

DEVELOPMENT OF MOBILE LEARNING APPLICATION AND ITS EFFECTIVENESS IN ENHANCING COMPETENCE IN TVL CSS

Lara Carullo Pantaleon*

University of Saint Anthony City of Iriga

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Abstract: This study assessed the competency level of TVL–CSS Senior High School students at Concepcion F. Llorin National High School, Sagurong, Pili, Camarines Sur, and developed a supplementary mobile learning application to address identified learning gaps. Specifically, it evaluated students’ competencies in installing and configuring computer systems, setting up computer networks and servers, and maintaining and repairing computer systems and networks. Using a descriptive research design, the study involved forty (40) students and ten (10) expert validators, including education supervisors, master teachers, ICT teachers, and IT experts. Data were analyzed using weighted mean.

The findings revealed that students demonstrated low competency across all areas, with an overall pre-test mastery level of 23.28% (Unmastered), indicating insufficient foundational knowledge and technical skills. In response, an offline mobile learning application, L.A.R.A (Learning Assistance and Reinforcement App), was developed to provide interactive, self-paced, and curriculum-aligned learning materials. The application was validated as highly acceptable, obtaining ratings of very satisfactory in content (3.99) and Excellent in technical functionality (4.33), and very satisfactory in instructional quality (3.70), usability and engagement (4.18), and overall acceptability (4.10), although improvements in motivation and critical thinking components were recommended.

Post-test results showed an increase in mastery to 37.55% (Slightly Mastered), indicating measurable improvement in all competencies. The study concludes that the mobile learning application is an effective supplementary tool that enhances students’ competencies, though sustained use and instructional reinforcement are necessary to achieve full mastery. It is recommended that schools strengthen competency-based instruction, increase hands-on activities, and continuously refine mobile learning resources.

Keywords: *Mobile Learning Application, TVL–CSS, Competency Enhancement, Computer Systems Servicing.*

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Chapter 1

THE PROBLEM

Introduction

The Philippine Education system places significant value in the integration of technology in teaching and learning to develop the student’s competencies and increase their employability to their respective fields. This is based on legal backing from Republic Act No. 10533 or the Enhanced Basic Education Act of 2013, which focuses on developing student’s skills in line with their employability, entrepreneurial ventures and higher education institutions. The law also highlights the significance of developing the student’s competencies in line with their Senior High School curriculum in TVL to meet the standards required for their respective industries and to support the states development agenda. In this context, Republic Act No. 10650 or the Open Distance Learning Act also supports the use of digital technologies to increase access to quality education in the Philippines. In this situation, the Department of Education supports and promotes the use of information and communication technology (ICT) in TVL, particularly in the Computer Systems Servicing (CSS).

During the past few years, the fast development of ICT has transformed the educational system across the world. In this regard, mobile learning has been recognized as a powerful approach for effective teaching. It is based on the use of smartphones, tablets and other mobile gadgets for facilitating the educational process. In a technology-driven world, where skill development is a qualification for survival, the use of mobile learning is essential. It is especially important for the implementation of competency-based, skill-oriented educational programs, where learners are required to acquire both theoretical and practical knowledge.

In this matter, the use of multimedia resources, including videos, simulations, step-by-step procedures and assessments, is helpful for the repeated practice of concepts, procedural knowledge and independent learning. These features allow the learner to reinforce his/her skills, perform better and narrow the gap between theory and practice. With this kind of industries across the globe has been increasingly becoming more digitalized and automated, the need for a technically competent and digitally practicality workforce has become more pressing.

This challenge has prompted educational institutions to employ innovative approaches in teaching and learning that follow the global workforce standards. Mobile learning helps TVL programs develop competencies relevant to the industry and promote lifelong learning among the students. Despite these developments, there are still challenges to overcome in order for the students to acquire the desired level of competencies at Concepcion F. Llorin National High School (CFLNHS) in Sagurong, Pili, Camarines Sur, TVL-CSS students still experience difficulties in mastering the NC II Competency Standards for Computer Systems Servicing, software installation, troubleshooting and network configuration.

Although students have mobile devices at their disposal, these devices are not maximized as effective tools for learning to help students acquire competency. As a response to the above-mentioned issues, the present study is focused on the development and implementation of the L.A.R.A. (Learning Assistance and Reinforcement App) mobile application for learning.

On the other side, this present study on the development of a mobile learning application and its effectiveness in enhancing competence in TVL-CSS primarily addresses the Sustainable Development Goals (SDGs), especially SDG 4: Quality Education, which promotes inclusive and equitable access to quality learning opportunities and the improvement of technical and vocational skills through innovative and technology-enhanced instruction. Through developing a mobile learning application that supports competency-based learning in Computer Systems Servicing, the study helps improve students' access to flexible, self-paced, and skill-oriented education, even in resource-limited settings.

In addition, it also aligns with SDG 9: Industry, Innovation, and Infrastructure, as it promotes the use of digital technology and educational innovation to strengthen learning systems and develop ICT-related competencies needed in a rapidly advancing technological environment. Furthermore, the study contributes to SDG 10: Reduced Inequalities by providing an alternative learning tool that can support learners who may have limited access to traditional instructional resources, thereby helping bridge the digital and educational gap among students in technical-vocational tracks.

The desired output which is a mobile application is intended to be a dynamic, offline and self-paced application for the enhancement of student competencies, the development of their technical knowledge and the bridging of the gap between their knowledge acquisition in the classroom and the application of their knowledge in the real world. In this regard, the integration of mobile learning in the TVL CSS curriculum is seen as a means to foster the continuous development of student competencies, their confidence and their preparedness for industry-relevant roles in a digitalized environment.

Essentially, this research underscores the importance of learning materials that incorporate technology in the assistance of learners

in the development of their competencies, especially for senior high school learners. In doing so, mobile learning technologies such as L.A.R.A. address learning gaps in a manner that can prove to be an effective solution in further developing both theoretical and practical competency. The significance of the findings of the study is anticipated to have a lot of usefulness in helping educators, curriculum specialist and policy makers develop a strategic approach towards mobile learning for technical and vocational education in constantly evolving industrial settings.

Theoretical Framework

Constructivist Learning Theory (Jean Piaget)

The theory of Constructivist Learning Theory, developed by Jean Piaget, states that learning is a constructive activity in which the learners build knowledge through direct experience and interaction with the environment. According to this theory, the learners cannot simply learn or immerse up the information but rather, they construct the learning through direct involvement with the tasks and the environment. The learning that is based on the constructivist theory is learner-centered. This study is rooted in the constructivist learning theory because it focuses on engagement and practice.

These two concepts are important in the development of technical skills for TVL-CSS. The mobile learning application created for this study is called L.A.R.A (Learning Assistance and Reinforcement App). The application offers students interactive lessons, activities, and multimedia presentations that allow them to practice their skills independently.

The application also offers students the opportunity to practice complex procedures repeatedly. Through these activities the students can construct their own understanding of computer systems servicing, software installation, troubleshooting, and network configuration.

The theory directly deals with the main issue of this research: how students find it hard to maximize the development of their competencies because of the limited number of instructional hours, resources and lab facilities. Through this constructivist method, the students will actively engage with the learning materials, perform simulations of real-world applications and get instant feedback through the mobile app.

Although Constructivist Learning Theory is a theory of learning, the design of the mobile learning application itself follows a model called ADDIE, which is actually a model for instructional design. ADDIE, or Analysis, Design, Development, Implementation, and Evaluation, is a process that follows a method to design an application that is consistent with constructivist theory. Lastly, there is a stress on actual learning experiences that are similar to real-life situations or problem situations as propounded in Constructivist Learning Theory.

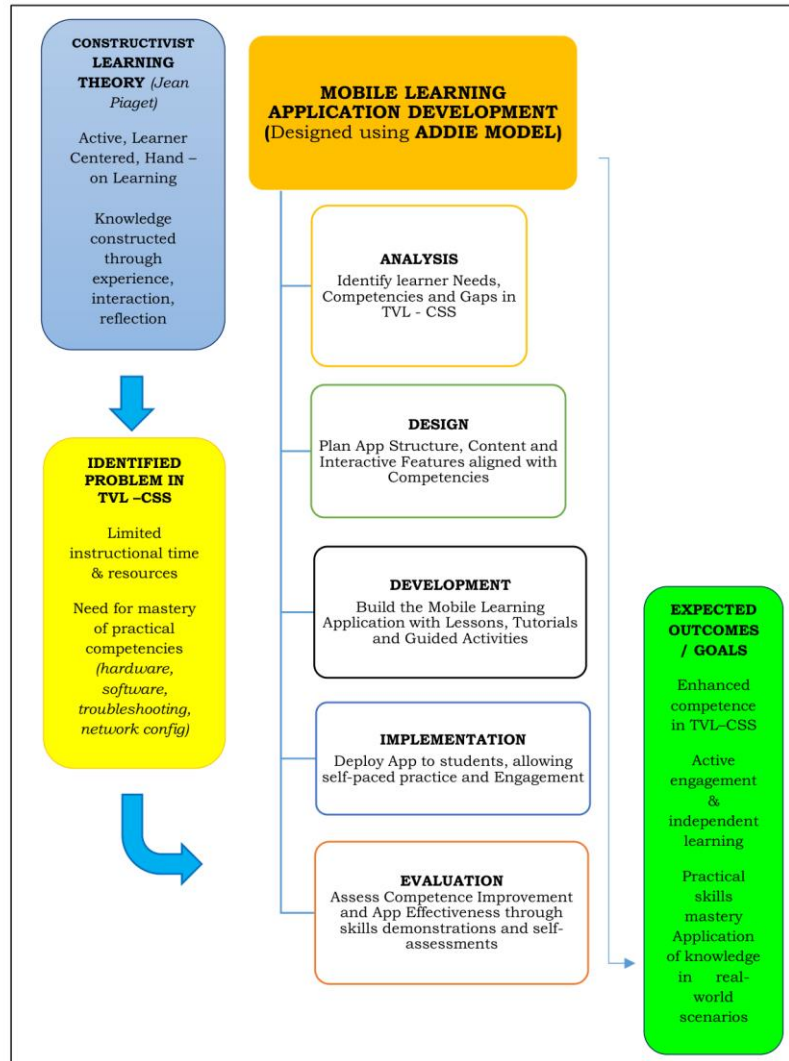


Figure 1. Theoretical Paradigm of the Study

In the case of TVL-CSS learning delivery, authentic learning experiences refer to the development of learning activities that resemble real-life computer servicing tasks. The L.A.R.A learning delivery system provides contextualized learning scenarios that allow learners to construct knowledge and skills. Through the use of instructional intervention based on Constructivist Learning Theory and implementing it through the ADDIE model, this study is able to ensure that learners are provided with active, meaningful, and competence-based learning experiences. In addition, the incorporation of mobile learning using the L.A.R.A app enhances the connection between theoretical knowledge and practical skills by ensuring that learning can take place continuously outside the classroom setting so that Learners can review their lessons,

consolidate their learning and apply what they have learned independently.

