

Mobile E-Module In Teaching Computer Hardware Servicing (CHS)

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Abstract

The K to 12 Basic Education Program of the Philippines emphasizes the importance of the integration of ICT in the teaching and learning process. Teachers are encouraged to utilize all available ICT resources for the betterment of lesson delivery. Relatively, this study was intended to develop, validate and determine the effectiveness of a mobile e-module in Computer Hardware Servicing for Grade 10 ICT students.

The study tried to determine the level of acceptability of the parts of the developed mobile e-module in terms of its objectives, contents, activities, and assessments as well as the level of its validity in terms of usability, consistency, adaptability, and aesthetic value. The difference between the evaluators' ratings on the acceptability of the module parts and the validity of its characteristics was also determined.

Selected ICT teachers validated and evaluated the developed mobile e-module. Selected Grade 10 computer students were also utilized in the conduct of the study.

The statistical treatment of data revealed that the overall weighted mean rating for the acceptability of the module parts as rated by the groups of evaluators was extremely acceptable. It also revealed that the overall mean rating on its characteristics validity as rated by the groups of evaluators was extremely valid. The evaluation of the components and characteristics of the mobile e-module bore no implication on how the students accomplished the practical test given.

Based on the foregoing findings presented, the following conclusion was made:

There was no significant difference in the evaluators' ratings on the acceptability of the developed mobile e-module parts and the validity of its characteristics. The evaluators' ratings on the components and characteristics of the developed mobile e-module bore no implications on how the students accomplished the practical test given. Therefore, the hypothesis are accepted as there were not enough evidence to reject the claim.

Based on the findings and conclusion made, it is hereby recommended that ICT teachers may use this mobile e-module as supplementary material in teaching computer subjects that will lead the students to have knowledge and skills that they can extend in their daily living.

Keywords: Type your keywords here, separated by semicolons ; E-Module; ICT; Mobile; E-Learning

1. Introduction

Despite being dubbed as Asia's ICT hub, the Philippines is one of the countries with the slowest internet speeds. The significant changes in our educational system where face-to-face learning is no longer a top option forced the Department of Education to implement several learning delivery methods. For the school year 2020-2021 and 2021-2022, the Department of Education focused on creating and producing printed learning modules because according to surveys students opted more for the printed modular delivery modality.

The K to 12 Basic Education Program of the Philippines emphasizes the importance of the integration of ICT in the teaching and learning process. Teachers are encouraged to utilize all available ICT resources for the betterment of lesson delivery. The Department of Education also launched various programs to support the needs of today's modern technology.

According to Lawrence et. al 2018; Information communication technology (ICT) is becoming increasingly important in our daily lives and our educational system. There is a growing demand for educational institutions to use ICT to show the talents and knowledge that students need in the digital age. The adoption and integration of ICT into the teaching and learning environment provide more opportunities for teachers and students to work better in a globalized digital age.

E-module is a mobile device-based instruction or lesson that helps the students in studying from their home or wherever and whenever by using their smartphone, tablet, or laptop. The teachers could also create their exercises related to the topic and materials explained in the e-module; M.A. Hamid et. al. 2020.

Furthermore, due to the drastic changes in our learning modality, it is now the perfect time to maximize the use of ICT resources especially the use of mobile phones as a means of delivering knowledge to learners.

Thus, the present study sought to propose an innovative e-mobile module that will utilize and maximize the usefulness of android mobile devices through an offline application especially in teaching Computer Hardware Servicing.

Statement of the Problem

This study was intended to develop, accept, validate and determine the effects of innovative mobile e-module in teaching computer hardware servicing.

Specifically, it sought answers to the following questions:

1. What is the component level of the mobile e-module in terms of:
 - 1.1. objectives;
 - 1.2. contents;
 - 1.3. activities; and
 - 1.4. assessment?
2. What is the level of characteristics of the mobile e-module with regards to:
 - 2.1. usability;
 - 2.2. consistency;
 - 2.3. adaptability; and`
 - 2.4. aesthetic value?
3. What is the extent of teaching computer hardware servicing relative to practical tests?
4. Do the components and characteristics of the mobile e-module has a significant effect in teaching Computer Hardware Servicing?

