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WEB-BASED LEARNING RESOURCES AND STUDENTS’ SCIENTIFIC APTITUDE: LESSONS FROM THE IMPLEMENTATION OF PROFESSIONAL LEARNING COMMUNITY

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Abstract

This study aims to develop a web-based learning resource by using the Moodle software to teach chemistry (electrolytes and nonelectrolytes subjects) for high-school students. To develop the instructional media, the researchers collaborated with the teachers of other subjects through the implementation of Professional Learning Community (PLC). This study used the 10 steps of Borg & Gall, which consisted of (1) a preliminary study; (2) planning of product development; (3) creation of the initial product; (4) a field early testing; (5) revision of the initial product; (6) initial field testing; (7) revised operational products; (8) operational field testing; (9) revision of the final product; and (10) dissemination and distribution. It conducted interviews and questionnaires-survey to the members of PLC. To assess the learning media, the assigned experts conducted the self-assessment questionnaires on media, subject matter, and learning process. The results of feasibility study and due diligence revealed that the learning source, the media learning, and the teaching and learning process are at the satisfied level, which has r values of 0.80, 0.79, and 0.85, respectively. It found (1) a high effectiveness of the information and the easily understood design (92.46%); (2) a fast comprehension on how to use the product (86.76%); (3) a supported user-friendly menu display (94.37%); (4) an attractive product attention (93.37%); (5) a motivated media for students to learn the electrolytes and non-electrolytes solution (97.86%); and (6) a high users’ demand to use the product as a learning resource (96.82%). It implies that the implementation of PLC through a web-based learning resource could support and increase the students’ scientific aptitude, specifically in chemistry (electrolytes and non-electrolytes subjects).

Keywords: Web-based Learning Resources, Professional Learning Community.

1 INTRODUCTION

National Education System states that distance learning is the education where their students apart from educators and learning using a variety of learning resources through communications technology, information, and other media. The used of a web-based computer for teaching and learning purposes in the developing world educational context is currently increasing. Web-based computer simulation enhances learning experiences by supporting knowledge impartation in the classroom. In recent years, the number of web-based education applications has been increasing at a remarkable rate (Jackson, 2000), and many institutions also individuals prefer to provide learning process via the Internet, by the latest requirements. It can be argued that the use of web-based computer have a positive effect in raising teachers’ awareness of students’ misconceptions and lack of conceptual understanding with evidence of incorrect representations by providing an image (Olakanmi, 2015). However, because of the various web-based learning applications and the lack of specific evaluation tools to effectively evaluate these web-based learning environments, it has been difficult for users (i.e. teachers/students/domain experts) to select the most suitable web-based learning applications for them (Funda, 2016).

Media can utilize Moodle web learning as an application. Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment which uses the principle of social constructionist pedagogy as software produced for the learning-based website. Moodle software package provides a complete four, namely Moodle, Apache, MySQL, and PHP. Moodle is also equipped with online quizzes so that students can train its own merits without an educator. Also, there is a chat feature, so user can open a discussion forum between students and teachers in everywhere so that students can learn independently.

To generate an appropriate learning media, researchers in collaboration with experts in the field of media (IT expert, computer teacher), linguist (language teachers), and chemistry teacher who belong to a community. Professional Learning Community or Professional Learning Community (PLC) is a
community which consist of competent teacher, where they can discuss, exchange experiences and seek solutions to the problems that arise during the learning process. As individuals’ learning, their relationships and interpersonal capacity are the key part of a PLC. As interpersonal, goal-sharing will motivate educators’ to actively seeking the best way for conducting learning process. Finally, it can build organizational capacities and knowledge structures that support teachers’ learning and teaching process in the classroom (Mitchell, 2015).

PLCs could help teachers to satisfy professional development requirements that include the mandatory evaluation component by the framework of all models. PLCs have been shown to be an effective strategy for improving student achievement and enhancing teacher’s quality (Dufour and Mattos, 2013).

Observations show that 75% of tenth graders still do not understand the concept of Electrolytes and Nonelectrolytes the absence of visualization in learning so that it can be studied further through this research in developing web-based learning resources on the material. Therefore, this research is expected to develop web-based learning resources as needed class X on the material Electrolytes and Nonelectrolytes through the implementation of Professional Learning Community.

