

Development of Fructuweb “A Learning Website of Banten’s Exotic Fruits” to Support Local Potential-Based Learning in Digital Era

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Abstract

Teaching-learning in the 21st-century is influenced by technological advances, such as the use of online media. In addition, based on Indonesia’s curriculum requirements, teaching-learning has to utilize the local potential of the environment. This study aims to develop a Fructuweb, a learning website with Banten’s exotic fruits as content to support local potential-based learning in the digital era. A 3D research and development methodology was used comprise of define, design, and develop. The subjects for expert validation were five lecturers, and for individually user response tests were four teachers and fifteen students of 10th-grade representatives from senior high school in Serang city and Lebak district, Banten Province, Indonesia. Descriptive analysis were carried out to identify learning process and media need in schools at Banten, Indonesia, also to validate the feasibility of the website. The expert validation result has an average value of 95.1% for the content material aspect of Fructuweb and 92.7% for the media aspect; as for the user response (student and teacher) was 93.4%. These results indicated that the Fructuweb is very feasible to use as an online learning source.

Keywords: Banten, Biodiversity, Exotic Fruit, Local-Potential Based, Website

INTRODUCTION

Along with the technological advances, people are considered as a digital society due to the use of digital media and the internet in their daily activities (Krishnaprabu, 2019). The use of computers and the development of information technology also have a major influence on teaching-learning in the 21st century (Keengwe & Georgina, 2012; Flake, 2017; and Thota & Negreiros, 2019). Particularly, in this pandemic Covid-19 period, online learning and the use of learning technology are effective ways for continuity of learning (Bhaumik & Priyadarshini, 2020; Crawford et.al., 2020; Mailizar et.al., 2020; and Mumtaz et.al., 2021).

Information technology can be used as a learning resource to assist the teaching-learning process, which involves searching for references and sources of information (Appana, 2008; Shen et.al., 2013; and Wekke & Hamid, 2013). Most students already use digital technology, such as tablets, smartphones, and computers in various learning activities (Maphosa et.al., 2019).

Digital platform technology in education can improve access to education since the learning materials can be used for distance learning, and also more extensive and flexible use (Moore et.al., 2011; Westermann, 2014; González-Gómez et.al., 2016; and

Krishnaprabu, 2019). Then, opening up opportunities to learn new and important issues, with empowering innovation as well (Brodie, 2018).

The use of internet-based technology in learning, such as websites (Thota & Negreiros, 2019; Hammad et.al., 2020), is currently being developed since the website provides extensive information sources, which can be accessed fast, anywhere, anytime, with easy-to-use procedures (Wasim et.al., 2014; Hardyanto & Surjono, 2016; Hammad et.al., 2020; and Nagel et.al., 2020). Moreover, the website content learning can be presented interactively because it contains pictures, videos, graphics, and other digital content as well as discussion forum facilities to stimulate active contributions in the form of comments that allow students for discussing (Tambunan, 2013; Widyastuti, 2014; and Waugh & Su, 2016)

Website-based learning supports distance learning which saves costs because there is no need for a hardcopy of material. It can be downloaded and shared in the form of a link, so it can minimize the transportation costs to get to the learning place, at one blow students are triggered to study independently (Hrastinski, 2009; Tambunan, 2013). The website as a learning resource can also increase the students' learning

enthusiasm and improve their scientific skills (Åberg et.al., 2016; Hudha et.al., 2019; and Kumi-Yeboah et.al., 2020). While, the website can be modified as needed (Chang et.al., 2011) and will have an optimal impact if it is designed properly (Peterson, 1998).

The use of educational technology must also be adjusted to the needs of education in a country, such as Indonesia, especially regarding the content required in the curriculum (Jumriani & Prasetyo, 2017). Further, one of the important opportunities in implementing websites in online learning is integrating cultural or local values as a part of website promotion (Gevorgyan & Porter, 2008).

The use of educational websites can be applied to support local potential-based learning, the learning with utilizing the student surrounding potential (Putri et.al., 2014; Jumriani & Prasetyo, 2017). Learning through local potential content and wisdom can induce environmental awareness of society to preserve their natural resources (Saefullah et.al., 2017; Nuangchalerm & El Islami, 2018; and Nisa & Wilujeng, 2020) also able to encourage student's critical and creative thinking (Sunarsih et.al., 2020).

