Development of web-based digital libraries as learning resource facilities in elementary schools

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Abstract

The development of Information and Communication Technology (ICT) has greatly influenced the world of education. One of the benefits of using ICT in education is that it makes it easier to find learning resources that it's used in the learning process is the school library through digital libraries. The schools should develop digital libraries with facilities adequately. This study aimed to develop prototypes of web-based digital library products suitable as learning resources at public elementary school. The type of research used was research and development (R&D) using the PPE (Planning, Production, and Evaluation) model, carried out at SDN Sindang III, Majalengka Regency. The subjects in this study were the school principal, ten teachers, and 43 students. The research instrument used observation, interview, and product validation sheets. Research data were analyzed qualitatively and quantitatively. The results of this research and development are web-based digital library products containing various textbooks adapted to the school curriculum, consist of 2013 curriculum books, Kurikulum Merdeka's, numeracy literacy modules, children's story books, learning videos, and teacher-supporting books. The product validation by three experts and two practitioners using the DigiQUAL instrument, which consists of seven aspects, an average score of 4.4 is obtained, which is in the excellent category. Conclusion this study is innovation web-based digital library product can be a learning resource at SDN Sindang III, Majalengka Regency.

Keywords: DigiQUAL; Web-based digital library; Learning resource

Pengembangan perpustakaan digital berbasis website sebagai fasilitas sumber belajar di sekolah dasar

Abstrak

Perkembangan Teknologi Informasi dan Komunikasi (TIK) telah banyak memengaruhi dunia pendidikan. Salah satu manfaat penggunaan TIK dalam pendidikan adalah memudahkan pencarian sumber belajar yang dapat digunakan dalam proses pembelajaran di perpustakaan sekolah melalui perpustakaan digital. Sekolah diharuskan mengembangkan perpustakaan digital melalui penyediaan fasilitas yang memadai. Penelitian ini bertujuan untuk mengembangkan prototipe produk perpustakaan digital berbasis website *yang layak digunakan sebagai fasilitas sumber belajar di sekolah dasar. Jenis penelitian yang digunakan adalah penelitian dan pengembangan (R&D) dengan menggunakan model* PPE (Planning, Production, dan Evaluation) *yang dilaksanakan di SDN Sindang III Kabupaten Majalengka. Subjek dalam penelitian ini adalah kepala sekolah, sepuluh orang guru, dan 43 orang siswa. Instrumen penelitian menggunakan lembar observasi, lembar wawancara, dan lembar validasi produk. Data penelitian dianalisis secara kualitatif dan kuantitatif. Hasil dari penelitian dan pengembangan ini adalah produk perpustakaan digital berbasis* website *yang memuat berbagai buku ajar telah disesuaikan dengan kurikulum sekolah, antara lain buku kurikulum 2013, buku kurikulum Merdeka, modul literasi berhitung, buku cerita, video pembelajaran, dan buku penunjang bagi guru. Produk dianalisis oleh tiga orang ahli dan dua orang praktisi menggunakan instrumen DigiQUAL yang terdiri dari tujuh aspek dengan mendapatkan hasil skor rata-rata 4,4 dan termasuk kategori baik. Penelitian ini dapat disimpulkan bahwa inovasi produk perpustakaan digital dapat digunakan sebagai sumber pembelajaran di SDN Sindang III Kabupaten Majalengka.*

Kata Kunci: DigiQUAL; Perpustakaan digital berbasis website; Sumber belajar

INTRODUCTION

The importance of digital libraries as learning resources that can assist the learning process involves educational institutions developing these facilities adequately. The development of learning resource facilities must also align with technological developments because patterns of human behavior tend to change according to the times and technology. In addition, unexpected conditions can be used as a basis for the importance of developing technology-based learning resources, for example, during the recent Covid-19 pandemic, which involved the learning process being carried out online.

