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Development of Weblog as Learning Resource of Coordination System for Student in Senior High School

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Abstract

Aim of this study to develop a weblog-based learning resource on the coordination system for senior high school students and to describe the weblog's quality 4D model which is limited only to the define, design and develop stages. The research sample was 30 students of class XII IPA MAN 2 Palu who had completed learning the coordination system in class XI. The data were analyzed qualitatively. Result of the study is weblog which consists of a homepage menu, video menu, handout menu, evaluation menu, download menu, reference menu and chat box menu. Weblogs were considered very feasible by media experts, material experts, college students, teachers and students. Thus, it can be concluded that the weblog is considered very feasible as a learning resource for students. This is evidenced by testing the 19 students who use a weblog in learning. Based on the results that there is strong effect positively of using weblog-based learning resources on student learning outcome.

Keywords: Learning Resource, Weblog

1. Introduction

PISA (Program for International Student Assessment) study in 2018 revealed that the scientific literacy of Indonesia students is still low, which is ranked 72nd out of 80 countries (OECD, 2019) [29]. This result can be caused by students' low understanding of science (Ni'mah, 2019) [28]. One of the reasons for the low understanding of students is the lack of motivation/interest of students in learning. Student interest/motivation in learning can be influenced by the learning process that takes place in class (Cherry, 2020) [28].

Biology is one of science subject that is taught in senior high school. One of the biological materials that are still considered complicated is the coordination system. Apart from being complicated, if it is taught by the teachers in class, students cannot fully understand the material due to the limited learning time in class.

In 2019, Indonesia was ranked fourth as the most internet user internationally (Statista, 2020) [37]. Indonesia is also the sixth largest gadget user internationally (Statista, 2019) [36]. Data on technology users in Indonesia is also supported nationally where high school students are the most internet users compared to people with other educational levels (APJII, 2018) [2]. Thus, high school students are familiar with the use of gadgets and internet access.

The closeness of students to the use of these two types of technology in their daily lives provides opportunities for teachers and other educator to develop online learning activities. Online learning activities are one of solutions from Permendikbud No. 36 of 2018, where the learning process can be carried out outside of class hours according to the agreement between the teachers and students (Kemdikbud, 2018) [18].

The use of internet access and gadgets has actually been held in the form of online tutoring, such as RuangGuru application (Gideon, 2018) [16]. This tutoring offers easy access to learning so that students can access material or get consulting services to teachers regardless of place and time (CNN Indonesia, 2019) [9]. The convenience provided by online tutoring still has shortcomings, which are specific in terms of tuition payment fees. To be able to take part in online tutoring, students need to prepare 2 types of fees, namely internet access fees and tuition fees. Thus, not all students have internet access and gadgets get equal access to education outside of school.

Innovation in utilizing internet access and gadgets encourages researcher to develop weblog-based learning resources. Weblogs are one of the tools that are freely available on the internet that can be used in making online learning resources (Rizki, 2014) [34].

Biology requires tools to be able to visualize the material objects being taught to students. A weblog can contain various components, such as text, images, audio and video (Sari, 2016) [35]. Therefore, researcher are interested in developing weblog-

based learning resources on the coordination system material to find out the quality of the weblogs that have been developed and to know the effect of weblogs on student learning outcomes.

2. Review of Literature
2.1 Weblog as Learning Resource
Weblog can be used for educational purposes, which is called an education blog (edublog). One example of using edublogs is that teachers can create an online learning process. Firstly, teachers register on the blogger site. Registration only requires an active google e-mail and password. After registration is complete, teachers can start blogging activities, such as creating a site name, adjusting the design, and layout and customizing advanced settings (such as font type, size and color; background color; etc.) and adding gadgets (such as calendar, chat box and others). After the blog is successfully created, teachers can add content, such as adding text-based material, video, audio and evaluation Teachers can invite students to enter the blog to start learning (Ray, 2006; Google Webspam Team, 2020) [32, 17].

The learning process organized through a weblog can create learning conditions without the need for face to face directly (Bhandari, 2014) [3], so two-way communication occurs without being limited by place and time. Therefore, the problem of material that has not been taught in class can be overcome by online learning, which is outside school hours. In addition to students being able to access teaching material, students can also strengthen their understanding by answering the questions and having discussion on the weblog. So, teachers and students will still be able to connect to each other through gadgets (Churchill, 2009) [8].

Weblogs also offer other conveniences related to the online learning process. Teachers can easily provide updates on anything, such as if they want to update materials, evaluations or even add other content from outside website sources. They can also arrange who can visit the weblog. Therefore, parents can also be allowed to monitor their children's learning situation with the consent of the teachers (Mora, 2013) [25].