Constructivist Learning Theory (by Jean Piaget) is the guiding theory for this study as theory asserts that learning takes place through constructive processes. The development of the learning tool will aim at addressing the need to improve the technical competence of senior high school students enrolled under the TVL-CSS strand. ADDIE instructional design model will be utilized in the design process. To start with, an assessment of students' skill level in Computer System Servicing and its competencies will be conducted to identify weaknesses that need to be addressed.

Conceptual Framework

This gap analysis will provide insight on the construction of the mobile learning application that involves interactive tutorials, demonstration steps, and other activities to help learners gain competency through repetition and hands-on experience. The mobile learning application is validated by the relevant experts to guarantee the quality and accuracy of the application before it is used. The mobile learning application will then be implemented among the students to assess its effectiveness in building competency. Based on the outcome’s analysis, the following interventions are recommended to improve the teaching strategies, supplementing materials used for learning, and competencies of TVL-CSS learners.

Because of the merging of the theoretical underpinning of the constructivist educational model with an effectively designed mobile app, the proposed intervention will be not only justified from a theoretical perspective but also efficient in addressing the stated problem. Additionally, the importance of mobile learning in education, specifically in technical vocational learning, is highlighted. Through the consistent provision of learners with learning resources in a structured way, mobile learning contributes to the development of the ability to acquire self-directed knowledge of complicated processes, which might be difficult to achieve through conventional means, due to limited time and other resources. Besides skill development among the learners, the mobile app promotes problem-solving skills and independence of learners.

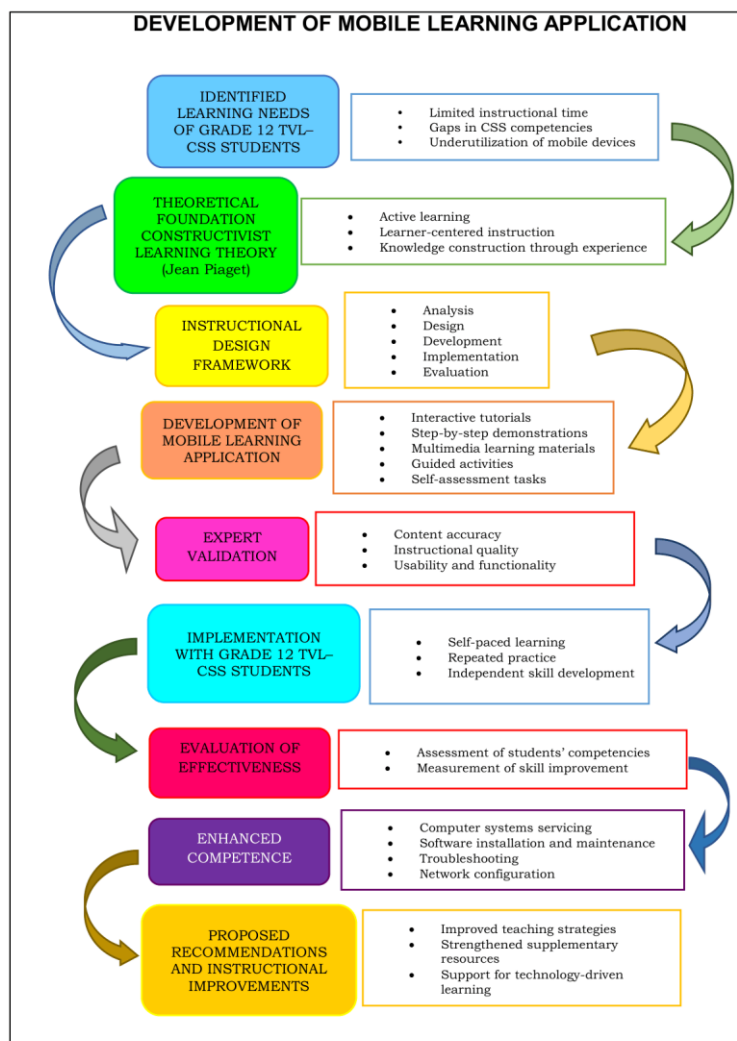


Figure 2. Conceptual Paradigm of the Study

The students will acquire necessary skills that will help them reach industry requirements and cope with new technologies.

The intervention is congruent with the current educational policies that aim to integrate ICT into technical and vocational courses.

Therefore, the research contributes towards innovative approaches in the TVL-CSS curriculum and shows how technological, learner-centered innovations can help fill the gap between classroom teaching and practical application.

The provision of constant learning material that is not confined within the four walls of classrooms by using the L.A.R.A. program makes it possible for the learner to own his learning process. Thus, using the L.A.R.A. Mobile Learning Application, learning becomes consistent and flexible for learners, providing them with an opportunity to improve themselves constantly.

Statement of the Problem

This study aims to develop a Mobile learning Application and determine its effectiveness in enhancing the competency level of Senior High School students in the Technical Vocational and Livelihood – Computer Systems Servicing Strand.

1. What is the competency level of the Senior High School TVL–CSS students before the use of the mobile learning application in terms of:

- Install and Configure Computer Systems
- Setup Computer Networks
- Setup Computer Servers
- Maintain and Repair Computer Systems Networks

2. Based on the competency level of the students, what supplementary learning resource can be developed to address the identified learning gaps?

3. What is the result of expert validation on the developed mobile learning application in terms of:

- Content
- Instructional design
- Functionality
- Usability

4. How effective is the use of the supplementary learning resources in enhancing the competency level of Senior High School TVL–CSS students?

5. What interventions and recommendations can be proposed based on the findings of the study to further improve TVL CSS instruction?

Assumptions of the Study

This study is conducted based on the following assumptions:

1. The Senior High School students enrolled in the TVL–Computer Systems Servicing (CSS) strand have varying levels of competency in Computer Systems Servicing and its Competencies prior to the use of the mobile learning application.

2. The instruments used to measure the competency level of the students before and after the use of the supplementary learning resource are valid and reliable indicators of their actual competencies.

3. The determined learning gaps based on the initial assessment of the learner’s competencies serve as an excellent foundation for the creation of the mobile learning app as another means of learning material.

4. The mobile learning app created through the current study is consistent with the TVL–CSS curricular competencies and may be used by senior high school learners.

5. The experts who have participated in the validation of the created mobile learning application are well-equipped to make objective judgments about it.

6. The Senior High School TVL–CSS students are capable of using mobile devices and are able to follow the instructions provided in the supplementary learning resource during its implementation.

7. Any change in the competency level of the students after the use of the supplementary learning resource is reflected through the results of the post-assessment conducted in the study.

Significance of the Study

The results of this study will be helpful to the following individuals, ranked from those who will benefit the most to those who will benefit the least alphabetically:

Students. The senior high school students enrolled under the TVL–Computer Systems Servicing (CSS) strand are the main individuals who will benefit from this research. The creation of a mobile learning application would provide an additional resource for their learning which can give easy access, flexible, and interactive educational materials. This will aid in improving their competency in CSS by filling in their learning deficiencies.

Teachers. The TVL–CSS teachers will also benefit from this study since the mobile learning application can be used as an additional instructional material. The output of this study will be very useful for the teachers to improve their teaching methods and techniques.

School Administrators. The findings of this study can be advantageous for school administrators since there is empirical evidence that backs up the inclusion of mobile learning in the process of teaching TVL. The outcomes can be applied in planning, policymaking, and making decisions regarding the use of this method in improving instructional quality and integrating it in technical-vocational courses.

Curriculum Developers. This study may be useful for curriculum developers who aim to create effective TVL–CSS curriculum materials. Specifically, this study may be taken as a guide in incorporating mobile learning and technology-based methods in competency-based education.

Future Researchers. This study can prove to be beneficial for future researchers since it can be considered as a reference in conducting other similar studies on mobile learning, learning tools, and competency enhancement in technical-vocational education.

Scope and Delimitation of the Study

This research concentrates on the design of the mobile learning application, and the analysis of the mobile learning application in terms of improving the students' competency in TVL-CSS Strand of Senior High School. Specifically, the study aims to assess the students' competency level before and after the use of the developed mobile learning application, validate the application through expert evaluation, and propose interventions and recommendations based on the findings.

Concepcion F. Llorin National High School located in Sagurong, Pili, Camarines Sur will be used for the conduct of the research. The target respondents of this study will be students who are

studying Grade 12 Senior High School under the TVL-CSS strand for the School Year 2025-2026. The conduct of this research will start in January and end in March 2026. The creation and preparation of research tools will take place after the approval of the research proposal after conducting the title defense scheduled for December 2025. Data collection, implementation of the mobile learning app, and the administration of the pre-test and post-test will start in January and end in February 2026 while data analysis, result interpretation, and conclusion and recommendation formulation will end in March 2026 before graduation season in public schools.

This study is delimited to the development and use of a mobile learning application as a supplementary learning resource for selected competencies in Computer Systems Servicing. The study does not include other TVL strands, other grade levels, or private school settings. Likewise, the study focuses only on the effectiveness of the supplementary learning resource in enhancing students' competency levels and does not cover long-term retention, employability outcomes, or comparison with other instructional methods.

Definition of Terms

Some definitions of terms which will be used in this paper are provided below so that this study can be made clearer:

Computer Systems Servicing (CSS). Denotes an academic strand under TVL that teaches students about computer technology, including its hardware, software, problem-solving abilities, and basics of networking. In this study, it pertains to Grade 12 TVL–CSS students performing practical tasks such as assembling computers, installing operating systems and software, configuring networks, and resolving technical issues.

Competency Level. Refers to the level of proficiency exhibited by the students in carrying out tasks concerning Computer Systems Servicing. It is assessed by the performance scores achieved by the students in carrying out tasks in Computer Systems Servicing before and after the use of the mobile application.

Expert Validation. The evaluation process supported out on the education material or information obtained from the professionals to determine whether it is accurate and effective. The expert validation process in this research involves evaluating the mobile learning application created through the IT experts point of view to determine its accuracy in terms of content and instructions.

Instructional Effectiveness. This is dependent on the degree to which pedagogical techniques and teaching aids contribute to learning and knowledge gaining by the learners. Efficiency of the instruction process in this case study can therefore be measured in terms of the improvement in learners' capabilities after use of the mobile learning aid.

Learning Gaps. This is used to refer to the weaknesses exhibited by students in CSS in terms of the knowledge or skills required in carrying out CSS activities. The identification of such gaps in the present study occurs through pre-assessment and competency assessment before the use of the mobile learning app.

Mobile Learning Application. This is an instrument that uses technology for purposes of making education resources available through the use of mobile technologies. In this case, it entails the application of L.A.R.A., where there are various types of

interactive activities provided to the learners such as quizzes and tutorials.

Senior High School Students. This is with respect to students who attend the last year of their secondary education period. Specifically, in this case study, these are the Grade 12 TVL-CSS students who have been using the mobile learning app.

Self-Paced Learning. Refers to a learning style that allows learners to study learning materials at their own speed. In this study, it is facilitated by the mobile learning application to allow students to revisit lessons, practice tasks, and improve competency independently.