Digital libraries are a further development of conventional libraries, which are currently being widely developed in educational institutions, government agencies, and library institutions in general. However, this digital library has yet to be widely developed and used at the elementary school level to assist learning activities, according to research conducted by Ariyani, Kumbara, Atmadja, and Pujaastawa (2022) which explains that the development of elementary school libraries still needs to be improved compared to high school and tertiary institutions.

According to Zha, Wang, Yan, Zhang, and Zha (2015) a digital library is a library accessed by a user through the use of a computer and website broadband at a defined place. That means, a digital library requires a computer or mobile phone device and access to the website. Sayekti and Mardianto, (2019) argue that a digital library is a term that describes the use of digital technology to obtain and store information/material published in digital form, be it print, audio, visual, or other forms.

As an integral part of the school, the library is an essential component of education in schools, which is expected to support these educational goals. In addition to being a supporter of learning, the library also acts as a learning resource (Akviansah & Sariyatun, 2020). School libraries in RI Law No. 43 of 2007 article 23 paragraph 5, as learning resource centers must be able to develop information technology-based services to compete with libraries in other countries (Republik Indonesia, 2007). Therefore, innovation is needed to present a digital library that can be accessed easily by all students and teachers.

Even though there is a formal provision that requires all schools to have a library, many schools still need libraries and adequate learning resources, as was the case with Sindang III Public elementary school (SDN Sindang III), Majalengka Regency. Based on field facts from observations and interviews with school principals, teachers, and students, schools need a library building and a good collection of books.

The absence of a library is one of the factors that make it difficult for students and teachers to access learning resources and other reading sources. The availability of main books, such as the 2013 curriculum book, still needs to be improved. In learning activities, students often have to use books in groups, even though the ratio of books should follow the ratio of students, namely, one book per student. In addition, other supporting books still need to be improved. The lack of a collection of these books also affects students' reading interests.

Based on the results of interviews with school principals and teachers, it was found that the school had made efforts to apply for library development assistance.

However, because the school has narrow land, it is difficult to add a new building for the library. Teachers also still need help accessing learning resources that can support learning and other sources that can support their profession. In addition, the results of interviews with students also indicated that students wanted more good books available so they could obtain more reading material.

Based on the problems and conditions of the school, one alternative that can help the learning process is to develop a digital library. This digital library must be developed to assist the learning process in schools and overcome the limitations of learning resources that schools have experienced. A limitation should not be used as a barrier to continuing to develop schools to be better. Therefore, this digital library can be a solution for schools that still need a library building.

The development of this digital library is also expected to be able to open the broadest possible access for students and teachers to obtain information, especially learning resources needed for the learning process. A digital library connected to the internet in every classroom allows students and teachers to learn more effectively because they can access learning resources from the classroom.

Digital libraries can be developed using the website. The website is a learning resource included in the device as it is an internet-connected software. Websites can also be used as learning media and resources as they provide information, images, and videos to bridge between students and teachers (Sulistiawati & Azizah, 2019). Using websites, if integrated into the teaching and learning process, can develop students' skills in technology and

help them achieve learning goals by using them as learning resources.

Digital libraries, with various advantages and benefits, are one of the innovations that can be applied to support school learning activities. The presence of digital libraries in educational institutions is a very rapid transformation of learning resources. Students are expected to increase their absorption in the educational process by acquiring library materials that support the curriculum.

At the same time, teachers are expected to broaden their knowledge in teaching activities. Digital libraries also indirectly provide integrated assistance for learning needs in the classroom. On the other hand, having a digital library will reduce operational costs for purchasing books or other learning resources.

Libraries in digital form also have many benefits. Based on the results of several studies related to the development of digital libraries, it has a positive impact on learning activities, as research conducted by Puwanti (2017) found that there is a relatively great significant influence between the use of digital libraries on increasing citizenship knowledge in students of SMA Negeri 4 Bandung. Bua (2021) further explains that using digital libraries in pandemic learning can be an excellent alternative to improve early reading comprehension of class I-B students at SDN Tarakan 007. Besides being useful for students, library collections are also beneficial for teachers.