Findings

Component Level of the Mobile E-Module

Mobile E-Modules are one of those learning materials that are used in today's lesson delivery. With the current education setup, the integration of mobile e-modules provides great importance especially in helping students track their own learning progress.

In this study, the researcher sought to assess the components of the developed mobile e-module in Computer Hardware Servicing 10 which was described in terms of objectives, contents, activities, and assessment and was determined by the weighted mean and standard deviation.

Table 1 shows that the component of the mobile e-module in terms of its objectives was *extremely acceptable* as imposed by the grand (M=4.80). This explains more that respondents *strongly agree* that the objectives were manifested to be fitted with the developed e-module.

Table 1. Component level of the Mobile E-Module in terms of Objectives

The objectives of developed e-module are...	Mean	SD	Remarks
...specific and simple.	4.80	0.42	Strongly Agree
...attainable and measurable.	4.70	0.48	Strongly Agree
...time bounded.	4.80	0.42	Strongly Agree
...in line with the TESDA training regulation.	4.90	0.32	Strongly Agree
...reliable.	4.80	0.42	Strongly Agree
Grand Mean	4.80		Extremely Acceptable

The respondents *strongly agree* that the objectives of the mobile e-module are in line with the TESDA training regulation, which garnered the highest (M=4.90, SD=0.32). On the same note, they *strongly agree* also that "the objectives of the mobile e-module are attainable and measurable" though it obtained the lowest (M=4.70, SD=0.48). This implies that evaluators perceive that the module's objectives are appropriate and acceptable as it conforms with the regulations and can be attained and measured.

Tubiera (2014), an objective is a desired or required result that must be attained at a specified period. The module's objectives should be specific and aligned with the teaching schedule. The findings of Cottrell (2013) in his study on modular objectives as a subject for material validation established a collateral link with the foregoing study by revealing that the said specific objectives were indeed achievable because they were streamlined to fit into the level of learning experiences of the learners covered in this research undertaking.

Table 2 shows that the component of the mobile e-module in terms of its contents was *extremely acceptable* as imposed by the grand (M=4.80). This explains more that respondents *strongly agree* that the contents were manifested to be fitted with the developed e-module.

Table 2. Component level of the Mobile E-Module in terms of Contents

The contents included in the e-module...	Mean	SD	Remarks
...are suitable, interesting, and current and up to date.	4.70	0.48	Strongly Agree
...contribute to the acquisition of concept and understanding of the lesson.	4.80	0.42	Strongly Agree
...give information appropriate to the level of comprehension of the students.	4.80	0.42	Strongly Agree
...present in correct sequence and progression.	4.80	0.42	Strongly Agree
...clear enough to be taken up for a specific period.	4.90	0.32	Strongly Agree
Grand Mean	4.80		Extremely Acceptable

The respondents *strongly agree* that the contents of the mobile e-module are clear enough to be taken up for a specific period, which garnered the highest (M=4.90, SD=0.32). On the same note, they *strongly agree* also that "the contents of the mobile e-module are suitable, interesting, and current and up to date" though it obtained the lowest (M=4.70, SD=0.48). This implies that evaluators perceive that the contents of the mobile e-module are appropriate and acceptable as it is clear enough to be taken up for a specific period.

According to Ornstein (2012), one must understand the content of instructional materials to figure out what they're going to be used for. The documents' content must be exact, and they must not contain any incorrect information.

Table 3 shows that the component of the mobile e-module in terms of its activities was *extremely acceptable* as imposed by the grand

($M=4.68$). This explains more that respondents *strongly agree* that the activities were manifested to be fitted with the developed e-module.

