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Perceptions and Online Experiences of STEM Students Toward Customized E-Commons

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ABSTRACT

To ensure learning continuity, the Philippine's Department of Education adapted distance education as the alternative, amidst the pandemic. To help with the shift, the department developed DepEd Commons for the purpose of providing easily accessible learning resources. In the same token, Calbayog City National High School in Samar, Philippines developed the customized E-Commons. Being a first attempt and a work in progress, the online platform is admittedly incomplete and the purpose of this study was to evaluate and improve it. Using the descriptive-correlation design, the study aimed to determine STEM students' perceptions and online experiences with the customized E-Commons. Fifty percent (50%) of the total STEM student population was assigned as respondents using the simple random sampling technique. The findings reveal positive perceptions and online experiences in all criteria, specifically in quality, usability, potential effectiveness, support system, and resources. However, despite the overwhelming approval, the customized E-Commons relatively had lower marks with indicators pertaining to internet connectivity and consumption, indicative of the needed optimizations to make the platform compatible with slower and limited internet. The study calls for further research on the subject with a more balanced representation of students from other strands and disadvantaged backgrounds.

INTRODUCTION

Once a distant threat, the virus that originated from China has now affected almost every country on earth. The Philippines was one of the hardest hits. To ensure the continuity of Education, the Department of Education switched to distance learning. In support of this change, the department established the DepEd Commons, with a framework proposed to provide teachers and students free and quality learning resources (DepEd, 2020). Additionally, the department emphasized its desire to develop a community that produces and curates Open Learning Resources (OERS) that are more relevant and practical for both learners and educators. This is an attempt to combat digital divide and at the same time bring the online modality to its maximum potential.

However, the Department of Education's first year in adapting distance education had been less than satisfactory (Magsambol, 2021). This performance can be attributed to the institution's lack of time to prepare as well as the lack of technological resources. Further worsening the case is the country's slow and expensive internet, which ranked below fifty (50) in the world in terms of speed but 32nd in terms of expensiveness (Barreiro, 2021). With the telecommunication industry's shortcomings highlighted during a time where the internet is not only used for acquiring learning resources but also used as the medium of instruction itself.

DepEd admits that the Commons is a work in progress and there is a need for continued effort to make it accessible for all students and teachers. In view of this, the customized E-Commons can also be considered an

incomplete work, having been derived from the DepEd Commons. Therefore, changes must be made within the employed digital commons of the nation's schools, the platform should be evaluated and improved. In the same spirit, the Calbayog City National High School in Samar, Philippines developed its own E-Commons, a derivative of the DepEd Commons. This is to provide a more customized, localized and relevant online platform to the institution's students and faculty.

This study aimed to enhance the customized E-Commons platform by evaluating its first-year performance. STEM students from Calbayog City National High School in Samar, Philippines were surveyed to determine their perceptions and online experiences with the platform. Based on the findings, recommendations were made to improve both the customized E-Commons and DepEd Commons platforms.

LITERATURE REVIEW

This research is built on the Community of Inquiry Theory by Garrison et al. (2003). A theory designed to help teachers create online communities. The distant feel of online learning can easily make students feel disconnected, and thus certain measures have to be employed. In this regard, the COI Theory introduces three essential elements educators should consider: the social presence, the teaching presence and the cognitive presence. The social presence refers to "the ability of learners to project their personal characteristics into the community of inquiry, thereby presenting themselves as real people." Online learning should not take away the

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individuality of each student, which it easily does due to restricted interaction between students, and with their instructors.

The teaching presence is described as “the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes.” One of the criticisms of online learning is the relatively lesser quality of teaching which is no fault of the teachers, but a weakness of the medium itself. Lastly, cognitive presence, which is “the extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication.” A good learning environment should foster discourse and reflection, and the same should be found in a good online educational community. These two presences are also existent within E-Commons, which is by definition also an online community. And so, the Community of Inquiry Theory is relevant and applicable to the present study, which aims to enhance the customized E-Commons to facilitate a better online community. The theory served as a guide to keep the current effort on the right track.

Sarkar (2020), listed the recent developments that made online learning much more appealing than ever before. Online learning has grown much less expensive than traditional learning methods. Since the cost of teaching has decreased, so have the students’ expenses. The modality has also vastly grown, with courses available on almost every topic at the touch of a button. And with it, the number of students also increased leading to the development of study groups involving those of different nationalities. The success can be attributed to the mediums’ flexibility that allows students to study at their own pace. And with the content available online, it can be revised wherever and whenever, helping establish standardized quality.