2 RESEARCH METHOD

Methods of research and development using the 10 steps of Borg & Gall with the stages of the study consisted of (1) a preliminary study; (2) planning of product development; (3) the creation of the initial product; (4) the initial field testing; (5) The revision of the initial product; (6) the initial field testing; (7) the revised operational products; (8) the operational field testing; (9) the revision of the final product; and (10) the dissemination and distribution. Data collection techniques in this study of interviews and questionnaires filled out by teachers who are members of the PLC, and the team needs analysis questionnaire filled out by the students. For the assessment of learning resources, assessment questionnaires were given to media experts, subject matter experts, and experts in the learning process.

Data analysis techniques of the study were using the techniques of descriptive analysis of the results of the analysis of needs, development of materials and testing the viability of instructional materials. Also using inter-rater reliability test Intraclass correlation coefficient (ICC) of Fleiss Kappa. ICC is a measurement to test the consistency of the average consensus rather more than two people in a measurement variable.

3 RESULTS AND DISCUSSION

The phase carried on research and development including requirement analysis phase, design phase and the development of media models, expert validation test phase, and the effectiveness test to the user.

3.1 Need analysis

Needs analysis were done by spreading questionnaires to students and teachers of chemistry. Respondents at this stage consist of 80 students and 5 teachers.

3.1.1 Need analysis of student

The aim of the analysis of learning needs is to obtain information about chemicals in the topic of Electrolytes and Nonelectrolytes as well as on the expected learning media. After the questionnaire distribution, the result are as much as 87.5% of the handbook which presented monotonously. As many as 75% of students have difficulty in distinguishing the type of electrolyte solution and Non-electrolytes, so that 95% of students stating the source of learning has an important role in the learning process, especially on the subjects of electrolyte and Nonelectrolytes solution. A total of 92.5% of students stated that learning media is less equipped with animation and 95% of students think if the electrolyte and Non-electrolytes solution would be more attractive if they are equippeded with animation. The use of photographs, images, colors, and charts will facilitate students in understanding and will improve student learning outcomes the topic of electrolyte and Non-electrolytes solution.
On the use of the internet, 90% of students get used to using the internet for searching references and it is easy to access from the house so as to motivate the students to do the learning process. A total of 92.5% of students stated learning web media is best combination of concepts and exercises for understanding of the topic. All students claimed that web media could be easily understood when using a language which is simple, straightforward, and communicative.

3.1.2 Need analysis of teacher

Based on the analysis needs of teachers, they said that the topic of electrolyte and Non-electrolytes solution require a mastery of concepts of basic chemistry. The student motivation in learning chemistry was still lacking which could influence students' understanding of the electrolyte and Nonelectrolytes solution. Learners expect the media to provide pictures and illustrations which make it interesting with communicative language so that students are more interested and easily understand the chemistry topic, especially on material electrolyte and Nonelectrolytes solution.

Teachers said that the best learning resources were maps of concepts, exercises, and discussion by using simple, straightforward, and communicative language. The fifth teacher stated that web-based learning resources on the electrolyte and Non-electrolytes solution could be developed through the application of peer collaboration.

3.2 Design and development of Web-Based Learning Resources phase

3.2.1 Design Learning Resources Phase

At this stage of collaboration design, the team discussed the problems of students and teachers based on the analysis of needs. The particular topic was Electrolytes and Nonelectrolytes and the teams found that the problems were the lack of time for learning process and media limitations when teaching and learning as well as discussed about the software used in the manufacture of media learning collaboration, the software Moodle. In the second design collaboration, team collaboration analyzed Electrolytes and Nonelectrolytes. This topic contained several sections, including the solution, electrical conductivity, electrolyte solution characteristics, as well as the application of electrolyte solution in everyday life. The next discussion was about the details of web contents, which were made learning modules to support the students in their learning at home, then inserted a video about electrolyte solution so that students could better understand the concepts of the electrolyte solution. Also, the web was filled with articles about the application of the electrolyte solution for a better understanding for the students to learn the topic.

