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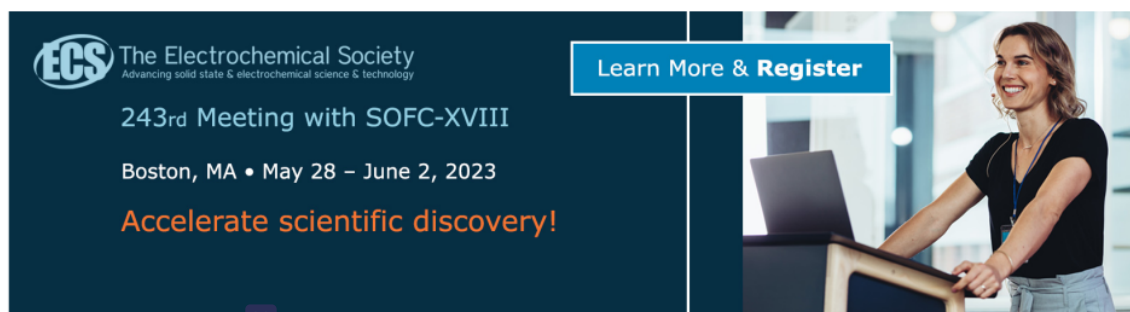
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The potential of students' creative disposition as a perspective to develop creative teaching and learning for senior high school biological science

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Abstract. This research aims to identify the potentials of students' creative disposition and the perceived position of their creative disposition in biology learning. Research participants were 72 senior high school students in Mataram, West Nusa Tenggara. Data were collected through questionnaires. The participants were required to complete a closed questionnaire as self-report responses to statements about creative dispositions and position of students' creative dispositions as compared to their peers'. The resulting data were processed qualitatively to determine the categories of creative characteristics and quantitatively t test was used to analysis the effect of creative disposition on students' position of creative disposition. The results showed that students have high category, average and low level creative disposition. The position of the students' creative disposition is influenced by their creative disposition. The male student group shows more creative characters in the persistent domain than in the inquisitive, imaginative, collaborative, and disciplined domains; meanwhile, the female student group exhibits more collaborative character. The student creative disposition importance as base for creative instructional development design.

1. Introduction

Education has the function of developing students into creative individuals, ie individuals who are able to generate creative ideas to solve the problems of life. The importance of developing the creative character of the students is regulated in Law of the Republic of Indonesia No. 20 of 2003 on National Education System [1]. The Government recognizes the importance of developing the creativity of Indonesia's young generation so that they are ready and able to compete against the global life challenges of 21st century. Creativity is a non-cognitive aspect or soft skills as a key component of 21st century skills [2]. Therefore the teaching system in schools should begin to focus on developing the creative potential of students.

Creative students will give arise to new discoveries even if using something that has been there before. However, a new creation does not mean it should be a discovery that no one has ever known before, but it can also be something new to him and should not be something new to other people or society at large [3]. Assessment of creativity in student learning can be a form an act or behavior [4].



Creativity is not a simple process but it must be cultivated with hard work and sincerity. Applying appropriate teaching methods will affect the process and the product in a lesson. Mumfrod [5] recommends the use of investigative methods to increase scientific creativity in science learning, and Lawson [6] curriculum should be designed to explicitly trigger inquiry skills.

In the face of the challenges of the 21st century, the curriculum of science including biological science must be oriented towards the development of student competence in order to apply, analyze and synthesize new knowledge [7] and the ability to relate knowledge to life experiences [8]. Science education is aimed at producing the scientific community [9], preparing learners to study science and technology at higher levels of education, preparing them to become scientists [10], and the ability to use scientific methods [11]. Potential biology of students should also be used to overcome social challenges, complex problems and the interconnectivity of various disciplines [12]. For that reason a learning model is needed that develops student creativity. On the other hand, the learning process hardly indicates any activity that demands creative thinking and a lack of creativity development in students' science process skills [13]. International Creativity Index survey results of 2015, Indonesia ranked 115 out of 139 countries involved in the survey [14].

The characteristics of creativity are uniqueness and originality in search of possible solutions. Creativity results from creative thinking activities that develop divergent thinking patterns. Creative thinking is the culmination of a person's cognitive dimension [15,16]. Creative thinking is the process used to generate new ideas [17], helping students discover the value of evidence-based reasoning, improve high-level cognitive skills (HOCS), and make them able to solve problems [18].

Although many studies attempt to reveal the creativity and creative thinking skills of students, research on creative disposition of students is still little studied. Creative disposition describes the habits of the subconscious mind and is oriented towards broad goals. This behavior pattern is shown in the absence of coercion and therefore it is said also as a character or creative nature. A person's creative disposition deals with the creative person's characters. Lucas et al. [19] mentions five creative disposition models: inquisitive, persistent, imaginative, collaborative and discipline. This study aims to identify the potential of creative disposition of students and their creative position of disposition in biology teaching as the basis of instructional perspective of creative student-oriented.

