

# Development of multimedia-based digital laboratory project center (CoLaP)

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## DEVELOPMENT OF MULTIMEDIA-BASED DIGITAL LABORATORY PROJECT CENTER (CoLaP)

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### Abstract

Designing *Digital Center of Laboratory Project (CoLaP)* a Multimedia-based can be used as a learning publication tool for students, lecturers, schools and other institutions and make the Mathematics Lab a source of information that can be a learning tool related to learning media, data processing and making learning media, Designing digital laboratory textbooks by elaborating several media, seeing feasibility, attractiveness and effectiveness of its use in *Digital Center Of Laboratory Project (CoLaP)* Multimedia-based. The method used in the process of making the *Center of Laboratory Project (CoLaP)* website is based on WDLC (*Web Development Life Cycle*) with 7 stages of development. Based on the research results, the creation of a digital library system for mathematics education which we call Digitalusing *CoLaPWDLC*. This digital CoLaP system produces a system that can be used by students, laboratory assistants, lecturers in viewing RPS and lecture contracts, viewing textbooks, viewing media, viewing lecture schedules or lab use, Lab activities, laboratory assistants can validate student data, process student data, upload the schedule for the use of the lab, the schedule of lecturers and students on duty by logging in first into the system. Based on the test results given that students and lecturers respond well to the creation of the Digital CoLaP Web system.

Students and lecturers find it helpful to make it easier to carry out the lecture process, starting with the lecture schedule, laboratory lecture tools are available.

Keywords: Center of Laboratory Project (CoLaP), Digital, Multimedia

## 1. INTRODUCTION

Today's technological developments have progressed very rapidly. One of the results of advances in technology is the internet. Internet is one of the new communication media. The internet, which is a product of communication technology, has been developing for decades, but until now its existence is increasingly needed by almost all people in the world. All information can be easily obtained from the internet anytime and anywhere as long as there is a connection (Anita, 2018).

Internet-based technology that can be used as a means of communication, one of which is a website. Website as a means of communication has become so widespread with a low cost factor, easy access and efficiency because it can be accessed within 24 hours. Website technology has developed quite rapidly. The current website is not only a medium of information that is read or tends to be static, but has developed into a more dynamic and interactive medium. Therefore, the website is very suitable as a medium of communication.

The laboratory is a place to carry out work activities to produce something (Sukarso, 2015). Furthermore, Emha (2002) states that the laboratory is a place to conduct experiments, investigations and so on related to science. Ni Luh (2016) stated that the laboratory is a means of teaching and learning activities. The laboratory is one of the facilities that must exist in universities. However, with this function, sometimes the existence of the laboratory is not managed properly. Usually the existence of a laboratory is only a display or just an accreditation requirement. Management is not good and not optimally utilized. Coupled with the current pandemic conditions. The existence of the laboratory is no longer considered, because the situation forces us not to do face-to-face learning. On this basis, researchers want to improve the function of the laboratory again.

Likewise in the Department of Mathematics, State University of Medan, the laboratory conditions are at a good level. The completeness and quality of computers in the laboratory is very good with some learning software, an adequate number of computers, teaching materials used as learning media. This Mathematics Education Laboratory has provided training to several partner schools related to school webs, making learning media, making school LMS, providing training on the development of learning tools to teachers, all of which are still being informed or asking schools and several teachers regarding the needs of teachers and students. current school. Student data processing, administrative processes, lecture schedules, providing information related to laboratory activities still use the bulletin board manually, namely by taking notes and sticking them on the bulletin board.

This method is of course not effective, so an information system is needed that can help laboratory assistants, students, lecturers and other users to manage and obtain information. The system will develop a laboratory web as a means of information and publication. So that the education community and the general public can find out what information is usually obtained from laboratories with learning device facilities supported by multimedia learning media in the lecture process.

By building information and publications, it is hoped that it can support the lecture process and provide information to the general public to meet the needs of schools and teachers, provide convenience to students in accessing the laboratory-free management process which is a requirement in completing studies and improving laboratory services.