Software Installation and Maintenance. It refers to the methods used in setting up, enhancing, and verifying that software works efficiently on computer systems. Software installation, according to this paper, refers to activities that include installing software, software upgrades, debugging software, and optimizing the system for CSS research.

Supplementary Learning Resources. Refers to any supplementary material used in teaching, which may be an addition to what is taught in classrooms. As used in this research, it includes the mobile application created to help teachers conduct their classes and enable learners to have more practice on CSS fundamentals.

Technical-Vocational-Livelihood (TVL). This term refers to one of the tracks offered in Senior High School within the Philippines' education curriculum that prepares the learner for work or further technical education. It means the specific strand in Senior High School where the learner will learn practical skills in hardware, software, and networking operations.

REVIEW OF RELATED LITERATURE AND STUDIES

I. Foreign Literature

The concept of mobile learning (m learning) is one that has proven its effectiveness in education. It makes learning possible from any place and at any time due to its convenience and accessibility (Crompton & Burke, 2020). Mobile learning has also been identified as a strategy that enhances the performance and engagement of learners in various disciplines (Sung et al., 2019). Moreover, mobile learning facilitates inclusive learning as well as lifelong learning due to its equity in accessing digital learning materials (Ally & Prieto Blázquez, 2020).

Mobile learning provides learners with the opportunity of self-paced learning which leads to self-regulation among students (Kukulka Hulme, 2020). Moreover, mobile technologies have evolved into collaborative platforms that improve interaction and communication among learners (Traxler, 2019).

Moreover, mobile learning is effective in increasing the motivation of learners through its interactive nature (Heflin et al., 2021). According to studies, mobile learning improves the learning experience and results in increased academic success if properly incorporated into instructions (Martin & Ertzberger, 2021). Mobile learning also plays a vital part in providing increased educational opportunities, especially for developing nations since mobile learning addresses geographical and economic obstacles (Traxler, 2019). Mobile learning also facilitates knowledge retention among learners as long as interactive applications are used (Kumar & Chand, 2019).

According to recent studies, mobile learning is also associated with blended learning environments wherein mobile technology complements the traditional method of learning (Sharples et al., 2020). Another benefit of mobile learning is that it facilitates situated and context-aware learning, which is important for competency-based education (Chen & Hsu, 2021).

II. Local Literature

In the Philippines' education scenario, mobile learning has proven to be a useful instrument for improving the teaching and learning processes. The use of mobile learning contributes to digital literacy as well as makes learners ready for 21st-century competencies (Marcial, 2020). Likewise, ICTs incorporated in the teaching process have made the conventional teaching method turn into an interactive and learner-centered approach (Tinio, 2020). In addition, mobile learning facilitates independent learning among learners (Sarmiento, 2022).

There is evidence showing that mobile learning helps improve academic performance and increase engagement of students in secondary education (Dela Peña, 2022). In addition, mobile learning promotes participation and increases motivation when used in classroom practices (Ramos, 2021).

Moreover, ICT incorporation plays a vital role in enhancing learner performance and skill development (Villanueva, 2020). Technical vocational mobile learning helps develop competencies and acquire practical skills (Olipas, 2022).

Teacher preparedness and ICT competence play an important role in implementing mobile learning in institutions successfully (Ubayuba, 2024). Students' perception of technology is another aspect that impacts student engagement and learning process (Sefain, 2023).

Local literature highlights that school infrastructure plays an important role in effective delivery of mobile learning (Reyes, 2021). In addition, there is research evidence showing that mobile learning increases learner autonomy in blended learning environment (Bautista, 2020).

III. Foreign Studies

Research has shown the efficiency of mobile learning as a strategy that boosts student achievements. According to experimental findings, students who adopt mobile learning outperform those using the conventional learning approach (Sung et al., 2019). It has also been demonstrated that mobile learning enhances problem-solving abilities and cognitive development of learners (Hwang & Chang, 2020).

Besides, mobile learning has been shown to promote self-directed learning and improve learners' performance academically (Joo et al., 2020).

Evidence from various studies has shown that mobile learning helps boost student motivation and collaboration, which in turn improves student engagement in learning (Martin & Ertzberger, 2021). Mobile learning has also been recognized as an efficient strategy for promoting flexible learning (Ally & Prieto Blázquez, 2020).

Further research suggests that mobile learning increases the retention of knowledge and makes the educational material more accessible (Kumar & Chand, 2019). In higher education, mobile

apps contribute to better learner engagement and improved learning experiences (Heflin et al., 2021).

According to recent findings, mobile learning contributes positively to academic performance in hybrid environments (Sharples et al., 2020). Furthermore, mobile learning promotes knowledge building among learners (Chen & Hsu, 2021). In addition, the latest literature highlights that the use of mobile technology positively correlates with desirable learning behaviors like persistence and active learning (Nguyen & Khoa, 2022). Moreover, mobile learning helps with language acquisition via interactive mobile apps (Wang & Smith, 2021).

IV. Local Studies

Philippine based empirical studies support the effectiveness of mobile learning in improving student performance. Mobile applications have been found to enhance both knowledge acquisition and practical skills among TVL learners (Bawal & Cuenca, 2023). Mobile learning tools also improve engagement and academic performance in technical vocational education (Olipas, 2022). In addition, education through mobile devices is also found to improve the academic performance of high school students (Dela Peña, 2022).

It is observed that the use of mobile applications can serve as motivational tools for students and help them learn better (Ramos, 2021). Technology integration is also critical for enhancing students' academic success and skill acquisition (Villanueva, 2020). Besides, ICT competence in teachers affects the effectiveness of mobile learning programs (Ubayuba, 2024). Awareness of the role of technology among learners and their perceptions about its importance also affect their engagement in the learning process (Sefain, 2023).

Moreover, local studies demonstrate that access to mobile phones positively correlates with the academic success of learners (Delos Santos, 2021). Another study proves that mobile learning helps promote socio-emotional engagement in blended classrooms (Garcia, 2023). ICT support in schools also contributes to the success of mobile learning programs (Lopez, 2022). Lastly, research proves that professional development of teachers enhances the use of mobile learning strategies (De Vera, 2021).

V. Legal Basis

This work will be grounded on Republic Act No. 10533 - Enhanced Basic Education Act of 2013 (Philippines), which emphasizes the application of technology in education that will help enhance learning and develop 21st century skills among learners. Moreover, the DepEd ICT Policy aims at integrating ICT into teaching and learning processes for providing high-quality and accessible education.

Besides, Republic Act No. 10173 – Data Privacy Act of 2012 (Philippines) guarantees protecting personal information about students who take part in the use of mobile learning applications. Thus, the combination of legal instruments mentioned above provides grounds for the effective and ethical use of mobile learning technologies in the educational process.

Synthesis of the State – of – the – Art

It is evident from the review of both foreign and local literature that mobile learning is one of the most useful strategies for enhancing learning outcomes, engagement and competency acquisition. Foreign and local literature (Naveed et al., 2023;

Garzón et al., 2025; Besa & Pañares, 2025; Bawal & Cuenca, 2023) suggests that mobile learning is effective since it provides flexibility in accessing learning materials through mobile devices, which makes learning learner-centered, enabling self-directed learning opportunities for learners.

Regarding the context of vocational and technical education, foreign literature indicates that mobile learning plays an important role in practical and hands-on competency acquisition (Rajamanickam et al., 2024; Chi & Nguyen, 2025). This is supported by local literature indicating that mobile applications and simulations are effective for enhancing student's practical and theoretical competencies and improving overall performance among TVL students (Capao et al., 2025; Chummani et al., 2025).

Moreover, according to the study conducted by Sandhya Kattayat (2017), students who used mobile apps were able to perform better compared to other students. Similarities among the previous studies, which include the current study, involve the use of mobile learning as a secondary tool to supplement traditional teaching rather than as an alternative to the latter. Mobile learning is said to improve students' motivation, engagement, and academic performance, particularly in competency-based courses, consistent with the objective of the current study, which aims to improve the TVL-CSS students' Computer Systems Servicing skills.

Moreover, both international and local literatures have recognized the significance of developing mobile learning tools through the use of appropriate instructional and theoretical approaches, such as the Constructivist Learning Theory and instructional designs like ADDIE (Naveed et al., 2023; Bawal & Cuenca, 2023; Al-Mabaredy, 2021). This ensures that mobile learning applications are developed using a theory that is both practical and valid. Finally, Olipas (2022) has highlighted that technology-enabled, learner-focused initiatives in technical education can fill the gap between traditional teaching and application in the workplace.

However, some differences were noted in scope and context. Many foreign studies focus on higher education and various disciplines, whereas local studies concentrate on secondary education and vocational strands like TVL-CSS, which is the primary focus of the current research.

Moreover, where past researches have generally been conducted on the theoretical effectiveness or implementation of ICT in general, the current study involves designing, developing, implementing, and testing a mobile application for learning which is customized to suit the needs of the TVL-CSS competencies.

In conclusion, it can be stated that from the findings of the reviewed literature and studies, mobile learning has proven to be an efficient mode of learning in any setting. What makes this research stand out from other studies done previously is the fact that this one introduces an application that has been designed based on the school's curriculum and was verified and tested for its efficiency by experts. This research aims to bridge the gaps seen in literature from both theory and practice perspectives.

Research Gap

Based from the literature and studies from both foreign and local sources, the use of mobile learning as a means for instruction has been proven to be a great way in improving students' participation, motivation, and performance in their academic subjects. The benefits of mobile learning have been discussed by different foreign studies (Naveed et al., 2023; Garzón et al., 2025;

Rajamanickam et al., 2024; Kattayat, 2017), as well as by several local studies (Besa & Pañares, 2025; Bawal & Cuenca, 2023; Capao et al., 2025).

Their discussion centers on the role of mobile learning as a supplementary approach in instruction which allows for more self-reliance and competence-oriented instruction. Nonetheless, no studies have been found which discuss the implementation of mobile learning in the TVL-CSS strand in senior high schools in the Philippines. While foreign research often focuses on higher education or broad technical-vocational contexts and local studies primarily examine general ICT integration, mobile learning readiness or supplementary skill development, few empirical studies develop, implement and evaluate mobile learning applications explicitly designed to enhance the specific competencies required in TVL-CSS, such as computer assembly, software installation, troubleshooting and network configuration.

Furthermore, most prior research centers on theoretical reviews or general efficacy of mobile learning without combining curriculum-aligned, competency-based tasks with practical assessments. There is also a lack of structured expert validation frameworks in local TVL contexts. Even though literature such as Al-Mabaredy (2021) and Olipas (2022) offers the frameworks of validating mobile learning applications, these do not include a contextual approach to the development of these skills among TVL-CSS competencies in senior high schools.