3.2.2 Media Development Phase

The development phase was to create and develop web-based learning resources using Moodle software which had been designed in the design stage. This phase consisted of five collaboration stages. In the collaborative development of Phase I, the team made a web-based course in the planning stages, namely the learning objectives, concepts, applications, and experiment. Then they further discussed the background theme which was simple and attractive. Then the team determined the learning resources that would be used to support learning media, Basic Chemicals books and some textbook-based curriculum in 2013.
In the second phase of the collaborative development, the team made the learning goals, which contained the core competencies, basic competencies and learning objectives. Then, they discussed the learning modules. In making learning modules, it designed based on the analysis of topic which had been done previously, so that the learning outcomes corresponded to the learning objectives.

In the phase III, the team discussed about the articles related to the application of electrolyte and Non-electrolytes solution in daily lives. In the process of making these articles, several resources were used. Then, the team determined which videos would be used in the media that could associated with the topic of electrolyte and nonelectrolyte solution.
At this stage of development collaboration IV and V, the team discussed the formative tests, where a formative test contained multiple choice questions, essay and make assignment of portfolio. Then the questions and tasks that had been completed would be uploaded to the web http://planetkimia.com/belajar.
3.2.3 Validation Test Expert Phase

Test validation by experts is conducted when media web-based learning has been developed by the team collaboration of PLC. The trial aims to know the feasibility of expert media before being used in the classroom as well as to obtain the advice of experts to improve the product. The trials include testing of content experts, media testing, and testing of teaching and learning process.

3.3 Effectiveness Test

The results of the effectiveness test calculations and interpretation of results shown in Table 1 below:

<table>
<thead>
<tr>
<th>No</th>
<th>Indicator</th>
<th>No. Questionnaire</th>
<th>Σ</th>
<th>Σmax</th>
<th>%</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Information and easy to understand design view</td>
<td>1, 2, 3, 4, 5, 6</td>
<td>754</td>
<td>816</td>
<td>92.46</td>
<td>Very Good</td>
</tr>
<tr>
<td>2</td>
<td>Guidance to use the product is quickly understood</td>
<td>7</td>
<td>118</td>
<td>136</td>
<td>86.76</td>
<td>Very Good</td>
</tr>
<tr>
<td>3</td>
<td>Products can display menu quickly</td>
<td>8, 9</td>
<td>257</td>
<td>272</td>
<td>94.37</td>
<td>Very Good</td>
</tr>
<tr>
<td>4</td>
<td>Product can attract attention</td>
<td>10, 11, 12</td>
<td>381</td>
<td>408</td>
<td>93.37</td>
<td>Very Good</td>
</tr>
<tr>
<td>5</td>
<td>Product can motivate student</td>
<td>13, 14</td>
<td>266</td>
<td>272</td>
<td>97.86</td>
<td>Very Good</td>
</tr>
<tr>
<td>6</td>
<td>Users want to use the product as a source of learning</td>
<td>16, 17, 18, 19, 20, 21, 22</td>
<td>922</td>
<td>952</td>
<td>98.82</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

The test results showed that the effectiveness of the information and the design view are easily understood (92.46%); quickly understood of how to use the product (86.76%); products can display menu quickly (94.37%); products can attract attention (93.37%); product can motivate students to learn the electrolytic solution and nonelectrolytes (97.86%); users want to use the product as a learning resource (96.82%). Based on the test results can be concluded that the effectiveness of the quality of web-based learning resources using the Moodle software are good and feasible as learning media for supporting the chemistry learning process especially for the topic of Electrolytes and Nonelectrolytes solution.

4 CONCLUSION

Based on the research and development of web-based learning through the implementation of Professional Learning Community at the topic of Electrolytes and Nonelectrolytes, it can be concluded that the learning resources which equipped with competencies, support materials, articles of applications, videos, assignments and formative tests are very good and feasible for use in the chemistry learning process since it could support the needs of students and teachers. Web-based learning resources using Moodle contains four courses, i.e. learning objectives, concepts, applications, and experiments and in each course there is a formative tests to determine the ability of students after learning.

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