One of the local potential resources in Banten, Indonesia, which students and the society need to know are exotic fruits. Exotic fruits are fruits that generally grows in nature. They are very

unique in shape, taste, color, and smell. These fruits are usually local fruits that are known and consumed in the local area, and most are not cultivated on a large scale (Mahattanatawee et.al., 2006; Susi, 2014; and Nasution & Hadiati, 2020). These fruits are highly nutritional (Zurriyati & Dahono, 2016; Madiyawati et.al., 2018; and Chamorro & Ladio, 2020). However, nowadays people are more familiar with imported fruits. This condition threatens the sustainability of exotic fruits in Banten, Indonesia due to the lack of cultivation.

The development of learning websites that currently exist focuses more on implementing a learning approach or model using a website (Garg, 2017; Rebelo & Isafas, 2020; Syakur et.al., 2020; and Purba et.al., 2021) or website design development (Lin & Gregor, 2006; Kusumastuti et.al., 2018; Aulia & Kusuma, 2020; and Hammad et.al., 2020). Furthermore, in developing learning websites, the content material is another important factor that needs to be considered (Rao & Hosein, 2017; Saxena et.al., 2021). In this study, by implementing TPACK approach, the integration of learning approaches, website design, and content materials that raises local biodiversity, such as Banten's exotic fruits was done to develop the website.

To integrate educational technology and local potential as learning content, this study is aimed to develop and to determine the feasibility of a learning website, namely Fructuweb. Fructuweb is a learning website with the content of Banten's exotic fruits to support local potential-based learning in the digital era, especially for the biodiversity concept. The development of fructuweb is not expected only to facilitate the achievement of student learning outcomes, but also to have an impact on the preservation of Banten's exotic fruit as a biodiversity resource.

METHOD

This study employed Research and Development (R&D) method. The developed product namely "Fructuweb", a learning website that presents exotic fruit plants in Banten, Indonesia as learning content. The development of the Fructuweb is intended to support local potential-based learning in the digital era. Fructuweb itself is derived from "fructus" (means fruit) and "web" (means website). A 3D of R&D model methodology was used that includes three stages: define, design, and develop (Akker et.al., 2007; Trianto, 2013). Detailed research procedures are shown in Figure 1.

