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Digital Learning Readiness in Developing E-Module for Intensification of Basic Science Process Skills among Grade 3 Students in a Collaborative Learning Environment

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Abstract

The COVID-19 problem has put a stop to this system, forcing educators to rethink how to teach and learn. Consequently, educators are looking for technological innovations to help bridge the gap between face-to-face and online education, most especially in collaboration. The focus of this study is to develop an e-module in line with their digital learning readiness that bridges the gap between face-to-face and online distance learning to enhance the basic science process skills of Grade 3 students in Science at Del Remedio Elementary School. The research design employed for this study is descriptive-developmental, which is a process for developing and validating a learning product. The participants of this research are the grade 3 online distance learners of Del Remedio Elementary School. The developed e-module meets the criterion of being highly acceptable in terms of material and media content, as per the findings. The dependent samples t-test revealed students' pre-test and post-test scores are significantly different from their basic science process skills; this implies that the student's grades improved after utilizing the e-module. The Pearson Product-Moment correlation shows that there is no significant relationship between the students; perceived acceptability for the developed e-module and their level of basic science process skills, with a significant level of 0.05. This led to the conclusion that the developed e-module, as a tool, helps students to improve their understanding of the lesson leading them to higher achievements.

Keywords: Basic Science Process Skills, Digital Learning Readiness, Collaborative Learning Environment

Introduction

Students around the country have been out of school and are now learning from home because of the worldwide pandemic. Many educators are striving to figure out how to effectively bridge the learning divide and meet the challenges of keeping pupils engaged. The COVID-19 problem, on the other hand, has presented teachers with a chance to reflect on their practices.

The foundation of inquiry-based learning is the scientific process skills. Developing science process skills and using them in scientific inquiry are both necessary steps in learning to perform science (Ngoh, 2008). There is still a concern, as evidenced by students' declining performance on the National Achievement Test (NAT) and PISA in Science and Mathematics, according to Prudente (2019).

Elementary students' poor science process skills are a serious issue that must be addressed. If this situation continues, students will be unable to develop other skills that will be useful later down the line. Students must be encouraged through the learning process so that they can freely and actively explore what they want to learn (Bybee et. Al, 2016).

According to the conceptual framework of the K–12 science curriculum, science education aims to foster scientific literacy in students, preparing them to be informed and active citizens capable of making judgments and decisions about applications of scientific knowledge that might have social, health, or environmental implications. Learning science process skills can help students become more critical thinkers. The fundamental science process skills are observation, hypothesizing, planning the experiment, controlling factors, interpreting data, making findings or inferences, predicting, applying, and communicating.

The COVID-19 problem has put a stop to this system, forcing educators to rethink how they teach and learn. Modern learning theories, together with what we've learned from recent events, should drive schools to prepare for a new instructional normal, one that focuses on the 21st Century skills children will need to achieve. Distance learning delivery modalities (DLDM) were adopted this school year in compliance with the Office of the President's decision that no face-to-face classes would be held until the COVID-19 vaccination is ready. Because the Department of Education's Curriculum Guide is inapplicable for this circumstance, the Department of Education must develop a way to elicit the most essential learning competencies that students should acquire or that teachers must impart to students in the New Normal (Enriquez, 2020). This method of delivering the K-12 curriculum while focusing on the most essential learning competencies is possibly the most beneficial guidance a teacher can employ. Unlike in the past, when each competency had to be taught and applied precisely, the MELC has been adapted to the current situation (Enriquez, 2020). Science as a separate subject currently starts in Grade 3 with the mother tongue as the language of learning and instruction following DepED Order No. 74, s. 2009.

Teachers are seeking tools to help with their lessons, teaching, and the transition to a large-scale online education system. While online learning is typically more inexpensive for students, this transition is most likely permanent. Consequently, educators are seeking technological innovations, to help close the gap between face-to-face and online education. Numerous academic institutions throughout the world are beginning to change their curricula and methods of instruction to better prepare their students for teamwork (Griffin and Care, 2015; Hesse et al., 2015).

Digital learning has expanded quickly in response to the pandemic issue, distance learning, and the internet's rapid growth and popularity. Furthermore, students and teachers must be able to master technology to facilitate online learning. Teachers and students are expected to acquire skills in learning technology in this era of more sophisticated technological disruption. This pandemic is being hailed as a catalyst for the digital revolution in teaching and learning. To summarize, online learning and electronic learning are the best options for teaching and studying from home right now.

