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E-LOW CARBON MEDIA AWARENESS FOR ELEMENTARY SCHOOL IN INDONESIA USING USER EXPERIENCE QUESTIONNAIRE

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Abstract

Web-based learning is commonly applied in this post-covid era since it is believed to improve some students' thinking skills. One of the implementations is the use of e-low carbon media which was developed to assist students in studying low carbon. Therefore, evaluating the use of e-low carbon media user interface according to user experience is the aim of this current study. A questionnaire that was applied to measure subjective impressions of user experience is the User Experience Questionnaire (UEQ) which contains 6 rating scales, namely: Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty. It consists of 26 question components with 7 answer choices. The results of UEQ data show that based on user experience e-low carbon media can be applied properly.

Keywords: Low carbon education, UEQ, Web-based learning, User experience.

1. Introduction

Learning media serves as a tool used to help teachers in carrying out learning activities both inside and outside the classroom to achieve learning objectives [1]. One of the common learning media nowadays is web-based learning (WBL) [2] which is commonly called online learning or e-learning because it includes course content and all educational interventions that involve the internet. WBL is an online learning media that is accessible through an internet connection [3] and is currently developed by most of the established academic institutions and organizations around the world in the form of courses [4, 5]. This is because the WBL has different characteristics compared to conventional learning scenarios [6]. In addition, web media is also a means of networking for teachers to improve their competence [7].

Many media developers work on product validation before marketing their products. The development of media in the field of learning is no exception. Often, media developers use only one key figure to rate the entire product, when multiple raters should be able to review their product [8]. Constraints faced in assessing products are usually related to the type of questions that result in relatively long processing times. Media must be easily learned, efficient, and well controlled, and must have supplementary criteria such as aesthetics, usage pleasure, novelty, or desirability to get a decent user experience.

User experience is the response a person receives after using a product or application [9]. Plenty of questionnaires to measure user experience have been developed, for example, Questionnaire for User Interaction Satisfaction (QUIS) [10], System Usability Scale (SUS) [11], Software Usability Measurement Inventory (SUMI) [12], UIQ Technology Usability Metrics (UTUM) [13], Usability Metric for User Experience (UMUX) [14] and User Experience Questionnaire (UEQ) [15]. This current project is based on key figures to better judge. This results in efficiency in the use of time in assessing the product. One of the measuring tools used in this study is the UEQ which is a standard and valid general questionnaire with an evaluation tool to measure and analyze user experience for a product or service. UEQ is commonly used to measure the subjective impression of the user towards the product usage experience and the user experience efficiently and reliably [16]. Based on these considerations, this study aims to test a web program, namely e-low carbon media which has been developed based on the UEQ analysis of teachers and students and also provides recommendations for technology-based learning media improvement. This research will not only benefit learning media developers, but also future students regarding better learning experiences in computer-based learning environments.

2. Low Carbon Education

The low carbon concept has several different perspectives. One of which is the low carbon concept from an education perspective which aims to develop low carbon education. In Indonesia, the term Low Carbon Education (LCE) is still rarely found in the curriculum because it has not been explicitly recognized among teachers and students [17]. In Indonesia, the implementation of the LCE program has been integrated into environmental learning or green schools. However, the coverage of low-carbon issues is too little, and additional materials related to low-carbon content in elementary school textbooks are still rare [18]. The availability of

teaching materials, guidance, and special learning models will help students carry out good environmental practices. Science education programs must be able to raise understanding and emerge emission-friendly behavior. Therefore, LCE should be the major significance in teaching science and environment to the students [19].

LCE concept is considered the solution to deliver knowledge to students regarding low carbon behavior [20]. LCE is also useful to be developed in the context of elementary school learning. LCE can be applied using an application or applied directly to school programs to increase students' environmental literacy knowledge [21]. The structure of low carbon content that can be developed in elementary school learning is presented in Fig. 1 [22].