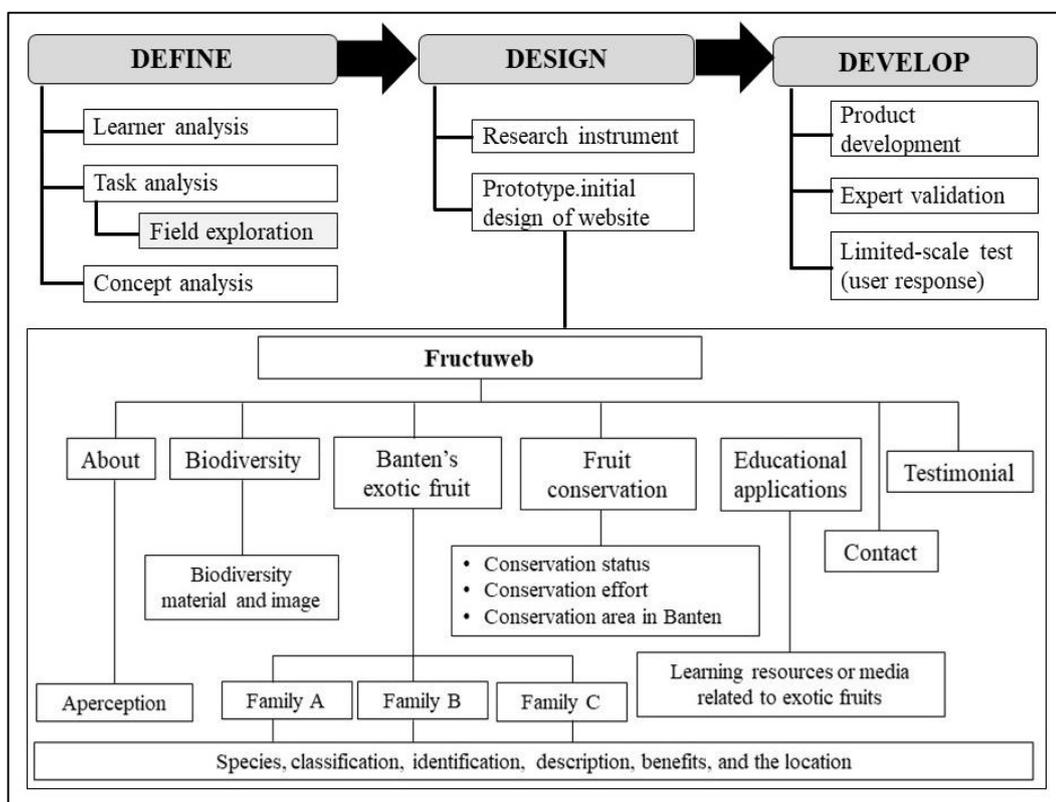


Figure 1. Research Procedures and web navigation

Research instruments

The research instrument consists of 1) interview guide and questionnaires to analyze the learning process and the needs of teachers and students in schools regarding online learning resources; 2) content material expert validation form; 3) learning media expert validation form; 4) teacher response questionnaires; and 5) student response questionnaires to determine the feasibility of Fructuweb as an online learning source.

Procedure and data collection

The define stage was conducted with several steps, including learner analysis, task analysis, and concept analysis. Learner analysis aimed to analyze and collect information from teachers and students about the learning processes and resources used in the biology subject at senior high school in Banten, Indonesia through interviews and questionnaires. Data collected in this study from 8 (eight) senior high schools representing districts and cities in Banten Province, Indonesia (Serang City, Serang District, Cilegon City, Pandeglang District, Lebak District, Tangerang District, Tangerang City, and South Tangerang City).

Furthermore, the task analysis and concept analysis are carried out to determine learning competencies that students are required to achieve and to identify local potential-based contents of

the Banten's exotic fruits which are intended to facilitate learning objectives on the concept of biodiversity. Task analysis and concept analysis were made out by integrating the results of curriculum reviews, literature studies, and field exploration of Banten's exotic fruit. The curriculum used in this study is the 2013 curriculum, the literature used is the biology book of 10th-grade senior high school in Banten, Indonesia. Then, the field exploration of Banten's exotic fruit was conducted in 8 cities and districts in Banten Province, Indonesia.

The design stage was performed to create a validation instrument and to prepare a prototype or initial design of fructuweb. The validation instrument which was in a questionnaire format was used to determine the feasibility of Fructuweb. Next, design layouts were done in the initial design of Fructuweb which include images and data of exploration Banten's exotic fruits as local potential-based content on the web. The next step was the construction of a storyboard and web navigation (Figure 1).

The development stage involved product development, expert validation, and individually limited-scale field test. The development of the product (Fructuweb) refers to the web navigation and storyboard that is designed previously. The expert validation step

was performed by 5 (five) lectures as experts on biology and web learning media. The individually limited scale test was done through user response judgment. It consists of four teachers and fifteen students of 10th-grade representatives from senior high school in Serang city and Lebak district, Banten Province, Indonesia. The product assessment was done by giving a score on every aspect of the validation questionnaire. The scoring criteria for expert validation shown in Table 1, while the user response is shown in Table 2.

Table 1. Scoring criteria for each indicator in expert validation

Score	Criteria
1	Not appropriate
2	Appropriate with notes
3	Appropriate without notes

Table 2. Scoring criteria for each indicator in user response instrument

Score	Criteria
1	Poor
2	Fair
3	Average
4	Good
5	Excellent

Data process and analysis

The data obtained through learner analysis, task analysis, and concept analysis were then processed and analyzed descriptively. Furthermore, the data from expert validation and user response questionnaires were processed using the formula below:

$$NP = \frac{R}{SM} \times 100\% \quad (1)$$

With:

NP = value obtained (%)

R = score obtained

SM = maximum score

The value obtained, categorized based on the feasibility criteria of the product shown in Table 3.

Table 3. Feasibility category of fructuweb as learning resource

Score (%)	Criteria
86-100	Very feasible
71-85	Feasible
56-70	Fair feasible
41-55	Less feasible
≤40	Not feasible

(Akdon & Riduwan, 2008; Widyoko, 2017)

RESULTS AND DISCUSSION

This study aimed to develop Fructuweb, the learning website with the content of Banten's exotic fruits to support potential-based learning. It was developed based on a needs analysis of adaptation and the use of advanced technology, especially internet use as learning resources that were carried out in schools in Banten Province, Indonesia. Furthermore, it is known that the content of biodiversity in school teaching materials need to provide more about the local potential of the region (Rusman, 2009). A website-based online learning resource has many advantages, such as its accessibility for it can be accessed anywhere and anytime as long as internet connection is available, and the content

material on the website can be updated easily (Tambunan, 2013).

