Abstract

This paper presents students’ feedback on the design and development of a Website for Biology, namely e-AV Biology for senior high schools in Indonesia. The teaching media was developed with the main feature of video lessons and other features supporting the learning of Biology such as the Interactive Quiz and Discussion to support students’ learning in Biology. Some video lessons described Renewable Energy on the field of Biotechnology Industrial, which is one of the topics that commonly difficult to visualize and explain. There is a need of aiding the explanation of Biodiesel sources, Biodiesel production process and Biodiesel usages by using audio visual. This study examined the design (Features and Interactivity, Video Content) and the Learning Impact of e-AV Biology Website. A total of 256 high school students participated in a larger study of a quasi-experiment in year 2011 with the intervention of two different ways of teaching, one with fully media instruction using e-AV Biology teaching method and another one the traditional manner of teaching. However, for the purpose of this paper, only the perception of the students participated in experiment group (n= 121, with 75 females, 46 males) were used, analyzed and reported. The last section of the paper presents the findings which indicated that majority students have positive response to overall feedback towards e-AV Biology teaching method, particularly the Features and Interactivity that provided in e-AV Biology Website.

Keywords: Feedback, e-AV Biology Website, Renewable Energy, Biodiesel, Learning Impact
Introduction

The teaching and learning Biology in Indonesia was done traditionally in the form of teacher-centred learning (Durbin, 2001). Teachers explain the subject according to the textbook, and then they write it on the whiteboard. After lecturing, teachers give some assignments to students. Meanwhile, students’ activities in classroom are mostly the following: listen to teachers’ explanation, take note, memorize the subject and also do assignments (Durbin, 2001). These are the scenario of Biology classes in Indonesia (Setiawan, 2008) resulted students who are generally passive and lack interest in Biology. This can be shown in the low enrolment of Biology major classes in upper levels (Puspita et al., 2008) as they do not find Biology an interesting subject (Setiawan, 2008).

The teaching aids such as audio visual materials or multimedia have been considered as an urgent necessity for the teacher to explain Biology subject in a more appealing way. A picture is worth a thousand words; multimedia appears to be more visual appealing supported by audio that explains the abstract concepts in a planned sequence based on instructional design principles. Teachers must have the ability to make the learning atmosphere more interesting while using the teaching aids for their classes. In this study, the teaching media platform, namely e-AV Biology Website, was developed with the main feature of video lessons in supporting the students' learning in Biology. e-AV Biology Website is one of the alternative aids to explain Biology in a visual appealing way supported by interactive features such as quizzes, and the control panel for the videos.

Objectives

The purpose of this paper is to report a part of the larger study. Focus of this paper is to gather feedback of e-AV Biology learning materials. There are two objectives here: 1) To examine the Design (Features and Interactivity, Video Contents) of e-AV Biology Website; 2) To examine the Learning Impact of e-AV Biology Website.

These objectives are in line with the research questions which in context of e-AV Biology: 1) What is the Improvement of the Design of e-AV Biology suggested by students? 2) What is the Learning Impact of e-AV Biology Website as perceived by students?

Difficulties in Studying Biology

Students’ difficulties in learning Biology concepts have been investigated by many researchers. The survey outcomes from a study conducted by Lu, Cowie, and Jones (2008) indicated that 66% of the student respondents expressed that their Biology classes were taught monotonously. Just over half of the respondents (53%) wishes their teachers would include more interaction and active involvement in the lessons.

Moreover, the Biology teaching and learning process was often faced with abstract concepts and it was out of the students’ daily experiences, particularly the process the production of Biofuel (Renewable Energy). Shelmet, Shields, and Huggins (2008) stated that many science classes have been conducted in 50-minutes content-driven lectures in traditionally classroom. Memorization of facts and algorithmic problem solving are often stressed, rather than conceptual understanding. Therefore, Biology needs to be taught dynamically, not as a static subject in textbooks (Tekkaya, Ozkan, and Sungur, 2001).

Finley, Yarroch, and Stewart (1982) reported that cellular respiration, photosynthesis, protein synthesis, mitosis and meiosis, were difficult and important topics for students to learn. Other topics which students find difficult to learn were respiration and photosynthesis (Anderson, Sheldon & Dubay, 1990), and concept of energy (Jennison & Reiss, 1991), all of these concepts were also supported by Tekkaya et al. (2001, p.145). Most of the participants of in the study conducted by Tekkaya et al. (2001, p.148) reported that “Biology is a course that presents overwhelm contents, most of which depend on memorization. Textbooks are boring and include excessive details; textbooks contain too much new and unnecessary information”.

