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RESEARCH ARTICLE

Scaffolding SETS for Colloid Material on Yoghurt Context

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ABSTRACT

The purpose of this research was to describe the scaffolding applied to the chemistry learning process on colloidal material in the context of yogurt using the SETS approach. The SETS approach means a learning approach that relates the things learned using SETS aspects that are synchronized reciprocally as a form of integrative linkage. Scaffolding is a learning strategy where teachers provide assistance to students in solving problems in the learning process. Yoghurt is one type of colloidal example with the type of emulsion colloid and is one of the applications of the colloidal concept. This type of research was quantitative description research. The subjects were 20 students of class XI SMAN 1 Padangbolak. The results of the analysis show that with the scaffolding provided by teachers, especially in colloid learning, it could help students understand the learning, which could be proven by the average student score of 82.9.

KEYWORDS

Scaffolding, SETS, Colloid

1. INTRODUCTION

The learning process involves a strategy that aims to provide assistance to students in solving problems; one of those strategies is scaffolding. Scaffolding, without realizing it already exists and is given by teachers every day during the learning process, has not been properly organized so that its use does not maximize the achievement of learning objectives[1]. Scaffolding is one of the forms of cognitive support that can be chosen to enhance student learning. As for the excellence of scaffolding in learning, it[2]: (a) solving students' learning difficulties; (b) keeps students from failure; (c) reduces student stress levels; (d) can attract student interest in engaging actively in learning; (e) Creates a supportive learning environment. Essentially, scaffolding seeks to enhance learning through social interaction by involving content, understanding, and learning needs[3]. One of the services provided by the teacher is the provision of teaching materials. Teaching materials can be in printed or non-printed form. E-modules are teaching materials in non-print or digital form, which is one of the positive impacts obtained from the development of science and technology[4]. E-module is one of the teaching materials in digital form in which there are images, videos, and animations that can support effective and efficient learning[5,6]. E-modules are considered innovative because they can present interesting and interactive learning with superior cognitive functions compared to printed books[7,8].

The SETS approach is an integrated approach between science, technology, and information in society. The SETS approach means a learning approach that relates the things learned using SETS aspects that are synchronized reciprocally as a form of integrative linkage[9]. With the SETS approach, students are required to be able to connect the concepts learned to their application in technology that has an impact on the environment and society[10].

The application of the SETS helps students utilize the school and surrounding environment to get information in alignment with the material they have learned. And students can also utilize society by interacting to find information[11].

Colloidal system material is material learned by students in class XI, and in this material we find many applications in daily life, such as the milk we consume and many products made from milk, such as cheese, yogurt, etc. Yoghurt is the result of milk fermentation using bacteria[12]. The common ingredient used in making yogurt is cow's milk. But it is also undeniable that the variety of yogurt on the market also comes from vegetable ingredients, such as soy yogurt[13].

In accordance with the SETS approach, this material is able to bring students into a situation where they can utilize science concepts in the form of technology for the benefit of society.

2. METHOD

The type of research was quantitative description research that aims to describe scaffolding on colloidal material with the theme of yogurt using the SETS approach. The subjects in this research were 20 students of SMAN 1 Padangbolak. The data collected in this research includes the results of student assignments on each question contained in the e-module.

3. RESULT AND DISCUSSION

Based on the research results, it was found that scaffolding is a type of assistance that can help students independently solve complex problems they face in learning activities [14]. Scaffolding is applied by providing instructions, e-modules, and explanations to students. The e-module contains learning materials and tasks related to colloid learning. The tasks given were adjusted to meet the learning objectives. The formulation of learning objectives was carried out after the basic competencies were analyzed. An analysis of basic competencies can be seen in Table 1.

Table 1 Basic competencies and Indicators of competence achievement

Basic competencies	
3.14	Classify different types of colloidal systems and explain the uses of colloids in life based on their properties.
4.14	Make food or other products that are colloidal or involve colloidal principles.
Indicators of competence achievement	
3.14.1	Classify solutions, colloids and suspensions.
3.14.2	Categorizing types of colloids based on dispersed phase and dispersing medium
3.14.3	Explaining the properties of colloids
3.14.4	Differentiating lyophobic colloids and lyophile colloids
3.14.5	Explaining the process of making colloids
4.14.1	Making colloidal products involves the colloidal principle of condensation.