Furthermore, a study by Paul & Jefferson (2019), found no significant difference in student performance between those who took online learning and those who opted for traditional classes. Implying that the medium itself is not a major factor in the decrease in quality, but the disparities evident between developed and developing countries. Literature on the subject is divided on which of the modalities is better (traditional f2f vs distance learning), but both modalities are proven to be relatively effective. The study further uncovered the translatability of concepts between traditional and online learning. Herman and Bannister (2017), as cited by Paul and Jefferson, also found similar results. The 2017 study found that instructors can design their courses effectively for online delivery with participating students performing just as good as traditional f2f learners

However, online learning is not always fully enjoyed by online learners. The reason being is the presence of barriers that prevent learning engagement to happen. Athabasca University (2019), identified five (5) barriers to online learning in their institution and proposed

solutions on how to overcome them. Among those, is poor time management on part of the students, which is partly due to the flexibility of the medium. Having the student establish an activity/assignment schedule could substitute the absent rigid structure. Lack of motivation is another issue, which is a product of a sense of isolation. Having family members involved themselves in checking with the students’ progress could be a solution. The list further includes administrative issues as one of the barriers, as students often find it difficult to keep in touch with their instructors. Encouraging students to contact classmates via social media instead for updates is an alternative. Technical issues are inevitable, but it can be solved by having the students prepare themselves against possible technical difficulties and having the IT Department assist them. Lastly, regarding cost issues, which is the main problem for students of disadvantaged backgrounds, the university solves it with the “pay as you go” program, where students can take courses whenever they find it affordable. Moneymax (2021), enumerated the advantages and disadvantages of distance learning, specifically in the Philippines. Distance learning, as is the case anywhere, provides flexibility, you can study anytime and anywhere as long as you submit your assignments on the given dates. It also saves time, once you’re done with the activities, you can spend the rest of the day doing what you want. It can also be cheaper, public school’s distance learning programs are offered free or with minimal fees, private schools also offer relatively cheaper programs as compared to traditional classes. It is also self-paced, you are not forced into a rigid structure that might not suit your circumstances, with distance learning you can plan things your own way.

The disadvantages, on the other hand, include minimal social interaction. There is little interaction between students and teachers, which may lead to a feeling of isolation. Distance learning also leaves students with little support, often leaving them to study on their own. In the Philippines, accessibility is also a struggle. Since not everyone has device access and internet connection. Lastly, distance learning requires a lot of self-motivation, as distractions and the lack of guidance may be discouraging factors. Most students are digital natives and so few will have digital difficulties, the priority then for most teachers is to teach them discipline and structured accountability (Acker, 2020).

While better than no schooling at all, the sudden switch to online education necessitated by COVID-19, may have led to subpar results when compared to traditional face-to-face (f2f) classes (OECD, 2020). UNICEF (2020) reports that in nearly 3/4th of the countries worldwide, only less than half of their population has connected to the internet, but 73 percent of the governments use distance education. Marcellis-Warrin et al. (2020) point out that rich families have a clear advantage in digital classrooms. The disparity of online education and technological access between rich and poor makes education delivery inconsistent and unfair. Institutions

should adopt distance education with empathy, and must understand the many difficulties students encounter.

Bolido (2021) writing for the Philippine Daily Inquirer noted that, locally, the instantaneous shift left schools in the Philippines no time to prepare, and the few successes were the schools that were already “easing their way into a more technology-rich system before the pandemic”. The main issues were the access to devices and cost of connectivity. Further worsening the situation is the fact that face-to-face classes are suspended therefore the burden of ensuring connectivity is on the individual households. These setbacks can be blamed on the slow adaptation of technology-rich management systems prior to the pandemic. There is a needed change of mindset, things will always be disrupted, and people have to be trained to cope with it.

Online learning in the context of a pandemic is different from traditional learning and much more challenging. The fact is that “exposure to the outside world is still essential even in e-learning” (Tannir, 2020). Distance education provides various benefits, but would those benefits still be fully enjoyed, if other aspects of the student’s life is affected by the pandemic? The only apparent solution is to replace exposure to the outside world with virtual communication since the pandemic forbids physical contact. To maintain the mental well-being of the student, the internet should play its role of facilitating social connection to the outside world.