Table 3. Component level of the Mobile E-Module in terms of Activities

The activities...	Mean	SD	Remarks
...answer the expected outcome of the content.	4.70	0.48	Strongly Agree
...provide realistic and practical enrichment for the real-life situation.	4.70	0.48	Strongly Agree
...conform to the objectives of the lesson.	4.80	0.42	Strongly Agree
...give interactive performances to develop interpersonal relationship among peers.	4.50	0.53	Strongly Agree
...help to develop knowledge and skills.	4.70	0.48	Strongly Agree
Grand Mean	4.68		Extremely Acceptable

The respondents *strongly agree* that the activities of the mobile e-module conform to the objectives of the lesson, which garnered the highest ($M=4.80$, $SD=0.42$). On the same note, they *strongly agree* also that “the activities of the mobile e-module give interactive performances to develop interpersonal relationship among peers” though it obtained the lowest ($M=4.50$, $SD=0.53$). This implies that evaluators perceive that the activities found in the module conforms to the objectives of the lesson and gives interactive performances which helps develop knowledge and skills.

Exercises and activities are the “core” of the module, according to Crisostomo (2015), as is the input-processing-20 output or input-practice-task-feedback sequence for each activity.

Table 4 shows that the component of the mobile e-module in terms of its assessment was *extremely acceptable* as imposed by the grand ($M=4.78$). This explains more that respondents *strongly agree* that the assessment were manifested to be fitted with the developed e-module.

Table 4. Component Level of the Mobile E-Module in terms of Assessment

The assessment measuring students' skills...	Mean	SD	Remarks
...contains various formative and practical tests.	4.90	0.32	Strongly Agree
...supports multiple intelligences among students provided by the assessment tools.	4.60	0.52	Strongly Agree
...serves as tools to determine the students' learning for every performed activity.	4.90	0.32	Strongly Agree
...provides the opportunity for self-assessment to improve the learning of the lesson given.	4.60	0.52	Strongly Agree
...follows an appropriate question that is congruent to the objectives.	4.90	0.32	Strongly Agree
Grand Mean	4.78		Extremely Acceptable

The respondents *strongly agree* that the assessment of the mobile e-module contains various formative and practical tests, serves as tools to determine the students' learning for every performed activity, and follows an appropriate question that is congruent to the objectives, which garnered the highest ($M=4.90$, $SD=0.32$). On the same note, they *strongly agree* also that “the assessment of the mobile e-module supports multiple intelligences among students provided by the assessment tools and provides the opportunity for self-assessment to improve the learning of the lesson given.” though both obtained the lowest ($M=4.60$, $SD=0.52$). This implies that evaluators perceive that the module's assessment conforms to the lesson's objectives and gives interactive performances which helps develop knowledge and skills.

Kizlik (2012) stated that evaluation is perhaps the most complex and least understood of the terms. Inherent in the idea of evaluation is “value.” When we evaluate, what we are doing is engaging in the same process that is designed to provide information that will help us make a judgment about a given situation. One way to identify the learners who reach mastery and who need reinforcement. The module uses evaluation or assessment to identify the prior learning of the students before and after the discussion of the content of the module.

Level of Characteristics of the Mobile E-Module

Mobile E-Modules characteristics plays a vital role in the success of every lesson delivery especially with the current situation wherein students only rely on teacher made learning materials.

In this study, the researcher sought to assess the characteristics of the developed mobile e-module in Computer Hardware Servicing 10 which was regarded as usability, consistency, adaptability and aesthetic value and was determined by the weighted mean and standard deviation

Table 5. Level of Characteristics of the Mobile E-Module with regards to Usability

The developed e-module...	Mean	SD	Remarks
...can be used independently.	4.80	0.42	Strongly Agree
...can offer various activities that are easy to accomplish.	4.70	0.48	Strongly Agree
...can be a substitute for difficult books or modules.	4.80	0.42	Strongly Agree
...uses terms/words that are easy to understand.	5.00	0.00	Strongly Agree
...can serve as a tool for developing the desired outcomes among students.	4.80	0.42	Strongly Agree
Grand Mean	4.82		Extremely Acceptable

Table 5 shows that the component of the mobile e-module with regards to usability was *extremely acceptable* as imposed by the grand ($M=4.82$). This explains more that respondents *strongly agree* that the usability were manifested to be fitted with the developed e-module.

