Contextual Teaching and Learning to Develop Critical Thinking and Practical Skills

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Abstract. Challenges in the 21st century demand high-level capability, one of them is critical thinking. On the other hand, 2013 another curriculum called skills. This learning can be realized in practical skills. Capable develop critical thinking and practical skills requires the right learning approach. This requires learning by students to construct their own knowledge, conduct investigations, develop curiosity, learning communities, present models, encourage reflection abilities, and discuss not only cognitive but also skills. Contextual Teaching and Learning is an approach that has a component that requires learning. Research and uncover the ability of CTL in developing critical thinking and practical skills of students. The research method used is the reference study method. The results show that CTL has a component that can encourage the development of critical thinking and practical skills of students.

Keywords: CTL; Critical thinking; Practical skills.

1. Introduction
One of the goals of learning is to make adults capable of solving problems and competition in the 21st century. There are various challenges in the 21st century that must be faced. One that becomes clear in the 21st century is critical thinking [1]. In addition, to prepare for the challenge, the government established 4 competencies that must be achieved, namely the competence of religious attitudes, social attitudes, cognitive and skills [2]. This shows that the skills competencies of students are also very necessary.

Science is essentially: a) a body of knowledge); b) a way of thinking; and c) a way of investigating the universe [3]. As a collection of knowledge, natural science is a collection of knowledge in the form of facts, concepts, principles, laws, theories, and models. As a way of thinking science is a human activity which is characterized by the thinking process of scientists in providing an overview of curiosity to understand natural phenomena. Science as a way of investigating is interpreted as a way of using scientific methods in solving problems. Science as a way of thinking in this paper is manifested in critical thinking as one of the demands in the 21st century. Critical thinking is a rational and reflective high-level thinking in processing information and beliefs. Critical skills on the other hand require attention and thought to implement and can be done with various levels of performance. Science as a method of investigation is closely related to laboratory work. Working in
the laboratory requires good practice skills. Practical skills are skills needed to complete tasks related to the psychomotor domain and laboratory work.

Critical thinking and practical skills of students need to be developed in learning activities. Teachers must design learning in such a way that in learning activities students can develop critical thinking and their practical skills. Learning should be arranged in order to encourage active students in learning activities. Besides that learning must also contain teaching materials that are close to students' daily lives, so that learning activities will be meaningful for students. Learning approach is one of the important things that must be considered in developing learning. Contextual Teaching and Learning Approach (CTL) is one approach that can be used to encourage student activity in learning activities. The CTL is a form of learning approach that emphasizes the process of student involvement as a whole in order to find material learned and relate it to real life situations to be applied in their lives. The CTL has 7 components that support learning including (a) constructivism, (b) inquiry, (c) questioning, (d) learning community, (e) modeling, (f) reflection, (g) authentic assessment [4].

Based on this background, critical thinking and students' practical skills must be developed. Development can be done by choosing the right approach. In this paper, the author shows that CTL is capable of driving the development of critical thinking and student practical skills through its 7 components.

The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.

2. Research Method
This research used a literature review method. We studied literatures, articles, books, and other sources such as dissertations, conferences and processes relevant to a particular problem, field of research or theory provides descriptions, summaries and synthesizes data.

3. Result and Discussion
This section presents the results used and the proposed discussion

3.1 Contextual Teaching and Learning (CTL)
Contextual Teaching and Learning (CTL) is a learning system that connects brain actions with creating patterns that have meaning [5]. Contextual learning is an educational process that aims to help students see the meaning in the learning material they learn [6]. The CTL help teachers link between what is taught in the classroom to real life situations students and encourage students to make connections between the knowledge possessed by its application in life [7] [8]. This is very important because it is able to help save students from storing long-term memory, which will help them to apply this memory to their work later in their lives.

The CTL has the advantage that it can make learning more meaningful and real [9] because students are required to be able to combine learning in the classroom with real-world problems [10]. Through contextual learning, students will be actively involved and able to experience meaningful experiences through the real objects they obtain from their own environment [8]. Another advantage is that it can make learning more productive and foster a strong understanding of concepts [9]. This is because in CTL students are required to be able to construct their own knowledge. The CTL approach has seven components that are very supportive of learning, namely constructivism, inquiry, questioning, learning community, modelling, reflection and authentic assessment [4,11]. Each component has a very large role in developing various abilities of students. The CTL components one by one in Table 1.

Table 1. Components of CTL

| Components  | Description                                                                 |
|-------------|-----------------------------------------------------------------------------|
| Constructivism | Constructivism emphasizes knowledge construction based on the interaction of existing |
knowledge and new knowledge through experience. Constructivism can be used in achieving critical thinking skills [8].

Inquiry. Inquiry allows the process of moving from observation to understanding. In addition, inquiry learning also allows students to use their critical thinking skills [6].

Questioning Contextual learning must be able to develop students' curiosity by asking questions [4]. Learning is essentially asking and answering questions. Asking is seen as a reflection of the curiosity of each individual; whereas answering questions reflects a person's ability to think.