The study of Baggott and Wright (1996) on the use of interactive video in teaching cell division, among first-year undergraduate Biology education students, indicated that they find it more advantageous and more motivating in grasping the relevant phenomenon. Moreover, Prinou et al. (2003) stated that most of students reported that the moving image clarified or enhanced their understanding. It seems that through video, they understood that mitosis is a continuous rather than step-by-step process.

Renewable Energy

Due to global trend of the reduction of fuel resources, the human efforts are collectively looking into a renew source of energy, especially biofuel. Indonesian is rich of biofuel resources such as Jatropha oil, Coconut oil, Cassava and Crude Palm Oil.
Biotechnology Industrial, especially Renewable Energy as a part of Biology is learned in the tenth grade of Senior High Schools, it is determined by the fifth Competency Standard of Indonesian Biology curriculum, which states that: “The Students are able to explain about Biotechnology - the principles, roles and its implications for sciences, environment, technology and society”. Energy resources and renewable energy is an important issue to be introduced to students; many side topics related energy such as energy consumption and preservation, generation of energy with consideration of environment protection are all related to this topic.

**Multimedia Website for Learning**

The educational content that build based on multimedia can be delivered through internet, so the teaching and learning process can be done via internet. According to Thierry and Deborah (2000, p.225), “The Internet is the major technological advancement reshaping not only our society but also that of universities worldwide. In the light of this, universities have to capitalize on the Internet for teaching, and one progressive development of this is the use of online delivery methods”. According to McAuliffe (2001), the online teaching and learning process could produce more relevant and consistent interaction than what is produced in the traditional undergraduate classrooms. A large traditional classroom does create communication barriers that make it more difficult for all students to participate in class discussions. The Internet is providing a practical way to remove learning barriers and encourage greater access to intellectual resources. The Internet has proved to be a powerful educational tool for Biology, because not only can it offer a large number of alternative images of the same phenomenon, but it can also provide a numerous of suggestions for the synthesis of relevant educational material (Prinou et al., 2003).

The Audio Visual is one of the popular multimedia components in education. Didactical video or Audio Visual is able to give a multisensory aspect to the learning experience to students than textual information. On the other hand, paper based pedagogical materials, such as books or articles, could allow students to think and analyses the content provided. Multimedia materials in this study presented in a Website can bring the two kinds of material together. Firstly, it allows the inclusion of Audio-Visual content into the array of educational materials. Secondly, it also allows the inclusion of textual information (Amatller & Simo, 2007).

Multimedia material has another distinctive characteristic: it allows interaction. Students can interact with the information in different mode. The access to information could be done in multiple ways, different items could be connected according to students’ interest and the practice and simulation of complex processes such as the processes of production biofuel is made possible. All the characteristics are not only the result of technological possibilities; they are also opportunities for constructivism based pedagogic materials (Amatller and Simo, 2007). Nowadays, Audio Visual Media is easily produced and published on the web and CD (Romero et al., 2008).

**Methods of the Study**

The teaching and learning process of Biology in Senior High Schools of Indonesia was tested using the e-AV Biology instructional design framework. Two Senior High Schools with 4 classes of students use e-AV Biology for their individual learning on Biology topics. They used it for 4 weeks, with first week as introduction to the website, 2nd week for Renewable Energy of Biodiesel Sources, 3rd week for Renewable Energy of Biodiesel Production and 4th week for Renewable Energy of Biodiesel Usages. In total 256 students completed their lessons and a post survey was conducted to seek feedback from them regarding audio visual learning on Biology. However, for the purpose of this paper, only the perception of the students participated in experiment group (n= 121, with 75 females, 46 males) were used, analyzed and reported. The instrument (post survey) contains various dimensions of learning measures and also students’ feedback on e-AV Biology. Those dimensions are: Video Contents, Features and Interactivity, and Learning Impact of e-AV Biology.

**Description of e-AV Biology Website**

A Website was used as the Multimedia technology. The website includes the interactive video about Biotechnology Industrial as a part of Biology subject. e-AV Biology had been developed with integrated and comprehensive video lessons, and other features supporting the student learning process. The use of animations, motion images, and videos was intended to render a scientific phenomenon and process to be easily comprehended by students.