In an attempt to identify the students’ perception on online learning, Al-Mawee et al. (2021), conducted a case study at the Western Michigan University, involving 420 students. The students’ negative perceptions included the perceived lack of interaction between teachers and students. In addition to this, there was no perceived improvement of grades, in comparison to if classes were done in person. This is attributed to the institution’s lack of preparedness as well as the limited information on the best practices with regard to the modality. Positive perceptions, on the other hand, included the time and place flexibility in terms of attendance and doing assignments. Other positive perceptions include gas savings and more free time to spend with family.

This time, including the faculty’s perspective, Elayan (2021) conducted a similar undertaking at the Middle East University. The respondents comprised eighty-six (86) students and twenty-nine (29) instructors. The study reveals that students agree that online learning provides easy access to learning resources and an efficient system of handling and submitting assignments and activities. Typically, the students’ perceived disadvantages of the modality is the high internet cost as well as the fact that the online modality is not suitable for all subjects, especially those that are more hands on. As for the feedback from the instructors, they positively commented on the modality’s ease of access to learning resources and its capability to record and archive online lectures for future use. The instructors’ negative feedback, pertained to the digital illiteracy present among the faculty and the online

exams’ lack of credibility. Elayan concludes that there is a need for proper infrastructure for the online learning modality to be a sensible replacement to traditional learning.

Research in the Philippines found the defining difference between studies conducted in developed and developing countries. Barrot et al. (2020) finds that while technology use and competency is one of the hurdles in developed countries, it is not the case in developing countries. Their research finds that the learning environment and internet access are the biggest hurdles in the Philippines. These hurdles are not significant issues for developed countries, however, in the Philippines where most families are in the low and middle-income groups, limitations in learning space and facilities and internet costs challenge students. Students frequently link their lack of financial resources to their access to the internet, educational materials and necessary equipment for online learning. The research also finds differences in results between pre-covid studies and researches conducted during the pandemic. While anxiety and financial issues is also numbered among the hurdles of online education in pre-covid studies, the study conducted by Barrot and his colleagues finds that COVID-19 has significantly aggravated it. Anxiety experienced by students during the pandemic, does not only come from the fear of COVID-19 itself but also from physical and social limitations, unfamiliarity to new educational platforms and concerns for their financial situation.

Rotas & Cahapay (2020) found that it is even worse for students in remote places. Although the threat of COVID-19 is much lesser, students from remote communities had a harder time adjusting to the new modality. After summarizing the responses, the researchers found twelve themes: unstable internet connectivity, inadequate learning resources, electric power interruptions, vague learning contents, overloaded lesson activities, limited teacher scaffolds, poor peer communication, conflict with home responsibilities, poor learning environment, financial related problems, physical health compromises, and mental health struggles. The researchers argue that the results reveal the multifaceted struggle of students from a developing country afflicted by a pandemic. The study encourages that politicians should lobby for the improvement of technology and electricity access for remote communities

Cuadrado-Garcia et al. (2010) noted however, that perception is not just influenced by socio-economic status. Other factors, such as gender can also influence it. For instance, female students were more interactive with their digital commons, and they showed higher resource and wiki views as well as comments in forums, which ultimately translated to them having higher grades. It also has been revealed that male students find their class activities negatively affecting their social life while female students want more of it, and show the need for more interaction. Results also included that male students require more assistance when it comes to utilizing the

online software, supporting the idea that the flexible and interactive nature of online learning is more compatible to women. Overall, though, the researchers find that gender differences in online learning are scarce, but still these differences are worth noting.

Yu (2021) conducted a similar study although covering more ground aside from gender, including educational level and personality. Consistent with the previously mentioned study, Yu's research found no significant difference in learner outcomes between genders. However, the research finds more clear differences between male and female learners in terms of perception towards online learning. Females were more persistent and committed and have more self-regulation than their male counterparts, while male learners were more stable in their attitude and can employ more learning strategies and have better technical skills. When it comes to educational levels, postgraduate students favor online learning over undergraduate students. This is because postgraduate students are more capable of self-regulating than their juniors. When it comes to personality, traits such as extraversion, agreeableness, conscientiousness,

and openness have a positive impact on learner outcomes, while neuroticism has a more negative effect.