2. Method

The subjects observed in this study were 72 tenth grade students of a senior high school in Mataram, academic year 2017/2018, consisting of 31 male students and 41 female students. The data collected were qualitative, describing the creative disposition of students and the position of creative disposition compared to their peers in the field of biology. The data were obtained through questionnaires, distributed to students to find about their creative disposition and the perceived position of their creative disposition compared to their peers'. The close-ended creative disposition questionnaire was developed on five domains covering inquisitive, persistent, imaginative, collaborative, and disciplined [19], and each character was developed into 25 statements. Another questionnaire corresponding to the previous one was used to reveal the position of students' disposition compared to their peers'. The choices provided to respond to the questionnaire statements in the form of qualitative data were converted into certain categories referring to the categorization by Arikunto [20] as shown in table 1.

Table 1. Scoring rubric of (a) students' creative disposition and (b) creative disposition position.

Score	Creative disposition category (a)	Category of creative disposition position (b)
5	Always	Much higher
4	Often	Higher
3	Sometimes	Equal
2	Rarely	Lower
1	Never	Much lower

The rubric in Table 1 was used to obtain the creative disposition score and the position of the students' creative disposition in the field of biological science. Subsequently, the scores obtained by the students on a scale of 1-5 were converted to a scale of 1 to 100 to facilitate subsequent data processing. Next, the conversion of the scores into qualitative scores follows the categories as displayed in Table 2. The data of creative disposition scores and position of creative disposition of the students were tested using linear regression to find the influence of creative disposition variable and index of determination on the position of students' creative disposition.

Table 2. Qualification of creative category disposition and creative position of student disposition.

Conversion scale 100	Quantitative category of creative disposition	Quantitative category of creative disposition position
$90 < x \leq 100$	Very High	Far above
$80 < x \leq 89$	High	Above
$65 < x \leq 79$	Average	Average
$55 < x \leq 64$	Low	Under
$0 < x \leq 54$	Very Low	Far below

3. Result and discussion

3.1. Students' creative disposition and the position of the creative disposition compared to their peers' in biology teaching and learning

Based on the result of questionnaire given to the students, there are three groups of creative disposition category that is high category, average and low. The result of questionnaire for creative position of student disposition found three categories that is above category, average and below. The percentage of students in each category is shown in Figure 1a. Similar results were shown after the students were grouped by gender, as shown in Figure 1 (b) and (c).

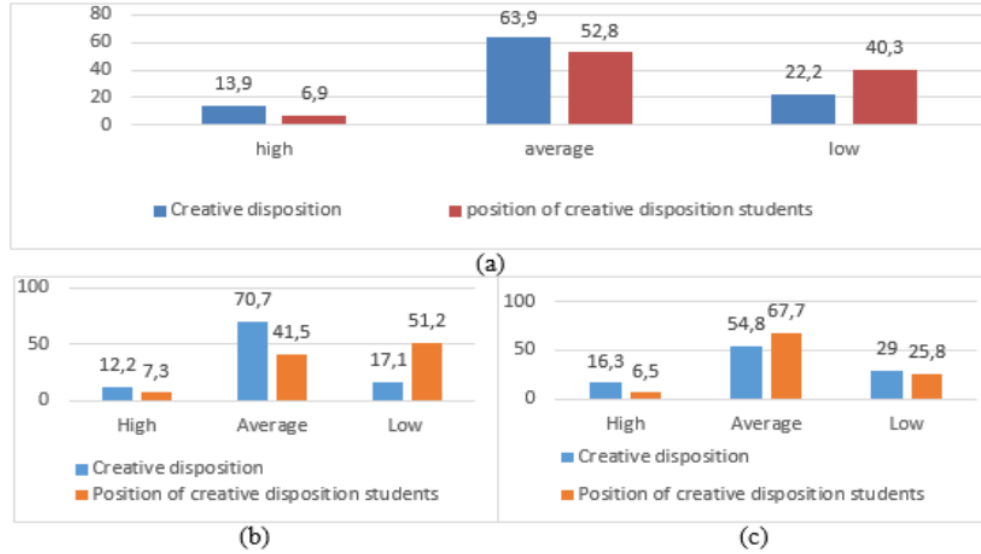


Figure 1. Percentage of students by creative disposition category and creative position of student disposition; (a) students in the class, (b) groups of female students, and (c) groups of male students.

