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GEOGRAPHY LEARNING DESIGN BASED ON SPATIAL PHENOMENON TO IMPROVE HIGHER-ORDER THINKING SKILLS

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ABSTRACT: Teaching material organizations must build higher-order thinking skills. This research is based on development research. Development research is oriented to the needs of the student through initial research to determine the design. Design of teaching materials including material organizations with formats based on the A-CAR model (Activation, Confirmation, Activities, and Resumes). The purpose of the research is to produce Meteorology-Climatology teaching material that can build higher-order thinking skills. This activity makes students compare weather or climate phenomena in different spaces. Design of validated teaching materials (content and language) is implemented in the teaching process. Revisions are based on input and experimental implementation. The results of the t-test analysis showed a significant effect on higher-order thinking skills.

Keywords: Geography Learning Design, Spatial Phenomenon, Higher-Order Thinking Skills

1. INTRODUCTION

Learning design can contain about how to teach students through strategies, models, methods, media, teaching materials, learning resources, and evaluations that aim to make it easier for students to gain knowledge and experience. Teaching material organized in the format of learning activities to achieve learning objectives can be a learning design. According to Gustafson learning design contains about how to teach [1] and Stevens & Goldberg suggest the learning design can produce learning that compatible with the brain [2]. Smith and Ragan confirmed the learning design through a systematic and reflective process of teaching and learning principles are into teaching materials plan, activities, information sources, and evaluations [3].

The function of teaching materials can be directed to learning activities that involve higher-order thinking skills because the organization of instructional materials precisely has a positive effect on the learning process [4]. Teaching materials play a role in bridging learning in the classroom and providing initial knowledge. Teaching materials allow students to dialogue, discuss independently, build their knowledge as a constructivist theory [5,6] to improve quality comprehensively [7]. The construct of teaching materials takes into account the theory of brain-based learning [8,9]. Students are free to explore their knowledge based on teaching materials in various ways [10]. Teaching materials are designed based on brain-based learning theory which procedurally activates the workings of the brain. Learning begins with the activation of the brain to activate neurons, then is ready to engage in high-level thinking processes, such as critical thinking, creative, problem solving, and decision making [11, 12].

The teaching materials contain text and images in a specific context. The text gives a description using clear and edible language. Images to reinforcement students' internal dialogues, turn on abstract ideas and provide direct experiences. Images as a visual elaboration proved to be very effective [13] and can visualize written verbal information with holistic visual symbols and patterns [14]. Information in the form of images can be reactivated by calling the image, such as looking at a photo album [15]. Context of dynamic learning design [16]. The teaching materials are designed to provide a structured, patterned learning process, based on the way the learning brain (Jensen, 2011), can be self-study by the students [17], wherever located and interacting with friends [18].

Critical thinking is a higher-order thinking skill is a self-regulatory judgment manifested through interpretation, analysis, evaluation, and inferences [19], organized cognitive process (Cüceloglu, 1994, in Arslan, Ramazan; Gulveren, Hakan; Aydin, 2015). The ability to think critically includes the knowledge, ability and willingness to ask and answer questions at the right time [21], through appropriate action, [22] called imperative survival. Critical thinking according Wade has characteristics: Asking questions, defining a

problem, examining the evidence, analyzing assumptions [20], interpretation, analysis, evaluation, and inferencing [19].

Critical thinking and creative thinking are interdependent, but creative thinking can also be influenced by critical thinking. Bloom incorporates creation in the highest cognitive level, producing new patterns or structures with different thoughts [14]. Creative thinking produces creativity in new ideas, patterns and models. Creativity implies that solutions are not only true, but also unique, useful, and effective in various situations [23]. Creativity requires cognitive abilities, such as effective control of working memory, ongoing attention, cognitive flexibility, and conformity assessment derived from the prefrontal cortex [13]. Creativity, as a cognitive activity that produces a new view of the problem and is not limited to pragmatic results [15].

2. METHOD

This research is development research. The development research is carried out on existing teaching materials to be revised into more up-to-date teaching materials. Development research models from various versions can be modified, or a combination. This development research is flexibly designed using a combination of the ADDIE model with Borg and Gall for optimizing the intervention. The development research steps include preliminary research, determining the design, validation, implementation, revision, final product, and dissemination. Implementation in the experimental framework is done on all teaching material topics for one semester.

The effectiveness test of teaching materials is by experiment in H class and G class as control class. The treatment differs between the control classes and the experimental class. The control class implements the existing teaching materials, while the experimental class applies the teaching materials based on A-CAR models. The learning is conducted for one semester, with two tests terminals. Comparative results of two test terminals were analyzed using the mean difference test (t-test). The effect is expressed by the difference of critical and creative thinking ability between the control class and the experimental class at the 0.05 significance level

3. RESULTS AND DISSCUSSIONS

The design of teaching materials is synchronized with brain-based learning that is compatible with the brain learns. Students learn without pressure, they discuss and access the internet. Students have patterned the habit of learning critical and creative thinking through teaching materials. The results of critical and creative thinking skills are higher in H class because they have learned that's synchronized in learning. Critical thinking skills can be taught as argued by [22-23]. Increased critical and creative thinking skills can occur because teaching materials that contain writing and images have consequences on reading activities. Reading is not spoken but is processed in the brain through eye sensors. Clarity of letters, clarity of words or images, the correctness of language, sentence demands, and accuracy of context have an impact on the clarity of information. The introduction of words or terms that are understood, forming new mental representations through information transformation [15], and manipulate the meaning of internal symbols [22]. [15] discovered the phenomenon that in the process of reading the human eye doesn't observe letter by letter sequentially, but moves in small jumps with momentary fixation at certain points.