Learning community Teachers can create learning communities by forming learning groups [4]. Working with others is better than learning alone. Collaborating in the learning community allows students to exchange funds sharing ideas [6].

Modeling This is done by presenting the model as an example in learning. The modeling process is not limited to teachers, but can also take advantage of students who are considered to have the ability. Modeling is a principle that is quite important in CTL learning, because through modeling students can avoid theoretical-abstract learning that can enable verbalism [8].

Reflection Reflection is a response to newly received events, activities or knowledge. Through a process of reflection the learning experience will be included in the cognitive structure of students which will eventually become part of their knowledge [8].

Authentic assessment Authentic assessment assesses the knowledge and skills acquired by students. Assessment is not only teacher, but can also be someone else. Assessment is not only carried out at the end of the learning period as in the evaluation of learning outcomes but is carried out together in an integrated (inseparable) manner throughout the learning process [6].

The CTL approach has features that can be integrated into various learning strategies [12]. Other strategies can also be integrated into learning strategies, but CTL can help with more learning strategies. Various strategies that can be integrated with CTL include inquiry learning, problem-based learning, project-based learning, collaborative learning, real-world applications, and authentic assessment [12,13]. Each learning instruction based on CTL with its strategies should be structured to promote five essential forms of learning: Relating, Experiencing, Applying, Cooperation, and Transfer (REACT) [5].

3.2 Critical Thinking Skills

Creative Critical thinking is very important for all levels of society. Critical thinking is part of every discipline, context, or situation that forms content to think. Experts agree that critical thinking is essential for survival in a complex system of functioning in every discipline and profession [14]. Critical thinking is defined as right thinking in pursuing relevant and reliable knowledge about the world. Real critical thinking is high-level thinking that allows students to, for example, evaluate people's needs for nuclear power plants, or assess the consequences of global [15].

Halpern in [16] expressed the opinion that, "Critical thinking is reasonable and reflective thinking focuses on deciding what to believe or do". Critical thinking includes a set of skills and the ability to produce and process information and beliefs. There are four key critical thinking, namely elements of thinking, ability, affective domain, and intellectual standard. The four elements are interrelated and dependent to function as complex skills, practices, dispositions, attitudes and values [14]. The development of critical thinking skills is a gradual process. Cognition, or effort in thinking is an important prerequisite for developing towards a level of critical thinking and higher learning [14] is shown in Figure 1.

Critical thinking is seen as a general skill. Skills are not born but are developed through practice, and they can be divided into two types. Facilities are skills that can be reduced to routines,
that is, by training them automatically. Critical skills on the other hand require attention and thought to carry out and can be done with various levels of performance [17].

The Delphi Committee identified six capabilities (interpretation, analysis, evaluation, inference, explanation, and self-regulation), 16 sub-abilities, and 19 dispositions [18].

![Core cognitive conceptual framework and subskills of critical thinking skills](image)

**Figure 1.** Core cognitive conceptual framework and subskills of critical thinking skills [14].

Another opinion states that there are several special abilities as indicators of critical thinking, among others: a) analyzing arguments, claiming, or proving b) making conclusions using inductive or deductive reasoning, c) evaluating or evaluating, d) making decisions or solving problems [19]. [1] express another opinion that critical thinking is the ability to analyze, interpret, evaluate, summarize, synthesize all this information, apply the results of synthesis to solve urgent problems.

### 3.3 Practical skills

Practicum (practical) can be done for students in science learning after the teacher gives direction, instructions, and instructions for implementation. This activity is used to use certain tools. Thus, the teacher trains students in using tools that have provided results and them [20]. Another opinion states that practicum activities are typical activities in science that are important elements to be applied in natural science learning, because they can do their own understanding and memory better [21].

There are three main objectives of the practicum, namely [22]: (a) develop their knowledge and understanding of the natural world, (b) learn how to use scientific tools or standard procedures, (c) compile their insights about the scientific approach. The practicum activity aims to help students in an attractive domain with an idea domain, and the participants not only have ideas but can also do it themselves [21]. A practical argumentation of students in a laboratory related to the psychomotor domain. This domain is used for manual tasks that manipulate objects and physical activity [23]. The term psychomotor in natural science learning is lived as a practice and work [24]. The following is a description of the practical skills category [23]: (a) recognition of tools and materials, (b) handling of tools and materials, (c) basic equipment operations, (d) competent tool operations, (e) expert tool operations. Practical skills were categorized become 4 aspects, that explained in the Table 2.