The result of t test shows a significant influence of creative disposition variable on creative position of student disposition (t count 4.99 > t table 1.67), meaning creative position of student disposition is determined by creative disposition of student with determination index 26.2%. T test results on a group of female students is known t count 2.807 > t table 1.68 and in the group of male students t count 5.47 > t table 1.70 with determination value respectively 16.8 and 50.7(%)

3.2. Distribution of creative disposition domains and position of creative disposition of students' choice

Creative disposition and creative disposition position of students as measured on the domain 5 shows the results as shown in Figure 2 below:

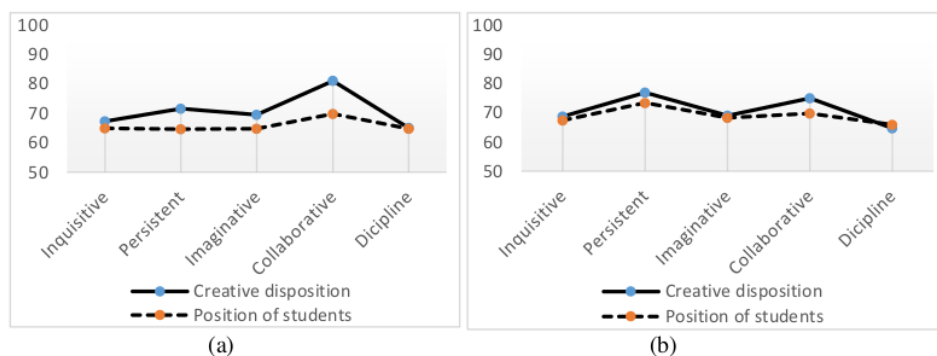


Figure 2. The distribution domain of creative disposition and disposition creative positions (a) group of female students and, (b) group of male students.

The result (Figure 2) shows that both female and male students groups have the same category of creative disposition and position of creative disposition that is included in the average category. However, in terms of the average score per domain, there are differences. In the female student group, the collaborative domain is at a higher position than the inquisitive, persistent, imaginative, and disciplined domains. Meanwhile, in the male group, the highest score is shown in the persistent domain. The male student group's belief in the position of their creative dispositions is more suitable to the chosen creative disposition. Out of the 10 students whose creative disposition is at a high category, only two have high conformity between their creative disposition and position of creative disposition.

Low creativity of learners does not only happen in this research but also in other places. Previous research saw that students' scientific creativity in Kenya is still low [21]. It is expected that creative disposition of students can be followed by creative thinking ability, creative process and creative product in the field of biological scientific creativity. In fact, a person's level of creativity can be taught and enhanced [22, 23], although it is not known to what extent that creativity can be improved [24]. If this scientific creativity is important in science education it will be useful to develop a strategy or intervention program to improve it [25].

Educators recognize of the importance of creativity in science education [26] and scientific creativity is expected to produce students who will be scientists [25]. The results of this study would be important for teachers to take decisions in trying to make their students become more creative. Creative teachers and creative ways of teaching are key to success in developing students' creativity. Creative teaching is an art and therefore a teacher cannot be taught didactically on how to be creative [27]. Creative teachers are innovative, knowledgeable, controlling the teaching process, and engaging in various social values that their students could accept [28, 29].

The characteristics of creativity vary in an individual or the field of science. Humans are creative in a particular field. The present research shows the female student groups is dominant in the domain of collaboration. Collaboration is a creative process that emphasizes social aspects and cooperation.

Collaboration as a transformative experience is consultative, collegial, and cooperative [30]. It is characterized by openness in product sharing, communicativeness, openness in giving and receiving suggestions or ideas and responsibility in carrying out the role in the group.

Different findings in this study suggest that male student group is dominant in the persistent domain, meaning male students are more resilient [31], do not easily give up, dare to try new things [32], have high self-confidence [33], and regard uncertainty as an opportunity to gain new knowledge [19]. The results of Robson and Rowe's study [32] indicate that perseverance is shown by high activity in trying ideas, analyzing ideas and engaging others. Furthermore, the results of Piaw's study [34] shows that gender was significantly correlated to creative thinking ability, whereas right-brain thinking and learning styles were positively and significantly correlated to the ability of original thinking, fluency, elaboration, imagination, and persistence.

4. Conclusion

The data of this study are students' self-reports in the forms of responses to statements about the students themselves. The results show that students' creative disposition and position of creative disposition in biological sciences are in the average category. Based on statistical analysis, the perceived position of students' creative disposition is significantly influenced by students' creative disposition. The female student group is more dominant in collaborative domain, while the male student group is more pronounced in the resistant domain. Students' creative disposition and position of creative dispositions describe their strengths and shortcomings that can be used as a basis for teachers in making creative instructional planning.

Acknowledgments

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PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7
