Effect of quantum learning model in improving creativity and memory

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Abstract: Quantum learning is a combination of many interactions that exist during learning. This model can be applied by current interesting topic, contextual, repetitive, and give opportunities to students to demonstrate their abilities. The basis of the quantum learning model are left brain theory, right brain theory, triune, visual, auditorial, kinesthetic, game, symbol, holistic, and experiential learning theory. Creativity plays an important role to be success in the working world. Creativity shows alternatives way to problem-solving or creates something. Good memory plays a role in the success of learning. Through quantum learning, students will use all of their abilities, interested in learning and create their own ways of memorizing concepts of the material being studied. From this idea, researchers assume that quantum learning models can improve creativity and memory of the students.

1. Introduction
Problems that are still a constraint in education such as the low quality of learning in schools. An indicator of the low quality of learning among others can be seen from the lack of preparation of learning devices prior to the implementation of learning [1] and the low ability to solve problems for learners in facing problems or situations that are not routine [2]. Educators, in this case, the teacher or lecturer should use the method or model of learning in accordance with the needs. Each student's cognitive development has different characteristics so that the learning approach or model used by the teacher should also be tailored to the child's cognitive development [1, 3], as well as the topic in the learning has its own character so that it requires appropriate delivery method. For example in science subjects with topics of plant pests and diseases can be done by model study Group Investigation (GI). On the topic of environmental conservation can be studied with Problem Based Learning (PBL). On the topic of temperature and heat can also use PBL. Educators expected to make the design of learning activities, apply during learning, and evaluate the success of learning that has been done.

Educators are expected to develop interesting, student-centered learning activities, and can shape the characters in students. Educators should be aware that learning can improve students' cognitive, affective, and psychomotor abilities. Educators should also make it possible for students to be creative, discuss in groups, be able to express opinions, be able to answer questions, mutual respect, and can work together to achieve goals. So the essence of science learning which consists of three components namely science as a product means science is a concept, facts, principles, and laws about natural phenomena, science as a process means there are a systematic and structured stages of science product discovery process, while science as a mean attitude through science learning activities can form
personality traits [4, 5, 6], therefore, as part of the national education process, science learning should be able to foster thinking skills [7, 8].

Memory is the ability to recall data that has been stored in memory. Memory also has an important role in cognitive development [9]. Still often found students who forget the material learned in the previous week. Especially material that has many terms as in biology or science. Therefore, it is necessary to apply the learning model that can help the students in improving the memory of the material or concepts learned. The memory of the material is important because it will affect student learning outcomes.

Learning should also improve students' creativity. To enhance creativity, students should be given the opportunity to be directly involved in scientific experiences [10]. Creativity is one of the thinking skills that can be developed in science learning, although not all students become scientists creative thinking needs students to be able to face their lives in the future [5, 11], allowing human beings to improve the quality of life [10]. Currently, college graduate users need a creative and innovative workforce. To be a successful entrepreneur also needs creativity. Creative students will be able to solve various problems in their life. Creative students are also able to create strategies to find work or create their own business. Therefore, creativity is an important point in learning. However, creativity still gets less attention.

One of the learning models that can enable students, fun, and spur students to use all the potential possessed is a quantum learning model. The logical reason for this is that the quantum learning model has a complex rationale. Quantum learning models review left-brain and left-brain theory. Quantum learning models also review visual, auditorial, and kinesthetic learning styles. Learning through experience and game activities. Quantum learning is a form of learning activity that is in an environment that makes happiness [12]. Through the quantum learning model students are invited to learn in a more comfortable and enjoyable atmosphere, so that students will be freer to find new experiences in learning [13]. Quantum Learning was developed by Bobby De Porter. Academic value is not the only thing important in learning, but enjoys learning and improves self-motivation [14]. Still, according to Bobby De Porter, the model of quantum learning model is a combination of various interactions that exist in and around the learning moment [15].

Based on the description of the quantum-learning model, there is a tendency that quantum-learning models can improve learning outcomes, creativity, and students' memory. Creativity arises through learning that optimizes the left-brain and right brain. Memory can be improved through interesting and fun learning. Creativity and memory in this study are limited to classroom learning activities, especially in the fields of biology and science. The purpose of this study is to look for a conceptual approach to applying a quantum-learning model with the TANDUR stages to improve creativity and memory in science learning.

2. Research method
This study is a preliminary study and does not intend to make a device or a model of learning, but only a conceptual approach prior to an eco-experimental research. So the main method that is done is to compare from various literature related to a quantum learning model, creativity, and memory.

3. Result
De Porter states that quantum learning packs very well into multisensory packages, multi intelligence compatible with the brain. Quantum learning will enhance teachers' ability to inspire students to excel [16]. Quantum learning is also easy to implement, fresh, flowing, and practical learning approaches.

The quantum learning applied in Indonesia is reduced to a model of learning abbreviated by TANDUR in Grow (natural), Natural (Alami), give a name (Namai), Demonstrate (Demonstrasikan), Repeat (Ulangi) and Celebrate (Rayakan). According to Fathurrohman, quantum learning with TANDUR stages is a learning model derived from quantum learning and has the principle of familiarizing learning with comfort, fun, trying to provide clues in sharpening understanding and
memory [17]. Because students are comfortable and happy in learning, hope will improve the success of learning one of them is the improvement of a memory of the material being studied.

In accordance with the above ideas, quantum learning models can be applied by teachers to improve the quality of learning. Through this learning, the students are trained to use all the potential of brain owned. The learning process is also more challenging and fun. Through learning that memorable then the information or materials learned will be longer stored in the memory.