Based on the results of the task and concept analysis, which were done through a review of the 2013 curriculum, showed that in the concept of biodiversity, the learning indicators that students must accomplish were identifying and classifying levels of biodiversity (genes; species; ecosystem), and linking the benefits of biodiversity and its conservation efforts. Meanwhile, based on literature studies, the sub materials that must be provided in the Fructuweb include levels of biodiversity, the distribution of biodiversity according to the Wallace and Weber lines, threats to biodiversity, and efforts to conserve biodiversity.

Furthermore, the results of field exploration showed that there were 38 species of exotic fruit plants identified in Banten, Indonesia. Exotic fruits obtained in this study are fruits that are not cultivated on a large scale so that these fruits have a high exotic value because they are rarely found by the public. The examples of Banten's exotic fruits such as "nam-nam" (*Cynometra cauliflora*), sapodilla (*Manilkara kauki*), "dewandaru" (*Eugenia uniflora*), "sambolo" (*Diospyros blancoi*), "alkesa" (*Pouteria campechiana*), "kepel" (*Stelechocarpus burahol*), and

"harendong badak" (*Bellucia axinanthera*).

The Banten's exotic fruits website "Fructuweb" has the domain name bantenbiology.com with the logo combining leaf images and the writing font "Banten Biology" (Figure 2a). The design of Fructuweb refers to aspects and criteria of a proper learning website. Things that must be considered in designing a website include an effective navigation structure, easy access, (Van Den Poel & Buckinx, 2005; Boyer & Hult, 2006; and Lepkowska & Eifler, 2008), excels in presenting information, presenting quality information and easily understood by users (Yang & Lester, 2004; Yang, Lester & James, 2007; and Lepkowska & Eifler, 2008).

In this research, to facilitate the achievement of indicators and learning objectives on the concept of biodiversity, the Fructuweb of exotic fruit plants Banten has 7 (seven) main menus. Those were "about us", "biodiversity", "Banten's exotic fruit", "fruit conservation", "educational applications", "contact", and "testimonials" menu (Figure 2a).

The first page of the web is "about us" menu. This page contains greetings and general information about the purpose of developing the website. The second page was "Biodiversity" page which contains information about the

definition of biodiversity, biodiversity level (gene; species; and ecosystem), as well as the distribution of biodiversity (Figure 2b). This information is in

accordance with the learning indicators and objectives. On this page, examples and pictures of Banten's exotic fruit diversity have been included.

