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e-MODYUL: TECHNICAL-VOCATIONAL-LIVELIHOOD SUPPORT LEARNING MANAGEMENT SYSTEM

Marco T. Quimod, **Wayne Custer G. Alegata, Phd**, **Dennis V. Madrigal, Phd**
University of Negros Occidental-Recoletos, Bacolod City, Philippines
marco.quimod85@yahoo.com,saynecrister@gmail.com,dennis_madrigal@yahoo.com

Abstract. e-MODYUL: Technical-Vocational-Livelihood Support Learning Management System is a mobile and web-based application running on Android and IOS platforms and other operating systems. This application would serve as an aid to help the students in accessing their lessons and answering their tests and examinations regardless of the type of operating system that they are going to use. Students can also use the application using different types of computers. Upon using the application, students will enjoy learning and accessing resources of the application at their own pace. e-MODYUL TVL application is designed for students to help them understand their lessons with the same objectives and for schools to achieve their goals of providing quality education using a blended type of learning. This application will help teachers and students find the balance in delivering learning to every Filipino learner. Using paper and pen and financial problems in going to school are just some of the problems encountered by the students. Watching relevant tutorial videos related to TVL are also needed. Based on these problems and challenges presented, the proponent develops this e-MODYUL Technical-Vocational-Livelihood Support Learning Management System with these features; a progress tracking system, interactive, user-friendliness, secured, and cross-platform dynamic environment. The e-MODYUL mobile app has six functions, namely, sign-in / out, log-in/out, TVL learning resources, assessments, settings, and progress tracking. Users, both the students and the teachers, can Log-in and Log-out of the system by using their credentials. PHP Hypertext Preprocessor language was used to develop the application and to break down modules in this application. The rapid application development (RAD) model was used in this capstone project up to the completion of the final product. Different stages were needed as a primary requirement for user description and planning. Users were provided with sample screen images for the application for them to familiarize the different interfaces, whether web-based or mobile. These interfaces were designed to be responsive regardless of any platform. All interfaces were user-friendly and easy to use and navigate. Respondents described the mobile learning resource application as an excellent innovation since all of the attributes are said to be "Excellent". Attributes described are accuracy, user-friendly, operability, consistency, conciseness, compatibility, and simplicity. Thirty respondents were selected to test the application, whereas 10 were teachers and 20 were students. After the data were gathered, the proponent used frequency distribution to determine if the purpose of the mobile learning resource app had been achieved. Then the average results were generated, and the percentile rank and mean scores were computed. The development of the application helps students and teachers provide quality education while using technology, particularly paperless technology. It was revealed in this research that we could innovate education with the aid of application. The application can be more accessible if uploaded to Google Play Store, where everyone can download it.

Keywords. Technical-Vocational-Livelihood, Learning Management System, Department of Education, COVID 19 Pandemic, Information and Communication Technology, Mobile, Assessments, Resources

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1. Introduction

Globally, there has been a growing trend of using mobile phones for educational purposes. Many groups, especially teachers and students, use these devices for sharing information, consulting dictionaries, and thesauri. They have been portrayed as one of the applications for teaching, which is a new opportunity for ICT use in education. Nowadays, most global institutions use mobile phones to help teachers teach their students as a tool for online learning. Teachers and their students meet at a pre-scheduled time as a part of interactive learning classes, while some teachers give the course without interaction with the students. In this mode, teaching and learning happen through electronic devices, which are relatively new to the entire teaching-learning community (Selvaraj,2021). Mobile learning acceptance is considered as the intention to use mobile technology or the attitude toward using that technology (Abidin & Tho, 2018)