The benefits that are given regularly to students are that students can be responsible for the knowledge they have. Compared to studying in class, of course the student independence factor is more optimized when studying online. Students who realize that knowledge will be obtained by the learning process, encourage students to train themselves in controlling what teaching material needs to be mastered, so that students become active learners. Even so, each student has different levels of these abilities, so that students still cannot be separated from the role of the teachers as the main educator in guiding, motivating and facilitating the student learning process (Sulistyowati, 2011) [38].

2.2 Coordination System
Nervous system is composed of nerve cells (neurons) and glial cells as support cells. Besides that, it also has special components, namely dendrites and axons. Both are branches of the cell body. Dendrites are generally short and have many branches. Its function is to forward impulses coming from receptors or other neurons to the cell body. Whereas axons are generally unbranched and long whose function is to transmit impulses from the cell body to other neurons or other cells (Manalu *et al*., 2004) [23]. Along the axons, there are layers that cover the axons. This layer is called the myelin sheath (Kimball *et al*., 2002) [21].

The stimuli received or recognized by the receptors will be transmitted or carried to sensory neurons (afferent neurons). The sensory neurons then pass the impulses to interneurons in the central nervous system. The central nervous system consists of the brain and spinal cord. The impulses that arrive in the brain are analyzed or processed to produce a response. The brain will give orders out of the central nervous system. Commands in the form of this information will be passed out of the central nervous system to motor neurons (efferent neurons). The motor neurons will pass on to the effector. Effectors can be muscle cells or glandular cells. Muscle cells will respond according to orders from the brain, which can be in the form of movement. Meanwhile, if it reaches glandular cells, glandular cells will produce hormones (Khan Academy, 2015) [20].

Nervous system in the human body is divided into two, namely the central nervous system and the peripheral nervous system. The central nervous system comprises the brain and spinal cord. The brain and bone marrow play a role in controlling any response generated to stimuli that have been recognized. Both the brain and spinal cord can communicate with the peripheral nervous system. The peripheral nervous system consists of all neurons originating in the brain and spinal cord. The peripheral nervous system in the brain consists of 12 pairs of cranial nerves and 31 pairs of spinal nerves. Both of them consist of sensory neurons and motor neurons (Brooker *et al*., 2008).

The peripheral nervous system can also be divided according to the type of effector that plays a role in the response, which consists of the somatic nervous system and the autonomic nervous system. The somatic nervous system will move effectors in the form of skeletal muscles, while the autonomic nervous system will move effectors in the form of smooth muscles, heart muscles and glands. The autonomic nervous system is further divided into two based on the type of activity, namely the sympathetic nerve and the parasympathetic nerve. The sympathetic nerves will actively work during fight or flight situations while the parasympathetic nerves work in rest or digest situations so generally they work in opposites process (antagonist) (Campbell *et al*., 2008) [6].

There are two types of movement, which are unconscious movement (reflex) and conscious movement. Conscious movements involve the central nervous system, namely the spinal cord and brain, while reflex movements are a response to certain stimuli that are shocking, painful, resulting in a rapid response to movement. This rapid response is caused by stimulation not being carried to the brain to be processed or analyzed, but through a pathway known as the reflex arc, where the stimuli are first recognized by receptors and then transmitted to sensory neurons to the spinal cord and then the information is carried to motor neurons and then ended up in effectors, resulting in a movement (Khan Academy, 2011) [19].

3. Method
Type of the study is research and development (R & D) which is to produce weblog-based learning resources on the coordination system material. The development model used is 4D from Thiagarajan (1974) [39] which consists of define, design, develop and disseminate respectively. However, this

study is limited on define, design and develop, and uses adaptations from Multyaningsih (2020) [27]. Data collection techniques used interviews and questionnaires that produce qualitative data and quantitative data. Qualitative data was from interviews and suggestions in the questionnaire. Meanwhile, the quantitative data obtained from the questionnaire score calculation.

Quantitative data analysis techniques used descriptive statistics, namely statements strongly agree, agree, doubt, disagree and strongly disagree to be converted into quantitative data with a scale of 5 with a score of 1-5. The steps in data analysis include: (a) the initial weblog product (prototype) that has been produced from the stages assessed by the assessment team (1 media expert, 1 material expert, 10 college students, 3 teachers and 30 students) by filling out a questionnaire, (b) the results of filling out the questionnaire (statement items and suggestions) are collected, (c) the score of the results of the statement items is converted into a value on a scale of 5, (d) the results of the calculation of the percentage of product feasibility are adjusted to the product feasibility indicator table (Ernawati, 2017) [13], (e) figure out effect size of using weblog on online learning process for 19 students individually and as whole (Dini *et al*., 2019) [11].