MATERIALS AND METHODS

The descriptive- correlational research design was used for the endeavor, which is a research methodology used for "studying the relationship between two variables with the help of statistical analysis" (Kermer, 2021). It is a non-experimental research design, wherein natural and occurring relationships between variables are investigated. The methodology is most useful when describing relationships between variables without establishing causal connection. In this study, the variables are: student perceptions, online experiences, and the students' profile in terms of grade level.

The respondents of this study were students from Calbayog City National High School Senior High School Department. STEM Strand consists of four hundred thirty (430) students all utilizing the Calbayog City National High School E-commons amidst the pandemic. The sample size was determined using the simple random sampling technique and the Slovin formula by utilizing

Table 1: Frequency and Percentage Distribution of the STEM students

Grade Level	Sections	Total	Sample No. of the Respondents	Percentage
Grade 11	Apollonius	59	29	13.30%
	Bernoulli	59	29	13.30%
	Copernicus	58	28	12.84%
	Diophantus	57	28	12.84%
Grade 12	Antares	49	26	11.93%
	Bellatrix	53	27	12.39%
	Centaurus	49	26	11.93%
	Delphinus	47	25	11.475
Grand Total		430	218	

the five (5%) error on it.

As tabulated above, there are a total of four hundred thirty (430), all of which are Senior High School STEM students. Of the four hundred thirty (430) respondents, there are a total of two hundred thirty-two (232) grade 11 students, and one hundred ninety-eight (198) Grade 12 students. In the four hundred thirty (430) respondents, there are a total of one hundred ninety-seven (197) male students, and two hundred thirty-three (233) female students. Only one hundred fourteen (114) students were the respondents in Grade 11 while in Grade 12 were one hundred four (104) respondents, a total of two hundred eighteen (218). These samples were calculated using the Slovin formula.

The researcher adapted the survey questionnaire used in a study by Chakraborty. et. al (2020), with minor modifications to facilitate the aim of the present research. The questionnaire consisted of statements concerning the perceptions and online experiences of STEM students toward the customized E-Commons, and the student's expressed affirmation or disagreement by using a 5-point

Likert Scale. With the guidance of the STEM cluster head and coordination with the advisers of the STEM Strand, the questionnaires were distributed and answered via online, and the data were transferred to a hard copy. After the data has been gathered, the respondents were then profiled and their responses tabulated and classified. Part I contained the profile of the respondents in terms of grade level. Part II pertained to the students' perceptions towards the customized E-Commons. It contained twelve (12) indicators for every sub-scale of quality, usability and potential effectiveness. Part III focused on the student's individual online experiences with the customized E-Commons. It consisted of twelve (12) indicators for every sub-scale of support system and the resources needed to use it.

In data gathering and completion of this study certain steps have been observed: The researchers asked first for the approval of a request letter for the conduct of the study from the office of the Schools Division Superintendent, Division of Calbayog City, Samar Philippines. The request letter was duly signed by the researchers, noted by

the research adviser, and recommended by the dean of the Graduate School.

A request letter addressed to the school principal was made, asking permission to gather information about the customized E-Commons through the focal person, and for the permission to distribute the questionnaires to the respondents. Another request letter attached to the questionnaire was distributed to the student-respondents. The gathering of data was undertaken with the STEM advisory teachers, who helped in administering the distribution of the questionnaires through google form or group chat or messenger. This was subject to the approval of the panel committee. The researchers

then processed the data to finally produce findings and formulate conclusions. The researchers kept the privacy and confidentiality of the student-respondents answer.

Percentage and frequency counts were used to describe the demographic profile of the respondents in terms of grade level. Sample mean and standard deviation were used to calculate the mean score of the respondents' answers in defining an overall view of the students' responses on their perceptions as well as their online experiences.