Transforming the educational system from face-to-face to techno-based is the focus of 21st-century education that demands personalized, productive, and collaborative teaching-learning experiences. Quality in higher education is one of the key enablers for developing nations to achieve their sustainable development goals by 2023. Recently, the Covid-19 pandemic forced students to shift from traditional face-to-face to remote learning. ASEAN countries and other developing countries such as Malaysia, Mexico, India, Thailand, Singapore, South Korea, Taiwan, Brazil, and Eastern Europe have adopted e-learning technology to complete their training easily, improving performance and greater productivity. The pandemic has compelled students in these developing nations, particularly those with limited access to medical facilities and low vaccination rates, to embrace online learning for a prolonged period (Shafie et al., 2021). Blended learning as the catalyst for change and seen as the solution for establishing the democratic principle of education is the way to provide equal access to education, which guarantees equity and justice to ensure the timely delivery of educational content. Open educational resources and other digital platforms provide numerous opportunities for learners to gain need-based learning and skills, as the most significant requirements for a vigorous living in a society (McKay, 2018).

This mobile learning technology integration is of utmost significance in new normal education, where the movement of students is limited due to the government's restrictions to protect its people. During the COVID-19 pandemic, the Department of Education (DepEd) has used distance learning modes while also applying blended learning programs. These include online classes, printouts, and lessons via TV and social media platforms. Although many students and teachers prefer face-to-face classes, they must adapt to online education as alternative learning (Childhope, 2021). The Department of Education can benefit a lot from this application, which can lessen the paperwork of teachers and, most importantly, can save the environment by protecting the trees. This can also be used for Alternative Learning System (ALS) students, where most work. Hence, they can use the application at their convenient time. The module components and the criteria and guidelines are strictly patterned by the Department of Education to protect and follow the design to ensure the quality of education given to the students.

The proponent chooses to conduct this study to help the students in the Department of Education to shift from traditional face-to-face to online learning. Students who use paper and pen motivate the researcher to pursue the study, which has affected him personally and drove him to be interested in mobile learning. In another context, Hass and Joseph (2018) referred to the boom of online technologies and the increasing use of the Internet and social media for imparting education in the 21st century. A new social constructivism has been put in place so teachers can reach out to each learner or directly interact with their teachers and share their ideas and thoughts with their peers. Since the conduct of blended learning, traditional distance education gradually evolved into a system that engaged teachers and learners in an interactive online environment, a system in which content is delivered through various means.

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Following the outbreak of the Covid-19 pandemic, there began a renewed interest in the role and utility of online and digital learning at the time of crisis worldwide. The different experiments with collaborative learning, constructive learning, cooperative learning, and transformative learning have shown that by adopting accessible, flexible, and affordable technologies in education and by integrating in-person and online activities while framing the learning objectives and assessing the expected learning outcomes of the learners, newer and effective ways of learning experiences can be visualized. Moreover, when our society faces a crisis like a pandemic, war, or any kind of natural disaster, such ideas of education might significantly help. But to ensure a sustainable education system and to meet the mission and vision of the government, the learners should be able to reap the benefits of techno-based education in an equitable way (Daniel, 2020)

The application of mobile learning can be used through the Android operating system chosen, considering that Android has been dominating the Smartphone market and is an open-source operating system that is quickly developed (Wang, 2017). For these reasons, mobile devices are widely used; these devices will introduce countless opportunities useful in the teaching and learning process and support learning outside the classroom, specifically in the Technical-Vocational-Livelihood (TVL) educational strand. Hence, the researcher aimed to design and implement a mobile support learning management system for Technological-Vocational-Livelihood education. The Department of Education needs to adopt this learning management system to support the educational system in the country and recognize that blended learning is very essential, especially when using today's technology. This learning management system can help address issues like students who could not go to school physically for some valid reasons but were willing to learn and study the lessons taught in the school to achieve their dreams.

2. Product Description

This is a mobile application TVL support learning management system for grades 7 and 8 students learning system based on formalized teaching using an electronic mobile learning management system content modules and resources. This application is also known as a learning management system (LMS) that can be used for hybrid online/offline learning. Learners can use the system with or without an internet connection.

