Design of a Web-Based Digital Learning Resource Center to assist online learning with mathematics content in primary schools

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Abstract. Implementation of online learning policy has become an alternative solution. In another way, also raises various problems faced by teachers, students, and also parents who accompany their children to study online from home. Especially in learning with Mathematics content which already has a negative stigma. This development process aimed to assist teachers in providing digital learning resources in the learning process by providing a digital learning resource center that can be used by teachers, students, and parents. The main focus of this study is 1) the design of the digital LRC website. 2) Development of a digital LRC website that can be used by teachers in presenting the learning process. 3) provide helpful guidance for teachers in digital learning development by utilizing digital LRCs. The development of the Website-Based Digital LRC is realized through a seven-step Software Development Life Cycle (SDLC) design model. This paper will only focus on Systems Analysis and Requirements and also describing the DLRC system design that will be developed. The design resulted from this study is a Website-Based Digital LRC that can be utilized by both teacher and student. Optimization of this Digital LRC has the potential to reduce the time and effort of a teacher in their preparation for learning.

1. Introduction
The Corona pandemic emergency status announced by WHO has an impact on the world community, including Indonesia. Apart from having an impact on the community in implementing the WFH (Work from Home) policy on all work that must be done from home, this virus also has an impact on the educational process. With the limitation of interaction between communities, the Ministry of Education and Culture of Indonesia issued a policy to dismissing schools and replacing learning activities through distance education utilizing both online and offline learning called Learning from Home. Home learning that has been initiated can be an alternative solution that has many advantages in facing the challenges of education during this pandemic [1,2].

Students in particular feel that online learning is not fun and runs more difficult [3]. In the opinion of students, this happens because of changing learning patterns, increasingly irregular time settings, unsupportive device and signal facilities, lack of interaction, and monotonous methods.

Among reasons for the difficulty of online learning during the COVID-19 pandemic, a monotonous method is one of the things that can be prioritized for the improvement of this connection. Among the reasons for the difficulty of online learning during the COVID-19 pandemic, a monotonous method is one of the things that can be prioritized for the improvement of this connection [4]. One of the things
that are considered to be able to improve is by increasing digital learning resources so that they can provide options for teachers to provide a variety of learning [5].

Essentially, learning resources can be divided into self-designed and utilized learning resources [6,7]. Learning resources by design requires the ability of teachers to develop learning resources both conceptually and technically. In contrast, the learning resources that are utilized do not require the ability of the teacher to develop learning resources as a whole, but only require the ability of the teacher to select and modify learning resources that are deemed appropriate to meet their learning needs.

With the use of media and learning resources in addition to increasing learning motivation, the focus of students is also able to enrich learning offerings [8,9]. In particular, self-designed learning resources are very suitable if you have spare time and abundant resources, while the use of utilized learning resources is highly recommended if the need for learning resources is demanded in a short time and the resources needed for development are not much available [10]. In the context of digital learning resources, one of the prerequisites for development is qualified digital skills, if these competencies are not owned, it is better if you can use the utilized learning resources.

Three important principles should be applied in online learning during the Covid -19 period, that is providing varied activities, the material duration that tends to be short, and the last one emphasizes the interaction process [11]. Teachers will be facilitated to provide learning variations if they choose to use teaching materials by utilization. The utilized teaching material has the advantage of providing variation because it is made by many different people even though they have the same material orientation [10]. Materials that tend to be short will make it easier for students to digest learning because of the significant reduction in focus during online learning [12]. Teachers can focus more on building interactive learning environments if they have sufficient time. This can only happen if the time is not consumed to prepare teaching materials.

Early research results reveal the cause of the difficulty of online learning during the Covid-19 pandemic, and one of them is the inability of teachers to produce digital learning resources. It is one of the causes that can be prioritized to resolve in this regard. Especially for Mathematics instruction. Mathematics learning on the other hand has quite a tough challenge. Even held by face-to-face learning, it tends to have a more negative stigma in elementary school, taught as a difficult subject matter [9]. This potential may increase with the limitations of online learning. It is necessary to take anticipation by support teachers preparing for their instruction, especially on mathematics in elementary schools.

The main focus of this paper is to explain the activity towards 1) developing a digital learning resource center website that can be used by teachers in presenting the learning process. 2) provide an overview for teachers to develop mathematic learning, by using utilized digital learning resource center.

2. Research methods
The main focus of this study is 1) the design of the digital LRC website. 2) Development of a digital LRC website that can be used by teachers in presenting the learning process. 3) provide helpful guidance for teachers in digital learning development by utilizing digital LRCs. That focuses will be implemented by Software Development Life Cycle methods as one of the most effective methods for designing, building, and maintaining information systems [13].

The development of the Website-Based Digital LRC is realized through adoption of a seven-step Software Development Life Cycle (SDLC) design model that is 1) Planning, 2) Systems Analysis and Requirements, 3) Systems Design, 4) Development, 5) Integration and Testing, 6) Implementation, and 7) Operations and Maintenance. This paper will only focus on the first three steps, from Planning, analyzing the system and its requirement, to the system designing.

The ease of following the stages it has is the main reason for choosing SDLC as a design development method. Apart from that The system development life cycle (SDLC) focuses on data, as opposed to processing and functionality [14]. This is related to the needs of the system, which relies on managing a lot of data. Meanwhile, the functions of the DLRC system are quite simple.
The start of this study was to ensure what context and limitation will shape the website. Create the structure and data flow diagram of the website. The outcome of this study of development is a prototype of a Website-Based Digital LRC that can provide various forms of free teaching materials.

