Analysis of critical-creative thinking styles and their implications on self efficacy teacher pre-service

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Abstract. Critical-creative thinking styles and self-efficacy are important things in facing the 4.0 industrial revolution. This study conducted to analyze the critical-creative thinking style and its implications for prospective teachers' self-efficacy. The method used is a survey method. The instrument for creative-critical thinking using Yanpiaw Creative-critical Styles (YCCS) test. The YCCS instrument has standardized with creative-critical thinking skills tests such as WGCTA (The Watson-Glaser Critical Thinking Appraisal) and TTCT (Torrance Test Creative Thinking). The results of the analysis show that (1) student-teacher prospective teachers do not have a supercritical or super creative thinking style, (2) prospective pre-service teacher are more dominant in having an intermediate thinking style, (3) pre-service teacher with a higher critical-creative thinking style have more significant implication for self-efficacy, compared intermediate thinking style.

1. Introduction
Thinking can be interpreted as a process that is carried out by brain to find answers, ideas or problems to answer problems faced [1–3]. Thinking style is a perspective used by a person to cultivate his abilities [4–6]. Creative-critical thinking style is a person's perspective to process their ability to use creative-critical thinking indicators such as interpretation, analysis, inference, explanation, evaluation, self-regulation, fluency, flexibility, originality and elaboration [1,7,8]. Creative-critical thinking and self-efficacy are increasingly needed in the life of the global community, especially in era of industrial revolution 4.0 [1,9,10]. Critical and creative thinking styles tend to be able to analyze, evaluate and elaborate problems that arise in everyday life while self-efficacy is an individual's belief to be able to behave following their hopes and desires [1–3].

Ability to think critically and creatively [5,7,10]. Ability to think critically and creatively is related to self-efficacy considering that ability to think critically and creatively supports self-efficacy indicators such as predicting erratic risks, identifying choices, analyzing information and ability to make choices [7,8,11]. Self-efficacy is an individual's belief to be able to behave following their hopes and [9,12,13]. Self-efficacy is a belief in a person's ability to organize and implement the sources of action needed to manage prospective situations.

Critical thinking style is an individual habit to be able to interpret, analyze, infer, explain, evaluate, and self-organize in problem-solving [10,14–16]. The ability to think critically and creatively is essential for students who are colon teachers to be able to train their students to solve problems both in the learning process and in everyday life [9,14,17]. Therefore, critical thinking is closely related to indicators of self-efficacy, for example, ability to interpret is related to the ability to predict risk, ability to analyze is associated with the ability to analyze information, ability to evaluate and infect ability to make choices.
Creative thinking style is an individual habit to be able to generate several ideas, generate unique ideas outside of routine, generate various views, and ability to develop ideas [2,4,5,18]. Creative thinking styles are essential for the pre-service teacher to direct their students to solve problems creatively both in the learning process and in real life [1,4,5]. Based on the above, ability to think creatively is closely related to indicators of self-efficacy, for example, ability to generate a number of ideas and develop ideas is closely related to the ability to identify in making choices. Given that critical and creative thinking styles are the tendency of ability to think critically and creatively, it is necessary to study implications of critical and creative thinking styles on self-efficacy of the pre-service teacher.

2. Method
The research was conducted using a survey method. Data were collected through a questionnaire from a sample that has been selected from the entire population of 48 chemistry education pre-service teacher. Questionnaires were distributed after the learning process was carried out for one semester. Data analysis techniques used statistics developed by Yanpiaw Creative-critical Style. Learning process uses Student Centered Learning (SCL) approach with a combination of problem-solving. Critical-creative thinking style instruments using the YCCS instrument have been standardized with tests of critical and creative thinking skills such as WGCTA (The Watson-Glaser Critical Thinking Appraisal) and TTCT (Torrance Test Creative Thinking) [4]. Self-efficacy instrument used a modifying instrument from Bandura [12].

3. Result and Discussion
Results of the study were analyzed for teacher pre-service in the form of creative, critical thinking styles for prospective teacher students. On the other hand, a creative-critical thinking style was discussed, and its implications for pre-service teacher self-efficacy.

3.1 Student Teacher's Critical-Creative Thinking Styles
Results of the research on creative-critical thinking styles of prospective teacher students using Student Centered Learning (SCL) approach with a combination of problem-solving obtained following Table 1.

| Thinking style | Critical | Middle | Creative | Total |
|----------------|----------|--------|----------|-------|
|                | 31       | 48     | 21       | 100   |

Based on Table 1, Medium thinking style is more dominant than creative-critical thinking style, this shows that prospective teacher students on average do not have a tendency or habits in interpreting, analyzing, inferring, explaining, evaluating and self-regulation in dealing with a problem [4,7,8]. On the other hand, the tendency to think to produce something with several ideas, to generate unique ideas out of habit, to create various ideas, and ability to develop ideas has not become accustomed [4,6,7]. This habit still affects old patterns of learning, and there are still a lot of waiting from teacher instructions, there is no creativity that appears in prospective teachers [19–21]. This is following data above, and it turns out that pre-service teacher creativity is lower. The habits of pre-service teachers need to be changed with strategies or techniques that are more appropriate to spur their thinking patterns.

**Table 2. Creative-critical thinking styles and their implications for self-efficacy**

| Thinking style | Master Experiences | Vicarious Experience States | Verbal Persuasion | Physiologically and Affective | Everages |
|----------------|-------------------|-----------------------------|-------------------|-------------------------------|---------|
| Critical       | 21                | 0.71                        | 0.78              | 0.58                          | 0.65    |
| Creative       | 31                | 0.75                        | 0.76              | 0.64                          | 0.68    |
| Middle         | 48                | 0.68                        | 0.70              | 0.59                          | 0.61    |
| Averages Indicator | 0.71        | 0.75                        | 0.61              | 0.52                          | 0.65    |

**Table 1. Thinking styles of pre-service teacher**
Based on table 2, medium thinking style has a low average self-efficacy compared to critical and creative thinking, which means that the ability to interpret, analyze, reference, explain, evaluate, and self-regulate is still weak. It is necessary to make a more motivating learning pattern; the learning model is more problem solving [6,11,22,23]. On the other hand, students who have a creative thinking style have higher confidence. This is influenced by the individual's habit of being able to generate a number of ideas, generate unique ideas out of habit, generate diverse ideas and be able to develop ideas [11,19,20].

The ability to think critically can train how individuals think, process and can generate motivation to enthusiasm for learning so that it is very supportive of increasing self-efficiency [15,17]. Self-efficacy is an individual's belief to master the situation and produce outcomes as expected, individuals who have high self-efficacy tend to be able to think analytically, have self-regulation, and tend to be more courageous in solving problems, in this case, more critically and creatively [17,19,24].

Individuals who have low self-efficacy in this study who have an intermediate thinking style tend to avoid lessons that have a lot of tasks and do tasks as they are not severe[6,20,22,24]. Individuals who have a creative-critical thinking style tend to be more self-efficacy in solving problems.

4. Conclusion
Creative-critical thinking style is able to influence in creating a spirit of critical-creative thinking such as analytical skills, self-regulation, ability to solve problems and find the best or latest solutions that are different from before. Based on the results of data analysis, the creative-critical thinking style has implications for pre-service teacher self-efficacy.

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