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An exploration of students' creativity through a mixed-methods study in the classroom

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ABSTRACT

Students' creativity is a fundamental goal in education. The school has a strategic role in developing students' creativity. This study elaborates on classroom activities to develop students' creativity. The study used a mixed-method sequential explanatory design. Quantitative data were obtained from six hundred junior and senior high school students in East Java, Indonesia. Qualitative data were obtained from nine teachers. Descriptive and regression analysis techniques are used to analyse quantitative data, while thematic analysis is used to analyse qualitative data. The results show that classroom climate, especially the following classroom activities: rule, positive teaching, teacher support, and teacher classroom management, strongly affect students' creativity.

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1. INTRODUCTION

The development of creativity in students has significant importance for three main reasons. First, invention is closely related to problem-solving skills. Creatively empowered students tend to develop innovative perspectives toward challenges, enabling them to identify effective and original solutions [1], [2]. Second, creativity has a positive impact on academic achievement. Creative thinking processes stimulate cognitive development, enrich learning experiences, and help students overcome learning barriers [3], [4]. Lastly, the development of creativity is closely related to students' mental health. The ability to express yourself creatively can be a positive channel for managing stress, boosting self-confidence, and building mental resilience [5], [6]. Thus, the role of education in schools is to prepare students to be creative and academically successful.

Current research on the influence of classroom activity on developing student creativity highlights three key trends. First is a project-based approach that allows students to apply knowledge in authentic contexts, encouraging creativity through problem-solving and collaboration [7], [8]. Second, using technology in learning, such as interactive applications and creative software, becomes a focal point in

exploring ways technology can motivate students and enhance their learning experience [9], [10]. Third, collaborative learning explores cooperation among students to stimulate the exchange of ideas and develop creativity through social interaction [11], [12]. These studies illustrate the effort to create holistic learning strategies, combining project-based approaches, technology, and collaboration to maximize students' creative potential in an innovative classroom environment.

Students' creativity can be analyzed through three main creative-related dimensions: thinking, personality, and products. Creative thinking includes students' ability to generate new ideas and find innovative solutions [13], [14]. A creative personality involves an interest in challenges, courage to take risks, and perseverance in exploring new ideas [15], [16]. Meanwhile, creative products are concrete results of students' creative processes, reflecting their unique expression and originality [17], [18]. By understanding and supporting these three aspects, educators can help facilitate the holistic development of students' creativity, enrich their learning experience, and prepare them for the demands of an increasingly complex and dynamic world.

A student's personality involves a series of traits that are crucial in developing their creativity. These personality traits include an interest in challenges, where students tend to be open to situations that require innovative solutions. The nature of perseverance is also essential, motivating students to keep looking for new solutions and ideas despite obstacles. Creative personality reflects an open attitude to new experiences and a desire to learn, often accompanied by high curiosity [15], [16], [19]. By guiding and supporting the development of these creative personalities, educators can provide a solid foundation for building students' creativity, preparing them to face future challenges in innovative and proactive ways.

Activities in the classroom can increase student creativity by applying rules that support positive learning and targeted teacher support. Clear and supportive classroom rules create a safe and structured environment, allowing students to feel comfortable to think creatively without fear of punishment. Positive learning is emphasized through providing constructive feedback and emphasizing achievement. Teachers who provide active support and guidance to students can help them overcome obstacles, stimulate confidence, and motivate the exploration of new ideas. By creating supportive classrooms, teachers can promote student collaboration, encourage critical thinking, and provide space for creative expression [20], [21]. Therefore, favorable classroom rules, positively oriented learning, and focused teacher support can empower students' creativity.

The article is premised on the idea that the educational environment is key to fostering creativity in students. It proposes that the nature of the classroom environment significantly influences creativity levels among students, with a more supportive and conducive learning atmosphere leading to enhanced creative abilities. This hypothesis was examined and the results were discussed in detail, utilizing qualitative insights from educators to provide a deeper understanding of the relationship between classroom climate and student creativity. The analysis highlights how certain aspects of the classroom setting, such as teaching methods, interactions, and the overall atmosphere, play a pivotal role in either nurturing or hindering student creativity, underlining the importance of a well-structured and positive educational environment in the development of creativity.