2.1. Product Perspective and General Feature

The Department of Education is always committed to ensuring that learning must continue as part of the different strategies to deliver lessons for the students in response to the COVID-19 global crisis. The system will be made to be one of the solutions how to manage the effects of COVID-19 in the field of education.

Schools have adopted modular systems to deliver education while prioritizing students' safety. This mobile application will serve as an alternate platform for students to gain access to educational resources as DepEd Secretary Leonor Magtolis Briones emphasized that online learning is only one option from the menu of learning modalities. These modalities will be offered appropriately depending on the learners' households. Therefore, for those learners with no internet connection in their homes, this application can be useful and effective for learning at their own pace.

This application offers offline features that will provide an interactive offline mobile learning management system to students, including interactive activities to provide the students with learning materials using the current technology instead of handouts or books. Upon initial registration, students will register their names, addresses, contact numbers, and other information. The application offers security features to safeguard information from unauthorized access. The teacher will upload these

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lessons, activities, tutorials, and assessments using the web application. All learning materials will be bundled with the application, including those multimedia elements such as infographics, videos, and interactive activities so students can access them easily. This will provide ease for the teachers in updating the lessons and activities instead of using printed modules.

Because it is online/offline, students can access those learning materials in a self-paced manner with a user-friendly interface using common buttons. Moreover, the content of the application is designed for different levels and kinds of learners to make it more interactive and engaging without face-to-face learning. It ensures high-quality education to students through mobile technology.

The mobile learning management system is an effective way of delivering lessons as a new type of modality. This application has three user types: the student, the teacher, and the administrator. The system administrator is responsible for creating student and teacher accounts. The teacher can add, edit the contents of the lessons, and upload them to the server. The student will have an initial registration before being given the link to the application. It protects the data of every user with a secured server aside from storing offline interactive content in a user-friendly environment.

Technology-Vocational and Livelihood (TVL) supports learning management system with a mobile application aims to provide teachers and students easy access to TVL lessons and courses online/offline. The application has four features (courses, topics/lessons, assessment, and summative test). Any student can download the application, but for those students who are not officially enrolled (out-of-school youth), only the feature of previewing limited topics and lessons can be seen. If the student is officially enrolled, the student may use the unique code given by the adviser to sign in or register for the application. The adviser will send a text message to the student with the unique code. Once the code is registered, the application will display the full contents of the courses, lessons, and topics, including the activities and assessments for the students.

When the student has read and studied all the lessons and activities, he or she will use the code again to activate the assessment button or feature to take the assessments per lesson. If he or she is done with all the assessments, the student may opt to take the summative test. The lessons in Technology-Vocational and Livelihood (TVL) are presented per module based on the topics in the teaching guide. This will serve as a guide in determining relevant and appropriate teaching techniques and strategies that will fit the learning needs and demands of the learners to make them best understand and appreciate the importance of TVL courses and the entrepreneurial competencies related to Computer System Servicing.

2.1.1. Data Protection. This unique feature is designed for every user to protect all the information stored in the application. For security purposes, the username and password interface used by the students is distinct from those used for the login interface of the system administrator or the teacher. The system provides unique usernames and passwords of the student.