Likewise, the effectiveness of mobile applications has been validated by Kattayat (2017) without considering any technical vocational strand competence. This research aims to fill this void by designing a specialized mobile learning application tailored to the senior high school students specializing in TVL-CSS competencies, conducting an experiment in real-life situations, and testing the validity of this application. In filling the identified gap, this study will provide the means necessary to further hone the technical skills of TVL-CSS students by using the MLC. In addition, the study adds to the small body of knowledge on the subject of curriculum-aligned mobile learning applications used in TVL-CSS courses.

Another significant contribution that can be derived from the study is the value of incorporating mobile learning as a means of improving the skills of TVL-CSS students in a constrained environment where laboratory space and teaching time are very limited. Through the provision of an interactive platform, MLC becomes useful in ensuring students acquire skills that are needed for future career endeavors.

Lastly, the study lays down a precedent for conducting future studies on curriculum-aligned mobile learning intervention among vocational strand senior high school learners. The proposed model can serve as basis to guide other researchers and educators alike in designing similar intervention strategies in the future. In summary, this research emphasizes the critical need for an intervention that specifically targets the TVL-CSS strand through competency-based mobile learning. It is in this context that the current study makes its contribution to literature as it highlights areas that are lacking in terms of curriculum design, implementation of practical skills, and appropriate localized learning design. This is expected to facilitate the reduction in the gap between existing learning methods and industry requirements in preparation for the employment world.

Notes

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Chapter 2

Research Methodology

This chapter of the study presents the methods and procedures employed in conducting the research. It includes the research design, method, development procedures, respondents, instruments, data-gathering techniques and statistical treatment used to accomplish the objectives of the study.

Research Design

This study employed a quasi-experimental research design, specifically the one-group pretest–posttest design, supported by developmental research procedures. The quasi-experimental design was used to determine the effectiveness of the developed mobile learning application by comparing the pre-test and post-test competency scores of SHS TVL–CSS students. Random assignment was not feasible due to the natural classroom setting.

Developmental research techniques were used to ensure that the mobile learning app is developed and validated through systematic planning and development process of the ADDIE Instructional Design Model. The purpose of applying these techniques was to make sure that the instructional product developed was pedagogically appropriate and in line with the TVL–CSS curriculum. As per Borg and Gall (1989), the primary focus of developmental research lies in designing, developing, and evaluation of instructional products or processes.

The use of developmental research in the quasi-experimental design helped not only in developing the instructional tool but also in evaluating its effectiveness within a real educational environment. The following were made possible by adopting the quasi-experimental design:

- The systematic development of the mobile learning application based on models such as ADDIE.
- The description of the present competency of SHS TVL–CSS students before the intervention.
- The evaluation of the effectiveness of the developed mobile learning application.

In this way, it made sure that the study captured all aspects related to the process of development as well as the effect of the mobile application on the instruction of TVL–CSS.

Respondents / Key Informants

The respondents of this study were Senior High School students enrolled in the Technical-Vocational-Livelihood (TVL) – Computer Systems Servicing (CSS) strand at Concepcion F. Llorin National High School, Sagurong, Pili, Camarines Sur, during the School Year 2025–2026. They were selected as respondents because they are the primary users of the developed mobile learning application, and their competency levels in Computer Systems Servicing. The inputs provided by the students were critical in assessing the L.A.R.A. Application, giving important information concerning the ease of use of the software and how effective it was.

Criteria for Selection of Respondents

The following were the criteria used for selecting respondents:

1. Active Student in TVL–CSS Strand – The students should be officially enrolled in the SHS TVL–CSS strand and are actively participating in class and practical lessons.
2. Ownership of Personal Mobile Phone – This will enable students to use the application efficiently.
3. Related to Research Objectives – This will ensure that students are actively learning modules associated with CSS in order for their skills to be assessed properly.

The respondents chosen for the study were those who were chosen using purposive sampling, which is one of the techniques used for non-probability sampling. This technique was employed by the researchers in order for them to be able to focus only on those respondents possessing the characteristics required by the study, thus ensuring that the collected data will be relevant to the analysis.

Other than the students, key informants were also incorporated during the process of developing and validating the mobile learning application. These key informants include the TVL–CSS Teachers, Master Teachers, Head Supervisor and IT Experts based on their professional knowledge and experience in teaching TVL–CSS subjects.

These people's views were very important in establishing whether the mobile learning application was correct, effective, functional, and user-friendly.

With the use of proper criterion and respondent/key informant selection, the researchers made sure that the data collected were accurate and valid representations of the target population for the mobile learning application.

Data Gathering Tools

In order to guarantee that the data obtained would be reliable and valid in assessing the effectiveness of the mobile learning application among TVL–CSS students, the study used the following data collection instruments:

- Survey Questionnaire
- Pre-Test
- Post-Test

Questionnaire

This instrument was created to gather data about students' levels of competency and their learning experience about the mobile learning app. The questions were created using the TVL–CSS curriculum competencies and the instrument that has been tested for validity in past studies conducted regarding mobile learning (Bawal & Cuenca, 2023; Pedraza & Canoy, 2025). The survey also attempted to determine what the students thought about the design and usage of the mobile learning app in order to enhance its efficiency further.

The researcher-made instrument consisted of five sections, covering:

- Student profile
- Competency in Computer Systems Servicing
- Effectiveness of the Mobile Learning Application

- Usability and Learner Satisfaction

Preparation of the Questionnaire

1. Content Identification – Competencies in TVL–CSS were examined to find out what should be assessed.

2. Item Development – Test items were generated to assess the knowledge, skills, and attitude of the students toward the mobile application.

3. Validation – Subject matter experts in TVL–CSS and Information Technology Education validated the questionnaire using a rubric.

4. Structure – The following parts made up the questionnaire:

Scales, Interval, Verbal Interpretation and Description

- Part I. Install and Configure Computer Systems
- Part II. Setup Computer Networks
- Part III. Setup Computer Servers
- Part IV. Maintain and Repair Computer Systems and Networks
- Respondent Information

Administration and Retrieval

The survey was conducted in the classroom setting. Paper versions of the survey were handed out to the respondents, and they were asked to complete the surveys in the presence of a supervisor. The completed surveys were collected immediately.

Pre-Test and Post-Test

Both pre-tests and post-tests were conducted in order to evaluate the level of learning that took place among the students and also the level of effectiveness of the m-learning tool. Pre-tests were conducted prior to the use of the mobile application by the students while post-tests were conducted after completion of the learning program using the m-learning tool.

Tests were developed based on the curriculum competencies of TVL–CSS and validated to check for conformity with the intended learning outcomes. Analysis of the test outcomes was done in a quantitative manner to determine the effect that the application had on students' achievements.

Ethical Considerations

In maintaining ethical considerations in the research, the following procedures were adopted:

1. Consent – Participants were oriented about the nature of the research, which was on their right and freedom to participate voluntarily.
2. Validity of Instruments Used -Questionnaire and pretest and post test were modified versions of already established instruments (Bawal & Cuenca, 2023; Creswell, 2014; Pedraza & Canoy, 2025).
3. Validation - The validation of all instruments was carried out by TVL–CSS and IT experts. The results obtained from their feedback were incorporated into the improvement of the instrument before administering it.

Using these methods, the research team ensured the accuracy, reliability, and ethics of the process of data collection, which safeguarded the rights and interests of the participants.

Statistical Treatment

The data gathered in this study were analyzed using descriptive and inferential statistical tools to determine the effectiveness of the developed mobile learning application in enhancing the competency level of Senior High School TVL–CSS students. The following statistical procedures were employed:

1. Frequency and Percentage Distribution

Frequency and percentage distributions were used to describe and summarize the respondents' profiles and their responses to selected questionnaire items. Frequency distribution shows how often responses occur, while percentage distribution indicates the proportion of each response relative to the total number of respondents (Creswell, 2014).

Formula:

$$\text{Percentage (\%)} = f / N \times 100$$

Where:

- f = frequency of responses
- N = total number of respondents

2. Mean

The mean was used to determine the average competency scores of students in the pre-test and post-test. It provides a representative value of the data set (Gravetter & Wallnau, 2014).

Formula:

$$\bar{X} = \frac{\sum X}{N}$$

Where:

- \bar{X} = mean

3. Weighted Mean

The weighted mean was used to determine the level of competency and effectiveness of the mobile learning application based on students' and experts' ratings. This is appropriate for Likert-scale questionnaires where responses are assigned numerical weights (Borg & Gall, 1989).

Formula:

$$\bar{X} = \frac{\sum fX}{N}$$

Where:

- \bar{X} = weighted mean
- f = frequency of responses
- X = numerical weight of each response

N = total number of respondents

Notes

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Chapter 3

DEVELOPMENT OF MOBILE LEARNING APPLICATION AND ITS EFFECTIVENESS IN ENHANCING COMPETENCIES IN TVL -CSS

This chapter presents the results and discusses the data gathered based on the research problems and hypotheses posited for this study. The data presentation follows the sequence of the statement of problems as it is presented in Chapter I.

The Competency Level of the Senior High School TVL–CSS Students Before the Use of the Mobile Learning Application

This study examined the competency level of Senior High School Technical–Vocational–Livelihood (TVL) students majoring in Computer Systems Servicing (CSS) prior to the utilization of the offline mobile learning application. Determining the students’ baseline competency level is important because this will provide information on the extent of the students’ knowledge and skills related to installing and configuring computer systems, and at the same time, help determine the areas where assistance is needed. The findings of this assessment prior to the implementation were used as a basis for evaluating the use of mobile learning as an aid.

Table 1A shows that students’ competency in configuring BIOS/UEFI settings correctly with a weighted mean of 2.15 is low, while can properly assemble and disassemble computer system units is poor with a weighted mean of 2.38.

The average weighted mean of the level of the competency to install and configure computer systems is 2.24, with a low competency verbal interpretation.

Table 1A: Install and Configure Computer Systems

Indicators	WM	VI	Rank
1. I can identify computer hardware components and their functions.	2.18	Low	3
2. I can properly assemble and disassemble computer system units.	2.38	Low	1
3. I can install an operating system following standard procedures.	2.18	Low	3
4. I can configure BIOS/UEFI settings correctly.	2.15	Low	4
5. I can apply safety procedures and occupational health standards during installation.	2.30	Low	2
Average Weighted Mean	2.24	Low	

Legend: Very High (4:21-5:00), High (3:41-4:20), Moderate (2.61-3.40), Low (1.81-2.60), Vary Low (1:00-1.80)

From the findings shown, one may presume that the students do not have sufficient competencies regarding the installation of computer systems both at the fundamental level and the more advanced level.

This implies that in terms of the competency in the installation of computer systems, the students are not yet competent enough to install and configure computer systems on their own.

This present links with the study carried out on (Abragan, 2025) that a prototype was created for the purpose of developing practical abilities in computer hardware installation among the students. This is done through the development of a prototype trainer whose functions include creating a hardware problem scenario that will help the learners identify and correct errors. Moreover, it was highlighted that the combination of practical experience along with

theoretical knowledge is essential for the success of students in their technological careers.

Table 1B shows that learners’ competency to identify different network devices and their functions and competency troubleshoot basic network connectivity issues with a weighted mean of 2.23 is low, while the competency to establish a simple LAN connection is moderate a weighted mean of 2.78.