In designing the development of the mathematics education laboratory information system the author uses WDLC (Web Development Life Cycle). Like other system design methods using SDLC (System Development Life Cycle) and while designing web-based systems more often use WDLC (Web Development Life Cycle) where this is the creation or development of information systems that aim to solve problems effectively which aims to generate a high-quality system that meets the customer's wishes or the purpose for which the system was designed. The steps that must be taken to process the development of a software. This system contains a complete plan for developing, maintaining, and replacing specific software. WDLC has many functions, including as a means of communication between the development team and stakeholders. WDLC also functions to divide roles and responsibilities clearly between developers, designers, business analysts, and project managers. WDLC also has stages in system design starting from planning, analysis, design and development, testing and implementation and maintenance (putra, 2020).

Building a website using WDLC has been used by (nur annisa and raden budiarto, 2020) with the research title "Design and build web-based electronic official script applications using WDLC" in the study explained that the electronic official document management application can meet security solutions related to official document management electronic = by guaranteeing confidentiality, authentication, integrity, and non-repudiation in the form of the application of the AES 128 algorithm in the disposition of data encryption and the implementation of HTTPS on data transactions that meet the confidentiality aspect. The electronic service script management application that was built has met the web security test case from Kundu. Publication of research results Web development has also been carried out by (Tiur et al, 2020). The instrument used to measure the quality of teaching materials was an assessment questionnaire from material and media experts, as well as a student response questionnaire. From the test results, namely by giving the developed product to media experts and material experts, respectively, the scores were 80.3% and 86.7%, which means they were included in the "Very Good" category.

This study aims to design web *CoLaP* a multimedia-based digital to be used as learning information and publications for students and other agencies and to make the Mathematics Lab a source of information that can be a learning tool related to learning media, data processing and making learning media. With the support of campus facilities that are already equipped with networks, it makes it easy to use internet-based system applications using the campus network to be able to access textbooks *CoLaP* digital by elaborating some of the media in it with the help of Video Powtoon, Augmented Reality, Virtual Reality and Kahoot Evaluation which can add to laboratory learning, more attractive and effective. Conduct a feasibility and attractiveness survey of *Digital Center Of Laboratory Project (CoLaP)* Multimedia-based (Video Powtoon, Augmented Reality, Virtual Reality and Kahoot Evaluation) which can make learning more interesting and effective for both students and lecturers who teach laboratory courses. The results of this research are expected to be able to make the Mathematics Education laboratory into a digital laboratory that adapts to the needs of graduates of technological developments, can



provide information and help the needs of partners, both schools and other agencies outside the campus.

## 2. METHODS

The method used in the process of making the *Center of Laboratory Project (CoLaP)* website is based on WDLC (*Web Development Life Cycle*). Where WDLC is a system development process that is used by systems analysis, to develop a website and an overview that is presented to users. There are 7 stages in the WDLC, namely information gathering, analysis, design, implementation and maintenance.



Figure 1 –Web Development Life Cycle by selly king

### a. Planning Phase

In order to produce a *website* good, careful planning is needed, namely by conducting a feasibility study on the methods used in the data collection process. Feasibility studies carried out include data collection methods, data sources, data collection techniques, and data analysis techniques.

### b. Analysis Stage

At this stage, an analysis of is carried out *websites* that are available in the public. This activity includes the analysis process on *website* a good. The goal is to see the advantages it has so that it can be implemented on *the website* CoLaP. Later, through this CoLaP, the UNIMED mathematics laboratory can introduce and provide information to the wider community about the facilities, achievements and activities that can be carried out at the UNIMED Mathematics Laboratory.

### c. Website Design and Development

The design of this website is carried out by a design plan which includes making a sitemap, website layout, determining fonts and colors. *Site Map* is designed to be easily found on internet pages, designed to be *user friendly*. This typeface was chosen by following the University logo font. The layout design consists of a *header*, *content*, and *footer*. The CoLaP page contains *home.profiles* Laboratory, information on Lab activities, student affairs, and *Content* containing any information that will be conveyed. While the design stage is one of the mandatory steps in making a work. In this stage there are several technical designs in it, including ideas, concepts, typography, web design and databases.

### d. Testing Phase

Trial design, the system that has been created will be tested according to the functionality of each form according to the method used to show how the work of the website builder is, whether the results of the website that have been created are in accordance with the needs, starting from the information system needed by students and the community, the components tested consist of content, function, usability and system accuracy.