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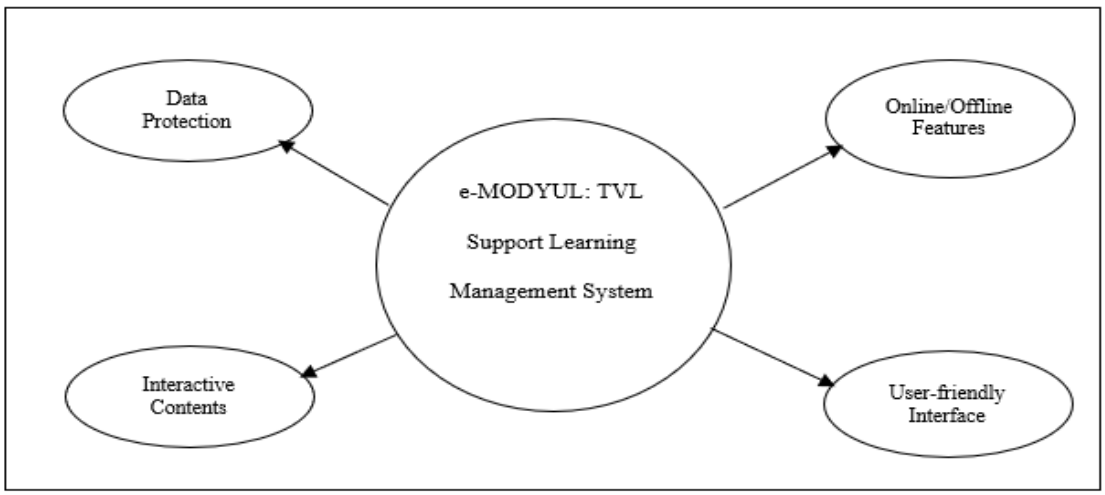

Figure 1. e-Modyul: (TVL) Support Learning Management System Features

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Key Features:

Online and Offline Learning. The student can learn their lessons anytime, anywhere. Interactive features and module assessment. Interactive lessons allow the student to learn to further explore the contents. Paperless assessment modules are also included in the application.

Reports. Tracks students' progress over time and can trace the student's level or accomplishments.

DepEd TVL Tracks designed curriculum. DepEd TVL specializations may be taken by the Grade 7 and 8 students through mobile learning management system.

Individual Education Plans (IEP). The teacher manages to create a personalized curriculum and lesson plans for every student in grades 7 and 8.

Student Data Management (SDM). Students' personal data, contacts, and other profiles are managed by the Computer Server of the application.

Dashboard. It Contains the Main Menus needed by the students to access all the contents in the application.

3. System Decomposition

The TVL mobile learning management system is an easy-to-learn application that improves and enhances the manual delivery of learning modalities. It improves students' tracking system and progresses through a self-paced application where students can learn and study anytime, anywhere.

This system provides the right direction and output that leads to a fast and reliable learning flow that satisfies the needs of both the school and the students. The applications provide an efficient and productive process for the benefit of the students. Figure 2 on the next page shows the process of the information from the administrator, teacher, and students. The students can access the TVL mobile learning management system using their registered accounts.

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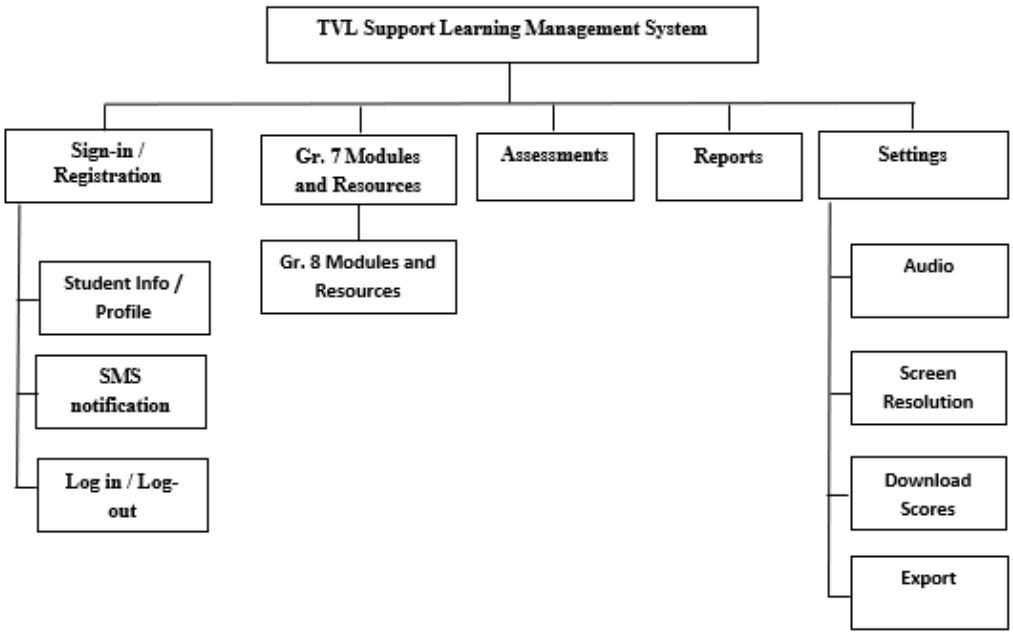

