

WEB-BASED LOW CARBON ON UNIVERSAL DESIGN FOR LEARNING: A CONCEPTUAL DESIGN

MUHAMMAD NUR HUDHA^{1,2}, IDA HAMIDAH^{1,*},
ANNA PERMANASARI¹, ADE GAFAR ABDULLAH¹

¹Universitas Pendidikan Indonesia, Jl. Dr. Setiabudhi no 229, Bandung 40154, Indonesia

²Universitas PGRI Kanjuruhan Malang, Jl. S. Supriadi no 48, Malang 65148, Indonesia

*Corresponding Author: idahamidah@upi.edu

Abstract

Low carbon education is a low carbon concept that must be taught to students from an early age. This concept can be developed using technology. This paper aims to identify application development procedure which consists of 2 phases. The first phase consists of communication with experts and components of integrated e-low carbon media. then the second phase consists of content analysis, gather models, develop conceptual design model and conceptual design model of integrated e-low carbon media. This web application product is a web-based multimedia called integrated e-low carbon media. This web application applies the Universal Design for Learning (UDL) learning principle so that it is friendly to all students with various characteristics. Therefore, integrated e-low carbon media can be used as a solution in low carbon learning.

Keywords: Integrated e-low carbon media, Low carbon education, UDL.

1. Introduction

Low carbon education (LCE) is an educational concept that has been widely practiced in the world of education by several developing countries. This concept is urgently needed by all students in order to acquire the knowledge and skills needed to promote sustainable development. LCE has become a trend in education that aims to reduce energy consumption and pollutant emissions, increase the utilization rate of environmentally friendly energy, and create awareness of low-carbon public behavior [1]. The topic of low carbon in Indonesia in general already exists in learning in elementary schools. However, its application is still implied in elementary school science textbooks. If we want our students to have awareness of low carbon content, then it is very important to incorporate the concept of low carbon starting at the elementary school level [2]. Utilization of low carbon in learning can be applied using technology [3]. Applications in the field of technology are expected to help students understand low carbon content. However, in the implementation of learning in some schools, there are still many obstacles or problems, especially for teachers. Based on observations and realities in the field, science learning is sometimes difficult to separate regular students from students who have slow learner barriers.

One way to overcome these problems is to use Universal Design for Learning (UDL). UDL is considered a learning approach to address student needs and overcome all obstacles and difficulties in the learning process [4, 5]. UDL design is one of the learning frameworks that can help teachers develop subject matter, activities, and assessments that can be tailored to the needs of all students [6]. UDL suggests that learning should provide multiple ways to engage students, contain content, and keep students active in the classroom. UDL can improve the quality of education through the creation of a more flexible and student-centered learning environment [7]. The UDL strategy also improves learning for all students.

Utilization of UDL [8] and LCE [9, 10] can be done using technology or multimedia. This utilization can be in the form of learning media. One of them is the use of online technology in learning [11]. The UDL design could be such as, (a) using short video narration (30 to 90 seconds) with embedded data and appropriate issues, (b) offering multiple videos to illustrate the same content in different ways in different contexts, (c) presenting various questions for each video to match the level of complexity and provide challenges and assistance based on student learning needs, and (d) embed a computer-based program to illustrate performance data to students. These four initial design principles align with UDL's principles of providing multiple ways of representation and engagement. Research related to the development of UDL-based blended learning systems for inclusive classes has actually been carried out, but it is still limited to the use of simple power point media [12]. The purpose of this study was to design an integrated e-low carbon media application for learning in elementary schools.

2. Design Procedure

This research is a research that develops a web-based application. The research procedure is an adaptation of existing research as shown in Fig. 1 [13]. This research was carried out in two phases. The first phase is carried out by analyzing the design of the problem between the researcher and the expert team who are also

involved as the research team. This discussion resulted in a web-based learning media design and analysis of its needs and accompanying web components.