3. Results

The first step is to carry out the Planning stage. Information and resources are gathered during this phase to support the system. Specifically, at this stage, the efforts are made by planning the system design preparation process before it is developed. The results of general planning in the development of this DLRC system design are contained in three main activities. First steps Collection and management of digital learning resources, Development of LRC website, and Workshop of Digital LRC website use.

Systems Analysis and Requirements is the first step in the realization of the planning that has been prepared in the previous stage. At this stage, several main questions are raised that will guide the focus of the analysis so that it can produce a system design that is not only good but also has an impact on the effectiveness of learning by the teacher. These questions include the following matters such as the main abilities of the DLRC website, the general resources of teachers, resources that can be utilized, and, the scope of DLRC content. The analysis of material coverage consists of two parts. First, the coverage of the content of the material presented and the second, the scope of what types of teaching materials will be accommodated. In the other way, the principle of content management and system design development on this website puts forward three main principles, namely open-access, a combination of the principle of repositories and online catalogs, and promoting non-commercial use.

Systems Design is the third phase that describes, in detail, the necessary specifications, features, and operations that will satisfy the functional requirements of the proposed system which will be in place. At this stage, it is carried out through several steps including determining a general description of the system, then making a classification of system users along with their authority, and creating an access flow and interaction between users and the system.

One of the results from the third phase is the category of users. There are three categories of DLRC system users, that is guest, contributor and admin. The Guest role has the authority to access the material and download it directly or just copy the link. Meanwhile, contributors have the authority of guests and added with the ability to add teaching materials. While administrators have the authority of guests and contributors, admins are also able to manage users and are also able to manage all content. The permission map of each user can be seen in figure 1.

Figure 1. The illustration of user classification and their authority.
4. Discussion

What main abilities does the DLRC website have? Analyzing the main capabilities of the DLRC website is quite a dilemma. Many desire to produce a perfect output, but due to the limitations of the current situation and conditions, the decision is made that the main features of the DLRC system are very simple. The DLRC system that was built is expected to have the main ability to provide opportunities to share digital teaching materials that are free to use and mutual appreciation for teaching materials that have been developed and shared. so that with this sharing effort, each user, especially teachers, can take advantage of a variety of teaching materials that have been shared [10].

What resources does the teacher have? Teachers tend to use the combination of student and teacher books from the government without doing further development. So that the possibility of variations in learning materials is quite small, especially in mathematics learning materials. Moreover, mathematics teachers tend to be more confident when delivering material directly and then reinforcing the direct mentoring process [9]. So that in general every teacher does not have many variations of teaching materials that are ready to be presented to help implement the ideal learning process.

What are the resources that can be utilized? The abundance of learning resources on the internet today is a fact of necessity. However, there is no validation and information on whether the material is relevant to the needs of a lesson. This includes determining its relevance, there are also difficulties in finding teaching materials that can be candidates for selection. This creates a problem for the teacher to get relevant and appropriate teaching materials from the internet.

Meanwhile, in higher education institutions, there are a lot of assignments that culminate in the activities of compiling teaching materials by students, regardless of the relevance of the assignments made by students, they have the potential to be used by the teacher as an alternative teaching material [11]. At least, the teaching materials are well categorized in terms of content and designed for certain grade levels so that they are quite specific, and tend to be easier to modify and adapt to instructional needs by each teacher.

How is the scope of DLRC content? The analysis of material coverage consists of two parts. First, the coverage of the content of the material presented and the second, the scope of what types of teaching materials will be accommodated. With the fact that elementary schools in Indonesia use integrated learning through thematic subjects [15], the content of the material will not be specific to mathematics. But generally, contains themes that have been determined by the national level curriculum developer from level one to level six. The digital learning resources center system design will be realized as a web-based system that provides access to content that can be used as ready-to-use or modifiable teaching materials. The principle of content management and system design development on this website puts forward three main principles, namely open-access, a combination of the principle of repositories and online catalogs, and promoting non-commercial use.

The principle of open-access or free to access is the main feature that we want to present, so there is no need for user authentication to be able to access available teaching materials. This is intended to improve system accessibility as well as answer the main background of the problem to be solved, facilitate efforts to share resources and provide teachers with the widest possible access to a variety of teaching materials. another effort to support the achievement of this idea, all files stored in the DLRC system will be registered with a CC-BY-NC license which means with this license allow users to remix, adapt, and build upon learning materials non-commercially [16], and although the new learning materials must acknowledge the author or contributor and be non-commercial. And also, users do not have to license their derivative works on the same terms.

The flow of access and interaction between the user and the system database is carried out with a very simple procedure as seen in figure 2. This simplicity is a form of realization of the open access principle that the DLRC system is currently developing. Especially for contributors and administrators, after carrying out the authentication procedure via login, they can directly access the database according to their capabilities and authority. Specifically for guest users, it is different from other users. Guest users generally do not need to authenticate via login to be able to access a limited database, with permission to “watch-only” the content available. However, if the guest wants to use the content...
available on the system on their platform by copying the link to the teaching material or by downloading it, then further procedures are required. By giving a rating and commenting on each content to be used, guests can display a link that can be copied or a button to download the desired teaching material.

![Illustration of system database access flow of each user based on their authority.](image)

**Figure 2.** The illustration of system database access flow of each user based on their authority.

5. **Conclusion**

The application of the three main principles of the Website-Based DLRC system, which are open-access, the combination of the principles of repositories and online catalogs, and non-commercial use is expected to help accommodate the needs of online learning in general and specifically for mathematics learning. The free of access was the main reason why the system built in a simple data flow. However, the interaction can still be seen in the adaptation of the repository and catalog context. And finally, the non-commercial materials have made the website-based DLRC rich in the content of teaching and learning materials. In particular, in providing teaching materials that can be used by teachers in schools so that teachers can be more focused to develop more varied and interactive learning, and present meaningful and quality learning activities for the student.

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