The SETS teaching associates four elements: Science, Environment, Technology and Society. Thus, with these four elements can improve the skills of the students' science processes. On each SETS element there is a relationship between the skill of the student's science process and, Like Science on the indicator measure, the Environment by observing and grouping, Technology on the predictive indicator and on the Society indicator communicating[15]. Based on the results research[16], the SETS learning model can guide the attitude of students toward socializing and improving their thinking especially on the chemistry applied in everyday life.

Yoghurt in SETS: it is known that yoghurt is colloidal, with a type of emulsion that has a liquid dispersed phase and a liquid dyspersed phase[17]. Yogurt in technology is a food biotechnology that comes from the fermentation of milk with two bacteria, namely Lactobacillus bulgaricus and Streptococcus

thermophilus[18]. Yogurt is also rich in prebiotics that are beneficial to boost the immune system[19].

Scaffolding holds an important role in achieving the level of potential development. Based on the research[20], it was stated that the application of scaffolding is guided by a lesson plan that contains the stages of scaffolding learning. As for the steps of learning scaffolding can be seen in Table 2.

Table 2 Scaffolding learning steps[21]

No	Scaffolding learning steps
1.	Determining Zone of Proximal Development (ZPD)
2.	Group students by ZPD
3.	Provide a study assignment on matters related to the learning material.
4.	Teachers monitor and mediate learning activities
5.	Providing guidance, motivation, examples, keywords, or anything else that can lead students towards learning independence

ZPD (Zone of Proximal Development) is the distance between the actual level of development and the higher level of potential development, in which each student has a different level[22]. Students will be able to reach the maximum area if assisted sufficiently. The help that a teacher can give is scaffolding.

The application of the learning strategy 'scaffolding' is one of the options for explaining the colloidal material. Where learning strategies on the subject of colloid language can be done in the way:

1. Early activity

   a) The teacher greets the student. b) The teacher sets the focus of learning. c) Teachers checked their previous learning results to determine the Zone of Proximal Development. d) Teachers divide groups based on the initial level of development of the student, known from the previous student's learning outcomes.

2. Core activities

   a) Teacher explains the use of e-modules to students. b) Teachers present the learning tasks on the e-module in a sequence by continuing to provide explanation, warning, encouragement, and problem delineation into the solving steps. c) Teachers reduce such support or assistance and allow students to complete tasks independently.

3. Closing activity

   a) Teachers check the learning results that have been achieved by the students. b) The teacher gives further explanations and instructions related to the material studied and concludes the study

The application of scaffolding is aimed at optimizing the ability of students to engage in colloidal learning[23]. Based on the categorization of the need for scaffolding, the results are classified in the category of some students needing necessary assistance that will help them understand student tasks. Assistance or scaffolding can also be provided in various forms, including encouragement, warnings, instructions, problem-solving steps, giving examples, and actions for students to learn independently[24].

Learning materials are provided in the form of an e-module so that students can be independent during the learning process. In line with research[25], providing e-modules in the learning process can increase student independence. Instructions and explanations are given to direct students attention and thoughts on what should be done. To assess the ability of the student, after learning continues, the student will work on the assignment contained in the e-module.

The analysis of student assignment scores can be seen in Table 2. The average score of 20 students is 82.9. This is in line with research[26] that shows that providing scaffolding in the learning process has a positive effect on the learning process. Result of research[27] concluded that with the application of scaffolding, students can solve their own problems after getting help from teachers and peers who are more capable.

Table 2 Average score student

Assessment	Total	Average
1	1500	75
2	1640	82
3	1850	92,5
4	1640	82
Grand total	6630	82,9

4. CONCLUSSION

Learning strategies using the help of scaffolding provided by teachers at the time of the learning process are very important. Providing e-modules with instructions can help students to understand colloidal material in the context of yogurt using the SETS approach. In addition, for teachers, scaffolding on colloid material in the context of yogurt with the approach of SETS can help teachers maximize student learning activity as well as be used as an alternative to teachers to help students achieve learning goals because in this study students earned an average score of 82.9.

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