The average weighted mean of the level of Setup Computer Networks is 2.39, with a low competency verbal interpretation. The presented findings can be inferred that learners have limited mastery of essential networking concepts and problem-solving skills and indicates weak foundational understanding and diagnostic ability.

Table 1B: Setup Computer Networks

Indicators	WM	VI	Rank
1. I can identify different network devices and their functions.	2.23	Low	3
2. I can create and terminate network cables properly.	2.35	Low	2
3. I can configure basic network settings (IP address, subnet, gateway).	2.35	Low	2
4. I can establish a simple LAN connection.	2.78	Moderate	1
5. I can troubleshoot basic network connectivity issues.	2.23	Low	3
Average Weighted Mean	2.39	Low	

Even though there is reasonable performance in creating a basic connection in the LAN, it can be observed that it is procedural in nature rather than being grounded in adequate concepts. Thus, it can be seen that the poor result in the Setup Computer Networks indicates that the learners’ networking skills have not been fully aligned to those required from them through the course.

Nevertheless, this study findings mentioned here is intended to offer background information even though it is not directly linked with the study conducted by (Gonzales et al., 2025), whereby they pointed out the difficulties experienced by students at grade 11 owing to inadequate use of current operating system, application software, and internet connections.

In addition, the study highlighted the need for incorporating technology in learning in order to improve the quality of education by improving the digital infrastructure within schools while adopting new approaches to teaching, which are the objectives of this current research in developing an offline learning app to prepare students for ICT jobs.

Table 1C shows that learners’ competency install a server operating system correctly, with a weighted mean of 1.85, is low while performing basic server monitoring and maintenance tasks with a weighted mean of 2.43 is low. The average weighted mean for the level of Setup Computer Servers is 2.08, with a verbal interpretation of low competency.

The presented findings could infer that learners exhibit weak competency in server-related technical skills. The very low weighted mean in installing a server operating system indicates serious difficulty with fundamental server setup procedures, while the low score in performing basic server monitoring and maintenance suggests limited operational understanding.

The average weighted mean score indicates that the students are not performing adequately regarding the required knowledge and skills in server management. This clearly shows that there is a need for training and learning of new skills among the students.

Table 1C: Setup Computer Servers

Indicators	WM	VI	Rank
1. I can identify different types of servers and their functions.	1.98	Low	4
2. I can install a server operating system correctly.	1.85	Low	5
3. I can configure basic server services (file, print, or user accounts).	2.03	Low	3
4. I can manage user access and permissions.	2.10	Low	2
5. I can perform basic server monitoring and maintenance tasks.	2.43	Low	1
Average Weighted Mean	2.08	Low	

The results below do not relate directly to the scope of this research although indirectly, it might have influenced the findings in line with the study conducted by (Ubayuba, 2024) indicating that the level of ICT competence of public-school teachers poses challenges in their effective integration in teaching processes.

One of the factors was teaching experience, and attitudes towards technology influenced teachers' ICT skills. It identifies challenges like inadequate training, limited resources, and resistance to change as major obstacles to ICT adoption. However, this study aims to address these challenges by developing and adopting offline

applications as supplementary ICT-integrated instructional material to enhance learners’ level of competencies in TVL-CSS.

Table 1D shows that document maintenance and repair activities accurately, with a weighted mean of 2.63, is moderate, while diagnosing common hardware and software problems and replacing defective hardware components safely is low with a weighted mean of 2.08.

The average weighed mean for level of maintaining and repair computer systems and networks are 2.19 with a verbal interpretation of low.

Table 1D: Maintain and Repair Computer Systems and Networks

Indicators	WM	VI	Rank
1. I can diagnose common hardware and software problems.	2.08	Low	3
2. I can perform preventive maintenance on computer systems.	2.13	Low	2
3. I can replace defective hardware components safely.	2.08	Low	3
4. I can perform basic network maintenance procedures.	2.05	Low	4
5. I can document maintenance and repair activities accurately.	2.63	Moderate	1
Average Weighted Mean	2.19	Low	

It can be inferred based on the result that learners demonstrate an overall low level of competence in maintaining and repairing computer systems and networks. Although learners show moderate ability in documenting maintenance and repair activities their performance in diagnosing common hardware and software problems and safely replacing defective hardware components is. This implies that although students have the ability to carry out procedural or administrative work, they do not possess the necessary technical skill or competence to troubleshoot problems.

Furthermore, the findings imply the need to strengthen practical, laboratory-based instruction and provide targeted interventions that focus on developing diagnostic abilities, safe hardware replacement procedures, and applied technical skills to improve overall competency in computer systems maintenance and repair. Similar to the findings, the study of (Sefain, 2023) it was mentioned that their learners have lack basic computer skills, which indicates a significant area of concern and can hinder their

ability to effectively engage with technology in their learning process.

Additionally, it was suggested that students' awareness of the effectiveness of learning with technology is crucial, and when they recognize this effectiveness, they are more likely to actively integrate technology into their learning. This study of developing a mobile learning application is learning with technology Table 1E shows that Setup Computer Networks, with a weighted mean of 2.39, and Setup Computer Servers low with a weighted mean of 2.05 level of competency is low. The average weighed mean for Summary of the Competency Level of the Senior High School TVL–CSS Students Before the Use of the Mobile Learning Application are 2.22 with a verbal interpretation of low competency.

Based on the analysis of the findings, it can be stated that prior to the introduction of the mobile application used for learning, the learners lacked adequate preparation in terms of knowledge, skills and performance in relation to key competencies required for CSS.

Table 1E

Summary of the Competency Level of the Senior High School TVL–CSS Students Before the Use of the Mobile Learning Application

Indicators	Weighted Mean	Interpretation	Rank
A. Install and Configure Computer System	2.24	Low	2
B. Setup Computer Networks	2.39	Low	1
C. Setup Computer Servers	2.05	Low	4
D. Maintain and Repair Computer Systems and Networks	2.19	Low	3
Average Weighted Mean	2.22	Low	

As can be seen from the results presented in Table 1E, it may be concluded that the senior high school students enrolled in the TVL–CSS strand possessed a generally poor level of competency prior to the deployment of the mobile learning application. In particular, students' competency in Setup Computer Networks was considered to be low.

Likewise, their Setup Computer Servers was also rated low, indicating insufficient practical ability to perform required technical tasks competently. Table 3A shows the pre-test item analysis of 40 SHS TVL–CSS learners of the COC (Certificate of Competencies 1-3). In the presentation reveals the highest competency is the Maintain and Repair Computer Systems and Networks, the computed mastery level reached 26.88%, interpreted as slightly mastered.

Although this is the highest among the four competencies, correct responses still ranged only from 5 to 12 learners (15.63%–37.50%), showing that troubleshooting and maintenance skills but were only partially understood while the Effective Demonstration of Technical Skills, the competency mean was 20.63%, interpreted as Unmastered. Correct responses in this cluster dropped as low as 3 students (9.38%), indicating minimal familiarity with server setup, system services, and technical implementation procedures.

The overall mean mastery level was 23.28%, interpreted as Unmastered, confirming that learners entered the study with insufficient foundational knowledge and technical skills in computer systems servicing.

Table 2A shows the pre-test item analysis of 40 SHS TVL–CSS learners of the COC (Certificate of Competencies 1-3).

In the presentation reveals the highest competency is the Maintain and Repair Computer Systems and Networks, the computed mastery level reached 26.88%, interpreted as Slightly Mastered.

Although this is the highest among the four competencies, correct responses still ranged only from 5 to 12 learners (15.63%–37.50%),

showing that troubleshooting and maintenance skills but were only partially understood while the Effective Demonstration of Technical Skills, the competency mean was 20.63%, interpreted as Unmastered.

Table 2A: Pre-Test Item Before the Use of the Mobile Learning Application

Subject:	TVL-CSS	Year &Section:	GRADE 11&12	No. of Takers	32
Item No.	No. of correct answer per item	Mastery Level (per item)	Interpretation	Mastery Level (per competency)	Interpretation
1	9	28.13	<i>Slightly Mastered</i>	COC 1: Install and Configure Computer Systems	24.58
2	7	21.88	<i>Unmastered</i>		
3	8	25.00	<i>Slightly Mastered</i>		
4	6	18.75	<i>Unmastered</i>	COC 2: Setup Computer Networks	21.04
5	10	31.25	<i>Slightly Mastered</i>		
6	8	25.00	<i>Slightly Mastered</i>		
7	9	28.13	<i>Slightly Mastered</i>	COC 3: Setup Computer Servers	20.63
8	8	25.00	<i>Slightly Mastered</i>		
9	7	21.88	<i>Unmastered</i>		
10	9	28.13	<i>Slightly Mastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
11	9	28.13	<i>Slightly Mastered</i>		
12	5	15.63	<i>Unmastered</i>		
13	5	15.63	<i>Unmastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
14	9	28.13	<i>Slightly Mastered</i>		
15	9	28.13	<i>Slightly Mastered</i>		
16	5	15.63	<i>Unmastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
17	3	9.38	<i>Unmastered</i>		
18	7	21.88	<i>Unmastered</i>		
19	9	28.13	<i>Slightly Mastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
20	9	28.13	<i>Slightly Mastered</i>		
21	9	28.13	<i>Slightly Mastered</i>		
22	5	15.63	<i>Unmastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
23	5	15.63	<i>Unmastered</i>		
24	8	25.00	<i>Slightly Mastered</i>		
25	11	34.38	<i>Slightly Mastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
26	4	12.50	<i>Unmastered</i>		
27	3	9.38	<i>Unmastered</i>		
28	7	21.88	<i>Unmastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
29	8	25.00	<i>Slightly Mastered</i>		
30	8	25.00	<i>Slightly Mastered</i>		
31	4	12.50	<i>Unmastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
32	6	18.75	<i>Unmastered</i>		
33	4	12.50	<i>Unmastered</i>		
34	3	9.38	<i>Unmastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
35	7	21.88	<i>Unmastered</i>		
36	8	25.00	<i>Slightly Mastered</i>		
37	10	31.25	<i>Slightly Mastered</i>	COC: Maintain and Repair Computer Systems and Networks	26.88
38	7	21.88	<i>Unmastered</i>		

39	8	25.00	<i>Slightly Mastered</i>
40	9	28.13	<i>Slightly Mastered</i>
41	10	31.25	<i>Slightly Mastered</i>
42	11	34.38	<i>Slightly Mastered</i>
43	7	21.88	<i>Unmastered</i>
44	9	28.13	<i>Slightly Mastered</i>
45	7	21.88	<i>Unmastered</i>
46	5	15.63	<i>Unmastered</i>
47	8	25.00	<i>Slightly Mastered</i>
48	9	28.13	<i>Slightly Mastered</i>
49	12	37.50	<i>Slightly Mastered</i>
50	8	25.00	<i>Slightly Mastered</i>
		23.28	Unmastered

The correct answers in this cluster ranged from 3 learners (9.38%) to the minimum number, which signified that participants had little experience on server configurations, system services, and the process of implementing these concepts.