Several previous studies from Puwanti (2017) and Bua (2021) described about determined that digital libraries positively impact learning, but only a few previous studies have developed digital libraries for the elementary school level. In addition, the digital library being

developed is still limited to certain subjects. In this study, researchers are trying to develop a digital library that can be used by students and elementary school teachers and includes all the lessons in the school curriculum. The digital library can also be accessed anywhere and anytime, so it is expected to make it easier for students or teachers to obtain learning resources. Based on the explanation above, this study aims to produce web-based digital library products that can be used as learning resources in elementary schools and to assess the feasibility of web-based digital library products so that they can be used as learning resources in elementary schools.

RESEARCH METHODS

This study used a research and development design type using the PPE (Planning, Production, and Evaluation) model proposed by Richey and Klein (2014). This research included level 1 research and development, where researchers only conducted research and created prototypes of web-based digital library products, which would be validated internally by experts and practitioners.

The study was conducted at SDN Sindang III, Majalengka, in March-May 2022. The research subjects were the school principal, ten teachers, and 43 students, which were taken using purposive sampling because the researcher only used high-grade students in the interview activities. The research object was a web-based digital library product.

The research procedures were carried out following the stages of the PPE model, namely: 1) Planning; at this stage, the researcher conducted literature studies and field studies through observation and interviews to identify potency, problems, and various needs from the school

principal, teachers, students, and the curriculum used by the school, so that later from this data it could determine what products would be developed along with their specifications. 2) Production; at this stage, the researcher designed and compiled product prototypes to be developed, namely web-based digital libraries. In addition, researchers also designed and collected various books, modules, learning videos, and other reading materials that followed the school curriculum. In designing digital libraries, researchers use the waterfall method (Murtina, 2020), which consists of defining requirements (detailing admin and user needs), system and software design, implementation and unit testing, integration and testing system, operation, and maintenance. Furthermore, 3) evaluation; researchers conducted product validation internally to experts and practitioners.

The instruments used in this study were observation sheets and personal sheets used at the planning stage. Observation was the first step in analyzing needs and exploring potentials and problems. At the same time, the method was carried out at the information-gathering stage to determine what product would be developed. Observations were made thoroughly of the school environment and learning process, while interviews were conducted with the principal, teachers, and students. Observations and interviews were carried out using previously prepared guidelines.

In addition to the two instruments above, this study also used a product validation sheet instrument as a questionnaire for three experts and two practitioners. The product validation questionnaire uses the DigiQUAL protocol

adapted to the needs (Alipour-Hafezi & Nick, 2015). The DigiQUAL protocol consists of 7 aspects, namely accessibility, navigability, interoperability, collection building, resource use, digital library as a community, and the federation's role.

Data analysis used for observation and interview data was carried out qualitatively using Miles, Huberman, and Saldana (2018). Qualitative data analysis was carried out during and after data collection was completed. The stages in qualitative data analysis were data reduction, data display, and conclusion. The data obtained was related to explaining the results of identifying school needs, school potential, and problems faced by the school.

While the data generated from the questionnaire was carried out quantitatively, namely descriptive statistical analysis, which aimed to process the data obtained from the product validation sheet into a description and an average score. The assessment results related to product validation were calculated as an average number and interpreted into the eligibility criteria shown in table 1.

Table 1
Criteria for a level of validation results

Score average	Qualification	Decision
4,51 ≤ x ≥ 5,00	Very good	Worthy
3,51 ≤ x ≥ 4,50	Good	Worthy
2,51 ≤ x ≥ 3,50	Average	Decent with repair
1,51 ≤ x ≥ 2,50	Poor	Not feasible
1,00 ≤ x ≥ 1,50	Very poor	Not feasible

Source: Arikunto and Jabar, 2018

Based on the table above, the web-based digital library developed is valid and feasible if it has good, very good, or average qualifications. If the assessment of the validator is weak or very weak, then the digital library is not yet feasible and must be improved again.

