Structure sense Mathematics with construct 2 and sticky notes

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Abstract. The purpose of this study was to determine the ability of the mathematical structure sense and attitudes of students through learning with construct 2 and sticky notes. The design of this study was Quasi Experimental with a non-equivalent control group design model, the research subject of the first semester biology of education students who were studying elementary mathematics. The results showed that the low ability of students' mathematical structure sense was caused by several factors including the low response of elementary mathematics learning students 43.24%, low ability of student symbol sense of students are 51.64%, construct 2 needs to be developed to respond to students who have basic math learning difficulties 63.21%, and 74.56% of students state that sticky notes are easier to apply, understandable and more practical. The ability of the structure is influenced by the learning model and the media used.

1. Introduction
Algebra is a part of mathematics that examines symbols in the form of variables and interrelationships between symbols. The material learned in algebra is factoring, algebraic multiplication and so on. Students are expected to be able to understand the concept of algebra well embedded from the cognitive structure possessed both assimilation and adaptation of thought processes. If students are faced with factoring or proving algebra he feels difficult and does not understand what they are learning the impact students lack enthusiasm and tend to be passive in carrying out the tasks given by the teacher [1]. Many students have difficulties with basic algebraic concepts at high school and at university [2]. The difficulty in learning to use algebraic notation has several things. Including cognitive constraints faced by participants in involving mathematical tasks, but not limited to assignments, student difficulties with syntactic or semantic integration, difficulties in recognizing applicable solution templates, not understanding assumptions about choice of variables, and representation of algebraic forms. A common mistake made by eighth grade students of SMP is a conceptual error that is caused by inaccuracy and lack of mastery of prerequisite material. Students' structure sense is still low because the sensitivity of students' symbols in algebra is still low [3,4]. Structure sense an intuitive ability towards symbolic expressions is considered as a key success in learning algebra [5].

Algebraic Experience Materials (AEM) teaching aids are one of the mathematical teaching aids that can help students to understand algebraic concepts, especially in terms of multiplication of quadratic equations or recording AEM can be used in mathematics learning as an effort to overcome students' difficulties in understanding of algebraic concepts. In addition, the use of AEM teaching aids makes...
students feel happy and unsaturated when learning algebraic forms using AEM props. Dienes AEM is an alternative to building algebraic concepts with teaching aids and providing student learning motivation [6]. If students can understand abstract algebraic concepts well, their thinking skills will also increase. Therefore, the teacher can apply the AEM teaching aids in mathematics learning the subject of algebraic form operations to improve creative thinking skills by 22.29% [7].

Nowadays, a new trend in e-learning is known as Mobile Learning, the use of portable media such as smartphone [8]. AEM that will be presented to students in the form of digital with Android-based using construct 2. Construct 2 is an HTML5 based tool that allows anyone to create games or other applications without having to have programming experience [9]. Android usage in productive age ranging from SMP / MTs to high school / Aliyah generally for social media, less use of android to help learning difficulties, this needs serious attention so that android can help to improve the quality of student learning outcomes and to motivate students to learn [10]. Learning through android is a new approach to education, and this is unique in its own way and offers learning opportunities anywhere and anytime [11]. Sticky notes are a medium that researchers use to understand abstract algebraic concepts of factoring, looking for the roots of quadratic equations and multiplying algebraic factors into quadratic equations. Through the use of sticky notes teaching aids students construct algebraic concepts with their friends. Sticky notes can improve in students' mathematical comprehension [12]. The purpose of this study is to improve the ability of the sense structure of students who are learning basic mathematics by using AEM assisted by Construct 2 and sticky notes, and knowing the students' responses to the use of these media.

2. Methods
The design of this study is Quasi Experimental with nonequivalent control group design models. The learning process carried out in this study consisted of pretest, treatment and posttest. The experimental class of learning using AEM was assisted by construct 2 while the control class with the AEM learning model was assisted by sticky notes. In both classes each model was introduced to be applied to the two classes in one meeting, in order to find out other models in completing algebra. After both classes get different treatment then post-test. To find out the response of student attitudes towards the lecture model that has been delivered, students are given a questionnaire in three parts of the questionnaire. The subject of this study was the biology education student UIN Sunan Gunung Djati Bandung who was studying elementary mathematics. The research instrument consisted of structure sense tests and questionnaires.