The respondents *strongly agree* that the developed e-module uses terms/words that are easy to understand, which garnered the highest ($M=5.00$, $SD=0.00$). On the same note, they *strongly agree* also that the developed e-module can offer various activities that are easy to accomplish.” though it has obtained the lowest ($M=4.70$, $SD=0.48$).

This implies that evaluators perceive that the usability of the module is user-friendly which plays a vital role as the learners utilize the

developed mobile e-module especially in navigating its different parts.

According to Eriks Klotins (2011), Usability and user experience refer to the quality of a product while it is used. The e-module's usefulness or usability is used for the benefit of both the teacher and the students; it should have user-friendly and easy-to-understand icons that direct students in the right direction. If students can easily understand the module, it is considered usable.

As mentioned by Ankita Madan et al. (2012), All software quality models take usability into account. It's a crucial aspect of creating successful interactive software applications. Usability is the most generally used notion in software engineering, and it specifies the demand for and use of a software system.

Table 6 shows that the component of the mobile e-module with regards to consistency was *extremely acceptable* as imposed by the grand (M=4.78). This explains more that respondents *strongly agree* that the consistency were manifested to be fitted with the developed e-module.

Table 6. Level of Characteristics of the Mobile E-Module with regards to Consistency

<i>The developed e-module...</i>	Mean	SD	Remarks
<i>...contains topic that are logically related to each other.</i>	4.70	0.48	Strongly Agree
<i>...provides learning tasks that are related directly to objectives of the lessons.</i>	4.80	0.42	Strongly Agree
<i>...focuses on the main goal.</i>	4.80	0.42	Strongly Agree
<i>...reflects attainable objectives for each lesson.</i>	4.80	0.42	Strongly Agree
<i>...includes topics that are important for learning computer concept.</i>	4.80	0.42	Strongly Agree
Grand Mean	4.78		Extremely Acceptable

The respondents *strongly agree* that the consistency of the mobile e-module is extremely acceptable as it *provides learning tasks that are related directly to the objectives of the lessons, focuses on the main goal, reflects attainable objectives for each lesson, and includes topics that are important for learning computer concept.*, which garnered the highest (M=4.80, SD=0.42).

On the same note, they *strongly agree* also that consistency of “*the developed e-module contains topics that are logically related to each other.*” though it has obtained the lowest (M=4.70, SD=0.48).

This implies that evaluators perceive that the consistency of the developed mobile e-module is extremely acceptable.

The consistency of the learning material was also considered by Ballesteros (2016). Instructional consistency was linked to the task, which was timed to the learners' capabilities. It describes how the developed worktext will be actual and acceptable to a panel of math experts who evaluated its capabilities. Garantuza (2015) received a very favorable rating in his research entitled Module in Teaching Listening in terms of usefulness, consistency, flexibility, appropriateness, and aesthetic value. He also discovered that there were no significant variations between the evaluations provided for consistency, adaptability, appropriateness, and aesthetic value. Furthermore, Domingo (2015) found that Supplementary Modules in Teaching Vocabulary Lessons for K–12 Learners were incredibly acceptable in terms of external and internal criteria in his study. He also concluded that there was no significant difference in the evaluations of faculty, master teachers, and English headteachers on the acceptability level of assessment and validation in terms of internal and external criteria. the learners utilize the developed mobile e-module especially in navigating its different parts.

Table 7. Level of Characteristics of the Mobile E-Module with regards to Adaptability

<i>The developed e-module...</i>	Mean	SD	Remarks
<i>...is versatile that can be used across curriculum.</i>	4.70	0.48	Strongly Agree
<i>...provides exercises which are aligned with the various learning styles of the students.</i>	4.70	0.48	Strongly Agree
<i>...provides opportunity for independent study.</i>	4.80	0.42	Strongly Agree
<i>...can be a supplement to books or manuals which are difficult to reproduce.</i>	4.50	0.53	Strongly Agree
<i>...can be revised to fit some other purposes.</i>	4.60	0.48	Strongly Agree
Grand Mean	4.66		Extremely Acceptable

Table 7 shows that the component of the mobile e-module with regards to adaptability was extremely acceptable as imposed by the grand (M=4.66). This explains more that respondents strongly agree that the adaptability was manifested to be fitted with the developed e-module.