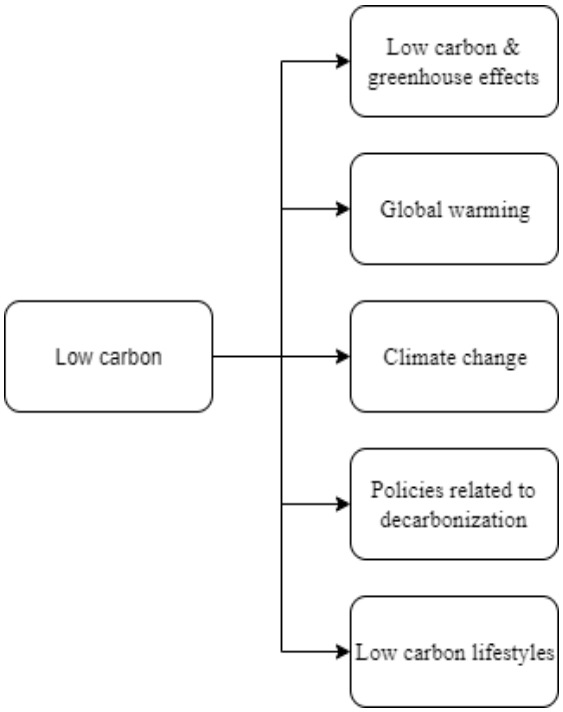

Fig. 1. The contents of e-low carbon media.

3. Method

The method applied in this study is based on UEQ and the media is presented in web form. Web-Based Learning (WBL) was developed using WordPress since it is open source and based on PHP and MySQL [23]. It is also the most widely used Content Management System (CMS) in the world [24-26]. After the respondents tested the web media, they were given a UEQ in Google Form to assess the user experience while interacting with the media and to assess how useful the media was. The UEQ used consists of survey questions that ask respondents to average their opinions on a linear scale between 2 points, which theoretically has 7 levels. Filling in UEQ takes between 3-5 minutes. This makes UEQ quite easy and efficient in terms of the duration it takes to answer all items to measure User Experience (UX) in an application design. Quick ratings like this are widely preferred by users in assessing products or user experience [27].

The targets of this study were teachers and students in Malang City who were randomly selected from both public and private schools. About10 teachers and 10 students voluntarily and intensively participated in this study. The teachers consist of 5 regular elementary school teachers and 5 inclusive elementary school teachers. Likewise with students, namely 5 regular students and 5 students who have slow learner limitations according to their school's IQ data. After the respondents finished learning with e-low carbon media, respondents were asked to fill out an online UEQ in 6 rating scales with 26 question components and 7 answer level choices which can be seen in Table 1.

The first group of criteria refers to the pragmatic quality aspect and the second is called the hedonic quality aspect, as shown in Fig. 2. The six rating scales used in this UEQ are as follows [28]: (i) Attractiveness: If the users love the product or not; (ii) Perspicuity: If the product is easy to recognize or not and whether the usage is easy to learn; (iii) Efficiency: If the users can finish their task without any simple determination or not; (iv) Dependability: If the users feel controlled toward interaction or not; (v) Stimulation: If the product usage is interesting and motivating or not; and (vi) Novelty: If the product is considered innovative and creative or not.

Table 1. The UX questionnaire items.

No.	Item Level 1	Item Level 7	Scale
1	Annoying	Enjoyable	Attractiveness
2	Not understandable	Understandable	Perspicuity
3	Creative	Dull	Novelty
4	Easy to learn	Difficult to learn	Perspicuity
5	Valuable	Inferior	Stimulation
6	Boring	Exciting	Stimulation
7	Not interesting	Interesting	Stimulation
8	Unpredictable	Predictable	Dependability
9	Fast	Slow	Efficiency
10	Inventive	Conventional	Novelty
11	Obstructive	Supportive	Dependability
12	Good	Bad	Attractiveness
13	Complicated	Easy	Perspicuity
14	Unlikable	Pleasing	Attractiveness
15	Usual	Leading edge	Novelty
16	Unpleasant	Pleasant	Attractiveness
17	Secure	Not secure	Dependability
18	Motivating	Demotivating	Stimulation
19	Meets expectations	Does not meet expectations	Dependability
20	Inefficient	Efficient	Efficiency
21	Clear	Confusing	Perspicuity
22	Impractical	Practical	Efficiency
23	Organized	Cluttered	Efficiency
24	Attractive	Unattractive	Attractiveness
25	Friendly	Unfriendly	Attractiveness
26	Conservative	Innovative	Novelty

UEQ already has Data Analysis Tools, so we only need to collect data from users and then enter it into the Data Analysis Tools which can be retrieved from the official UEQ website (https://www.ueq-online.org/). Excel tool aims to simplify the UEQ data analysis. Researchers only need to input data in the appropriate worksheets in Excel UEQ_Data_Analysis_Tool_Version<x>.xlsx.