The research aims to elaborate on the activities of teachers and students in developing student creativity in the classroom. In parallel with this goal, the study's objectives are formulated as follows: First, describe students' perceptions of the classroom climate and their level of creativity. Second, this study examines the influence of classroom practice on student creativity. Finally, this study proposes strategies to develop students' creativity by creating a conducive classroom climate. These three goals are expected to make an academic contribution to the role of schools in developing student creativity.

2. RESEARCH METHOD

The study involved a mixed-quantitative and qualitative method, with a sequential explanatory approach conducted in two stages, with the intention of examining the influence of classroom climate on students' creativity. Technical terminology was clearly defined when first introduced. Quantitative data was obtained from six hundred and one students and qualitative data from nine teachers in (No of) junior and (No of) senior high schools in East Java province. The selection of subjects was performed randomly and purposively.

During the first stage, the Multidimensional School Climate Questionnaire and the Creativity Scale were used for quantitative data, and descriptive and regression analyses were used. Theoretical testing was then conducted on the effect of classroom climate on creativity during this stage. Students were asked to provide a statement according to The Multidimensional School Climate Questionnaire (classroom practice dimension), which contains twenty-seven items that reveal six indicators: positive teaching, teacher support, encouragement, rules, student engagement, and classroom management. This scale has been validated and has a satisfactory level of reliability [22], [23]. The Creativity scale consists of 24 items that can uncover six

indicators: willingness to grow, openness to new experiences, perseverance in doing tasks, tolerance for ambiguity, taking risks, and consistency. The selection of both scales was based on the consideration that both can be used on students as a subject in this research and have established a satisfactory level of reliability [15], [24]. The effect of classroom practice on student creativity was tested through regression analysis as part of the quantitative analysis. Testing was performed both simultaneously and partially, adhering to theoretical models.

In the second stage, the teachers were interviewed about their perceptions of the effectiveness of the creativity development strategy in schools. Thematic analysis was used to classify the participants' responses based on the themes from the informants' statements. Qualitative data focused on the teachers' activities in developing student creativity in the classroom. The interview results explained three themes of classroom practice: rule, positive teaching, and teacher support. The findings from this stage shed light on the results obtained in the first stage.

3. RESULTS

This section outlines the outcomes of the study's investigation, which is divided into two phases and detailed across three distinct categories: In the first phase, the findings include i) outcomes from the descriptive analysis, as seen in Tables 1 and 2, and ii) outcomes from the regression analysis, presented in Table 3. The second phase focuses on iii) advancing students' creative strategies, as documented in Table 4.

3.1. The result of descriptive analysis

This section presents an analysis of two critical variables assessed about the participants' demographic background, encompassing gender, type of educational institution attended, and age. For a detailed breakdown of the variables in context with the demographics, refer to the information provided in Table 1. Table 1 explains that the highest mean in the classroom practice is female, junior high school, and twelve-year-old subjects, while in the classroom practice, the highest variables mean is female, second-grade, and fourteen-year-old subjects. Nevertheless, mean scores based on demographics do not vary significantly.

Table 1. Research subject profiles (N=600)

Demographic	N	Percentage	Classroom practice		Creativity	
			Mean	SD	Mean	SD
Gender						
1. Male	296	49.3	54.92	12.37	53.48	11.05
2. Female	304	50.7	56.19	11.52	54.28	10.37
School type						
1. Junior high school	304	50.6	55.81	13.12	53.94	11.97
2. Senior high school	296	49.4	55.29	10.74	53.81	9.35
Age						
1. 12 years old	38	6.3	50.10	9.14	49.52	10.86
2. 13 years old	116	19.5	51.72	12.58	52.57	11.08
3. 14 years old	66	11.0	59.54	11.11	54.93	11.74
4. 15 years old	98	16.3	58.69	14.08	57.38	12.23
5. 16 years old	91	15.1	54.60	11.32	53.52	9.36
6. 17 years old	123	20.5	57.16	10.49	54.42	9.29
7. 18 years old	68	11.3	55.11	10.18	51.98	9.39