The respondents *strongly agree* that the adaptability of the mobile e-module is extremely acceptable as it *provides opportunity for independent study*, which garnered the highest (M=4.80, SD=0.42). On the same note, they *strongly agree* also that adaptability of “*the developed e-module can be a supplement to books or manuals which are difficult to reproduce*” though it has obtained the lowest (M=4.50, SD=0.53). This implies that evaluators perceive that the adaptability of the developed mobile e-module is extremely acceptable.

Adaptability, according to Ballesteros (2016), refers to how teachers and students may utilize and use the modules in various contexts.

In addition, Bermudez, R. S., Mogol, C. R. & Guerra, E. A. (2017), the activities provided for the learners must be very much flexible, thus developing their creativity and making them explore and connect their previous and personal experiences with that of Dr. Jose Rizal.

Table 8 shows that the component of the mobile e-module with regards to aesthetic value was extremely acceptable as imposed by the grand (M=4.80). This explains more that respondents strongly agree that the aesthetic value was manifested to be fitted with the developed e-module.

The respondents *strongly agree* that the aesthetic value of the mobile e-module is extremely acceptable as it *is made in bold and clear; graphics and other illustrations for the intended lesson* garnered the highest (M=4.80, SD=0.42). On the same note, they *strongly agree* also that the aesthetic value of “*the developed e-module uses appropriate text font, size, and type, and is colorful enough to get the attention of the learners to*

motivate in answering the exercises” though both have obtained the lowest (M=4.60, SD=0.52). This implies that evaluators perceive that the aesthetic value of the developed mobile e-module is extremely acceptable.

Table 8. Level of Characteristics of the Mobile E-Module with regards to Aesthetic Value

<i>The developed e-module...</i>	Mean	SD	Remarks
<i>...contains visually pleasing and easy to understand icons.</i>	4.90	0.32	Strongly Agree
<i>...uses appropriate text font, size, and type.</i>	4.60	0.52	Strongly Agree
<i>...makes use of illustration needed for the topic.</i>	4.90	0.32	Strongly Agree
<i>...is colorful enough to get the attention of the learners to motivate in answering the exercises.</i>	4.60	0.52	Strongly Agree
<i>...is made in bold and clear; graphics and other illustrations for the intended lesson.</i>	5.00	0.00	Strongly Agree
Grand Mean	4.80		Extremely Acceptable

According to Garantuza (2015), aesthetic value does not refer to the material's pleasing look. More significantly, it places a premium on its ability to attract people and, as a result, value it. In addition, Badillo (2015), aesthetic value refers to the material's pleasing look to attract people and subsequently enjoy it. The materials' look motivates users to utilize the e-learning module and appreciate its beauty, which leads to users' happiness and satisfaction in using it regularly. Moreover, Bermudez, R. S., Mogol, C. R. & Guerra, E. A. (2017), give importance to the aesthetic value of their interactive package in terms of attractiveness which then content specialists reported that it is quite appealing in terms of its drawing, font size, layout, and color.

It was justified that the results of the group of evaluators' assessments did not differ. The properties of the mobile e-module are rated as extremely acceptable by the evaluation groups. As a result, the study's findings are valid in the eyes of instructors and specialists. It implies that the usefulness, consistency, flexibility, and aesthetic value of the mobile e-module are all visible on the mobile e-module. The produced mobile e-module in Computer Hardware Servicing may be used as a supplement to difficult-to-reproduce books or manuals. The designed mobile e-module, on the other hand, can be utilized independently and comprises themes that are vital for learning computer concepts, according to the evaluators. It simply indicates that the evaluators' assessments were accurate, as evidenced by the overall findings.

Extent of Teaching Computer Hardware Servicing Relative to Practical Test

Practical tests are essential in every learning and instruction as it measures the students skill set and different capabilities.

In this study, the researcher sought to determine the extent of teaching Computer Hardware Servicing 10 relative to practical test and was determined by using Regression Analysis.