The second phase is the content analysis phase with the qualitative content analysis process method with research steps, namely 1) Data collection; 2) Data analysis textbook; and 3) Ethical considerations [14]. Researchers analyzed low carbon content in learning in elementary schools from a review of 26 textbooks from ten publishers in Indonesia, with the focus of the study covering the selection, presentation, provision of supporting materials, and the existence of issues that discuss low carbon. After that, the Gather Model was carried out, namely the existing conceptual model was used as a basis for understanding the requirements for designing and developing applications to propose new technology concepts with the same goal. Then define requirements, namely the process by which researchers describe and select application requirements. As the final stage of designing and developing applications, namely the process of designing and developing applications.

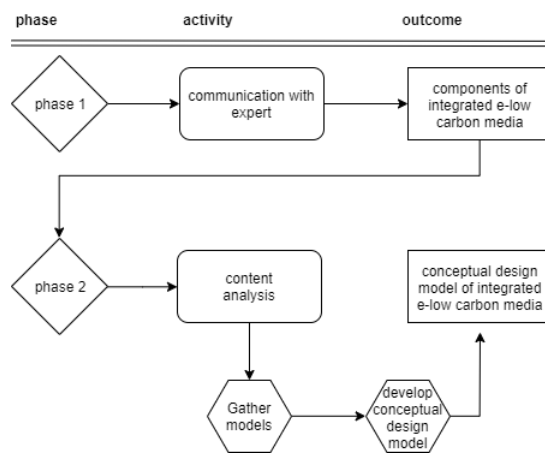


Fig. 1. Application development procedure.

The components of this application as shown in Fig. 2, namely the web must have visual, audio, audio-visual and animation. While the web as the tool for delivering information on this web is learning engagement, learning characteristic, and action & expression. The web application elements are as shown in Fig. 2.

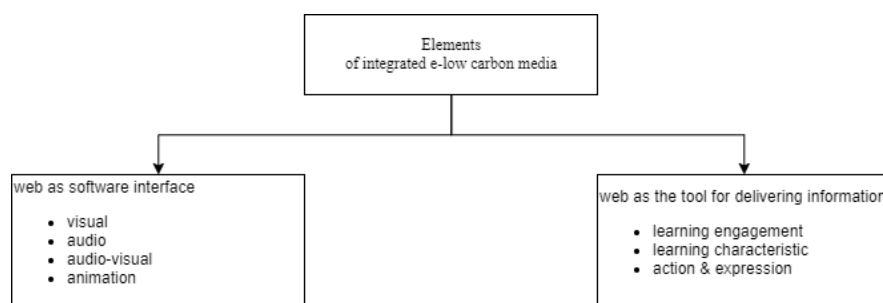


Fig. 2. Elements of integrated e-low carbon media.

3. Results and Discussion

The working system of this application is a web application that functions as a medium that interacts directly with users (students and teachers). The flowchart of the integrated e-low carbon media web application system design can be seen in Fig. 3.