3. Results and discussion
The use of technology in learning is needed considering the limited ability to complete high-level or complex mathematical or geometric operations. Android as a tool that helps illustrate or display the right solutions and complicated mathematical problems. One of them is the use of construct 2 in completing factoring or multiplying two or more degrees of equality factors. Construct 2 and sticky notes help understand the factoring concept the difference lies in the level of understanding and tools the device presents. Through construct2 students can understand the concept independently, can be done anywhere and can be repeated as well as sticky notes. The thing that distinguishes it from sticky notes can be done together, this appears to be an interaction with other students. Sticky notes are easier and more practical because there is no need to make a display design in advance compared to construct 2, there needs to be a display design and modeling up to product trials that have been validated by material and media experts. The researcher did not attempt to compare the two-learning media but saw aspects of ease and response to understanding algebraic concepts.
In Figure 1, the main menu for displaying AEM helps users to see the initial appearance of AEM consists of lesson objectives, basic competencies and content, material and evaluation, tribe of algebra.

In Figure 2, the AEM display determines the quadratic equation, it appears that the rectangular colors give different meanings, namely $x^2$, $x$, and numbers as the last term or constant. AEM is expected to help minimize confusion in students.

In Figure 3, the AEM view determines the quadratic equation factors.
In Figure 3 find the factors of the quadratic equation of the AEM formed. In the picture the coefficient used is two, so with AEM construct 2 we can find the quadratic equation factors whose coefficient is not only one. The image has the purpose that from the form of AEM that has been formed can be found the factors of quadratic equations or the opposite of image 2. Next to find out the response or response of students after studying the structure of mathematical sense with AEM construct 2 and sticky notes given questionnaires. The results of the questionnaire given are divided into three parts, namely the response of students to the media, lecture strategies, and learning outcomes shown in table 1 below.

| Section | Statements                                                                 | Yes     | No     |
|---------|-----------------------------------------------------------------------------|---------|--------|
| A       | The media used is very helpful in increasing the understanding of concepts about algebra | 43.24%  | 56.76% |
| B       | Basic math lectures with sticky notes are easier to understand than construct 2 | 74.56%  | 25.44% |
| C       | Basic mathematics is one difficult subject                                  | 63.21%  | 36.79% |

In table 1 it appears that the low response of students to basic mathematics learning is 43.24%, the low ability of student symbol sense is 51.64%, construct 2 needs to be developed to respond to students who have basic math learning difficulties 63.21%, and 74.56%.

In Figure 4 shows that sticky notes can understand the mathematical structure sense concept with the help of the AEM concept, so that it determines the quadratic equation if it is known that the factors are more concrete and visible, as well as determining quadratic equations if the AEM with sticky notes is known to be resolved [13]. The ability to structure sense through AEM with sticky notes helps to understand the mathematical structure sense besides learning can be done in groups so that there is interaction between students. The ability of the mathematical sense structure is presented in the table below.
Table 2. Enhancing the ability of mathematical structure sense.

| Model        | N   | Mean Pre-test | Mean Postest | Gain  | Std.Deviation |
|--------------|-----|---------------|--------------|-------|---------------|
| Sticky Notes | 30  | 49.56         | 55.64        | 6.38  | 0.55          |
| Construct 2  | 30  | 48.35         | 53.47        | 5.12  | 0.42          |

In table 2 shows that the two lecture models are able to improve the ability of mathematical structures sense but not too different levels of increase. The results of the pretest class with an average sticky note are 49.56; posttest 55.64 with a gain of 6.38 students, while with construct 2 pretest 48.35 postes 53.47 with gain 53.47. Through AEM with sticky notes, students are more responsive because they do active math through teaching aids, but in construct 2 with a gain of 5.12 students are not very active because their learning is more independent through the help of a gadget.

4. Conclusion
Factors causing the low mathematical structure sense ability of students in biology education are due to the ability to understand concepts, student attitudes towards basic mathematics courses, and low mastery of pre-requisite material. The application of media construct 2 and sticky notes can help understand the structure of the student's mathematical sense, this can be an alternative learning media used in understanding the mathematical sense structure on the subject of factoring quadratic equations and determining quadratic equations in which the root solutions are known.

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