Table 9. Extent of Teaching Computer Hardware Servicing relative to Practical Test

Grading Scale	Frequency	Percentage	Descriptors
90 – 100	39	83%	Outstanding
85 – 89	6	13%	Very Satisfactory
80 – 84	2	4%	Satisfactory
75 – 79	0	0	Fairly Satisfactory
Below 75	0	0	Did Not Meet Expectations
Mean	94.26	Interpretation	Outstanding

Table 9 revealed the Extent of Teaching Computer Hardware Servicing Relative to Practical Test. It can be manifested that 39 out of 47 or 83 percent of the students showed an outstanding performance, 6 out of 47 or 13 percent got a very satisfactory performance while there are 2 out of 47 or 4 percent obtained a satisfactory performance. The mean of 94.26 implied that the performance of the students was *outstanding*. This means further that teaching computer hardware servicing had been very effective as implied by the outstanding performance of the students in their practical tests.

Significant Effect of Components and Characteristics of the Mobile e-module in Teaching Computer Hardware Servicing Relative to Practical test.

Minitab 14 was used in computing the data gathered and treating them statistically using Regression Analysis. The computed p-values were compared to the level of significance at 0.05 to determine the significant effect of components and characteristics of the mobile e-module in teaching computer hardware servicing relative to practical tests.

Table 10. Significant Effect of Components of the Mobile e-module in Teaching Computer Hardware Servicing Relative to Practical test

Variables	f-value	p-value	Analysis
Objectives	0.07	0.796	Not Significant
Content	0.08	0.785	Not Significant
Activities	1.39	0.244	Not Significant
Assessment	0.00	0.995	Not Significant

*significant at a .05 level of significance

Table 10 presents the effect of the components of the mobile e-module in teaching computer hardware servicing relative to practical tests.

It can be seen that the components of the mobile e-module relative to objectives gained a p-value (0.796), content obtained a p-value (0.785), activities gained a p-value (0.244) and assessment attained a p-value (0.995) which were all higher than 0.05 level of significance which suggested that these components have *no significant* effect on student's performance in the practical test. This meant that the evaluation of the components of the mobile e-module bore no implication on how the students accomplished the practical test given.

Table 11. Significant Effect of Characteristics of the Mobile e-module in Teaching Computer Hardware Servicing Relative to Practical test

Variables	t-value	p-value	Analysis
Usability	0.02	0.900	Not Significant
Consistency	0.08	0.785	Not Significant
Adaptability	2.82	0.099	Not Significant
Aesthetic Value	0.66	0.420	Not Significant

*significant at a .05 level of significance

Table 11 presents the effect of the characteristics of the mobile e-module in teaching computer hardware servicing relative to practical tests.

It can be seen that the characteristics of mobile e-module relative to usability gained p-value (0.900), consistency obtained p-value (0.785), adaptability gained p-value (0.099) and aesthetic value attained the p-value (0.420) which were all higher than 0.05 level of significance which suggested that these characteristics have *no significant* effect on student's performance in the practical test. This meant that the evaluation of the characteristics of the mobile e-module bore no implication on how the students accomplished the practical test given.

The results of the evaluation of the e-modules validity of components garnered a grand mean of 4.765 which means *Extremely Acceptable* and acceptability of characteristics garnered a grand mean of 4.765 which means *Extremely Acceptable* and a 94.26 mean on the students scores on practical test which means *Outstanding* implies that the mobile e-module have been very effective in teaching computer hardware servicing. The analysis which resulted to not significant may be influenced by the high level of understanding of students with regards to the topic.

Conclusion

Based on the foregoing findings presented, the following conclusion was made:

There was no significant difference in the evaluators' ratings on the acceptability of the developed mobile e-module parts and the validity of its characteristics. Therefore, the null hypothesis was accepted.

The evaluators' ratings on the components and characteristics of the developed mobile e-module bore no implications on how the students accomplished the practical test given. Therefore, the null hypothesis was accepted.

Recommendations

Based on the findings and conclusions made, it is hereby recommended that to further determine the effectiveness of the developed mobile e-module for Grade 10 ICT students, an experimental group can use it and compare the result to a control group that does not use it. The e-module should be used by other teachers/classes to further test its effectiveness

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