Furthermore, the results of descriptive analysis on both variables are presented in Table 2. Table 2 reflects the descriptive analysis results of various classroom practices and personal attributes based on a sample size of 600. It illustrates each variable's mean, standard deviation, minimum, and maximum values. The findings reveal notable variations across different aspects, such as classroom practice, positive teaching, teacher support, encouragement, rules, student involvement, class management, creativity, perseverance, risk, willingness, tolerance, openness, and consistency. These metrics offer insights into the range and distribution of behaviors and attitudes within the sampled population, highlighting areas of strength and potential improvement in fostering conducive learning environments and promoting desirable personal traits among students.

Table 2. The result of descriptive analysis (N=600)

Variables	Mean	SD	Minimum	Maximum
Classroom practice	55.55	11.96	25	113
Positive teaching	10.30	3.16	5	25
Teacher support	6.02	2.14	3	15
Encouragement	9.72	3.12	4	20
Rules	8.64	2.68	4	20
Student involvement	10.06	3.09	4	20
Class management	10.78	3.87	4	20
Creativity	53.88	10.71	27	100
Perseverance	7.26	2.49	4	20
Risk	8.75	2.71	4	20
Willingness	10.25	2.29	4	18
Tolerance	8.65	2.40	4	16
Openness	10.29	2.25	4	20
Consistency	8.65	2.74	4	20

3.2. The regression analysis result

The results of simultaneous regression analysis showed the value of R=0.532, R^2=0.283, and p<0.001. These results mean that classroom activity significantly affects student creativity by 0.532. Furthermore, a partial regression analysis of six types of class activities showed that five types of classroom activities affected student creativity. The five types of classroom practice are encouragement, positive learning, involvement, rule, and class management. Additional data are shown in Table 3.

Table 3. Effect of classroom practice on student creativity

Variables	Unstandardized coefficient		Standardized coefficient	
	β	Std. Error	t	β
Rule	0.921	0.167	5.517	0.231**
Positive teaching	0.983	0.170	5.787	0.290**
Teacher support	0.945	0.222	4.261	0.189**
Student involvement	-0.047	0.157	-0.299	-0.014^{ns}
Encouragement	-0.129	0.149	-0.866	-0.038^{ns}
Class management	-0.284	0.101	-2.802	-0.103^{ns}

level of significance **=0.001, *=0.005, ^{ns}=no significant

Table 3 reveals the critical factors influencing student creativity in the classroom, with rule enforcement, positive learning environments, and teacher support identified as significant contributors. In contrast, factors like student involvement, encouragement, and classroom management showed no substantial impact. Furthermore, qualitative insights from six educators offer an in-depth interpretation of these findings, elucidating the nuances of how these elements affect the nurturing of creativity through hypothesis testing.

3.3. Classroom practice for students' creativity development

This section details the summarized outcomes of interviews with various teachers, focusing on methods to foster creativity among students in classroom environments. For an in-depth view of the collected data, refer to Table 4, which encapsulates the complete interview responses and insights on pedagogical approaches used to enhance creativity among learners. Table 4 explains that classroom strategies for developing student creativity include rules, positive teaching, and teacher support. Teachers can foster student creativity by making class rules clear and flexible, creating creative assignments, and encouraging active class participation through questioning. Further explanation is shown in the Figure 1.

Figure 1 depicts a mind map highlighting teacher strategy for developing student creativity in a school setting. It branches into three main categories: rule, positive teaching, and teacher support. Under the rule, the strategy of expression without fear suggests creating an environment where students can share ideas openly. Positive teaching is linked to engaging students with dynamic class questions and fostering organization and planning skills through mind map assignments. The teacher support category emphasizes the importance of praise for creative work as a form of encouragement and suggests that teachers should provide a positive stimulus for active learning to maintain student engagement. Additionally, active questioning and active learning are integral to the approach, alongside classroom transparency, which could imply honest communication and clear expectations. These interconnected strategies form a comprehensive approach to nurturing a creatively stimulating classroom environment.