RESULTS AND DISCUSSION

The product of this research was a web-based digital library that contained various books and learning resources such as 2013 curriculum books, *Kurikulum Merdeka's* books, numeracy literacy modules, children's story books, learning videos, teacher books, and other learning resources that were adapted to the school needs. All of these collections amounted to approximately 407 collections. The stages of developing a web-based digital library according to the PPE model steps were as follows.

The first stage of planning was analyzing the potential problems in the school and then analyzing the need to find solutions. From the observation results, the physical and social environmental conditions at SDN Sindang III were excellent and conducive to learning activities. However, in learning, the problem faced by students and teachers was the lack of accessibility to learning resources.

The availability of adequate learning resources will help students and teachers achieve the desired learning objectives. As Hadiapurwa, Novian, and Harahap (2021) explained, learning resources are essential

in the learning process because in understanding the material, students need to depend more on what the teacher gives but must be assisted with sufficient learning resources.

Even so, according to Samsinar (2019), learning resources are essential to the educational process. Learning resources include images, videos, audio, text, people, or media that students use to help the learning process. The 2013 Curriculum textbook facilities, both teacher's and student books, still need to be improved, so students still have to use the books in groups. Schools also need a library building, and book collections need to be improved while building a library requires a long process.

The results of the interview with the school principal also stated that the school had applied for library assistance several times. However, it was always constrained because the school needed more land to construct a new building. So far,

> "Students and teachers had difficulties accessing books since book collections were only kept in classrooms, and it was common for these books to be damaged and lost due to lack of maintenance" (N. Hendariah, Interviewed, March 21, 2022).

Interviews were also conducted with teachers and students, who confirmed that the school is still lacking in learning resources. As said by teachers,

> "When implementing learning, sometimes we are still limited to the use of books at school" (A. Ajiz, Interviewed, March 21, 2022).

> "Schools need to apply for library assistance because it is one of the important components in schools"

(N. Rohilah, Interviewed, March 21, 2022).

In addition, students also complained that they were still uncomfortable with the condition of learning resources at school.

> "During learning, sometimes we have to share resource books because there are not enough books in the classroom" (M. Kaffa, Interviewed, March 22, 2022).

> "In the classroom there are only textbooks; there are no story books for children even though we want to read story books too" (I. Oktaviani, Interviewed, March 22, 2022).

On the other hand, SDN Sindang III already had adequate ICT facilities, namely the availability of laptops for teachers, android tablets for students, and adequate internet access. Supporting devices needed in building a digital library included computers, the internet, and software. Judging from the supporting facilities owned by the school, it could be used to support the creation of a web-based digital library so that students and teachers were expected to find it more accessible and easier to access learning resources as needed. Digital libraries organized according to learning needs will be better than open digital sources available online (Chen & Lin, 2014).

Based on the analysis of school conditions, the researcher decided to create a web-based digital library at this stage. Researchers also began to design a web-based digital library which would be developed later. Before designing a web-based digital library design, collections must be prepared that would later be published, such as textbooks, children's story books, numeracy literacy modules, learning videos, books for

teachers, and other relevant learning resources.

The collection of books included in the digital library was selected by adjusting the curriculum used by schools, namely the 2013 curriculum. In addition, non-learning books and learning videos were also adapted to the material being studied by students according to their grade level. This was the collection of digital books the Ministry of Education and Culture provided so that the teacher was no longer needed.

It was also designed regarding appearance, layout, and what features were needed in this web-based digital library. They were turning printed books into digital books. The display and design were designed to make it easier for students, teachers, and other users to operate and obtain information resources. A well-designed digital library will benefit readers (Ilahi, Widiaty, Wahyudin, & Abdullah, 2019).