Teaching materials as a product of development, the term educational products not only teaching materials and supporting equipment but also the development of learning processes and learning models [24]. Teaching materials as one unity of learning activities play a role in the acquisition of targeted knowledge according to competence. The teaching materials contain a series of lectures arranged in sequence, with a systematic presentation [25] by following the plan semester lectures. Students can design their learning activities by following the order of course plans so that students become ready to learn. Illustrations or images on each topic of the teaching materials have built up the knowledge and helped to become critical thinkers [26].

The teaching materials contain learning topics, writings, and images involving sensors of all senses (especially the eyes). Sensors fill the memory up to tens of thousands of fragments of information in the memory of the brain [14] which is useful in reading comprehension, logic, and problem-solving [13]. It reads closely concerning seeing that is controlled by visuospatial sketches. Speech is controlled by a phonological loop, as a storage system that can integrate the memory code of different modalities (visual and verbal). Information is integrated and logical because logical information can be stored in long-term memory [14].

The teaching material leads to the formation of critical and creative thinking, engaging the mind based on learning theory [27], cognitive theory and its application [13], cognitive psychology [15], and brain-based learning [8, 22]. The indication lies in the responsive action of the question [21]. Concerning the content of teaching materials involves more students to think about the concept.

Students can find their clarity of concepts using their minds, links to the internet for the development of insight and reasoning. Students use their reasoning to analyze, synthesize, analogy, critical thinking, and creativity, as well as metaphysical abilities [28], or metacognitive [15] to explore logic.

Teaching materials can not be separated from the influence of communication technology, such as laptops, mobile phones, and wifi into a tool to complete the information. This matter, teaching materials become relevant, accommodate the needs of students, pay attention to the world of students, Els [25] call it a customized and work environment-oriented. Students are free to browse and have become their passion for exploring unlimited information.

The attractiveness of teaching materials lies in the layout setting of teaching materials in the form of images, graphics, and text supporting maps. Views can give the impression of a challenging outlook, even as an orchestra [16], and as a catchy framework [22]. Support for textual content has the principle of relevance and unification, can strengthen long-term memory [15, 13, 27, 14]. Content bears a special topical name and distinguishes it from other content though on the same subject matter, but remains consistent on the continuity between topics. Characteristics of this content can provide direction of competence that can be realized in the student. In other words, the identification of content requirements specifically indicates the competence that can be realized in the students. The specification of this content can not be separated from the curriculum that has become a procedural system.

Variations in students' creative thinking ability are not always influenced by academic ability. Low academic ability is not necessarily low creative potential, and high academic ability does not necessarily show high creativity [29]. This can happen because the development of creative thinking is not only through learning but also through a culture that 'wraps' the ability to think creatively [30]. Culture as a source of experience for creative action. Creative action is demonstrated by the interaction of individuals (personality, intelligence, knowledge, and experience) with contextual factors (education, social environment, family, economy, and physical condition) [30].

Creative thinking is divergent thinking, whereas critical thinking is convergent thinking. Thinking divergently requires creative ways, new solutions, whereas convergent thinking is the way to determine the best solution [31]. Creative thinking focuses on suggesting different ideas [32], while critical thinking seeks validity that already exists. Beyer argues critical and creative thinking is like two sides of the coin [33, 34]. According to Torrance and Safter a student can learn to be creative by explaining, asking, experimenting, manipulating, listening, and testing [35]. Critical thinking resulting from education, training, and practicum [36] as well as capacity building [37] Critical thinking as a source of power expressed in various experiences, situations, and events [32].

The ability of critical and creative thinking of students becomes an important educational goal [38] as stipulated in the curriculum, which is to produce qualified and highly competitive graduates. The ability to think critically and creatively is settled in long-term memory. Students can easily call and utilize critical and creative thinking skills in different situations. The ability to think critically and creatively becomes the qualification required in the Indonesian National Qualification Framework. These qualifications include the ability of the work field, knowledge of mastered, managerial skills, and accountability.

4. CONCLUSION

In general, the design of learning through the organization of teaching materials can be concluded: 1) There has been an increase in higher-order thinking skills (critical and creative) as a logical consequence of the organization of teaching materials that are compatible with the way the brain learns; 2) Teaching material as a guide to thinking activities that produce new ideas which have meaning; and 3) There is a significant difference between the control class and the experimental class in higher-order thinking skills, where the experimental class has higher grades.

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