Table 4. Development of students' creativity according to teachers

Theme	Statements	Finding
Rule	Informant 1. I make it a rule for the classroom to be transparent for students. My strategy is to interact and communicate casually with students (Female, 28 years old, guidance and counselling teacher). Informant 2. I make rules in class to make students dare to express their opinions without fear. In sports lessons, I don't punish students for erring (Male, 28 years old, sports teacher). Informant 3. I invite students to be actively involved in the learning process in the classroom. In my opinion, in this way, students will be motivated to learn and think creatively (Female, 28 Years old, English language teacher)	Teachers make class rules clear and flexible so students feel comfortable.
Positive teaching	Informant 4. I ask questions that enable students to develop the class by giving them assignments to answer questions that make the classroom atmosphere dynamic. There is active interaction and mutual respect among students (Female, 33 years old, Indonesian language teacher). Informant 5. I ask questions that help students develop their creative thinking skills. I also give assignments using the mind map method (Female, 23 years old, Java language teacher). Informant 6. I create an interactive classroom atmosphere and encourage students to ask questions without fear. This method can develop students' creative potential (Male, 28 years old, sports teacher).	Teachers create learning processes in the classroom by making creative assignments, interacting positively, and appreciating all tasks done by students.
Teacher support	Informant 7. I strongly encourage them to develop creative minds. I also appreciated their innovative work by giving praise in front of the class (Female, 35 years old, guidance and counselling teacher). Informant 8. To develop students' creativity, I always allow them to actively ask questions about subjects they do not understand (Male, 35 years old, Indonesian language teacher). Informant 9. I provide a stimulus that students can respond to positively. The goal is to build students' self-esteem and learning motivation so that their creative ideas flourish (Male, 29 years old, Social Science teacher).	Teachers encourage students to ask questions in class actively. The goal is to increase their self-esteem and creative thinking skills.

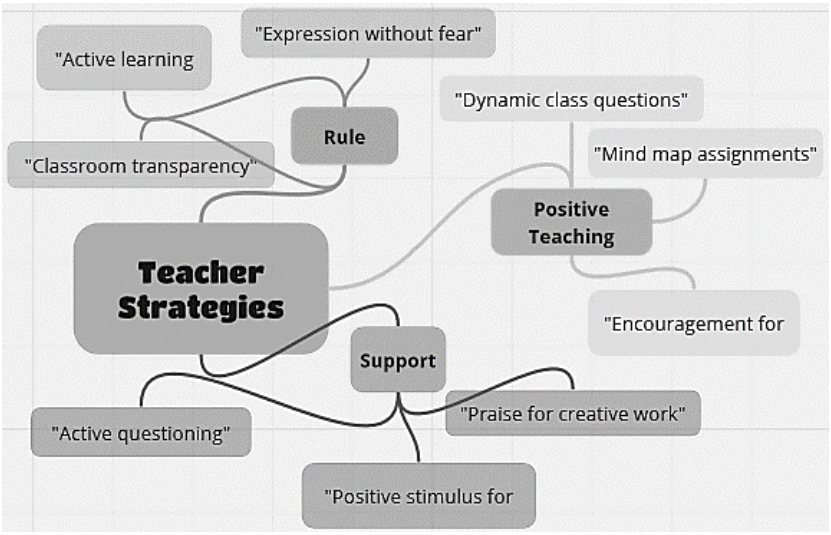

Figure 1. Teacher strategies for creativity development in the classroom

4. DISCUSSION

The results showed that activities in the classroom had a significant positive impact on developing students' creativity. Clear and supportive classroom rules create a safe and structured environment, providing a foundation for students to feel comfortable exploring creative ideas without fear of punishment. The positive learning process emphasized through constructive feedback and emphasis on learning achievement, has encouraged students to be innovative and think innovatively. In addition, active support from teachers plays a crucial role in developing student creativity by providing guidance, stimulating collaboration, and helping students overcome creative barriers. These findings confirm that rules, positive learning, and teacher support in activities have created an environment that promotes and supports the holistic development of student creativity.