**Table 2. Aspects of Practical Skills**

| Aspects       | Indicators                                                                 |
|---------------|---------------------------------------------------------------------------|
| Procedural    | 1) select appropriate apparatus / instrumens for performing the experiment. |
**Manipulative Skills**

1. Know the limitations of the apparatus/instruments regarding their size, least count and accuracy.
2. Know the limitations of the apparatus/instruments regarding their size, least count and accuracy.
3. Handle the apparatus, instruments, chemicals carefully to avoid any damage or injury.
4. Perform the experiment with reasonable efficiency and accuracy.
5. Separate and remove desired parts of a specimen for detailed study without damaging it.
6. Use appropriate methods and materials for specimen mounting.
7. Locate and rectify the errors in apparatus, instruments, etc.
8. Add chemicals in appropriate quantity.
9. Dismantle the experimental set-up carefully.
10. Practise the precautions in handling sensitive apparatus or chemicals or flame.

**Observational Skills**

1. Find the least count of the instrument.
2. Read the instrument correctly.
3. Notice colour change, evolution of gases, formation of precipitates, chemical reactions, etc., carefully.
4. Notice the relevant details in the given specimens minutely.
5. Locate the desired parts in a specimen accurately.
6. Take observations carefully and in a systematic manner.
7. Read graph correctly.

**Drawing Skills**

1. Make proper observation tables.
2. Draw circuit diagrams, ray diagrams, experimental set-ups, sketches, etc., correctly and proportionately.
3. Label sketches and diagrams correctly.
4. Draw graphs from observed data correctly.

**Reporting and Interpretative Skills**

1. Make a proper plan for recording the observations.
2. Record the observations/data/information correctly and systematically.
3. Classify and categorize organisms.
4. Make correct calculations/predictions.
5. Use proper formulae and mode of summarizing and reporting the result.
6. Report the result using correct symbols, units, terms and chemical equations.
7. Interpret the observations and results correctly.

Practical learning skills most often use laboratory activities and workshops, especially with tools and materials with small class sizes and require a long time [25]. Kendra in [26] states that practical skills have other categories: skills and manipulation of skills, skills, skills, and interpretation. In addition, Practical skills designate people who have learned from observation, manipulation, interpretation, planning, reporting and confidence.

**3.4 The Relationship between CTL with Critical Thinking and Practical Skills.**

Meaningful learning can be obtained if learning can link material with real life. The CTL emphasizes learning that is not only fixated on teacher's books and lectures. Students are required to play an active role in ongoing learning. While the teacher acts as a facilitator. In designing learning with the CTL approach it is not easy for teachers. The teacher must be very creative to bring all components in CTL into learning activities. Each component is closely related to the competencies to be achieved. In this article, the competencies highlighted are critical thinking and student practical skills.
Critical thinking is the ability of students to think more deeply than just memorize. Critical thinking is the ability to analyze, interpret, evaluate, summarize, synthesize all this information, apply synthesis results to solve urgent problems. This ability is included in the category of high-level thinking skills. This shows that without help, this ability will be difficult to develop. At the level of junior high school students critical thinking should be developed.

Practical skills are also not things that can develop without assistance. If learning is always held in class with conventional methods, students cannot develop their practical skills. These skills will develop if students do a job related to laboratory work, both experimental and observation activities. The CTL has components that strongly support the development of these two things. The first component is constructivism. By holding this flow of learning can require students to construct their own knowledge. Students must be able to relate the knowledge that he has now with the knowledge they already have. In this case students' critical thinking develops.

The next important component is the inquiry. Inquiry is the process of finding something. This can be done by observation or experiment, by presenting the inquiries component in student learning can act as an inventor. They can observe, formulate hypotheses, design experiments, conduct experiments, collect data, analyze, conclude, and report results. This component is not only able to develop students 'critical thinking, but also students' practical skills. Inquiry is a key component that is supported by other component components to develop critical level and practical skills. The next component is questioning. This component greatly influences the development of students' critical thinking. Learning that can arouse curiosity will encourage thinking skills, one of which is critical thinking. This curiosity will usually be stimulated through observation activities. Therefore, this matter is also related to practical skills.

The learning community component is a very important supporting component. In terms of developing a variety of students' abilities, it will be easier to carry out activities in groups, including developing critical skills and practical skills. Group activities will make students exchange ideas so that students who are less will be helped by other students. In this case each member in the group can be a scaffolding for other members in developing critical level and practical skills.

The modeling component also has a supporting role. The presence of a model will help students not think abstractly and can observe thoroughly. This component can be included in various learning strategies. Reflective components are more supportive components in developing students' critical thinking. This component trains students to evaluate themselves, as well as the learning they have done. It also encourages students to be able to provide criticism and assessment of various things.

The last is the authentic assessment component. This assessment requires an assessment not only of students 'cognitive abilities, but also on students' psychomotor abilities. This clearly supports critical critical development and student practical skills. Critical thinking as a cognitive ability and practical skills as a psychomotor domain.

4. Conclusion

This paper has presented contextual teaching and learning to develop critical thinking and practical skills. Critical thinking and students' practical skills need to be developed to deal with the challenges of the 21st century. The development of critical thinking and practical skills can be done by compiling learning with the CTL approach. The CTL has 7 components that can support the development of critical thinking and practical skills. Each component has its own role in supporting the development of critical thinking and practical skills.

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