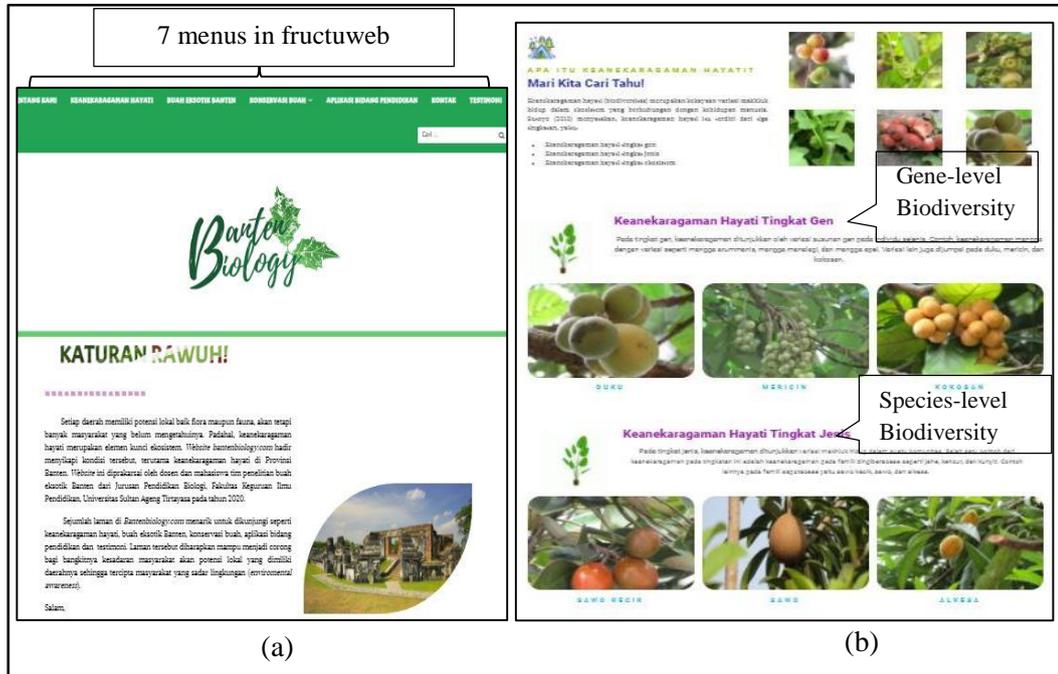


Figure 2. (a) Fructuweb home page; (b) Biodiversity page menu in fructuweb

The third page is the "Banten Exotic fruits" menu. It contains interesting information about Banten's exotic fruits. This page shows the latest information related to the exotic fruits that are presented based on their family of species. There are 21 fruit families available on Fructuweb, based on the data from field exploration (Figure 3a). Each family of species page provides an explanation, fruit species, classification, identification, description, benefits (including nutrition), and the location where these fruit species were found in the Banten province, Indonesia (Figure 3b).

The fourth is the "Fruits Conservation" menu. It consists of 3 (three) sub-menus, which cover conservation status, conservation efforts, and conservation areas in Banten, Indonesia. The conservation status sub-menu contains general information about conservation status; category of the conservation status of Banten's exotic fruits based on IUCN (International Union for Conservation of Nature and Natural Resources) red list (Figure 4). Banten's exotic fruits are categorized into 3 (three) conservation status, NE (Not Evaluated), LC (Least Concern), and NT (Near Threatened).

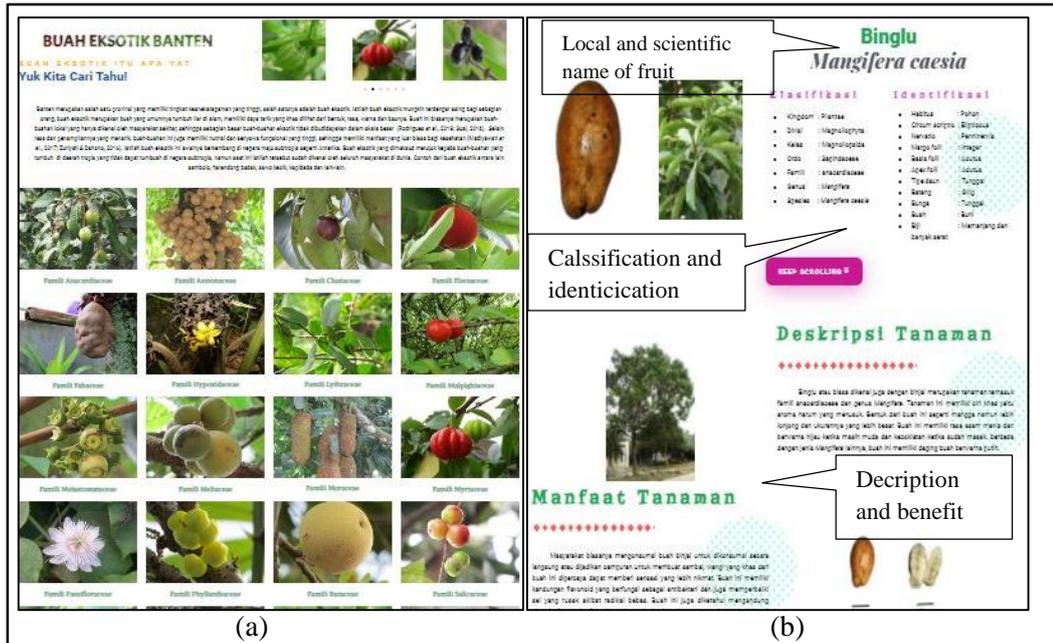


Figure 3. (a) Banten Exotic fruits page menu; (b) Species description in fructuweb