Figure 2. System Decomposition

The process of going in and out of the information, from the teacher's registration of the account to the uploading of files, is also included in the application. It also shows the verification of the student's information to send the application link to the user. This teacher can access the web application using the login and log-out interface and the dashboard for uploading modules, videos, and assessments. Students may use the TVL mobile application by downloading the application first from the link.

Hardware Interface.

e-Modyul: Technical-Vocational-Livelihood (TVL) Support Learning Management System is a mobile Android app that runs on phones running the Android operating system, version 6 Marshmallow and above. In today's mobile standards and trends, most Android devices come pre-loaded with android marshmallow or above to support new Android features and functionalities. The succeeding section discusses the hardware interfaces of the application.

The application needs hardware devices that match the requirements when implemented. These devices may include mobile phones or smartphones with at least the operating Android ver. 6 or above.

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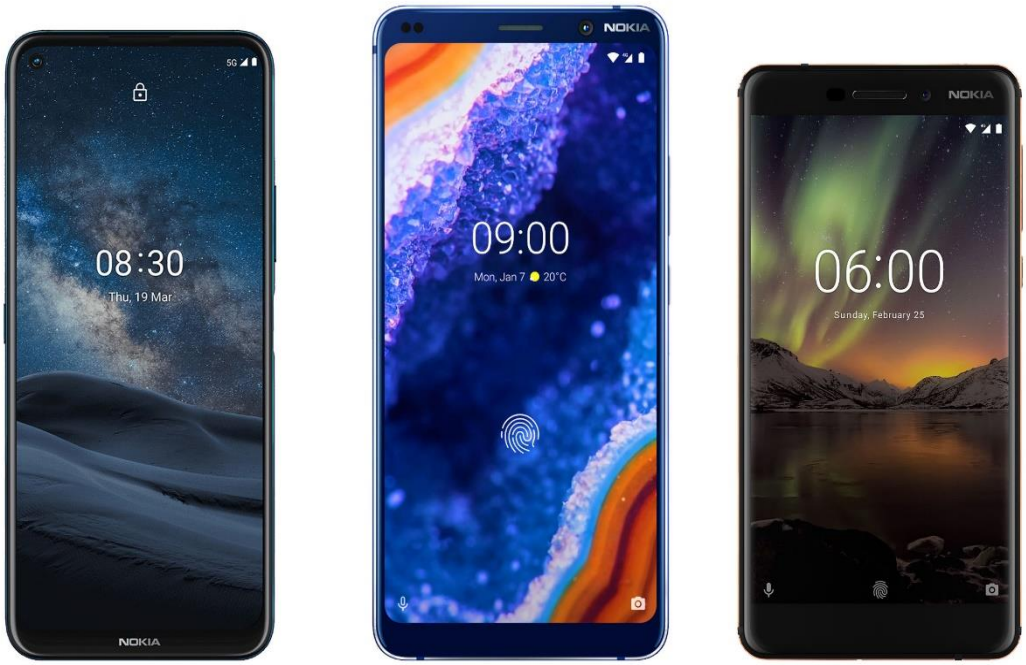

Figure 3. Hardware Interfaces

Project Management

The project proponents and the project manager were responsible for this stage of program development. It began with the approval of a transmittal letter which allowed the project proponent to conduct an interview and observation. Interviews and observation were among the techniques used for fact-finding. As soon as the letter was approved by the head of the Department of Computer Studies, the project proponents gathered related data in billing and record management of the beneficiary establishment.