4. Results and Discussion

This study used teacher and student respondents to gain user experience. Teacher respondents were randomly selected with various education levels of 80% undergraduate and 20% master. Teachers' teaching experience also varies from senior teachers with more than 20 years of teaching experience to those with less than 5 years of teaching experience. The distribution of students in this study was the sixth graders in elementary school. The reason for choosing them is because students in grade 6 had already taken topics related to low carbon in their schools. Figures 3 shows the UEQ results after the filling session of the user experience. The scores in the red segment present a more negative response and the scores in the green one reflects the response more positively. Based on Fig. 3, both teachers and students have a positive response to the user experience.

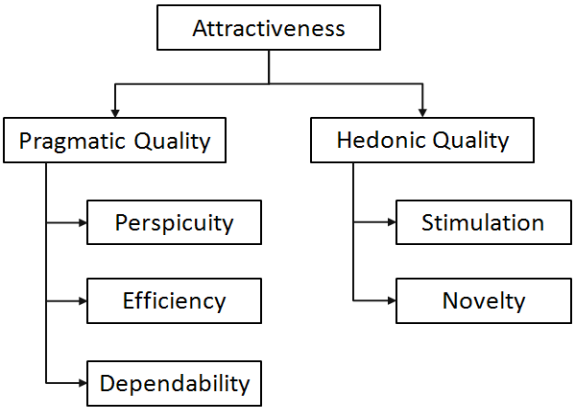

Fig. 2. The user experience questionnaire (UEQ) scale structure assumption.

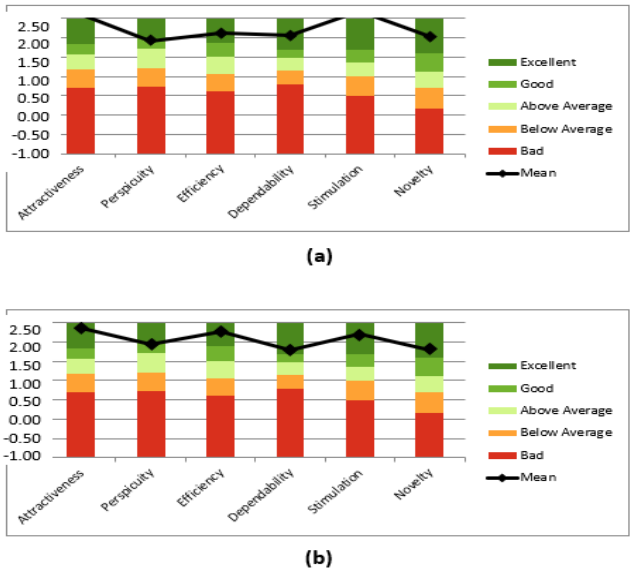

Fig. 3. a) Teachers' UEQ results; b) Students' UEQ results

Based on Fig. 3, both teachers and students provided positive responses to the tested media because, according to them, this media is very familiar to their daily lives. This media uses the web in its operations. In addition, this media is also supported by multimedia devices that present words and images. The presentation of words can be reflected in sound or audio and images can be in the form of static graphics (diagrams, photos, or illustrations) or dynamic graphics (animations or videos) [29]. On the other hand, according to the teachers, this media should be used as synchronous learning first and then continued with asynchronous one. This media is indeed designed with a hybrid or blended learning system to simplify the way of students in learning before the study begins in class or by repeating the learning material that the teacher has conveyed in class. By developing mobile technology and online courses, students can easily access multimedia materials without being limited by time and place [30].

This media also discusses good material, namely low carbon which is following the curriculum in elementary schools in Indonesia. According to the analysis results of the low carbon content in the level of elementary school, the topics that can be taught in Indonesia are low carbon and greenhouse effects, global warming, climate change, policies related to decarbonization, and low carbon lifestyles [22]. The essential purpose of this e-low carbon is to define and introduce the concept of low carbon to elementary school students. This media also has examples from everyday life, namely, they were instructed to reduce vehicle use, electricity consumption, and carbon emissions at home. Students are also taught how carbon emissions contribute to global warming.

5. Conclusion

The conclusion obtained from this study is the use of e-low carbon media has a positive impact based on the UEQ obtained from both teachers and students. The multimedia aspect of the developed media is a plus point media. Materials related to the environment that are packaged in the form of animation and online learning are materials that are favored by students. Teachers also easily use this media because of synchronous and asynchronous learning.

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