There are some features to aid teaching and learning, available in e-AV Biology Website:
Home Page of e-AV Biology

This part aims to introduce students to the e-AV Biology Website. It starts with a description of how-to-use and register to become users of the e-AV Biology, followed by a short description of e-AV Biology menu and other e-AV Biology features.

Video Lessons

This part contains various videos concerning biofuel sources, biofuel production and biofuel usages (in Indonesian and English). Students were provided with contents in the form of audios, videos and animation that enables them to explore e-AV Biology Website on their own pace/individually. The integration of various media elements such as diagrams, audio, video and animation in this part adds more value to the website. Figure 1. shows e-AV Biology Videos, while Figure 2 shows sample of e-AV Biology Lesson for Indonesian students.

Figure 1: e-AV Biology Videos

Figure 2: Sample of e-AV Biology Lesson for Indonesian Students

The video lessons also supported by articles and textual information related to Biology for the benefit of students to read about Renewable Energy such as Biodiesel Sources, Biodiesel Production and Biodiesel Usages. It provides materials for students in a more convenient way of access through text based information.

Findings and Discussions

This section present the survey results on e-AV Biology Website gathered the students’ participants of experiment group, after they were using e-AV Biology Website for their learning individually. Mostly descriptive findings are presented to highlight popular items and also to notice which items are less agreed or more agreed by students. A mean score of 4.5 with low standard deviation value indicates that the items are agreed and strongly agreed by students, and also many of them sharing the similar feedback on the scale of 5 or 4 (agreement). These items will be mentioned and discussed in the following sections. Likewise, for items with mean scores near to 3 indicated that the items are neither agreed nor disagreed by students (only one item in Table 3), it indicates indecisive opinion by students for those items or other words a mixture of opinion of agree and disagree by the group of students collectively. Majority of the items draw favorable agreement by most of the students, with mean scores value ranging from 3.22 to 4.78 and the standard deviations around 0.42.

a. Feedback of Video Contents in e-AV Biology Website

Table 1 shows the Students’ Feedback of Video Contents in e-AV Biology Website. The table shows that majority the students have a positive response to Video Contents in e-AV Biology Website, with aggregate mean value = 4.35, and standard deviations around 0.53. The percentage of students’ agreement and disagreement were represented by ‘%’, while ‘number of students’ was represented by ‘n’. ‘Positive Response/Agreement’ indicated the students’ agree and strongly agree with the statements, while ‘Negative Response/Disagreement’ indicated the students’ disagree and strongly disagree.
Table 1: Video Contents Feedback

<table>
<thead>
<tr>
<th>Items</th>
<th>Statements</th>
<th>Agreement (%) (n)</th>
<th>Undecided (%) (n)</th>
<th>Disagreement (%) (n)</th>
<th>Mean</th>
<th>Aggregate Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>q8</td>
<td>Video contents of e-AV Biology are useful to learn Biology</td>
<td>98% (119)</td>
<td>2% (2)</td>
<td>0% (0)</td>
<td>4.554</td>
<td></td>
</tr>
<tr>
<td>q9</td>
<td>I am interested in using the video contents of Biology</td>
<td>77% (93)</td>
<td>20% (24)</td>
<td>3% (4)</td>
<td>4.207</td>
<td></td>
</tr>
<tr>
<td>q10</td>
<td>Video contents of e-AV Biology are suitable for Biology courses</td>
<td>97% (117)</td>
<td>3% (4)</td>
<td>0% (0)</td>
<td>4.562</td>
<td></td>
</tr>
<tr>
<td>q11</td>
<td>I am satisfied with the video contents for learning Biology</td>
<td>82% (99)</td>
<td>12% (15)</td>
<td>6% (7)</td>
<td>4.314</td>
<td></td>
</tr>
<tr>
<td>q12</td>
<td>The video contents are attractive</td>
<td>89% (107)</td>
<td>9% (11)</td>
<td>2% (3)</td>
<td>4.214</td>
<td></td>
</tr>
<tr>
<td>q13</td>
<td>The video contents can increase my ability to learn Biology</td>
<td>92% (112)</td>
<td>6% (7)</td>
<td>2% (2)</td>
<td>4.471</td>
<td></td>
</tr>
<tr>
<td>q14</td>
<td>The video contents can motivate me to learn Biology more</td>
<td>82% (100)</td>
<td>17% (20)</td>
<td>1% (1)</td>
<td>4.303</td>
<td></td>
</tr>
<tr>
<td>q15</td>
<td>The sequence of video contents are easy to follow</td>
<td>87% (105)</td>
<td>11% (13)</td>
<td>2% (3)</td>
<td>4.595</td>
<td></td>
</tr>
<tr>
<td>q16</td>
<td>The video contents allow me to clarify my misconception in Biology</td>
<td>77% (94)</td>
<td>21% (25)</td>
<td>2% (2)</td>
<td>4.331</td>
<td></td>
</tr>
<tr>
<td>q17</td>
<td>The background music is attractive, the background music is appropriately used.</td>
<td>54% (65)</td>
<td>38% (46)</td>
<td>8% (10)</td>
<td>3.868</td>
<td></td>
</tr>
<tr>
<td>q18</td>
<td>The background music is distracting</td>
<td>17% (20)</td>
<td>18% (22)</td>
<td>65% (79)</td>
<td>3.893</td>
<td></td>
</tr>
<tr>
<td>q19</td>
<td>Video content can explain abstract concepts clearly</td>
<td>86% (104)</td>
<td>13% (16)</td>
<td>1% (1)</td>
<td>4.562</td>
<td></td>
</tr>
</tbody>
</table>