Objectives of the Study

The focus of this study is to develop an e-module in line with their digital learning readiness that bridges the gap between face-to-face and online distance learning to enhance the basic

science process skills of Grade 3 students in Science at Del Remedio Elementary School. Specifically, 1) to identify the respondents' perception of their Digital Learning Readiness and capacity of using Digital Learning Technologies, 2) to know the material and media experts' validation of the developed e-module, 3) to determine the respondents' perception of the effectiveness of the developed e-module, 4) to analyze whether the pre- and post-assessment scores of the respondents are significantly different, and 5) to evaluate whether the respondents perceived acceptability of the developed e-module relate significantly to their level of basic science process skills.

Methodology

The research design employed for this study is descriptive-developmental, which is a process for developing and validating a learning product. The participants of this research are the grade 3 online distance learners of Del Remedio Elementary School.

The respondents for this research were composed of forty-eight (48) Grade 3 students who are officially enrolled in Del Remedio Elementary School for the academic year 2021 – 2022, therefore, the entire population was used. A single group of participants was assessed for basic science process skills, treated, or intervened with, and then assessed again to identify the change or difference between the initial and second measurements.

The researcher administered survey questionnaires that were crafted by various researchers. A Digital Learning Readiness survey was crafted by a researcher from Penn University to give an idea of the student's ability in using or manipulating various digital platforms and ICT devices. It is composed of twenty (20) questions, five (5) each four (4) aspects. A Digital Learning Technologies survey was also crafted and composed of the personal information that the students used in online class as well as the frequency of using a certain digital technology. A teacher-made test was crafted by the researcher and validated by many Science experts. It has sixty multiple-choice types of questions. The said test will be given to students before the use of the strategies to determine their initial level of basic science process skills. The same test was then used after the use of the strategies to compare the performance of the respondents. The survey for the acceptability of the developed e-module is composed of a sixteen-item researcher-made survey divided into three sub-parts that will determine the mean perception of students towards the strategies in terms of interest in the media, benefits of e-module learning media, and applications used.

The e-module was developed using software or programs such as Microsoft Office and 3D PageFlip Professional. It will contain the whole topic for the Third Quarter of Science 3. E-module contains material, samples, questions, practice questions, and simple practicums accompanied by pictures, animations, videos, simulations, and interactive quizzes so that they are expected to make it easier for students to understand the lessons. The e-module development stage in this research will be carried out until the expert validation stage. The validation and reliability of the e-module will be evaluated by the material experts and e-learning experts before the product runs. The experts' validation tools are adapted from the study of Hamid, Aribowo, and Desmira (2017).

The mean and standard deviation of the respondent's perception of their digital learning readiness and technologies and their Basic Science process skills were computed. To determine if there was a significant difference between the respondents' pre- and post-assessment scores, a dependent samples t-test was utilized. The perceived acceptability of the developed e-module by the respondents and their basic science process skills were correlated significantly using Pearson Product Moment Correlation.

Results and Discussion

1. Digital Learning Readiness

Table 1
Respondents Perceived Digital Learning Readiness

Indicators	Mean	SD	VI
Time Management.	2.67	0.48	Great Extent
Study Habits	2.79	0.31	Great Extent
Abilities	2.69	0.36	Great Extent
Technology Access	2.56	0.37	Great Extent

Table 1 shows the respondents' perceived readiness when it comes to their digital learning. The item that shows students' flexible strategies in study habits had the highest mean value (mean=2.79). It is followed by the student's abilities in using technology effectively in a range of learning contexts (mean = 2.69). The item that represents students' positive time management toward courage in the face of a challenge was next (mean = 2.67). The item that reflects students' technology access (mean = 2.56) proceeded.

According to our results, students show a great extent in terms of study habits, abilities, time management, and technology access, therefore students are highly ready for digital learning.

In terms of study habits students are highly ready; students have a thorough understanding of how to utilize technology to enhance their learning process and how to merge it with other relevant technologies in this manner.

Students' abilities to use technology effectively in their learning are great therefore students are highly ready for digital learning. Students are fairly good at using computers and very comfortable in surfing or browsing the internet.

2. Digital Learning Technologies

2.1. Type of Technology

Table 2
Type of Technology

		Responses	
		N	Percent
type of device used	Smartphone	46	50.5%
	Tablet	14	15.4%
	Computer	31	34.1%
Total		91	100.0%

The data gathered from Table 2 reveal a high frequency in the use of technological devices by the student, with smartphones being the most utilized (50.5%) followed by computers (34.1 %), and tablets (15.4%). These data point to the smartphone's predominance and ubiquitous presence in student households.

Based on our findings, smartphones are one area of technology that the survey identified as rising. Many surveys conclude that both teachers and students rely on technology to enhance and add value to

education. Students are expected to have more autonomy in the learning process in the future, choosing the technology that best suits their needs. Smartphones, laptops, and desktop computers, as well as pens and paper, will undoubtedly play a role.