RESULTS AND DISCUSSIONS

In terms of Quality of the customized E-Commons, the

Table 2: Perceptions toward Calbayog City National High School E-Commons as Determined by STEM Students

Indicator	Mean	Description
A. Quality		
The costumized E-Commons ...		
1. Has the same quality of education to traditional learning.	4.12	Agree
2. Has given me a satisfactory experience.	4.06	Agree
3. Is adequate in its role as a platform for online education.	4.01	Agree
4. Has engaged me in the teaching and learning process.	4.20	Agree
5. Has a satisfactory performance.	4.19	Agree
6. Delivering appropriate lesson delivery and instruction.	4.24	Strongly Agree
7. Provides features which are beneficial to the students.	4.24	Strongly Agree
8. Provides access to a sufficient array of learning materials and resources.	4.45	Strongly Agree
9. Does not contain content that promotes any form of discrimination.	4.25	Strongly Agree
10. Provides error-less and reliable resource materials.	4.27	Strongly Agree
11. Facilitates a good learning environment.	4.19	Agree
12. Provides learning that is compatible with a diverse group of learners.	4.13	Agree
Overall Mean = 4.20 SD = 0.70 (Agree)		
B. Usability		
The customized E-Commons...		
1. Is useful amidst the current circumstances.	4.62	Strongly Agree
2. Is well designed and easy to navigate.	3.34	Neutral
3. Is properly maintained and has minimal malfunctions.	4.05	Agree
4. Is well-optimized to cope with bad internet connection.	3.89	Agree
5. Helps make schoolwork easier to do.	4.17	Agree
6. Is simple enough to be used by students with low digital literacy.	4.05	Agree
7. Is applicable to mobile devices for navigation purposes.	4.40	Strongly Agree
8. Allows multiple types of internet connection.	4.08	Agree
9. Provides a comforting experience as much as usability is concerned.	4.20	Agree
10. Allows on-device storage and sharing options.	4.21	Strongly Agree
11. Contain contents of different media formats (video, audio, image and text).	4.26	Strongly Agree
12. Provides features that enable feedback to the contents available.	4.24	Strongly Agree
Overall Mean = 4.13 SD = 0.75 (Agree)		
C. Potential Effectiveness		
The customized E-Commons...		
1. Is capable of helping produce competent students.	4.13	Agree
2. Is able to instill the necessary skills and attitudes in students.	3.93	Agree
3. Can be incorporated for the long-term.	4.20	Agree

4.	Shows relevance for a long-term use.	4.08	Agree
5.	Can substitute physical classrooms for the time being.	4.36	Strongly Agree
6.	Has the potential to bring the school's quality of education to new heights.	3.40	Neutral
7.	Has no significant barriers that keep students from fully enjoying it.	2.58	Disagree
8.	Provides an array to finish my grade level with the expected competencies.	4.19	Agree
9.	Has no significant issues as much as continuity of adoption is concerned.	4.19	Agree
10.	Provides comfort while engaging with my studies.	3.91	Agree
11.	Is able to showcase the benefits of e-learning.	3.94	Agree
12.	Provides the same effectiveness to students with disadvantaged backgrounds.	3.77	Agree
Overall Mean = 3.89 SD = 0.93 (Agree)			

Scale	Description
1.00-1.80	Strongly Disagree
1.81-2.60	Disagree
2.61-3.40	Neutral
3.41-4.20	Agree
4.21-5.00	Strongly Agree

overall mean of the perception of STEM students was 4.20 with a description of 'Agree'. The result implies that the STEM students agree that the customized E-Commons in Science is of quality all across the board. Providing the same quality of education, quality user experience, accurate, sufficient and helpful. This implies that the E-Commons is largely well-received among STEM students.

In terms of the Usability of the customized E-Commons, the overall mean of the perception of STEM students was 4.13 with a description of 'Agree'. This implies that they are also satisfied with the customized E-Commons

in terms of usability, with five of 12 indicators with "Strongly Agree" ratings. However, despite the high overall result, the students found issues with the E-Commons compatibility with slow internet connection. Implying that the customized E-Commons could use improvement in that regard.

Regarding the Potential Effectiveness of the customized E-Commons, the overall mean of the perception of STEM students was 3.89 with a description of 'Agree'. The high rating implies that the students perceive the customized E-Commons with high potential effectiveness, with students strongly agreeing that it is capable of substituting classrooms for the time being. However, students refute that the customized E-Commons are free from significant barriers, and are neutral to the notion that the E-Commons could bring the school into new heights. Suggesting that students, though highly satisfied, have reservations with the highly satisfactory but not faultless platform.