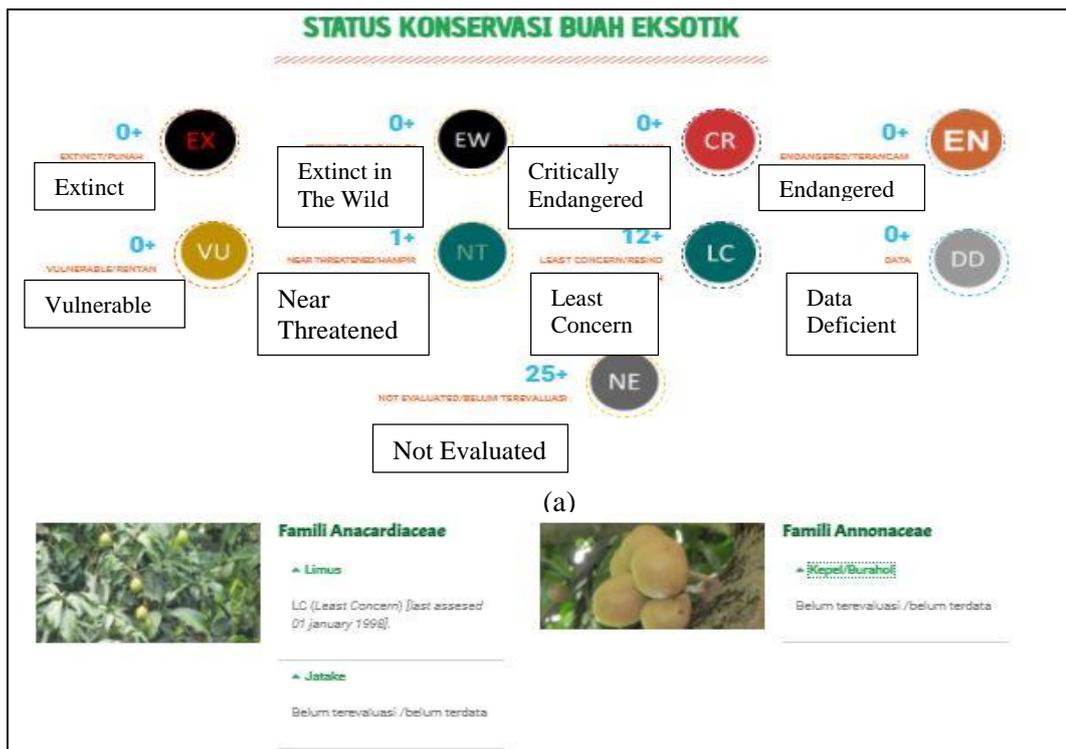


Figure 4. (a) The IUCN Red List Categories and Criteria; (b) Fruit conservation status sub menu in fructuweb

The conservation efforts sub-menu contains information on an attempt to conserve the Banten's exotic fruit, in-situ

and ex-situ conservation, enforcing the law, protecting habitat, becoming a conservation agent, and cultivating

exotic fruit plants. While, the Banten conservation area sub-menu presents information about Ujung Kulon National Park, Nature Reserve (Pulau Dua and Rawa Danau), Nature Tourism Park (Sangiang Island), and Forest Park (Carita). The menu "Fruits Conservation" is expected to be information that arouses a sense of environmental awareness so that it can inculcate a good attitude towards biodiversity and the environment.

The fifth is the "educational application" menu. It is provided to integrate other learning resources or media related to exotic fruits. In further website development, this menu will provide other teaching resources and materials containing exotic fruit content, such as encyclopedias and interactive multimedia fruit exotic.

The sixth is the "contact" menu which contains the authors' biodata information, address, and time zone. Last, the "testimonial" menu is made to provide testimonials after learning through this website. Users are expected to be able of sharing experiences that have been conducted to conserve biodiversity, especially exotic fruits in the environment, as well as add data or information about Banten's exotic fruits.

The development of Fructuweb has been through the learning resource feasibility validation, which consists of

expert validation (content material and media aspect) also user responses (student and teacher). The results of expert validation indicated that the Fructuweb is very feasible to use as a learning source in terms of its content material and media aspects (Figure 5).

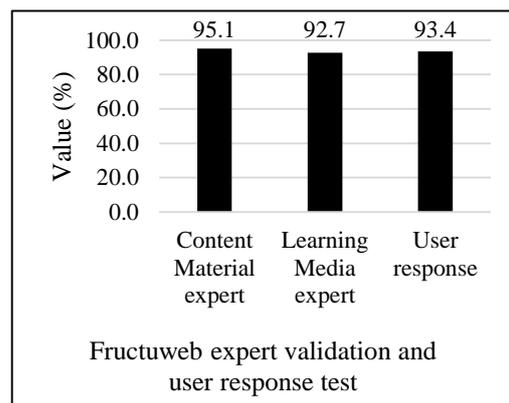


Figure 5. Fructuweb expert validation and user response test result

The average value obtained for each sub aspects of content material and media aspect in expert validation showed in Figure 6. To optimize the application of Fructuweb in teaching-learning, the expert validation result was supplemented by recommendations.