In the quantum learning model with the TANDUR stages, Grow (Tandur) means the effort of the teacher to unlock memories and knowledge that are related to the topic being studied. In other learning models, growth can be aligned with the apperception stage. Growing stages can motivate students to learn and understand the purpose of learning to be done.

The next step in quantum learning with the TANDUR stages is Natural (Alami). At the Natural stage, the materials or topics that students will learn are associated with events in the student's daily life. This shows that the topic really exists in the student's life. Topics studied are close to students or not foreign matter. At the Natural stage, the teacher can give a simple question. The question has a link between material and student life.

Examples of questions at the Natural stage are very diverse. For ecosystem materials, for example, teachers can ask various animals and plants in the home garden of students. For high-level plant reproduction materials can begin with simple questions about the flowers that have been seen in the daily life of students.

The next step is to give the name (Namai). After going through the learning experience on a certain basic competence, students are directed to write, name whatever they get, whether the information is in the form of pictures, or writing [17]. In the implementation in the classroom, the teacher can provide the keywords to the students. Furthermore, students can make observations or investigations and can conclude on their own what they get.

When applied to students, Namai stages will be more complex. Students can discuss with group members and also conduct reference studies. At this stage also aims to generate ideas and ideas from students. students will think complexly using the various intelligence they have.

After stage give the name followed by Demonstration (Demonstrasikan). At this stage, students are given the opportunity to connect with their experience and the newly acquired data. Thus, they can experience and make it a new experience. Based on the author's experience, Demonstration stage can help students to learn to express opinions in front of the class. Students are also trained to answer questions and ask questions. Discussions take place over a wider session and may occur in mutual arguments. The teacher acts as a facilitator and controls the ongoing learning process.

The Repeat Step (Ulangi) means what repetition activity has been learned. Repeat activities can be done through posters, tasks, or a summary of learning outcomes. Through repeat, activities are expected to foster long-term memory. So the topic studied is not only understood for a short time.

Stage Celebrate (Rayakan) is a form of celebration of the success that has been obtained. This form of celebration may vary. Teachers can give praise, gifts, or ask the class to give you a round of applause. This celebration can bring a sense of happiness in students and motivate students to the spirit of learning.

If all the stages in TANDUR can be done well, then the students have done meaningful learning activities. The result will be better than conventional learning. To be able to apply quantum learning is needed preparation from the teacher. This learning requires teacher creativity and to be taught to students. Without proper preparation and good material understanding from the teacher, the result will not be maximal.

Creativity is an activity that brings results that have some properties of novelty, usefulness, comprehensible [18]. Another definition of creativity is the willingness to create new arrangements or combinations based on data. Creativity also means the ability to get varied answers from a problem based on the information obtained. According to Krulik & Rudnick, creativity is the ability to do high-level thinking [18].
The things that reflect the manifestations of creativity include (1) eloquence, the ability to convey ideas to solve problems, (2) flexibility, the ability to produce multiple solutions of a problem, (3) Originality, the ability to respond from self (4) elaboration, the ability to convey ideas in detail and apply them to others appropriately [18]. In the quantum learning model with the TANDUR stages, creativity can be developed at Namai (N) and Demonstration (D) stages. At the stage of given the name, students conduct learning activities independently and develop their own knowledge. At this stage, the students also create what is known by involving all the potential of the brain. The data studied can be pictures or writings. At the demonstration stage, students re-optimize all their potential. Students show their work to other groups in a variety of ways. Teachers can creatively design the demonstration activities to be performed by the students.

In accordance with the author's experience, in biology or science lessons, creativity can be realized by memorizing term or concepts by creating a fast way of memorizing like a donkey bridge. By using donkey bridges, students will more easily memorize the concept of biology or science being studied. In addition, with the donkey bridge, the concept will be long term. This will improve students' memory of the biology or science concepts studied.

Quantum learning has a resemblance to the principle of MERDEKA learning on Tamansiswa teachings. MERDEKA itself stands for challenging fun, effective efficient, rational, democracy, empathy, creative contextual, and fair. If taken literally, MERDEKA it self-means free from shackles and colonization. In the learning process, MERDEKA means students can learn according to their wishes and develop naturally. There is no compulsion in learning to learn in a fun way. MERDEKA is a principle of learning whereas quantum learning is a learning model. When reviewed rationally, the principle of learning MERDEKA is in the quantum learning model.

The existence of a pleasant learning environment in quantum learning can make students become creative and maximal in exploring the initial knowledge (old) that has been previously owned and combined with additional new knowledge. The integration of the old knowledge possessed by the students with their new knowledge is a process of labeling knowledge into memory or memory in accordance with the understanding of each student. The process can train students' creativity. The hope can also improve students' memory because the process of naming new knowledge by students is tailored to the understanding of each student, for example in terms of "donkey bridge", which will last long, memorable, and understood by students.

Creative thinking is a combination of logical thinking with divergent thinking based on one's intuition, but still in consciousness based on available data or information that can generate many possible answers to a problem. The answer is emphasized on the quantity, usability, and diversity of answers, which can be measured by several indicators, including fluency, flexibility, originality, and elaboration [19].

4. Conclusion
Based on the results of reference studies that have been done, it can be concluded that the quantum learning model can optimize students' brains, learning by experience, learning with interesting and fun, thus enabling students to be more creative. In addition, quantum learning models train students to find their own concepts that must be learned in each way so that students' memory will be better material.

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