Table 3: Overall Perceptions toward the Customized E-Commons in terms of Quality, Usability, and Potential Effectiveness as Determined by STEM Students

Grade Level	Mean	SD	Description
Quality	4.20	0.70	Agree
Usability	4.13	0.75	Agree
Potential Effectiveness	3.89	0.93	Agree
Overall Total	4.07	0.79	Agree

Overall, the perceptions toward the customized E-Commons as determined by STEM students when it comes to Quality, Usability, and Potential Effectiveness is highly satisfactory. Generally, this infers that STEM students have positive feedback toward the online platform and this learning management system can assist the needs of students in terms of quality, usability, and potential effectiveness. This was in line with Paul & Jefferson (2019) statement that there is no significant

difference in student performance between those who took online learning. Inferring that it is not the medium itself that is causing the decline in quality, but rather the disparities between developed and developing countries. The literature on the subject is divided on which modality is superior (traditional face-to-face vs distance learning), but both modalities have been shown to be relatively effective. The study also revealed the concept's translatability between traditional and online learning.

Table 4: Perceptions toward Calbayog City National High School E-Commons as Determined by STEM Students

Indicator	Mean	Description
A. Support System		
The customized E-Commons ...		
1. Provides an option to contact my science teachers for assistance.	4.11	Agree
2. Is responsive as much as the support system is concerned.	4.19	Agree

3.	Encourage students to provide feedback and suggestions.	4.11	Agree
4.	Has multiple channels which provide assistance.	3.86	Agree
5.	Allows feedback from the student.	4.17	Agree
6.	Has a robust support system.	4.31	Strongly Agree
7.	Has offline channels for feedback.	3.75	Agree
8.	Provides affordable options for financially struggling students.	4.08	Agree
9.	Allows and enables teachers to monitor their students regularly.	4.53	Strongly Agree
10.	Provides the student the flexibility to attend their homework within a workable time frame.	3.89	Agree
11.	Helps manage stress while engaging in the learning process.	4.05	Agree
Overall Mean = 4.10 SD = 0.77 (Agree)			
B. Resources Needed			
The customized E-Commons...			
1.	Requires no other resources other than hardware and internet access.	3.94	Agree
2.	Can work with low-end devices.	3.94	Agree
3.	Can work with slow internet connection.	2.26	Disagree
4.	Is friendly to mobile devices.	4.22	Strongly Agree
5.	Is not too demanding of internet data.	2.19	Disagree
6.	Offers affordable courses.	4.05	Agree
7.	Provides reasonable offers for financially struggling students.	4.14	Agree
8.	Provides cost-effectiveness of online education.	3.81	Agree
9.	Provides satisfying resources and investments.	4.02	Agree
10.	Allows flexible time for household chores and for oneself.	4.83	Strongly Agree
11.	Provides free and accessible learning materials.	4.45	Strongly Agree
12.	Contains no premium features available only to the financially able.	4.19	Agree
Overall Mean = 3.84 SD = 1.07 (Agree)			

Scale	Description
1.00-1.80	Strongly Disagree
1.81-2.60	Disagree
2.61-3.40	Neutral
3.41-4.20	Agree
4.21-5.00	Strongly Agree

In terms of the Support System of the customized E-Commons, the overall result shows a mean of 4.10 with a description of 'Agree'. It can be concluded that the STEM students are in agreement that the online platform provides a satisfactory support system. Which in turn, strongly substantiates the claim that the said platform has working and responsive feedback channels, and active monitoring staff.

In terms of Resources Needed of the customized E-Commons, the overall result shows a mean of 3.84 with a description of 'Agree'.

This implies that the students have found the customized E-Commons as resource-efficient, and considerate to the disadvantaged. However, indicators that pertain to internet connections earned disagree ratings, which indicates that the online platform is not slow-internet friendly and internet data-efficient, suggesting a need for optimization of the platform, with regards to internet connectivity.

Therefore, the online experiences using the customized E-Commons as determined by STEM students when it comes to Support System and Resources needed are overall 'Agree'. Generally, this infers that the STEM students have positive online experience while using the online platform for their online classes. This also suggests that the customized E-Commons are appropriate and built for the ease of use by the students to make their online classes more bearable since the system is supportive of the needs and capacity of students.