Table 1: Feasibility Indicator

Value %	Qualification
80 – 100	Very good
66 – 79	Good
56 – 65	Adequate good
46 – 55	Less good
0 - 45	Very poor

Table 2: Effect Size Indicator

Size	Qualification
0 – 0,20	Weak effect
0.21 – 0,50	Modest effect
0,51 – 1,00	Moderate effect
> 1,00	Strong effect

4. Results and Discussion
4.1 Weblog Making Process
1. Define is the initial stage which is usually called a needs analysis by looking at the conditions of the school, determining the material, identifying the character of students and determining the appropriate source / media to be developed.
2. Design is the stage of designing an initial weblog-based learning resource (prototype), starting from designing the story board, collecting the material sources which contain the process of creating a weblog and creating weblog content.
3. Develop is done after the prototype has been completed. The prototype was then assessed by material expert, media expert, college students, teachers and students.

After calculating the scores on all the questionnaire instruments that were filled in, the percentage of product eligibility was obtained as shown in the Fig below. Based on the total eligibility percentage, the weblog was considered very feasible by the assessment team (media expert, material expert, college students, teachers and students). The prototype was then revised in accordance with suggestions from the assessment team so that the final product was produced.
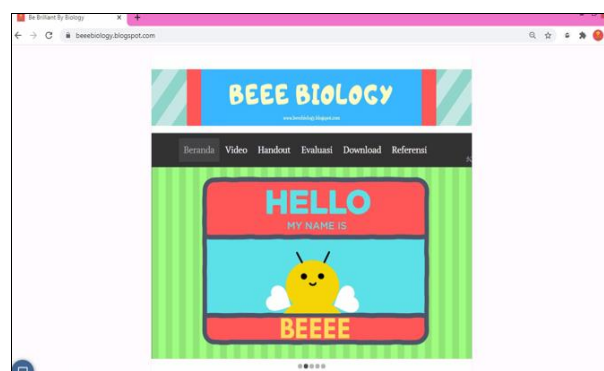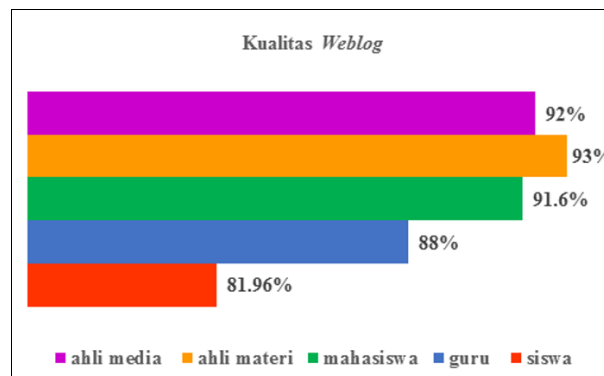

Fig 1: Story Board

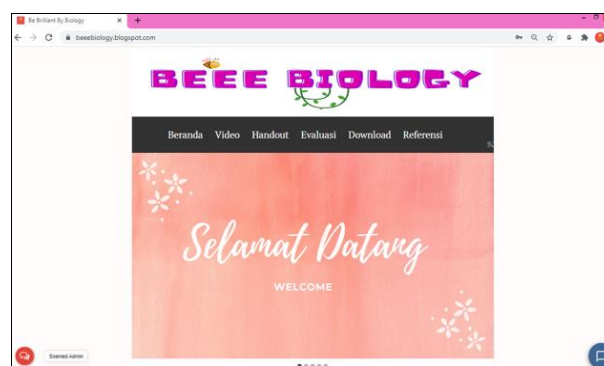**Fig 2:** Protoype

Fig 3: Quality of Weblog

Fig 4: Final Product

4.2 Weblog Specification
Weblog can be accessed online on www.beeebiology.blogspot.com. This weblog consists of 7 menus, which include a homepage, videos, handout, evaluation, download, reference and chat box.

The homepage menu contains weblog introduction audio and video tutorials to access the weblog using a laptop and smartphone.

The video menu contains youtube channel link and a list of learning videos consisting of 28 videos containing the nervous system. The duration of each video ranges from 3-15 minutes with a total duration of about 3, 5 hours.

The video developed is a type of interactive video lecture in which there is the use of a variety of powerpoint slides, audio, video and other additional features (such as background music, animation and others). The variety of media is expected to make students enjoy the learning process because they find learning is fun. This is in accordance with the opinion of Palaigeorgiou et al. (2019) [30] and Ljubojevic et al (2014) [22] stated that the use of interactive video allows students to feel comfortable while studying, which in turn makes students more motivated to learn independently. In addition to its flexible use, a variety of features that involve simultaneous audio and visual elements can speed up the process of transferring information in students' brains into long-term memory which makes students understand faster.