Note: n = 121
Likert Scale 1: Strongly Disagree, 2: Disagree, 3: Undecided, 4: Agree, 5: Strongly Agree
Agreement = agree and strongly agree; Disagreement = disagree and strongly disagree

Students’ feedback on Video Contents of e-AV Biology indicated that item q8, q10, q15, and q19 shows higher mean scores (mean ≥ 4.0) with low standard deviation scores (SD ≤ 0.8), which mean that the items have low variability of the feedback from students. Many of them agreed and strongly agreed that Video Contents of e-AV Biology were useful to learn Biology, it was suitable for Biology, the sequence of Video Contents were easy to follow, and Video Contents can explain abstract concepts clearly.

b. Feedback towards Features and Interactivity of e-AV Biology Website

Table 2 shows that majority the students have a positive response to the Features and Interactivity of e-AV Biology Website, with aggregate mean value = 4.55, and the standard deviations around 0.66.

Table 2: Features and Interactivity

<table>
<thead>
<tr>
<th>Items</th>
<th>Statements</th>
<th>Agreement (%) (n)</th>
<th>Undecided (%) (n)</th>
<th>Disagreement (%) (n)</th>
<th>Mean</th>
<th>Aggregate Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>q20</td>
<td>There are many visual examples in e-AV Biology Website</td>
<td>90% (109)</td>
<td>8% (10)</td>
<td>2% (2)</td>
<td>4.603</td>
<td></td>
</tr>
</tbody>
</table>
Students’ feedback on Features and Interactivity of e-AV Biology indicated that item q20, q21, q22, q23, and q25 shows higher mean scores (mean ≥ 4.0) with low standard deviation scores (SD ≤ 0.8), which mean that the items have low variability of the feedback from students. Many of them agreed and strongly agreed that e-AV Biology has many visual examples, Features and Interactivity in e-AV Biology help students learn better, they can easily get the visualization and explanation of the studying material, e-AV Biology was helpful in students’ learning because it has interactivity feature, where students can pause and play on their own paced, and it make them easy to study and make discussion based on the assignment, hence, enrich their learning.

### Feedback of the Learning Impact of e-AV Biology Website

Table 3. shows that majority of the students have a positive response to the Learning Impact of e-AV Biology Website, with aggregate mean value = 4.27, and the standard deviations around 0.42. Students’ feedback on the Learning Impact of e-AV Biology indicated that item q26, q28, q36, and q39 shows higher mean scores (mean ≥ 4.0) with low standard deviation scores (SD ≤ 0.8), which mean that the items have low variability of the feedback from students. Many of them agreed and strongly agreed that they were motivated to learn Biology using e-AV Biology because the contents were able to attract students’ attention. e-AV Biology has positive impact on students’ learning of Biology. Students did not feel bored studying Biology with e-AV Biology. e-AV Biology has shortened students’ learning time on a particular topic of Biology, and students’ knowledge was improved by e-AV Biology.