The next stage was production. At this stage, the creation of a web-based digital library prototype was started according to the design that had been previously designed. Researchers used the Google Site to develop this web-based digital library because it was easy to use, and its features could be adjusted according to needs. In addition, an internet-based digital library that can be updated at any time is one of the most significant assets of this developing technology (Kaur, 2015). The internet also provided the impetus and technological environment for developing and operating a digital library.

Teachers could also upload material or modules that are made according to the needs of their class. This web-based digital library was open access so that not only teachers, students, and school members could access it, but others could also use it in general. Hartono (2020) explains that the library also carries a mandate as a place of learning and partnership for the community, so it must be open to all groups to realize lifelong learning. In addition, the existence of this digital library can improve the quality and speed of the service process for library users to facilitate the teaching and learning process in the school and home environments (Mulyawati & Marini, 2022).

The third stage was evaluation. Three experts and two practitioners then validated the created digital library. Next, it was revised based on these experts' and practitioners' suggestions and product improvement recommendations. This web-based digital library validation instrument used the DigiQUAL protocol, which consisted of seven aspects. The DigiQUAL protocol is a comprehensive and thorough protocol for evaluating digital libraries because it covers all aspects of the digital library (Alipour-Hafezi & Nick, 2015).

According to Purwaningsih and Dewi (2019), the explanation of these aspects is as follows: 1) Accessibility, related to users' convenience when using digital libraries. 2) Navigability, related to menus and links as a guide for visitors in obtaining information on pages in the digital library. 3) Interoperability, related to digital libraries' ability to interact with other applications. 4) Collection Building related to the development of digital library collections. 5) Resources use, related to the relevance of existing

resources in digital libraries according to what users need. 6) Digital library, as a community, relates to the existence of a place to provide suggestions, reviews, and interactions between users and developers. Furthermore, 7) the Role of the federation is related to aspects of the usability of features in digital libraries.

Validation was carried out by experts consisting of three people and by practitioners (teachers) consisting of two people. The validation results from several experts and practitioners are in table 2. Moreover, information was obtained from the seven DigiQUAL aspects used to assess the validation of digital library products. The developed web-based digital library could be used as a learning resource. It could be seen from the average score of each aspect, namely for the aspect of accessibility, obtaining an average score of 4.5, navigability obtaining an average score of 4.5, interoperability obtaining an average score of 4.2, collection building obtaining a score an average of 4.2, resources use, got an average score of 4.4, digital library as a community got an average score of 4.1. The federation's role got an average score of 4.5 (table 2).

Table 2
Results of the validation product

Aspect	Average	Qualification	Decision
Accessibility	4,5	Good	Worthy
Navigability	4,5	Good	Worthy
Interoperability	4,3	Good	Worthy
Collection building	4,2	Good	Worthy
Resources use	4,4	Good	Worthy
Digital library as community	4,1	Good	Worthy
Role of federation	4,5	Good	Worthy

Source: Product validation questionnaires, 2022

Of the seven aspects, the acquisition of scores that were still low was in the digital library as a community aspect. It was because digital libraries had yet to be widely used, and there were still few users who interacted in digital libraries, so they tended only to be catalogs of books. They did not evoke a sense of togetherness. For this purpose, the digital library development at SDN Sindang III had features where users could interact with other users and developers. Users could also provide suggestions and input for developers through the comments column.

In addition, the collection-building aspect still got a low score compared to other aspects. It was because the book collections in the digital library that were being developed still needed to be added, especially for children's story books and books for teachers. Nevertheless, overall, from the acquisition of the average score for each of these aspects, the developed web-based digital library was already in the excellent category, with an average score of 4.4. This web-based digital library was suitable for use as a learning resource.

In addition to validating products through validation questionnaires, experts and practitioners also provided suggestions and recommendations for developing this digital library, namely the

need for other book collections, textbooks, and other supporting books. Digital libraries should also focus not only on sources of learning resources for students but also on the need for reading sources for teachers so they can develop their profession with the hope that later teachers will also have digital skills. Educators must also have digital skills because educators are critical players in driving the new digital environment in schools and universities (Camilleri & Camilleri, 2016).