In the content material aspect, it was suggested that the exploration of more integrated content of Banten conservation area and conservation of exotic fruits should be done. Therefore, the example of exotic fruits that can be found in Banten conservation area was added to the Banten conservation sub-menu, such as "nam-nam" (*Cynometra cauliflora*) in Ujung Kulon National Park,

also “kepel/burahol” (*Stelechocarpus burahol*) in Ujung Kulon National Park and Rawa Danau Natural Reserve. All elements in learning including learning content must integrate, relevant, and influence each other to properly support

the accomplishment of learning objectives (Dolong, 2016). It is because the content of the website plays an important role, particularly in the teaching-learning process (Rao & Hosein, 2017),.

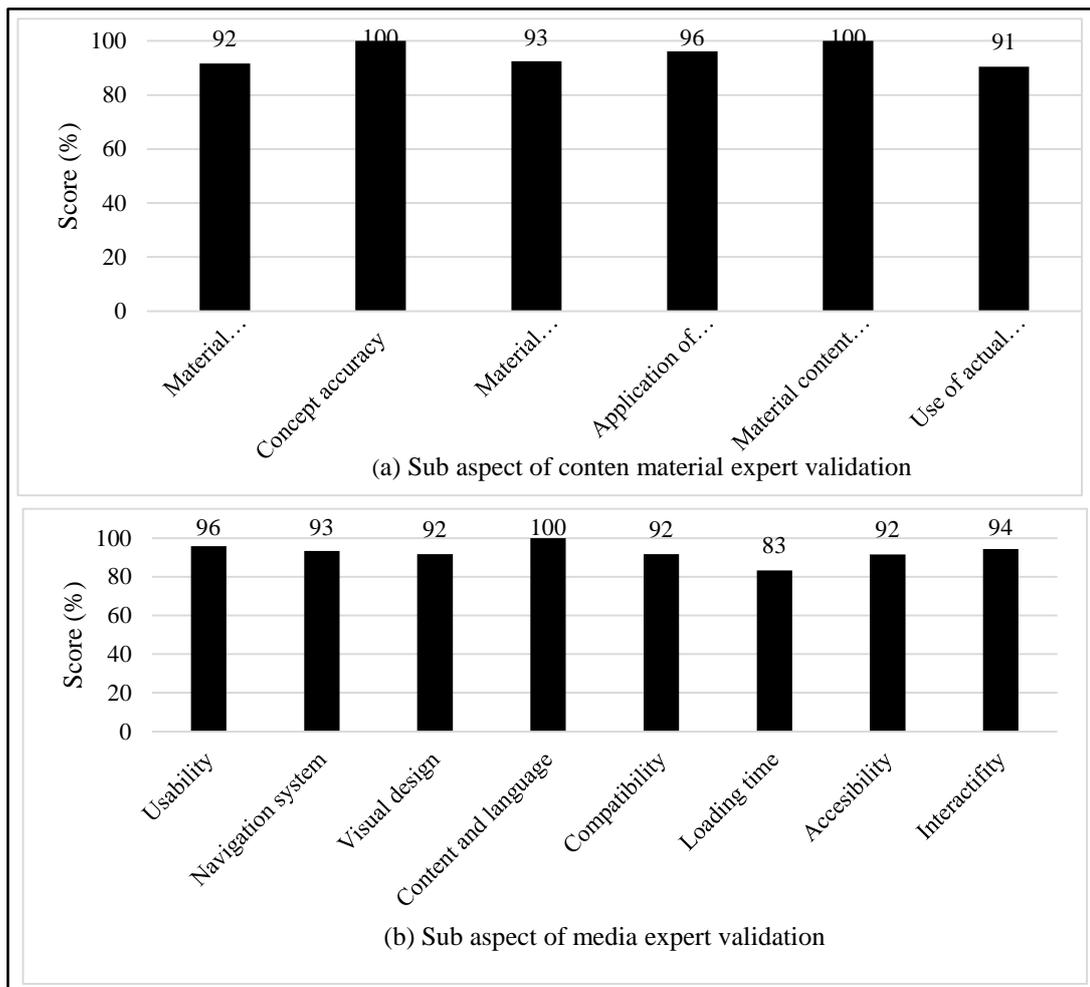


Figure 6. Expert validation result for each subaspect (a) in content material aspect; and (b) media aspect

In the media aspect, the recommendation was more directed to the loading time sub-aspect to make the indicators more appropriate. It is better to use a kilobytes unit to measure a loading time (internet speed) than the unit of time

(like second). A kilobyte is a unit of measure used to see the speed of a unit of information or computer storage (Ammar & Hanafi, 2016). As for the accessibility sub-aspect, Fructuweb is already considered user-friendly or easy to

operate. The features of tools, websites, software, or operating systems that can be categorized as user friendly are easy to use, easy to understand, practical, aesthetically attractive, and users feel comfortable when running the system.