This research supports several findings that found that classroom activities affect student creativity [2], [21], [22]. Nevertheless, this study provides essential information about the research results that investigate the development of student creativity by applying the mixed method explanatory model, which can be considered

research that brings novelty value. Through this approach, quantitative patterns and trends can be identified. This research also provides an in-depth understanding of the context and meaning behind the data. The study's novelty lies in its ability to provide answers about what happens and explain why and how a phenomenon occurs. Thus, research using mixed method explanatory models satisfies the need for quantitative and qualitative data and increases understanding of the complexity of developing student creativity.

The results of this study also explain that students are seen as active constructors of their knowledge through interaction with the environment and experience. Clear rules provide a structure that supports creative exploration without fear of punishment, allowing students to build their understanding. The positive learning process, emphasizing constructive feedback and achievement, stimulates students' intrinsic motivation to try new things and innovate. Teacher support in providing guidance and collaboration creates a zone of proximal development where students can develop their creativity through interaction and guidance [23], [24]. Thus, from a constructivist perspective, classroom activities that blend these elements will facilitate the formation of students' understanding and creativity through an active and student-centered process of knowledge construction.

Furthermore, the results of this study have significant practical implications for junior and senior high school students, particularly those in the early and middle adolescent phases. For early teenage students, creating a classroom environment that supports creativity through clear and positive rules is necessary, building a sense of security for exploring new ideas. The positive learning process and emphasis on achievement can provide the intrinsic motivation needed at this stage of development, while the active support of teachers guides and stimulates their creativity [11], [25]. For middle students, an emphasis on independent and project-based learning approaches can deepen the development of creativity, allowing for deeper exploration of personal interests and the development of creative skills [10], [26]. Thus, applying differentiation strategies and learning approaches that follow the developmental characteristics in these two adolescent stages is essential in forming an educational environment that supports the optimal development of student creativity.

Moreover, the results of this study have several practical implications that can be applied to the professional development of teachers. First, teachers can be given additional training on using supportive rules in the classroom to create an environment that facilitates student creativity [27], [28]. Learning exercises can also be focused on positive learning strategies, including providing constructive feedback and emphasis on student achievement to stimulate intrinsic motivation [29], [30]. In addition, the development of teachers' pedagogical skills in providing active support, such as guidance and encouraging student collaboration, can be strengthened. Professional development programs may also emphasize differentiation approaches to accommodate differences in student development in the early and middle adolescent stages [31], [8]. Thus, focusing on developing creative skills and approaches in a classroom context can enhance the quality of teaching and enrich students' learning experience.

5. CONCLUSION

Based on the results of this study, it can be concluded that classroom activities that integrate supportive rules, positive learning, and teacher support have a positive impact on developing student creativity. The practical implications of this research emphasize the need for a differentiation approach in teacher professional development by providing training related to applying creative strategies in teaching, creating an environment that supports student creativity, and enhancing positive learning skills. Thus, this research provides an essential foundation for improving the quality of education and developing students' creativity at the junior and senior high school levels.

Schools and governments can take practical steps to boost students' creativity. First, incorporate materials and learning methods that encourage students' creative thinking into the curriculum. Second, teachers should be trained in teaching methods that support creativity and allow them to create an innovative classroom atmosphere. In addition, support programs for students, such as extracurricular activities or tutoring, should be designed so that they can overcome difficulties in creative thinking and increase their confidence. Governments can also help by creating education policies emphasizing creativity and providing financial support and incentives to encourage schools to adopt innovative practices. In this way, it is possible that schools can stimulate imagination, and the government can create a foundation supporting student creativity development in the education system.

Experimental research can be a solution to improve this research for the following reasons: First, an experimental design compares an experimental group that implements an intervention that stimulates creativity with a control group that does not. It can provide a more substantial basis for evaluating the direct impact of interventions on students' creativity development. Second, controlling outside variables that might affect the study results must be strengthened to ensure the study's internal validity. Furthermore, it is necessary to consider an adequate and representative sample size for the results to be more commonly applied. Finally, empirical findings need to be contextually interpreted and adapted to the practical needs of teachers and school administrators. By emphasising experimental research, it is anticipated that this study can provide more substantial evidence regarding the effectiveness of concrete interventions in increasing student creativity.

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