Information and Communication Technology (ICT) has revolutionized how the world community obtains and uses information (Kato, Kisangiri, & Kaijage, 2021). ICT utilization greatly influences

the teaching profession in the 21st century. In addition, with the help of information and communication technology, learning can be carried out in multiple ways and provide individual services anywhere and anytime. So, with ICT, knowledge can be transmitted quickly and widely. Technology is the result of scientific developments that occur in education. Therefore, it is appropriate for education to use technology to assist learning.

After analyzing and processing the validation data, the digital library was revised again according to several experts' and practitioners' validation results and suggestions. Here is a look at the revised digital library.

Figure 1. Home of web-based digital library
Source: SDN Sindang III, 2022

The homepage contains initial information about the digital library, the school's learning activities documentation, a brief school profile, and a menu of available books. Researchers also added

links to Ministry of Education and Culture portals that are suitable for elementary schools, and there is also a discussion forum for visitors.

Figure 2. Some book menus
Source: SDN Sindang III, 2022

Some book menus include 2013 curriculum books, *Kurikulum Merdeka's*, numeracy literacy modules, children's story books, and teacher-supporting books. The books are adjusted to the elementary school level and the curriculum used by the school. In addition, this digital library is also enriched with learning videos.

Books contained in the digital library are catalogued as a tool for information retrieval. Cataloguing is carried out based on the class level to make it easier for students or teachers to find the needed books. Besides that, the catalog also describes the book title, author, publisher, and physical appearance.

Presenting a digital library to achieve the criteria used as a learning resource cannot be separated from considering the characteristics of students and teachers, school conditions, and the supporting facilities owned by the school. With a digital web-based library, students can find information about the subject matter more quickly. Knowledge will be formed collectively from many thoughts and views spread through internet media.

Libraries worldwide are changing rapidly due to ICT's continuous growth and application (Masrek & Gaskin, 2016). From this base, the school library must be able to develop and use information technology to achieve learning goals. The rapid development of the internet and new sources of information have forced libraries to make changes, both in the form of collections and in the pattern of their services.

Technological advances have spawned new learning resources (Dopo & Ismaniati, 2016). Digital libraries promise new social benefits, especially in learning in this digital era, starting from removing time limits so that they are easily accessible anywhere and anytime. Web technology-based digital libraries will allow users to access collections anywhere and anytime as long as users are connected to the internet (Wardana, 2015). Information and communication technology is also changing the educational landscape by providing opportunities for students to engage in asynchronous learning activities (Hyman, Moser, & Segala, 2014).

In addition, this digital library also provides sourcebooks that have been adjusted to the school curriculum and grade level so that students and teachers can only sort out a few books available on the internet and can be used as an alternative in finding learning resources. According to Rohmadhani, Sobri, and Gunawan (2019), developing a school library as a learning resource can create excellent schools and extraordinary students if the school library still needs to get a physical library building. Therefore, the digital library can help students and teachers to access and enrich the learning resources needed, as well as get them used to using technology.

CONCLUSION

The development of a web-based digital library as a learning resource facility in elementary schools has fulfilled the eligibility criteria to be used as a learning resource. Web-based digital library products from this research and development are developed through three stages: planning, production, and evaluation. Development is carried out according to the needs and conditions of schools that still have limited access to learning resources and still need a library building. The digital library product contains various learning resources adapted to the curriculum used by schools, including the 2013 curriculum book, *curriculum Merdeka's* books, numeracy literacy modules, storybooks, learning videos, and other learning resources that can be accessed openly by students and teachers. The results of product validation by several experts and practitioners, according to 7 aspects of the DigiQUAL assessment, show that the product feasibility level is in the excellent category

by obtaining a score of 4.4, so the digital library product is suitable for use as a learning resource. However, this digital library product must be developed, especially in book collections. Further research will likely continue to develop and manage digital libraries, especially in elementary schools, to support easy access to learning resources and create effective and innovative learning.

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