Handout menu contains summary consisting of 42 pages. This handout is type of storytelling. As one of the digital media for storytelling, its use has been proven in research by Csikar et al. (2018) [10] and Donelan (2001) [12] that it can attract students to study longer. By presenting the stories in everyday life, students can understand the material contextually, because there is an emotional closeness between reading material and student experiences.

Evaluation menu contains a quizizz website link which consists of 20 multiple choice question numbers where each question has 5 answer choices. The quizizz website can be used as a solution for teachers in training students' habit of working on questions, which is also related to improving students' understanding of the material. This is consistent with research conducted by Boulden et al. (2017) [4] and May et al. (2018) [24] that students are more comfortable working on questions on the quizizz because there are interesting features in the quizizz which consist of a display like a quiz game, interesting reactions available for each question answer, background music, knowing the answer score and ranking between students based on scores, questions and answers can be shuffled every time repeating a practice question and can be used multiplayer.

Download menu contains links to learning videos that can be used as an alternative choice if students want to watch them offline.

Reference menu contains a list of references used in the production of instructional videos and handout.

Discussion menu contains chat box and researcher social media links. Students and teachers can interact in the discussion box directly while opening the weblog. This is in accordance with research conducted by Alhabbash (2012) [1] and Mtshah and Maistry (2015) [26] that online discussion by using chat box can facilitate several things, for example, both students and teachers can exchange information outside of school hours and allows students to be actively involved in conveying and responding to ideas (especially for students who are less assertive).

4.3 Weblog in Learning Outcome

Weblog is then used in learning to findout effect on student learning outcomes. A total of 19 students took the pretest, then studied online and independently using a weblog and did a post test at the end of the lesson.

Table 3: Effect Size Using Weblog

Siswa	Pretest	Post test	Cohen
1	70	90	3,7
2	70	100	39
3	70	100	3,9
4	65	95	11,3
5	65	95	11.3
6	65	100	6
7	60	80	2,3
8	60	85	4,7
9	45	95	4
10	40	85	2,7
11	25	75	1,7
12	70	100	3,9
13	70	100	3,9
14	65	85	3,8
15	75	90	1,7
16	60	80	2,3
17	70	95	4,5
18	75	100	2,4
19	70	100	3,9
Total			2,7

Based on table 3, result of the effect size obtained from the overall calculation of the students is 2.7, where the result is in the strong category. This shows that the effect of using a weblog in the learning process on students has a strong positive effect. Specifically, each student also has in the strong category. This indicates that students like learning by using the weblog.

Based on table 3, the use of a weblog in learning carried out by students causes an increase in learning outcomes. Students' preferences for learning by using a weblog are in accordance with the opinion of Restulowati et al. (2016) [33] that increased learning outcomes can be due to students having better learning experiences by using weblogs.

Based on research conducted by Peechapol et al. (2018) [31], weblogs used in learning affect learning experiences, feeedback and rewards; communication and interaction; social influence; and student attitude during learning. Students will get a different learning experience from studying in class. Students are more enthusiastic about learning with the technology they already like (internet and gadgets). With this convenience, it allows students to continue to interact with teachers and other students. Giving rewards and feedback online can provide emotional closeness between students and teachers, thereby creating trust in each other. Therefore, organizing an online learning process can lead to better behavior changes for students due to good social influences from teachers and other students.

Learning outcomes that have increased after learning in weblog are related to student self-efficacy and motivation. Both are part of the character (personality) of students. According to Fitriani et al. (2017) [15] and Firmansyah et al. (2018) [14], both self-efficiacy and motivation have similar patterns. Self-efficacy is the confidence of students to carry out the learning process from start to finish so as to achieve their learning goals. Students with high self-efficacy will be able to face any difficulties during learning, be consistent in learning and have good time management. The motivation is the willingness and encouragement in students to achieve their learning goals. Students who are highly motivated will

study seriously, focus and sincerely.

5. Conclusion

Based on the result, there are conclusion below:

1. Weblog contain nervous system material. The weblog that is developed based on define, design and develop from 4D model. The weblog consists of seven menus, namely homepage, video, handout, evaluation, download, reference and chat box.
2. Weblog is considered very feasible by the team of experts and can be used as a source of learning biology.
3. Weblog can be accessed free by anyone, whether students, teachers or parents. Weblog have many variations media consisting of instructional videos and handout. Evaluation feature has an interesting screen display and can be used repeatedly. Download feature can be a student's choice to access the material offline. Chat box feature can facilitate students and teachers to have online discussions.
4. Weblog has strong effect positively in increasing student learning outcome.

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