The results obtained from the user response (teacher and student), the Fructuweb is categorized as very feasible as a learning source (Figure 7). The user

generally approved that the Fructuweb attracts their attention since the website provides Banten's biodiversity contextual content and this type of learning source is hard to find. In addition, the students whose rarely aware of its existence stated that through Fructuweb they could learn Banten biodiversity.

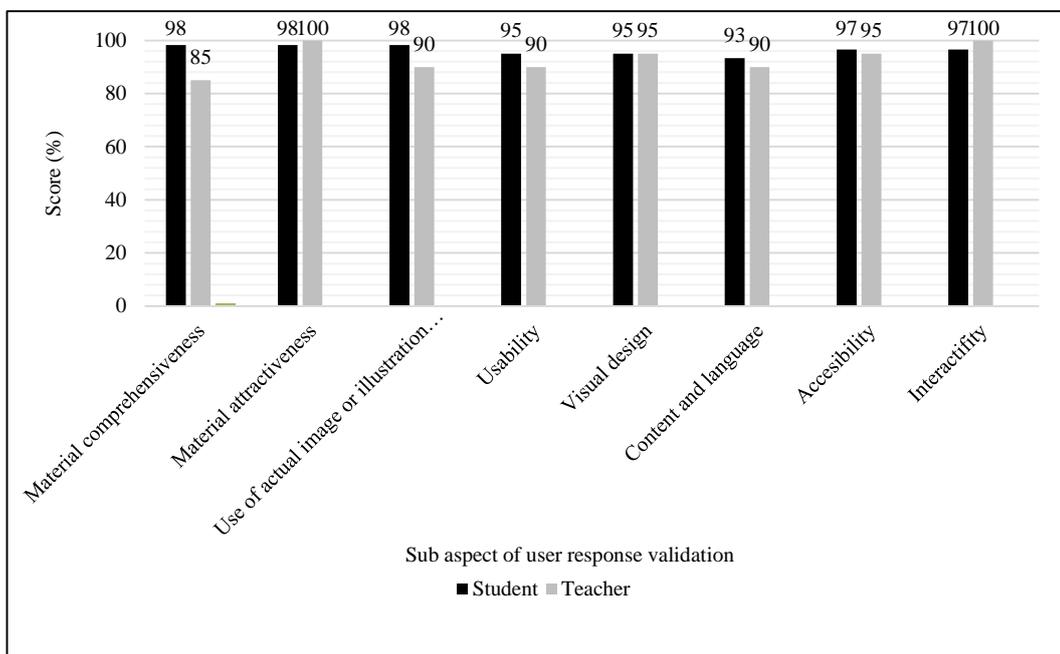


Figure 7. User response result for each sub aspect assessment

Users were interested in many examples and images of exotic fruits in Fructuweb, which they have not been familiar with. Photosharing websites can improve biodiversity knowledge (Goula et.al., 2013). Knowledge of biodiversity local potential is important to be discovered since local potential such as local wisdom or also natural resources must be utilized by giving attention to its

sustainability (Bahri, 2016). Website-based learning with biodiversity local potential content could help the teacher explain contextual learning material even though it could not be studied directly in the field.

CONCLUSION

The Fructuweb is a learning website with Banten's exotic fruit as a delivered material content for

biodiversity concept, which provides seven menus, consist of "about us", "biodiversity", "Banten's exotic fruit", "fruit conservation", "educational applications", "contact", and "testimonials" menu.

The results of expert validation showed an average value of 95.1% for the content material aspect, and 92.7% for the media aspect. It means the Fructuweb has a very feasible category as an online learning source.

User response (teacher and student) as alimited-scale field test showed an average value of 93.4%. it means the Fructuweb is very feasible used as an online learning source to support potential-based learning.

SUGGESTION

Further research needs to be conducted to determine and verify the effectiveness of a website-developed product in the teaching-learning process. Content on the website can also be used to facilitate increased biodiversity literacy and conservation attitudes or environmental awareness.

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