Overall, the mean level of mastery attained was only 23.28% or Unmastered, proving that participants lacked background knowledge and competencies in servicing computers.

Herein, the pre-test results it can be inferred that learners demonstrated very low prior knowledge and technical preparedness across all four competencies (COC1–COC4). The overall mean of unmastered competencies such as in installation, Setup Computer Networks and Setup Computer Servers were not yet internalized, indicating significant gaps in foundational Computer Systems Servicing (CSS) skills.

While it can be seen that there is slight mastery of COC4 (maintenance and troubleshooting), it is quite obvious that it falls under the category that is not yet at the mastery level; hence, only minimal understanding is gained. Moreover, the poor performance on the item analysis shows that the concepts have not been understood well. Generally, the outcome of the analysis implies that the learners started with low initial competency levels, making it imperative to introduce instructional methods to enhance mastery in CSS.

The results strongly imply the need for enhanced instructional strategies, scaffolded learning activities, and competency-based reinforcement to improve mastery in Computer Systems Servicing.

Developed Supplementary Learning Resource

A Learning Reinforcement App can a developed as supplementary learning resource that was integrated into an offline mobile learning application, can effectively address the low assessment performance of Computer Systems Servicing (CSS) students, particularly in competencies such as install and configure computer systems, Setup Computer Networks, Setup Computer Servers and maintain and repair computer systems and networks.

Many learners struggle to achieve mastery due to limited access to functional laboratory equipment, insufficient hands-on practice, prolonged class disruptions caused by typhoons, and unstable internet connectivity.

The development of the mobile learning application referred to as L.A.R.A (Learning Assistance and Reinforcement Application)

was done to provide an interactive platform for assisting TVL–CSS learners with their learning needs. This application offers lessons, tutorials, multi-media content, and self-assessments in the form of tasks through which learners can practice their CSS skills individually and repetitively.

The application was created using the KODULAR platform, which is a visual mobile application development tool that allows for the development of Android applications by utilizing a block-based programming approach. This software helped the researcher develop and implement the features of the application without needing any in-depth programming skills. Using the KODULAR platform, the L.A.R.A Application was capable of incorporating interactive elements, offline capability, and a user-friendly interface designed for autonomous learning.

Through the offline mobile application, the learners are able to gain access to educational materials at all times via their mobile phones without being limited to internet access. In addition, the app upholds the competency-based model of the DepEd K to 12 curricula and meets the industry skill standards mandated by TESDA within the Computer Systems Servicing NC II certificate program.

In addition, with this program, there are interactive learning modules that provide structured instructions through visual representations, audio guidance, and simpler technical terms to ensure understanding. In relation to the proficiency in Install and Configure Computer Systems, it is possible to guide individuals through assembling computers, identifying components, configuring BIOS, and installing operating systems using multimedia demonstrations. Through illustrations, images, and diagrams with labels, one can learn about the positioning of components and system configuration. Embedded safety reminders, electrostatic discharge precautions, and troubleshooting tips reinforce correct procedures and help prevent common errors during actual laboratory performance.

Moreover, this app has a link to more educational videos that will serve as an actual drive to master competencies. These resources strengthen procedural knowledge and increase learners’ confidence when performing installation tasks.

In order to ensure the Setup Computer Networks, the application includes competency mapping features that link each lesson to the DepEd CSS Curriculum Guide and TESDA training regulations. Supplementary resources such as competency checklists,

performance task rubrics, and simulated national certification assessments help learners understand performance expectations.

The use of scenario-based exercises for work environments, health and safety in the workplace, and prompts on how to communicate with customers helps create realistic service contexts, thereby guaranteeing that the learners not only become technically skilled but also acquire necessary workplace readiness skills for the ICT servicing industry.

Moreover, the additional features in the application could comprise digital dictionaries containing technical vocabulary when there is no Internet connectivity, repair manuals, videos, and self-test quizzes to get instant responses from the system. The fact that this application works offline ensures equity in accessibility, enabling constant learning despite class interruptions, inadequate lab time, and even connectivity problems, yet still being suitable for low-end android phones widely owned by students.

By presenting the learners with additional learning materials, procedural instructions, and assessments that match their levels of competence, the offline mobile learning application tackles issues that lead to poor academic performance such as poor procedural memory, lack of laboratory experience, and performance anxiety.

It enables learners to rehearse technical tasks, internalize troubleshooting processes, and build confidence before performing actual hands-on activities. At the same time, teachers benefit from standardized remediation materials that support differentiated instruction and progress monitoring, while schools may use the

application as an intervention strategy in action research initiatives aimed at improving CSS competency outcomes.

This learning app will serve as resources to enhance learner autonomy, improve assessment performance, and prepare students for national certification and future employment in the ICT servicing sector.

Expert Validation on the Developed Mobile Learning Application

The mobile learning app underwent validation among experts in order to determine the applications in content validity, instructional quality, technical quality and usability. It is intended that the evaluation would determine the appropriateness of the learning tool in terms of accuracy, instructional design, technical capability and other aspects before it can be used as a supplemental material for learning.

The recommendations of the experts became the basis of further improvement and modification of the app before its use.

Table 3A shows that the assessment survey questionnaire items are aligned with the identified competencies., with a weighted mean of 4.50, is excellent, while the content difficulty level is appropriate for the target learners is satisfactory with a weighted mean of 3.10. It was found that the weighted mean of content validity had a value of 3.99, with a verbal interpretation as very valid.

Table 3A: Content Validity

Indicators	WM	VI	Rank
1. The mobile learning application content is aligned with the TVL–CSS units of competency.	4.40	Excellent	2
2. The lessons and activities reflect real-world CSS tasks and practices.	3.80	Very Satisfactory	6
3. The learning objectives are clearly stated and appropriate for Grade 12 TVL–CSS students.	4.10	Very Satisfactory	4
4. The assessment survey questionnaire items are aligned with the identified competencies.	4.50	Excellent	1
5. The content difficulty level is appropriate for the target learners.	3.10	Satisfactory	7
6. The material are appropriate and relevant to the required skills and competencies of TVL–CSS learners.	4.20	Very Satisfactory	3
7. The lessons, activities, and assessments reflect the core knowledge and skills required in Computer Systems Servicing.	4.00	Satisfactory	5
8. The lessons, activities, and assessments reflect the core knowledge and skills required in Computer Systems Servicing.	3.80	Very Satisfactory	6
General Weighted Mean	3.99	Very Satisfactory	

Legend: Excellent (4.21-5.00) Very Satisfactory (3.41-4.20) Satisfactory (2.61-3.40), Fair (1.81-2.60) Poor (1.00-1.80)

From the results above, it can be concluded that the assessment survey questionnaire has a good degree of content validity, considering the value of the weighted mean and its verbal interpretation as very satisfactory.

It was determined that the item, which states that the questionnaire is based on the competencies identified, has a weighted mean with

an interpretation of excellent, which indicates the close correspondence of the items with the competencies learned.

The results imply that that the mobile learning application is well-designed and closely aligned with TVL–CSS competencies, with an overall rating of Very Satisfactory. It effectively measures students’ skills and provides relevant content that supports the required technical competencies in Computer Systems Servicing.

However, some areas need improvement. The level of difficulty of the content and the realism of tasks should be better adjusted to match students' abilities and actual industry practices. This means the application is already useful and reliable, but it can still be improved by making activities more realistic and appropriately challenging to further enhance students' learning and skill development.

Table 3B shows that learning activities are appropriate to the students' level of understanding, with a weighted mean of 4.60, is excellent, while the lessons encourage critical thinking skills is Fair with a weighted mean of 2.50. The average weighted mean for instructional quality was 3.70 with a verbal interpretation of very satisfactory.

Based on the findings, it can be inferred that the instructional quality of the material is very valid, as indicated by the overall average weighted mean. The findings that learning activities are appropriate to the students' level of understanding obtained an interpretation as excellent, suggesting that the activities are well-matched to the learners' comprehension level.

However, the item stating that the lessons encourage critical thinking and problem-solving skills received a lower weighted mean, interpreted as satisfactory, indicating that this aspect of the instructional material may not be sufficiently developed.

Table 3B: Instructional Quality

Indicators	WM	VI	Rank
1. The instructional flow of the mobile learning application is logical and well-organized.	3.50	Very Satisfactory	6
2. The activities support skill development in Computer Systems Servicing.	2.80	Satisfactory	7
3. The application promotes independent and self-paced learning.	4.30	Excellent	3
4. The instructions provided in the application are clear and easy to follow.	4.40	Excellent	2
5. The lessons encourage critical thinking and problem-solving skills.	2.50	Fair	8
6. The learning activities are appropriate to the students' level of understanding.	4.60	Excellent	1
7. The application provides sufficient practice exercises for skill mastery.	3.60	Very Satisfactory	5
8. The instructional strategies used are suitable for mobile learning delivery.	3.90	Very Satisfactory	4
General Weighted Mean	3.70	Very Satisfactory	

In light of the above-mentioned results, it should be stated that despite the appropriateness of learning activities used and proper design thereof, the need for improving elements of instructions related to the development of high-level cognitive skills, especially critical thinking and problem-solving skills, becomes obvious.

The results obtained in the research are consistent with findings of the study conducted by Capao et al. (2025) that mobile simulation technologies in the field of basic electronics can serve as a great means to improve educational processes and increase the skills acquired through such activities as well as to link practical skills with mobile accessibility.

Furthermore, it should be mentioned that according to the study of Sandhya et al. (2017), students using mobile applications received higher test results than other students.

Table 3C shows application operates smoothly with minimal errors or crashes, with a weighted mean of 4.80, is excellent, while application is compatible with commonly used mobile devices. is very satisfactory with a weighted mean of 3.80. The average weighted mean for technicality and functionality was 4.33 with a verbal interpretation of Excellent.

Table 3C: Technicality and Functionality

Indicators	WM	VI	Rank
1. The application design is user-friendly and easy to navigate.	4.70	Excellent	2
2. The application functions properly without major technical issues.	4.00	Very Satisfactory	6
3. The multimedia elements (text, images, videos) are appropriate and relevant.	3.90	Very Satisfactory	7
4. The application is compatible with commonly used mobile devices.	3.80	Very Satisfactory	8

5. The application loads and responds efficiently during use.	4.50	Excellent	3
6. The interface layout is clear and visually appealing.	4.40	Excellent	2
7. The buttons, links, and features function as intended.	4.50	Excellent	5
8. The application operates smoothly with minimal errors or crashes.	4.80	Excellent	1
General Weighted Mean	4.33	Excellent	

From the information provided, it is safe to say that the mobile learning application created has a very high technical validity and functionality, based on the weighted mean value with the interpretation of very valid. The finding that the application runs without frequent errors or system failures is considered very valid because it suggests that the application is of high technical validity. On the other hand, the item on whether the application works well in commonly available mobile devices is considered to be very valid.