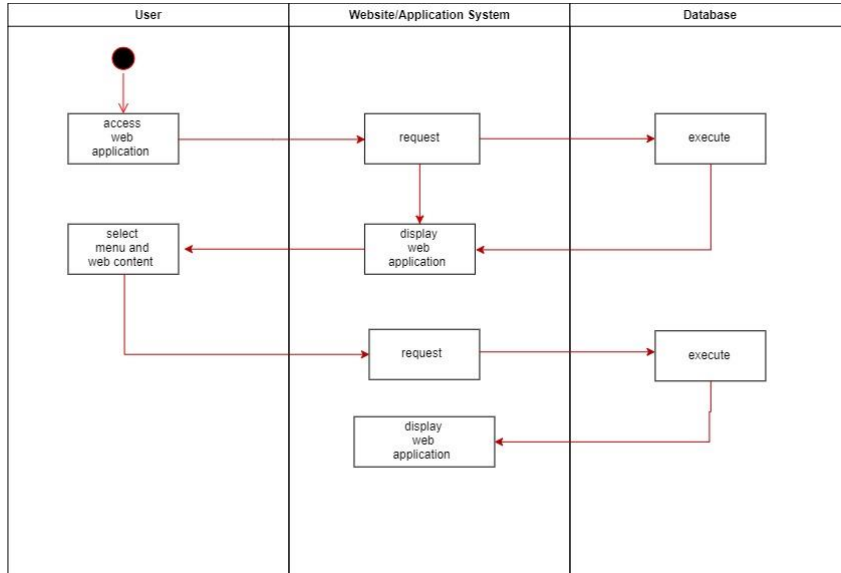


Fig. 3. Flowchart of system design.

The web application system design flowchart starts from the user/student accessing the integrated e-low carbon media web application url. The web application requests a command to the database to display the landing page. Users will see the content and menus on the page. Then the user selects and performs access activities on the web and the web application will return the request to the database system to display content. This application can be run with various browser engines such as internet explorer, Mozilla, safari, opera, and google chrome.

We chose the web application as a media platform because the use of web applications has several advantages, such as involving students in activities and interactions during learning. In addition, a significant advantage is that web applications have been widely used by most students in daily life [15]. Therefore, the proposed approach can please most of the participants in using web applications in a new and meaningful way.

The main platform for web applications is WordPress. WordPress is open source and based on PHP and MySQL [16]. WordPress as one of the most prominent Content Management System (CMS) on the web [15] which is used to run and manage web applications [17] with more than 60 million websites in the world [18]. WordPress is very popular with 31.3% market share usage among all websites on the internet [19]. One of the advantages of this platform is its intuitive and user-friendly software interface. Another advantage is that it has a lot of plugins

that can be added [20]. This feature is installed to help website application services. There are paid and free features, one of which is Elementor. Elementor is used to organize the interface design to make it look attractive and dynamic. Video conferencing features can be facilitated using the Video Conferencing with zoom plugin. Asset Management features supporting websites are very important. Features related to video conferencing are very important for learning because this video is a long-distance communication and communication medium used for various lectures, student tutorials, project reviews, and so on [21].

Assets are developed and produced in the form of Visual, Audio, Audio Visual and Animation. Visual assets are developed using Adobe Photoshop, Illustrator, and CorelDraw. Assets in the form of digital books are developed first using the software above and then processed using flip html 5 to obtain file extensions that suit your needs. Video assets are recorded using the camera and edited using Adobe Premier and 3ds Max. Animated assets using Adobe Illustrator and video scribe software.

Existing assets are stored in cloud sourcing utilizing Google Drive and YouTube. This method was chosen to reduce the performance of the website in loading data. How to paste sources that are in Google and YouTube drives using the sharing feature attached to the website page. YouTube is a learning tool in education [22] and the largest video sharing site on the internet [23, 24]. The choice of using YouTube apart from being light is that there are many learning resources in the form of videos that can be found on YouTube [25]. The use of video in learning makes students more enthusiastic in the learning process because the delivery of material is not monotonous, as a result student are more motivated [26]. Then the lightweight visual assets will be directly included in the hosting database. So that the performance of the website is maximized.

This application has various service features that really help students in learning. Among them are learning engagement, learning characteristics, and action & expression [27]. With this multimedia content, students will find it easier to understand the material to create a child's focus in learning. In order for children to create focus and attention, several things are pinned that make students focus. Among them are video content or other things that are considered interesting. The use of audio and visual can help students learn more effectively and attract students' attention when learning [28]. In addition, learning using interactive multimedia-based applications is considered more effective in learning in elementary schools [29]. The use of media applications (multimedia) can also be used to visualize the understanding of abstract concepts [30].

Students are given the option of reflection to arouse students in self-regulation learning. This is important because students who have self-regulation are able to complete the task completely [31]. Students are given several options for learning materials so that students understand the concept according to the characteristics of each student. This application presents information digitally and gives students the opportunity to customize the display according to the perceptual needs of students. This web application also displays information in a variety of ways (visual, text, multimedia, etc.) and provides a choice of learning resources for students' level of understanding. Students' understanding is also shown by the evaluation feature. A selection of action and perception features are available on this web. The workflow and application services can be seen clearly in Fig. 4.