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Table 1.

System Budget

Development costs		
System		
Estimated Cost	Php 50,600	
Equipment		
2 Computer packages	75,400	
2 Printers	19,000	
305M CAT5E LAN Cable	5,990	
2 UPS	5,200	
Users' Training, including manuals	10,000.00	
Total Development Cost		Php 166,190.00
Annual operating costs		
Database admin (PhP15,500.00/mo.)	Php 186,000	
Supplies		
32 Replacement inks @ PhP390.00 each	12,480	
24 Reams - short bond paper @ PhP500.00	12,000	
Electricity (PhP300.00/mo.)	5,014	
Total Annual Operating Cost		Php 215,494.00
Annual benefits		
Reduction in manpower (1 @ PhP13,000.00/mo.; 1 @ PhP10,000.00/mo)	Php 276,000	
Savings in supplies (paper forms, pens, etc.)	2,700	
Total Annual Benefits		Php 278,700.00

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This proponent shows the beneficial profit to the beneficiary and the budget of the system from the start-up to the end of the system development. This shows the one-time cost, tangible benefits, and developmental cost.

Table 2. Cost-Benefit Analysis

	Y0	Y1	Y2	Y3	Y4	Y5
Development costs	166,190.00					
Annual operating costs (4% inflation rate)		215,494.00	224,418.00	233,646.96	243,245.08	253,227.12
Discount rate/factor (12%)	1.00	0.89	0.80	0.71	0.64	0.57
Discounted costs (time-adjusted to PV)	166,190.00	191,724.36	177,625.76	164,487.78	152,288.22	140,960.06
Cumulative Time-Adjusted cost over lifetime:	166,190.00	357,914.36	535,540.12	700,027.90	852,316.12	993,276.18
Benefits from implementing new system (4% inflation rate)		278,700.00	289,848.00	301,441.92	313,499.60	326,039.58
Discount rate/factor (12%)		0.89	0.80	0.71	0.64	0.57
Discounted benefits (time-adjusted to PV)		248,839.29	231,065.05	214,560.40	199,234.66	185,003.61
Cumulative Time-Adjusted benefit over lifetime:		248,839.29	479,904.34	694,464.74	893,699.40	1,078,703.02
Cumulative lifetime adjustment net benefit (cost)	(166,190.00)	(109,075.07)	(55,635.78)	(5,563.16)	41,383.28	85,426.84
ROI	9%					
Net Present Value	85,426.84					
Payback Period (discounted)	1 yrs. & 12 mos.	*1 yr.*	*1 yr.*			

The table shows that all our beneficiary expenses will be paid back after two years, achieving a 19.2% rate of increase yearly. It also shows the cost and benefits of our system when it comes to money matters.

The system analyst conducted first-hand observation and interviews with the administrator, teacher, and students. As part of the business study, all data was needed as the project proponents gathered system requirements; brainstorming and identifying problems or issues were also conducted to develop a well-equipped plan. The system was presented to at least two (2) IT experts who assessed and determined whether it is beneficial to the client and conforms to the standard set forth by the project screening committee.