These findings imply that the mobile learning application is technically reliable and suitable for implementation, with strong operational performance and generally good device compatibility, thereby supporting its usability as an effective instructional tool. This result links and followed the suggestion in the study of Al-Mabaredy, (2021) that structured approach to ensure that mobile

learning applications must not only technically sound but also functionally effective.

Thus, by following the presented standards, one will be able to develop applications that satisfy the requirements imposed by education and at the same time guarantee great usability and efficiency.

The presented system is a tool that helps evaluate not only the performance but also the functionality of mobile applications.

Table 3D shows application /materials are easy to access, readable, and available across devices or offline, with a weighted mean of 4.70, is excellent, while application motivates students to complete learning tasks is satisfactory valid with a weighted mean of 3.10. The average weighted mean of usability and engagement is 4.18 with a very satisfactory verbal interpretation.

Table 3D: Usability and Engagement

Indicators	WM	VI	Rank
1. The application design encourages learner engagement.	3.50	Very Satisfactory	6
2. The application is suitable for classroom and independent learning use.	4.30	Excellent	4
3. The application motivates students to complete learning tasks.	3.10	Satisfactory	7
4. The features of the application sustain learners' interest.	4.40	Excellent	3
5. The application allows learners to learn at their own pace.	4.60	Excellent	2
6. The application /materials are easy to access, readable, and available across devices or offline.	4.70	Excellent	1
7. The learners can access and understand the instructional material	4.20	Very Satisfactory	5
8. The overall user experience is satisfactory for students.	4.60	Excellent	2
General Weighted Mean	4.18	Very Satisfactory	

From the above results, it is evident that the usability and engagement level of the mobile learning application is extremely high with an average weighted mean having a verbal interpretation of very valid. The statement shows that the application and the content are easily accessible, legible, and available online/offline having a highly valid verbal interpretation.

On the other hand, the claim that the application stimulates the learners' motivation to perform learning tasks was rated with a low weighted mean, indicating moderate validity. It means that the motivational features of the application might be improved.

In addition, it indicates that although the application is very easy and convenient to use by the learners, it would be beneficial to improve its interaction and motivation aspects.

Table 3E presents that the application allows learners to learn at their own pace, and mobile learning applications and questionnaires are recommendable for implementation with a weighted mean of 4.50, is excellent, the application design encourages learner engagement. is satisfactory with a weighted mean of 3.20. The average weighted mean for overall acceptability was 4.10 with a verbal interpretation of very satisfactory.

From the results, one may conclude that the mobile learning application designed exhibits a very high degree of overall

acceptability in terms of the interpretation of an excellent measure. The statement "The mobile learning application enables learners to learn at their own pace and it is recommended that the mobile learning application and questionnaires be used in the instruction process" was interpreted as being excellent.

Conversely, the statement concerning the aspect of application design fostering learner engagement was interpreted as being excellent as well.

This suggests that the mobile application designed is indeed highly acceptable and can be successfully implemented especially when it comes to facilitating self-paced learning; however, it is worth considering ways of improving the engagement aspect.

Table 3E: Overall Acceptability

Indicators	WM	VI	Rank
1. The application design encourages learner engagement.	3.20	Satisfactory	5
2. The application is suitable for classroom and independent learning use.	4.40	Excellent	2
3. The application motivates students to complete learning tasks.	4.30	Excellent	3
4. The features of the application sustain learners' interest.	3.80	Very Satisfactory	4
5. The application allows learners to learn at their own pace.	4.50	Excellent	1
6. The content presentation helps learners focus on the lesson.	3.80	Very Satisfactory	4
7. The application supports active participation of students.	4.30	Excellent	2
8. The mobile learning application and questionnaire are recommendable for implementation.	4.50	Excellent	1
General Weighted Mean	4.10	Very Satisfactory	

The general acceptability relates to the research findings of Olipas, (2022). In particular, the creation of mobile apps as reinforcement and assistive instruments in the process of learning is related to students' perception of those apps as being able to be used for improving their academic performance and having ease of usage, resulting in the development of a positive attitude to incorporating them into the learning process; moreover, the necessity to consider gender differences in their acceptance and intention to use these apps is pointed out.

Table 3F presents the summary of experts' validation on the developed mobile leaning application where Technicality and Functionality obtain a weighted mean of 4.33, is Excellent, while the instructional quality is very satisfactory with a weighted mean of 3.70. The average weighted mean for overall validation of the mobile application is 4.06 with a verbal interpretation of very satisfactory.

Table 3F: Summary of Expert Validation on the Developed Mobile Learning Application

Indicators	WM	VI	Rank
1. Content Validity	3.99	Very Satisfactory	4
2. Technicality and Functionality	4.33	Excellent	1
3. Instructional Quality	3.70	Very Satisfactory	5
4. Usability and Engagement.	4.18	Very Satisfactory	2
5. Overall Acceptability	4.10	Very Satisfactory	3
General Weighted Mean	4.06	Very Satisfactory	

Based on the revealed result it can be inferred that the developed mobile learning application has met high standards of quality as evaluated by the experts, as reflected by the overall weighted mean with a verbal interpretation of very valid.

When the domain of Technicality and Functionality is considered to be very valid, then the implication is that the software performs well, functions smoothly, and adheres to all technical specifications for its implementation. On the other hand, when Instructional Quality is deemed to be very valid, the implication is that it is good educationally.

These findings imply that the mobile learning application is technically reliable and instructionally suitable for classroom and independent use. Although both areas were rated very valid, the slightly lower mean in instructional quality suggests that minor enhancements in instructional design and higher-order learning activities may further strengthen the effectiveness of the application.

Overall, the results support the application’s readiness for implementation as a supplementary learning resource in TVL–CSS.

Effectiveness of the Supplementary Learning Resources in Enhancing the Competency Level of Senior High School TVL–CSS Students

From the post-test performed approximately two months after the pre-test on 40 SHS TVL-CSS learners, the data analysis shows significant improvement in their mastery of the competencies, thus showing knowledge retention and skill enhancement through time. For COC1, Install and Configure

Computer Systems, as shown in Table 4A, the post-test results indicated a mean mastery level of 42.50%, meaning the learners slightly mastered this competency. The correct answers per question were from 10 to 18 students, or from 31.25% to 56.25%.

Several items approached the Nearly Mastered level, with as many as 18 out of 40 learners (56.25%) answering correctly, reflecting improved understanding of installation procedures and system configuration.

On the other hand, the COC2 – Setup Computer Networks, the computed mastery level increased to 36.69% (Slightly Mastered). The number of learners giving correct answers to each question was between 9 and 16, meaning 28.13% to 50.00% improved their understanding of networking terms like IP addressing and network establishment.

The general mean for mastery is now at 37.55% or Slightly Mastered, which is quite an increase from the pre-test's 21.68%. Clearly, learners made progress and learned some knowledge about all the four competencies two months after being initially assessed by the test. Thus, it is reasonable to conclude that the competencies of the learners showed improvements, meaning that the teaching approaches and other learning processes were effective enough to facilitate learner performance and knowledge acquisition. The reason why all the four competencies progressed from being Unmastered to Slightly Mastered is that the learners could learn and apply new concepts.

This progress reflects cognitive growth, increased familiarity with technical procedures, and greater confidence in performing computer servicing tasks.

Table 4A
Post Test Item Analysis of the TVL-CSS Competency Level

Subject:	<u>TVL-CSS</u>	Year & Section:	<u>GRADE 11&12</u>	No. of Takers	<u>32</u>
Item No.	No. of correct answer per item	Mastery Level (per item)	Interpretation	Mastery Level (per competency)	Interpretation
1	15	46.88	Slightly Mastered	42.50	COC1: Install and Configure Computer Systems Slightly Mastered
2	12	37.50	Slightly Mastered		
3	10	31.25	Slightly Mastered		
4	11	34.38	Slightly Mastered		
5	12	37.50	Slightly Mastered	33.96	COC2: Setup Computer Networks Slightly Mastered
6	10	31.25	Slightly Mastered		
7	13	40.63	Slightly Mastered		
8	15	46.88	Slightly Mastered		
9	12	37.50	Slightly Mastered	34.69	COC 3: Setup Computer Servers Slightly Mastered
10	14	43.75	Slightly Mastered		
11	13	40.63	Slightly Mastered		
12	19	59.38	Nearly Mastered		
13	18	56.25	Nearly Mastered	39.06	COC:4 Maintain and Repair Computer Systems and Networks Slightly Mastered
14	18	56.25	Nearly Mastered		
15	12	37.50	Slightly Mastered		
16	16	50.00	Nearly Mastered		
17	11	34.38	Slightly Mastered		
18	10	31.25	Slightly Mastered		
19	10	31.25	Slightly Mastered		
20	12	37.50	Slightly Mastered		
21	10	31.25	Slightly Mastered		

22	14	43.75	Slightly Mastered		
23	9	28.13	Slightly Mastered		
24	10	31.25	Slightly Mastered		
25	13	40.63	Slightly Mastered		
26	9	28.13	Slightly Mastered		
27	8	25.00	Slightly Mastered		
28	10	31.25	Slightly Mastered		
29	10	31.25	Slightly Mastered		
30	11	34.38	Slightly Mastered		
31	9	28.13	Slightly Mastered		
32	11	34.38	Slightly Mastered		
33	10	31.25	Slightly Mastered		
34	9	28.13	Slightly Mastered		
35	10	31.25	Slightly Mastered		
36	12	37.50	Slightly Mastered		
37	13	40.63	Slightly Mastered		
38	10	31.25	Slightly Mastered		
39	14	43.75	Slightly Mastered		
40	13	40.63	Slightly Mastered		
41	16	50.00	Nearly Mastered		
42	14	43.75	Slightly Mastered		
43	10	31.25	Slightly Mastered		
44	12	37.50	Slightly Mastered		
45	12	37.50	Slightly Mastered		
46	9	28.13	Slightly Mastered		
47	13	40.63	Slightly Mastered		
48	12	37.50	Slightly Mastered		
49	16	50.00	Nearly Mastered		
50	11	34.38	Slightly Mastered		
				37.55	Slightly Mastered

This result links with the study of Garzón et al. (2025) where the use of mobile learning exerts a large positive effect on student learning gains across various contexts, reinforcing the pedagogical value of mobile technologies in both in asynchronous and synchronous learning setting.

In this case, mobile learning was a link to the results of the study by (Sandhya Kattayat, 2017), where the author indicated that those students who used mobile applications scored better than others when taking post-tests, meaning that mobile learning might be useful in improving educational results.

The study (Al-Mabaredy, 2021) is aimed at developing standards that will enable a structured approach to ensuring that mobile learning applications have both good technical performance and functionality. Thus, it will help to develop educational applications that will be able to meet the needs of users while being technically perfect.

This framework can serve as a means of validating mobile applications in terms of their technical performance and functionality in an educational environment (Olipas*, 2022).

The results of this study confirmed that the intervention had a positive impact on competency building among learners, even though some competencies have not been fully mastered yet. It underlined the importance of using competence-based learning in the process, having more experience in using hands-on approaches, as well as reinforcing skills to achieve full mastery. This implies that

technology-enhanced learning could contribute significantly to the process as well.

