Respondents			
	Experts		Teachers	
	WM	VI	WM	VI
1. Purpose of the material is well defined.	4.00	VS	4.00	VS
2. Material achieves its defined purpose.	4.00	VS	4.00	VS
3. Learning objectives are clearly stated and measurable.	4.00	VS	4.00	VS
4. Level of difficulty is appropriate for the intended target user.	3.80	VS	3.80	VS
5. Graphics / colors / sounds are used for appropriate instructional reasons.	3.65	VS	3.58	VS
6. Material is enjoyable, stimulating, challenging, and engaging.	4.00	VS	3.95	VS
7. Material effectively stimulates creativity of target user.	3.70	VS	3.75	VS
8. Feedback on target user's responses is effectively employed.	3.65	VS	3.62	VS
9. Target user can control the rate and sequence of presentation and review.	4.00	VS	3.93	VS
10. Instruction is integrated with target user's previous experience.	3.95	VS	3.90	VS
Overall Weighted Mean	**3.88**	**VS**	**3.85**	**VS**
Standard Deviation	**0.18**		**0.20**	

It can be gleaned on the table that the Science experts and the teachers evaluated the developed e-learning materials utilizing Kotobee Application in terms of instructional quality as Very Satisfactory as reflected in the overall weighted mean of 3.85 and 3.88 and standard deviation of 0.20 and 0.18 respectively. From the results, it can be noted that both groups of

respondents believe that the developed e-learning achieve its well-defined purpose, have clear objectives and appropriate level of difficulty, use graphics and colors for appropriate reasons, contain engaging learning experiences which stimulate creativity among target users, employ feedback on learner's responses, and allow the users to connect their previous experiences.

This implies that the instructional quality of the e-learning materials manifests the target learning expectations through the scope, range and depth of topics which are appropriate for the target users, shows stimulating and engaging learning activities, and confirms easy navigation and control among the users allowing them also to link their prior knowledge with regard to the given topics.

Table 4. Respondents' Evaluations on the Developed e-Learning Materials Utilizing Kotobee for Grade 11 Learners as to Technical Quality

B. Technical Quality	Respondents			
	Experts		Teachers	
	WM	VI	WM	VI
1. Audio enhances understanding of the concept.	3.60	VS	3.63	VS
2. Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood.	3.60	VS	3.58	VS
3. There is complete synchronization of audio with the visuals, if any.	3.60	VS	3.62	VS
4. Music and sound effects are appropriate and effective for instructional purposes.	3.60	VS	3.62	VS
5. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing.	3.60	VS	3.60	VS
6. Visual presentations (non-text) are clear and easy to interpret.	3.65	VS	3.67	VS
7. Visuals sustain interest and do not distract user's attention.	3.70	VS	3.65	VS
8. Visuals provide accurate representation of the concept discussed.	3.70	VS	3.68	VS
9. The user support materials (if any) are effective.	3.65	VS	3.65	VS
10. The design allows the target user to navigate freely through the material.	3.95	VS	3.92	VS
11. The material can easily and independently be used.	3.95	VS	3.93	VS
Overall Weighted Mean	**3.69**	**VS**	**3.69**	**VS**
Standard Deviation	**0.40**		**0.40**	

It can be glanced on the table that the Science experts and the teachers evaluated the developed e-learning materials utilizing Kotobee Application in terms of technical quality as Very Satisfactory as reflected in the similar overall weighted mean of 3.69 and standard deviation of 0.40 respectively.

The results suggest that both group of respondents have similar view that the developed e-learning materials utilizing Kotobee Application use audio that enhances understanding of the concepts, clear and understandable speech and narration, synchronized audio-visual, appropriate instructional music and sound effects, uncluttered, easy to red, and aesthetically pleasing screen displays, clear and easy to interpret visuals that sustain user's attention and interests, and easy to navigate design which allow the users to control and use the materials freely and independently.

This implies that the technical quality of the e-learning materials supports the understanding and comprehension of the given topics

through a clear, appropriate, and accurate utilization of sounds, graphics, texts, and other screen displays which catch then user's interest and attention. Likewise, the materials encourage the users to establish independent learning.

Table 5. Test of Significant Difference Between the Evaluations of the Two Groups of Respondents on the Developed e-Learning Materials Utilizing Kotobee

Criteria	Teachers		Experts		$t_{computed}$ Value	Decision	Interpretation
	OWM	s	OWM	s			
a. Content Quality	3.74	0.34	3.78	0.33	0.52	Fail to Reject the H_0	Not Significant
b. Instructional Quality	3.85	0.20	3.88	0.18	0.43	Fail to Reject the H_0	Not Significant
c. Technical Quality	3.69	0.40	3.69	0.40	0.00	Fail to Reject the H_0	Not Significant

As reflected in the table, the experts and teacher respondents' evaluations on the developed e-learning materials utilizing Kotobee regarding content quality, instructional quality, and technical quality did not show significant differences since the respective computed t values are lower than the critical t value. This means that their evaluations are the same.

This implies that the Science experts and the teachers agreed that all the aspects of the developed e-learning materials met the Very Satisfactory evaluation on each of the criteria. It can be concluded then the e-learning materials are acceptable and appropriate for the target learners.

Suggestions of the Two Groups of Respondents to Further Improve the Developed e-Learning Materials

The respondents were also asked about their suggestions for the improvement of the developed learning materials utilizing Kotobee application. Their suggestions were as follow:

a. The e-learning materials would have been better if they had instructional videos.
b. The completed materials should be given free to the other teachers for their students' use.
c. Enhance the presentations of the pictures to catch the learner's interest.
d. Make sure to give a copy of key to corrections for the teacher's reference.
e. Conduct an orientation among the teachers and students for the familiarity of the application.
f. Target the affective aspect of the learners by including the reflection part which allow them to express their feelings towards answering the activities using the developed e-learning materials.
g. This may be discussed to the faculty with the purpose of producing e-learning materials for the other subject areas.

Conclusion

Based on the results of the study, the following conclusions were drawn:

1. The teachers' preferred topics that were included in the e-learning materials with Kotobee Application in Physical Science for Grade 11 were parallel to the prescribed lessons by the Department of Education.
2. The developed e-learning materials with Kotobee Application in Physical Science for Grade 11 as evaluated by the Science experts and teachers were highly acceptable in terms of content quality, instructional quality, and technical quality that could enhance the acquisition of knowledge and skills of the students and the facilitation of learning of teachers.

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