2.2. Frequency of Use on Various Technology

Table 3
Frequency of Use on Various Technology

	Smartphone		Tablet		Computer	
	N	Percent	N	Percent	N	Percent
Daily	44	91.7%	13	27.1%	22	45.8%
Weekly	2	4.2%	2	4.2%	11	22.9%
Monthly	1	2.1%	0	0	3	6.3%
Never	1	2.1%	33	68.8%	12	25.0%
Total	48	100.0%	48	100.0%	48	100.0%

Table 3 presents the time spent using the most frequently used ICT device (most often a smartphone). It shows that 91. 7 % of the students use smartphones daily, only 4.2% use them weekly, and a similar percentage of 2.1% use them monthly and never use them at all. However, more than half of the students never used a tablet (68.8%) while 27.1 % use it daily and 4.2% use it weekly. Computers as a very helpful ICT device are often used daily at 45.8%, 22.9% weekly, and 6.3% monthly. Surprisingly, 25% have never used it.

As a result of the pandemic, primary school pupils were obliged to spend much more time using their ICT devices as a result of the crisis-driven remote learning (which included both classroom and out-of-school activities). Because of the ongoing lockdown and other factors, many individuals gravitated to electronic devices to pass the time.

2.3. Usage of Technology

Table 4
Usage of Technology

	Smartphone		Tablet		Computer	
	N	Percent	N	Percent	N	Percent
Texting	46	80.7%	2	3.5%	9	15.8%
voice calls	45	78.9%	3	5.3%	9	15.8%
Emails	39	62.9%	4	6.5%	19	30.6%
Messaging	46	74.2%	3	4.8%	13	21.0%
Website	40	60.6%	4	6.1%	22	33.3%
Apps	45	83.3%	4	7.4%	5	9.3%

Table 4 shows the ICT device that students frequently use and their use. Smartphones are often used for different apps, with the highest rating of 83.3 %, while 9.3 % used the Computer and just 7.4 % utilized tablets to use for apps. As it was originally used, smartphones are 80.7% used for texting while some use tablets and computers for texting at 3.5 % and 15.8%, respectively. For video calls and other video conferencing activities, 78.9% do it on their smartphones and only 15.8% used their computer while 5.3% used their tablet for this activity. For messaging, 74.2 % used their smartphones while there are still using their tablets and computer with this activity at 4.8% and 21.0%, respectively. Meanwhile, when it

comes to viewing websites, smartphones continue to lead with 60.6 %, while 33.3 % use Computers and only 6.1 % utilize tablets.

2.4. Apps Used to Communicate

Table 5
Apps Used to Communicate

		Responses	
		N	Percent
apps used to communicate	Viber	1	1.5%
	Facebook	48	73.8%
	Texting	13	20.0%
	Others	3	4.6%
Total		**65**	**100.0%**

Table 5 shows the most popular communication apps. Facebook, the world's largest and most well-known social networking site, got the highest rating, at 73.8 %. However, texting is still used as a mode of communication by 20% of respondents, while Viber is used by 1.5%. Other applications are still utilized by 4.6 %, as are other social media sites where people may contact others even from afar.

3. Validation of E-module

3.1. Material Experts' Validation

Table 6
Material Experts' Validation

Indicators	Mean	SD	VI
Format	4.54	0.35	Very Evident
Content	4.38	0.23	Very Evident
Language	4.88	0.35	Very Evident

Table 6 shows the validation of the material expert's language, with a mean value of 4.88 got the most valid mean followed by format then content with a mean value of 4.54 and 4.38, respectively.

These findings indicate that the overall usage of language in e-module conforms to the needs of the learners and is easy to understand as four out of five aspects got the perfect score. The "ease of understanding the language used" got the lowest mean because the material is in the mother tongue of Southern Tagalog which is Tagalog and there are scientific words that are in Tagalog or some English words that are spelled in Tagalog baybayin. Nevertheless, students understand the material because of the use of the standard language. Also, the format of the e-module is acceptable as the clarity of instruction, suitability of colors, and text got a high mean. In creating an e-module, readability, and retention of the learning topics and learning experiences must be considered.

The content of the e-module relatively passed the standards of the validators. Topics are based on the level and needs of the students. Specifically, it conforms to the suitability of the learning objectives. The e-module developed promotes both collaborative and independent learning resource that is easily accessible and attractive to students.

3.2. Media Experts' Validation

Table 7
Media Experts' Validation

Indictors	Mean	SD	VI
Display	4.77	0.17	Very Evident
Design	4.63	0.23	Very Evident
Usability	4.75	0.13	Very Evident

Table 7 shows the validation of the media experts in terms of display, design, and usability. These data show that the quality of the e-module as the media is very evident. The display in the e-module learning media got the highest mean of 4.77. The usability of the e-module got a mean of 4.75. The design of the e-module learning media (mean= 4.63) got the lowest mean and yet is still very evident.