Development of Mobile Learning Application and Its Effectiveness in Enhancing Competencies in TVL-CSS

The development of an offline mobile learning application plays a significant role in enhancing the competencies of TVL–Computer Systems Servicing (CSS) students, particularly in helping them achieve high and mastered levels of competency. The course requires learners to develop both theoretical understanding and hands-on technical skills such as computer assembly, troubleshooting, networking and system maintenance which a mobile learning application will provide students with continuous access to instructional materials, tutorials, simulations, and practice activities anytime and anywhere, allowing them to review lessons at their own pace and according to their learning needs.

In addition, interactive features such as step-by-step demonstrations, video tutorials, presentation, self-assessment quizzes, and guided performance tasks, students are able to reinforce learning beyond classroom and laboratory hours.

This continuous practice is crucial in courses such as CSS, which involve skills; skills can be acquired by putting what one learns into constant use. This additional instructional tool provides personalized learning, thus providing a platform for those who find some skills hard to acquire to review lessons until they attain mastery. Also, the use of this technology-based learning application helps increase the level of student motivation because it uses technology that is related to the students.

As students become more engaged, they are more likely to take ownership of their learning, resulting in improved confidence and competence in performing CSS tasks. The application also helps bridge learning gaps caused by limited laboratory resources, time constraints, or absenteeism, ensuring that students still have opportunities to practice and master required competencies.

Moreover, the incorporation of the mobile learning application in the curriculum helps instructors assess the performance of the learners and give timely feedback to improve areas where the learners might be having problems. The merging of the traditional classroom-based learning approach with technology-based learning allows the learners to gain more knowledge regarding CSS.

Furthermore, the mobile learning application creates an opportunity for learners to develop their skills independently as they will have access to learn at their convenience and revise any subject they may find hard to understand. In addition, the learners have an opportunity to practice their technical skills and acquire more experience as they will be allowed to do things repeatedly until they master them. Collaborative learning is made possible through the provision of features like discussion boards, assignments, and peer assessment. In general, it can be said that the use of mobile learning is useful for the TVL–CSS students to acquire knowledge competently and become highly motivated.

This present study directly supports and strengthens the Department of Education K–12 Senior High School program, particularly the TVL track, by addressing key gaps in access, instruction, and skills development.

First, it reinforces the goal of competency-based learning in TVL–CSS. By aligning the mobile application with TESDA standards and curriculum competencies, the study ensures that learners develop industry-relevant skills such as computer installation, configuration, and troubleshooting—core outcomes expected in Senior High School graduates.

Second, it strengthens access to quality learning resources. In many public schools with limited equipment, unstable internet, or class disruptions, the mobile application provides an offline, self-paced learning tool. This supports continuity of learning and makes technical education more inclusive and flexible, which is a key goal of the K–12 reform.

Third, the study enhances teaching and learning strategies by integrating technology. The use of an interactive mobile application promotes learner engagement, independent learning, and reinforcement of difficult competencies—helping teachers deliver more effective and modern instruction.

Finally, it contributes to workforce readiness and employability, which is a central aim of the K–12 program. By improving students' technical competence in CSS, the study helps prepare graduates for TESDA certification, employment, or entrepreneurship.

In essence, the study strengthens K–12 Senior High School by making TVL education more accessible, relevant, technology-driven, and aligned with industry needs.

Notes

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Chapter 4

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary of findings on how the study was conducted, and the results obtained. Conclusions were drawn from these outcomes from which recommendations were proposed.

SUMMARY

This study explored the competency level of TVL–CSS SHS students of Concepcion F. Llorin National High School in Sagurong, Pili, Camarines Sur. It determined the students' competency level prior to the use of a mobile learning application in terms of installing and configuring computer systems, alignment with curriculum and industry standards, effective demonstration of technical skills, and maintaining and repairing computer systems and networks.

Based on the identified competency levels, the study developed a supplementary mobile learning resource to address existing learning gaps. The developed application was subjected to expert validation in terms of content validity, instructional design, usability and engagement, and overall acceptability. The study further assessed the effectiveness of the supplementary learning resource in enhancing the students' competency levels and proposed appropriate interventions and recommendations to further improve TVL–CSS instruction based on the findings.

The descriptive method of research was used. There were forty (40) TVL–CSS Senior High School students of Concepcion F. Llorin National High School which are the main respondents of the study. There are 10 Validators - 1 PSDS, 2 Master Teachers, 3 ICT

CSS Teachers, and 4 IT Experts who were included to Validate the Developed Mobile Learning Application.

The data gathered were treated statistically using weighted mean. This mobile learning application made it easier for the participants to be able to learn in an interactive learning environment whereby they could learn various technical skills related to installing computers, networking, server, and maintenance all in line with the standards required. This was also achieved through the usage of multimedia content, scenario-based tasks, and self-assessments to enable the development of various skills such as independent learning and critical thinking skills. It was also validated by experts that the application was correct, valid, user-friendly, and acceptable.

FINDINGS

The following summary of findings was revealed:

1. The competency level of senior high school TVL-CSS SHS students along with A.) Install and Configure Computer Systems with an average weighted mean of 2.24 verbally interpreted; B.) Set up Computer Network with an average weighted mean 2.39, C.) Set up Computer Server with an average weighted mean of 2.05, interpreted and D.) Maintain and Repair Computer Systems and Networks with an average weighted means of 2.19, where all has a verbal interpretation of low competency. Furthermore, the pre-test test analysis of the four competencies revealed that the overall pre-test rate is 23.28% with Unmastered mastery level.

2. There identified learning gaps, an offline mobile learning application named L.A.R.A (Learning Assistance and Reinforcement App) was developed. The application was designed to it can reinforce installation and configuration procedures, strengthen networking and troubleshoot skills, support server management competencies, provide interactive, self-paced and offline-accessible learning materials, align lessons with DepEd Curriculum Guide and TESDA CSS NC II standards, the application aimed to address limited laboratory access, unstable internet connectivity, and insufficient hands-on practice.

3. The expert validation results showed that the application was generally Valid across all criteria such as content validity with general weighted mean: 3.99 (very valid), instructional quality with general weighted mean 3.70 (very satisfactory), technicality and functionality with general weighted mean: 4.33 (very valid), usability and engagement with general weighted mean: 4.18 (very satisfactory), overall acceptability with general weighted mean: 4.10 (very satisfactory) .Whereas, the Experts and Validators gave high recommendations for the implementation of the application with respect to its functionality and ease of access as well as facilitating self-pacing, there was room for improvement concerning motivation and critical thinking elements.

4. The effectiveness of learning resource showed based on the pre-test and post-test results demonstrated measurable improvement, Overall pre-test mean mastery level: 23.28% (Unmastered) while the Overall post-test mean mastery level: 37.55% (Slightly Mastered). All four competencies were raised from “Unmastered” to “Slightly Mastered,” showing that there is some form of knowledge retention and skill development even after almost two months of intervention. Therefore, this confirms that the mobile learning application had a positive and sustained impact on students’ competency development, although full mastery had not yet been achieved.

5. Based on the findings, the study suggests the strengthening competency-based instruction, Increase laboratory-based and hands-on activities, enhancing critical thinking and problem-solving components in lessons, continuous use and refinement of the mobile learning application, ongoing assessment and remediation strategies to achieve mastery, Moreover, the findings strongly justify the use of structured supplementary learning materials, particularly offline mobile learning applications, to improve competency outcomes in TVL–CSS.

CONCLUSIONS

Based on the findings of this study the following conclusions are drawn:

1. The findings lead to the conclusion that Senior High School TVL–CSS students demonstrate consistently low competency across all four core areas—installation and configuration, networking, server setup, and maintenance and repair. The overall pre-test mastery level categorized as Unmastered further confirms that students possess insufficient foundational knowledge and technical skills required by the curriculum. This indicates a critical need for targeted instructional interventions to bridge competency gaps.

1. The development of the L.A.R.A (Learning Assistance and Reinforcement App) is concluded to be a relevant and responsive intervention to the identified learning gaps. Its design features—offline accessibility, alignment with DepEd and TESDA standards, and support for self-paced and interactive learning—make it a practical and context-sensitive solution to challenges such as limited laboratory resources, unstable internet connectivity, and lack of hands-on opportunities.

2. The expert validation results confirm that the developed mobile learning application is highly acceptable and pedagogically sound, having met standards in content, instructional quality, technical functionality, and usability. However, the feedback also leads to the conclusion that enhancements are still necessary, particularly in strengthening motivational elements and integrating higher-order thinking activities to further improve learner engagement and critical thinking skills.

3. The comparison of pre-test and post-test results supports the conclusion that the mobile learning application is effective in improving students’ competencies, as evidenced by the increase from Unmastered to Slightly Mastered. This demonstrates that the intervention contributed to measurable learning gains and sustained skill development, although the level of mastery achieved suggests that continued exposure and reinforcement are still required to attain full competency.

4. Based on the findings, it is concluded that improving TVL–CSS competency outcomes requires a multi-faceted instructional approach, including strengthened competency-based teaching, increased hands-on experiences, and enhanced integration of critical thinking and problem-solving tasks. Furthermore, the study affirms that offline mobile learning applications serve as effective supplementary tools, and their continuous use, refinement, and integration into instruction are essential

in supporting mastery learning and addressing persistent skill gaps.

RECOMMENDATIONS

Based on the findings of this research, it is recommended that:

1. The four competencies such as installing and configuring computer systems, alignment with curriculum and industry standards, effective demonstration of technical skills, and maintaining and repairing computer systems and networks with low competency and overall pre-test mastery level of Unmastered, it is recommended that the school implement intensified competency-based instructional strategies, structured remediation programs, and additional guided hands-on laboratory sessions to strengthen students' foundational knowledge and technical skills in TVL–CSS.

2. As the L.A.R.A app was created to solve the learning issues found, it is suggested that the app be included in classroom lessons regularly for it to be used as an effective learning aid that will help develop the learners' skills in installation, networking, troubleshooting, and server management while being aligned to the requirements set by DepEd and TESDA CCS NC II.

3. Despite the highly valid rating of the mobile learning app in terms of content validity, instructional quality, technicality and functionality, usability and engagement, and acceptability, it is strongly advised that constant improvements be done, especially in incorporating critical thinking exercises and motivation, for the purpose of increasing engagement and developing high-level skills among learners.

4. Given the positive change observed in the post-test score of the learners moving from the Unmastered category to the Slightly Mastered category, it is recommended that the learners continue using the mobile learning application for a longer period of time, and that they undergo more performance-based assessment and mastery reinforcement activities.

5. In the overall findings, it is recommended that schools strengthen competency-based instruction by increasing laboratory exposure, enhancing problem-solving and critical thinking integration in lessons, continuously refining supplementary mobile learning resources, and implementing regular monitoring and remediation strategies to ensure long-term mastery and improved competency outcomes in TVL–CSS.

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