#### Table 3: The Learning Impact

<table>
<thead>
<tr>
<th>Items</th>
<th>Statements</th>
<th>Agreement (%) (n)</th>
<th>Undecided (%) (n)</th>
<th>Disagreement (%) (n)</th>
<th>Mean</th>
<th>Aggregate Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>q26</td>
<td>I am motivated to learn Biology using e-AV Biology because the contents are able to attract my attention</td>
<td>87% (105)</td>
<td>12% (15)</td>
<td>1% (1)</td>
<td>4.578</td>
<td></td>
</tr>
<tr>
<td>q27</td>
<td>My motivation will be decreased after using e-AV Biology for several times</td>
<td>20% (24)</td>
<td>15% (18)</td>
<td>65% (79)</td>
<td>3.876</td>
<td></td>
</tr>
<tr>
<td>q28</td>
<td>e-AV Biology has positive impact on my learning of Biology</td>
<td>98% (119)</td>
<td>2% (2)</td>
<td>0% (0)</td>
<td>4.777</td>
<td></td>
</tr>
<tr>
<td>q29</td>
<td>I have interest to use e-AV Biology during the learning of Biology</td>
<td>84% (102)</td>
<td>14% (17)</td>
<td>2% (2)</td>
<td>4.488</td>
<td></td>
</tr>
</tbody>
</table>
Overall Feedback

Students had reported about Feedback of Video Contents in e-AV Biology Website, Feedback of Features and Interactivity and Feedback of The Learning Impact of e-AV Biology Website. The survey results indicated that majority the students have positive response (agree and strongly agree) for overall feedback of e-AV Biology Website. The data had been collected from results of the questionnaires as presented in Table 1 to Table 3.

The findings of students’ feedback towards e-AV Biology Website for learning Biology can be summarized as shown in Figure 3. The graph indicated that majority of students have positive responses towards e-AV Biology Website, particularly in the Features and Interactivity that provided in e-AV Biology Website with mean value = 4.55.
Conclusion

The study on Students’ Feedback of Audio Visual teaching media through e-AV Biology was conducted due to the increasing challenge of teaching an abstract subject, and the importance of the topic of Biotechnology Industrial or Renewable Energy (Biodiesel Sources, Biodiesel Production and Biodiesel Usages). Audio and Visual media was incorporated as the key component in e-Learning website, based on Integrated Framework of e-AV Biology which have been designed and developed. Findings indicated that majority the students have a positive response to the Video Contents in e-AV Biology, the Features and Interactivity, and also the Learning Impact of e-AV Biology Website for students’ Biology learning.

Students’ feedback on Video Contents of e-AV Biology indicated that many of students agreed and strongly agreed that Video Contents of e-AV Biology were useful to learn Biology, it was suitable for Biology, the sequence of Video Contents were easy to follow, and it was able to generate similar perception of students about abstract concepts.

Students’ feedback on Features and Interactivity of e-AV Biology indicated that many of students agreed and strongly agreed that e-AV Biology has many visual examples, Features and Interactivity in e-AV Biology help students learn better, they can easily get the visualization and explanation of the studying material, e-AV Biology was helpful in students’ learning because it has interactivity feature where students can pause and play on their own paced, and it make them easy to study and make discussion based on the assignment, hence, enrich their learning.

Students’ feedback on the Learning Impact of e-AV Biology indicated that many of students agreed and strongly agreed that students were motivated to learn Biology using e-AV Biology because the contents were able to attract students’ attention. e-AV Biology has positive impact on students’ learning of Biology. Students did not feel bored studying Biology with e-AV Biology. e-AV Biology has shortened students’ learning time on a particular topic of Biology, and students’ knowledge was improved by e-AV Biology.

Limitations and Future Research

The limitation of this study is mainly due to: (1) a short time frame of conducting the study and the impact on knowledge gain has not shown much significance. (2) The research is only conducted in one of the major cities in Indonesia, (3) the research sample is limited to International Schools by the Indonesian Government.

The contribution of the study is to propose the e-Learning Website design and development for Indonesia Senior High Schools to address the problem faced in Biology education. e-AV Biology website will be further developed to include more videos related to different topics of Biology since generally students are able to accept it and perceived it as useful to improve their interest and attitude toward Biology.
Acknowledgement

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References