The findings also show that the researcher focuses more on the comfortability of using the e-module as it got a very evident value, therefore the experts consider the module's validity in terms of its usability. Since most of the students are using smartphones, the research thinks of a way for how the e-module can be communicative and interactive.

4. Perception of the Effectiveness of the Collaborative Learning Design E-Module

Table 8
Perception of the Respondents on the Effectiveness of the Developed E-Module

Indicators	**Mean**	**SD**	**VI**
Interest	4.24	0.70	Very Evident
Benefits	4.28	0.77	Very Evident
Application	4.45	0.67	Very Evident

Table 8 shows the perception of the respondents on the effectiveness of the developed e-module. The application got the highest mean of 4.45 while benefits and interest also show a valid mean of 4.28 and 4.24, respectively.

The designed e-module is easy to manipulate, as evidenced by the respondents' excellent ratings for simplicity of use and navigation, as well as the quality of discussion and questions. The construction of the e-module takes into account factors such as the student's skills. And therefore, in terms of the application used, the e-module is still highly acceptable.

The findings indicating the e-module assisted students in comprehending the lesson therefore, in terms of the benefits of using it, the developed e-module is very valid. It indicates it's a useful tool for helping students comprehend the issue at hand. As a result, students' comprehension improves indirectly during the teaching and learning process. Also, the findings show that the students are interested in the media since it got an overall rating of very evident. It is found that the students are likely interested in using an e-module compared to the printed one because "the difference in the learning media" got the high mean, therefore in terms of the interest of the students the e-module is highly acceptable. E-module being readable, the use of color also got positive feedback. The researcher focuses more on the design that will not distract the students from learning.

5. Test of Difference

Table 9
Test of Difference between the Pretest and Post Test Scores

	Posttest		Pretest		T	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Mean	Std. Deviation			
Observing	8.52	1.07	7.33	1.60	-5.346	47	0.000
Communicating	8.75	1.19	6.50	1.91	-10.053	47	0.000
Classifying	8.60	1.16	7.27	2.04	-5.814	47	0.000
Inferring	8.13	1.38	6.60	1.91	-5.979	47	0.000
Predicting	8.35	1.21	7.17	1.74	-6.415	47	0.000

Legend: *p > 0.05 Not Significant; p < 0.05 Significant*

Table 9 presents the test of the difference between the pretest and post-test scores of the students in their basic science process skills test. The table reveals significant differences between the scores of the respondents before and after the use of the collaborative design e-module. It can be gleaned from the table that there is a significant difference between the pre and post-assessment scores of the students as to their basic science process skills at 0.05 level of significance.

6. Students' Perceived Acceptability of the Collaborative Learning Design E-Module and their Level of Basic Science Process Skills

Table 10
Relationship Between the Students' Perceived Acceptability of the Collaborative Learning Design E-Module and their Level of Basic Science Process Skills

	Observing	Communicating	Classifying	Inferring	Predicting
Interest in the media	-0.035	0.059	0.115	0.082	0.176
Benefits of e-module	-0.048	0.215	0.129	0.095	0.162
Application used	-0.020	0.112	0.106	0.107	0.086

Table 10 presents the relationship between the students' perceived acceptability of the collaborative learning design e-module and their level of basic science process skills. It shows that there is no significant relationship between their perceived acceptability for the E-module based on Collaborative Learning and their level of basic science process skills with a significant level of 0.05. It depicts that the E-module is helpful in their study as a tool but it has no relationship with their basic science process skills.

Conclusions

In light of the aforementioned findings, the following conclusions are hereby drawn:

1. The scores of the respondents in the pretest and posttest are significantly different. It is therefore implied that there is an improvement in scores after using the Collaborative Learning Design E-module.

2. The relationship between the students' perceived acceptability of the collaborative learning design e-module and their level of basic science process skills is not significant. This leads to the conclusion that the Collaborative Learning Design E-module, as a tool, helps students to improve their understanding of the lesson leading them to higher achievements.

Recommendations

Based on the findings and conclusions drawn, the following are hereby recommended:

1. Since the developed E-module gives the impression to be interesting to the students, science teachers or instructors can use it to help students improve their performance by stressing basic process skills and assigning group activities that require collaboration.
2. This study also found that a digital learning environment is suited for both lower-order and higher-order mental processing tasks. However, it is recommended that the next step in assuring successful digital teaching and learning is to discover the right mechanism for determining the level of readiness of teachers and students to use the strategy emphasized in this research and proven to be effective.

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