### e. Implementation and Maintenance

Stage The stage where the system is implemented in a real situation with hardware selection and design preparation (coding). The implementation is by informing the user, training the user, installing the system and maintaining and maintaining the web. If necessary, minor repairs will be made, then if the system period is up, it will enter again at the planning stage.

## 3 RESULTS AND DISCUSSION

Based on the results of research that has been carried out, the first step is to update learning tools in digital form by integrating multimedia and having ISBNs as shown below:



Figure 2 –Books with ISBNs become Ebook

### Planning Web (CoLaP) Digital

All these services are incorporated in one system so that services can be carried out quickly and precisely. The following is an overall diagram of the CoLaP system that will be designed.

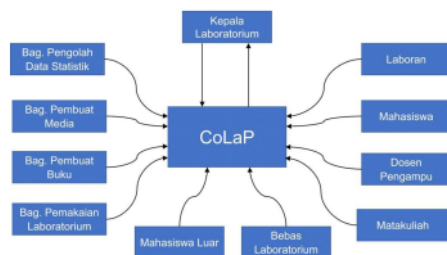
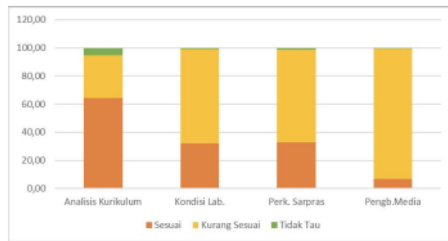


Figure 3 – Design Diagram

### Digital Web Requirements Analysis (CoLaP)

Center of Laboratory Project (CoLaP) In Learning Needs Analysis is an initial activity carried out before developing laboratory multimedia that is in accordance with the subjects and learning needs. The first analysis carried out was a literature study related to the curriculum of laboratory conditions, infrastructure and media development as stated in the article (Tiur et al, 2021).

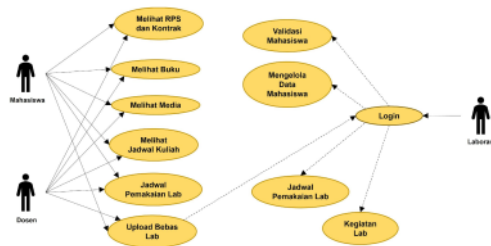


**Figure 4** –CoLaP needs analysis

From the graphic chart of the CoLaP needs analysis, it can be seen that 180 people or 64.52% answered appropriate, 84 people or 30.11% said they were not suitable and 15 people or 5.38% answered they did not know related to curriculum analysis for laboratory courses with the material taught in the laboratory. Here it can be seen that the curriculum is almost in accordance with the profile of graduates of Mathematics Education but still needs to make revisions related to the learning system that we are currently running to make it more supportive for our current graduate profile. For the case of laboratory conditions, 89 people or 31.90% answered accordingly, 187 people or 67.03% answered less appropriate and 3 people or 1.08% answered they did not know. In this case, the laboratory conditions are still not good, but to support online learning we are currently experiencing, it is still very necessary to make improvements or additions to laboratory rooms including virtual laboratory and digital laboratory.

### Design and Development Web (CoLaP) Digital

Use Case Diagram shows in a simple way how the interaction between users and the system is built so that users can understand the system. The following is an image of the Use case diagram that was built.



**Figure 5** – Use Case built

In the use case diagram, which acts as a user or actors in the system are a regular user, Students, Faculty and laboratory. Ordinary users, students and lecturers can view lesson plans and lecture contracts, view textbooks, view media, view lecture schedules or lab use, Lab activities, laboratory assistants can validate student data, process student data, upload lab usage schedules, schedule lecturers and students who task by logging into the system first.