Table 5: Overall Online Experiences Toward the Customized E-Commons in terms of Support System and Resources Needed as Determined by STEM Students

Grade Level	Mean	SD	Description
Support System	4.20	0.70	Agree
Resources Needed	3.89	0.93	Agree
Overall Total	4.07	0.79	Agree

Table 6: Test of Difference in the Perceptions of the STEM Students Toward the Customized E-Commons when Grouped According to Grade Level

Sub-scale	Respondents				Mean Difference	t-value
	Grade 11 (N = 114)		Grade 12 (N = 104)			
	Mean	(SD)	Mean	(SD)		
A. Quality	4.1	-0.66	4.3	-0.58	0.2	2.390 ^s
B. Usability	4.1	(0.66	4.3	-0.47	0.2	2.568 ^s
C. Potential Effectiveness	3.96	-0.78	4.1	-0.59	0.13	1.446 ^{ns}

Critical Value (*c.v.*) = 1.982 at 0.05 level of significance with *df* = 216 *s* = significant; *ns* = not significant

The table presents the difference in the perceptions toward the customized E-Commons when grouped according to grade level in terms of: quality with a mean difference of 0.20 and t-value of 2.390; and usability with a mean difference of 0.20 and t-value of 2.568. These values are greater than the critical value (*cv*) of 1.982. Thus, the corresponding null hypothesis is rejected. Hence, there is a significant difference in the perceptions toward the customized E-Commons when grouped according to grade level.

The mean difference in the perception toward the customized E-Commons when grouped according to grade level regarding its potential effectiveness is 0.13. The corresponding t-value for this difference is 1.446.

This value is less than the critical value (*cv*) of 1.982. Thus, the corresponding null hypothesis is not rejected. Hence, there is no significant difference in the perceptions toward the customized E-Commons when grouped according to grade level regarding its potential effectiveness.

Overall, the null hypothesis is rejected. This implies that there is a significant difference in the perceptions toward the customized E-Commons when grouped according to grade level. This indicates that the Grade 12 STEM students have more positive perceptions toward the online platform in terms of its quality and usability than Grade 11 STEM students. However, they are not much different across the grade level in terms of their perceptions toward its potential effectiveness.

Table 7: Test of Difference in the Online Experiences of the STEM Students Toward the Customized E-Commons when Grouped According to Grade Level

Sub-scale	Respondents				Mean Difference	t-value
	Grade 11 (N = 114)		Grade 12 (N = 104)			
	Mean	(SD)	Mean	(SD)		
A. Support System	3.97	0.68	4.23	0.56	0.26	3.118 ^s
B. Resources Needed	3.67	0.62	4.02	0.60	0.35	4.308 ^s

Critical Value (*c.v.*) = 1.982 at 0.05 level of significance with *df* = 216 *s* = significant; *ns* = not significant

The table shows the difference in the online experiences using the customized E-Commons when grouped according to grade level in terms of: Support System with a mean difference of -0.26 and t-value of -3.118; and Resources needed with a mean difference of -0.35 and t-value of -4.308. These values are greater than the critical value (*cv*) of 1.982. Thus, the corresponding null hypothesis is rejected. Hence, there is a significant difference in the online experiences of the STEM students toward the online platform when grouped according to grade level. This implies that Grade 12 STEM students had more positive online experiences using the platform in terms of support system and resources needed than the Grade 11 STEM students.

CONCLUSION

The customized E-Commons has been proven useful and effective in its role in helping cater the continuity of education in Calbayog City National High School, Samar

Philippines at least according to the STEM students. The respondents reported satisfaction with the customized E-Commons' quality, usability and potential effectiveness. Similarly, the respondents reported positive online experiences with the customized E-Commons, regarding the support system and the resources required. All of this an implication of a well-designed and functional online platform. However, despite the overwhelmingly positive feedback, indicators pertaining to internet consumption had a relatively negative response. Indicative of a needed improvement of the learning management system's internet connectivity.

The study indicates that grade 11 and 12 STEM students have different experiences with online learning. Grade 11 students generally report more challenges, such as technical issues and difficulty staying motivated, compared to grade 12 students who appear to have adapted better. Possible factors contributing to these differences include maturity level and previous experience with online

learning. However, it is important to note that individual experiences may vary, and further research is needed to fully understand the factors that influence perceptions and online experiences of these students.

To improve the online learning experience of STEM students, the researchers recommend optimizing the E-Commons platform to reduce internet data consumption. Additionally, the school should raise awareness among students about the benefits of using the platform and provide guidance on how to make the most out of it through orientation sessions. These measures can enhance the overall online learning experience of STEM students using the E-Commons platform.

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