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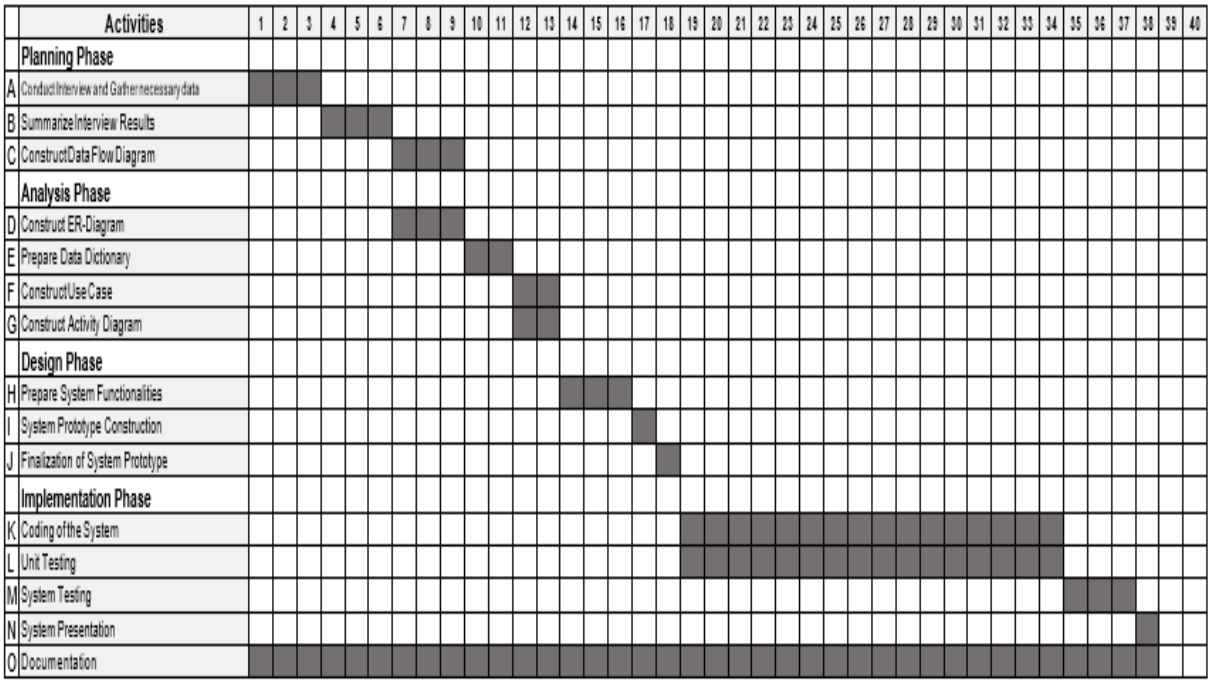
Table 3.Gantt Chart



Recommended hardware and components must be compatible with the app so that the operation runs smoothly. The specifications of the server should be higher than the usual specs because it will as the host of the said app, databases, and the student's information is also stored on the computer. Additionally, the server will be used to access the hosting site for proper configuration and to check the domain. Android phones are needed for the application to run because the app was specifically designed for those phones with Android OS. It will not run on phones with IOS. Internet Service Provider

Table 4.

Software Recommendations

Development Tools	The Use
Application and Software • XAMPP 2.5 • NotePad++ • Adobe Photoshop CS5 • Adobe Dreamweaver CS5 • PostgreSQL	These are the software requirements that must have used by the developer to develop the system. These will be the software tools to develop a good product or output.
Operating System Platform • Windows 10 Ultimate • Windows 10 Professional	The Operating system needed will fit our system.
Tools for Documentation • Microsoft Office	Tools have to use for documentation and report purposes. Also used for the configuration of some pictures and editing.

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The hardware needed for the system development of the TVL mobile learning management system for Calatrava National High School is shown in the table below:

Table 5. Hardware Recommendations

Server Specs	Client Mobile Phone Specs	Network Peripherals
Windows 10 OS (64BIT) Intel I5 Processor 10th Gen 1 TB Hard drive 8GB RAM 2GB VGA	Network LTE Cat4 150/50Mbps, HSPA+ 42/5.76Mbps GPU Adreno 630 OS Android 8.0 (OREO) Chipset Qualcomm Snap Dragon RAM 4.0GB (RAM) + 16GB Battery 2,600 mAh Android version: Android 8.0	1 Modem 1 Router 1 Switch Hub 2 Network Printers

4. Other Nonfunctional Requirements.

The requirements for the mobile application specify the criteria to determine the efficiency of the application and how the system operates. e-MODYUL has all the requirements to test the application and determine the quality of the system.

The different features that e-MODYUL needs to perform are the interactive environment, the downloading of the .apk (Android Package Kit) file, the activation of assessments, the arrangements of questions with the time limit in taking the tests and examination, and the examination proper of the mobile application.