After testing the system that was built, we then saw the student responses related to the system

that was built and obtained data that the average student response on the cognitive aspect was 82.32% with a positive category, on the affective aspect, which was 83.23% with a positive category. , and the cognitive aspect is 83.00% with a positive category. So that the overall average response is 82.32% with a positive category, this indicates that Web CoLaP *which is* used attractively easy to understand according to the needs of students, lecturers and laboratory assistants. Information and lecture tools presented on the web meet the needs needed by students regarding RPS, Digital Books, Media presented, Lecture Guides, Laboratory activities according to what they need at this time. In accordance with the statement of Kopp (1982) *cit.* Keller & Suzuki (2004) have illustrated how important it is to combine various tactics to get students' attention by using interesting pictures, animations or events that are odd or out of the ordinary.

### Implementation of the Digital Web (CoLaP)

At this stage the system has been tested and combined with the faculty web via the CoLaP link by simply clicking on the Mathematics laboratory icon Front page display

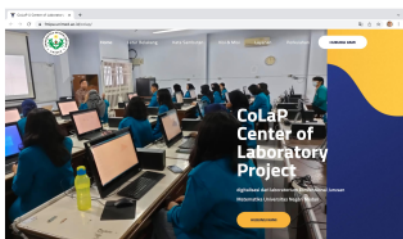


Figure 6 – CoLaP Web front

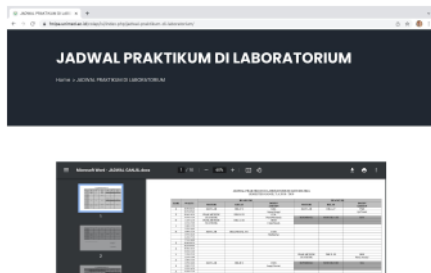
Page The Digital Web (CoLaP) main page is the first page that will be displayed. open when the user accesses the web. From this front page, you can see the menus and facilities on the Digital Web (CoLaP) and can be accessed by students, lecturers, laboratory assistants and other service users.



Figure 7 –Laboratory Textbooks with ISBN

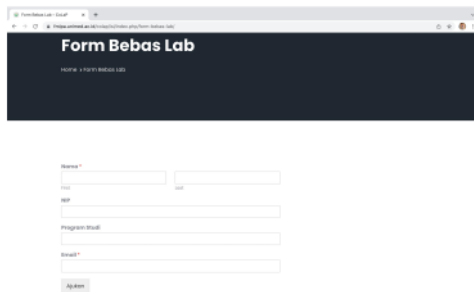
following is a display of teaching materials <sup>3</sup> that can be accessed by students, lecturers and laboratory assistants, in the learning process in lectures, starting from RPS and lecture contracts for each course.





**Figure 8** –Laboratory Practicum Schedule

Web (CoLaP) Digital also makes a menu of practicum schedules for each class, lecturers for each subject, laboratory assistants on duty and student assistants who help in the Lab. Each semester the schedule will be uploaded, then students can immediately view the laboratory lecture schedule online.



**Figure 9** –Lab Free Form

After students complete all lectures there will be a Lab free letter that will be issued by the laboratory as a condition to ensure the student concerned has finished carrying out laboratory lectures. Students will fill out an online lab-free management form which will then be signed by the head of the laboratory which will then become a graduation requirement for students.



**Figure 10** –Laboratory Activities

Digital Web (CoLaP) have a history menu or activities carried out outside the campus or Lab services that have been used by the school, such as making school LMS, making digital

libraries, Creating School Webs, Conducting training for teachers -teachers at the elementary, junior high and high school levels in several schools in the city of Medan, from some of the activities that have been carried out we also display them in the mass media.

## CONCLUSION

1. Making a digital library system for Mathematics education which we call Digital CoLaP using the *Web Development Life Cycle (WDLC)*. This digital CoLaP system produces a system that can be used by students, laboratory assistants, lecturers in viewing RPS and lecture contracts, viewing textbooks, viewing media, viewing lecture schedules or lab use, Lab activities, laboratory assistants can validate student data, process student data, upload lab usage schedules, lecturers and students on duty by logging in first into the system and other visitors who want to obtain information related to the use of laboratory services.
2. Based on the tests given, it is known that students and lecturers respond well to the creation of a Digital CoLaP Web system for the Mathematics Education laboratory. Students and lecturers feel helped by this system because it can make it easier to carry out the lecture process, starting from the lecture schedule, laboratory lecture tools ranging from RPS to teaching materials are already available.

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