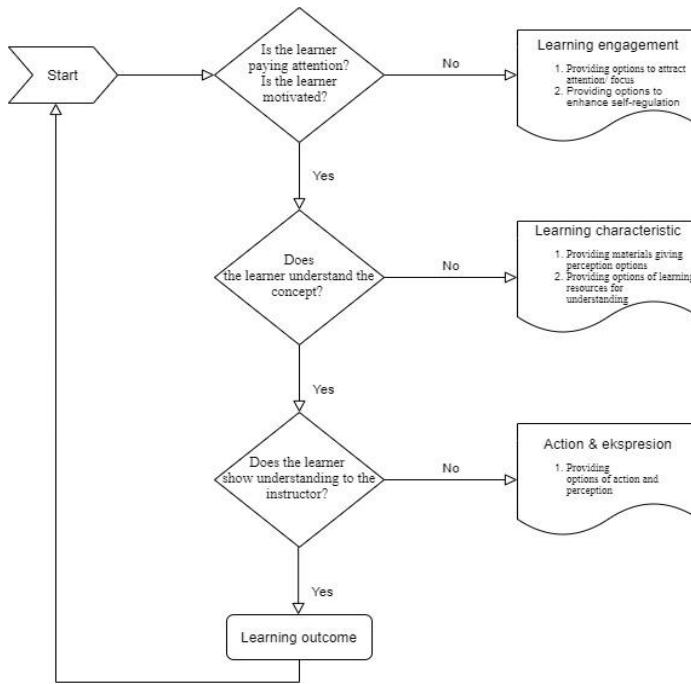


Fig. 4. Workflow and application services.

This web application is based on the level of knowledge that will be achieved by students on the material being studied, which is related to low carbon. Students learn the material in a structured manner in accordance with the order of the material that has been available so that students learn in a gradual way. This application provides various features that will make it easier for students to learn according to the principles of UDL learning. Web applications must also meet the honeycomb criteria as shown in Fig. 5, namely valuable, useful, desirable, accessible, credible, findable, and usable. This is because UDL is a program that proposes a series of guidelines to make learning more accessible to all students with a focus on the concept of variability [32]. UDL includes three core principles namely multiple means of representation (i.e., presenting information and content in different ways); different ways of acting and expressing (i.e., differentiating the way students can express what they know); and various modes of engagement (i.e. stimulating interest and motivation to learn) [33, 34].

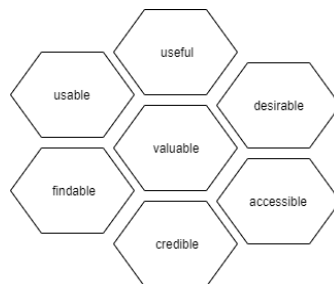


Fig. 5. Experience honeycomb.

4. Conclusion

This paper defines the conceptual design of the term integrated e-low carbon media. This integrated e-low carbon media is a web application that allows students to learn low carbon content with UDL principles. This application has service feature attributes that are very helpful for students in learning. Among them are learning engagement, learning characteristics, and action & expression. In addition, this web application is developed in the form of Visual, Audio, Audio Visual and Animation. This web application has several advantages including loading multimedia content and is user-friendly, namely elementary school students. Thus, this web application can be used by all students with various characteristics in learning low carbon education. It is recommended that further research put more focus on bigger samples and various levels of schooling in order to have bigger impacts.

Acknowledgements

Authors would like to thank the Ministry of Research and Technology/National Research and Innovation Agency, Kemdikbud-Dikti, the Indonesian Education Fund Management Institute (LPDP-Indonesia), the Graduate School of the Indonesian University of Education and the University of PGRI Kanjuruhan Malang for sponsoring this research.

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