The instrument includes 22 measures. However, only ten measures were considered relevant to product features. Thirty respondents were selected to test the mobile application, whereas ten professionals and 20 students. The instrument allows the respondents to rate each measure using a five-point Pomel scale: 5 = Excellent, 4 = Good, 3 = Average, 2 Low, and 1 = Very Low.

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Table 6. Pomel Seale for Software Evaluation

5	4.50-5.00	Excellent	The performance and quality of the product based on the measure have reached an excellent level
4	3.50-4.49	Good	The performance and quality of the product based on the measure have reached a satisfactory level
3	2.50-3.49	Average	The performance and quality of the product based on the measure have reached an acceptable level
2	1.50-2.49	Low	The performance and quality of the product are below the acceptable level but remain workable. Improvement is highly recommended.
1	1.00-1.49	Very Low	The performance and quality of the product are not acceptable. There is a need to re-analyze and re-design the entire application.

The different features of the e-MODYUL mobile application are accuracy, user-friendliness, reliability, operability, learning reinforcement, interactivity, compatibility, and cross-platform environment. The developer should meet the features mentioned for a stable and good result. The following features of e-MODYUL and its corresponding software quality attributes are discussed in the succeeding sections. Each attribute is described and defined in how it is to be included as one of the attributes of e-MODYUL.

Table 7.

Summary of Features and Attributes of e-MODYUL

Product Features	Software Quality Attributes
1. User-Friendliness (Usability)	Operability, Training, and Communicativeness
2. Compatibility (Adaptable)	Operability and Consistency
3. Reliability (Reliability)	Accuracy, Consistency, and Simplicity
4. Interactivity (Human Engineering)	Simplicity and Communicativeness
5. Learning Reinforcement (Understandability)	Consistency, Conciseness, and Modularity
6. Dynamic Environment (Flexibility)	Operability, Expandability, and Modularity

Table 7 discusses the different features of the mobile application using TVL learning management system with corresponding quality attributes of the application, mean, and interpretation,

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which are the results based on the formulas presented. The table below shows how to evaluate the mobile application based on the given attributes and make it suitable for the target users.

Table 8.

Mapping of Features and Relevant Measures

Product Features	Software Quality Attributes	Mean	Interpretation
User-Friendliness (Usability)	Operability	4.87	Excellent
	Training	4.93	Excellent
	Communicativeness	4.90	Excellent
Compatibility (Adaptable)	Operability	4.87	Excellent
	Consistency	4.89	Excellent
Reliability (Reliability)	Accuracy	4.93	Excellent
	Consistency	4.89	Excellent
	Simplicity	4.91	Excellent
Interactivity (Human Engineering)	Simplicity	4.91	Excellent
	Communicativeness	4.90	Excellent
Learning Reinforcement (Understandability)	Consistency	4.89	Excellent
	Conciseness	4.87	Excellent
	Modularity	4.87	Excellent
Dynamic Environment (Flexibility)	Operability	4.87	Excellent
	Expandability	4.90	Excellent
	Modularity	4.87	Excellent

The proponent used a five-point Pomel scale to rate and measure the application. Google Forms was used as a survey administration software distributed to each respondent. After answering the survey, the proponent got the results instantly from the 30 respondents and tabulated the data in each feature.

5. Summary

The proponent started learning the different e-learning software and other learning resources. Lessons were integrated into the system so that there would be a paperless type of assessment for students. This will give aid to different teachers in accomplishing their tasks. The proponent uses the TESDA-based lessons to let the users explore the contents using the mobile application. The mobile application was built for Android devices and IOS-operated devices. Browsers in different operating systems are also compatible with the application. The proponent used the progress tracking system to determine the level of the users during the assessment.

Implementing the different functionalities of the e-MODYUL was done, and bugs, errors, and problems were checked. The proponent performed a series of tests to identify and improve the features of the mobile application.

6. References

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