

# Application of Project-based Learning in Nursing Education

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## Abstract

*In response to the growing demand for problem-solving skills in nursing, this study explores the impact of Project-based Learning (PBL) on enhancing creative personality among nursing students. The shift from teacher-centred to learner-centred education emphasizes the development of creative thinking and collaborative problem-solving abilities. The primary objective of this study was to assess how PBL influences various aspects of creative personality, including curiosity, self-confidence, imagination, humour, and independence, in nursing students. Thirty-four students in a health program development course participated in this study, with creative personality measured before and after the PBL intervention. Data were analyzed using descriptive statistics and paired t-tests through SPSS software. The results revealed a significant improvement in overall creative personality scores post-intervention ( $p < .001$ ), with notable increases in self-confidence, curiosity, imagination, and independence. Correlations among sub-factors indicated positive associations between self-confidence, imagination, and humour. These findings suggest that PBL can effectively foster creative traits crucial for problem-solving in nursing practice. Given the importance of creativity and critical thinking in healthcare, this study advocates integrating PBL into nursing curricula to enhance students' creative problem-solving capabilities and teamwork competence. The results offer valuable insights for educators seeking to cultivate adaptable, innovative nurses who can address complex healthcare challenges.*

**Keywords:** *Project-based learning, Nursing education, Creative personality, Problem-solving, Self-confidence, Teamwork, Nursing students*

## 1. Introduction

Society demands creative thinking and problem-solving skills. These social changes also occur in the hospital environment. Instead of delivering nursing knowledge, nursing education must train students to gain creativity, critical thinking, communication, and collaboration. For this reason, teacher-centred education needs to be shifted to learner-centred education. In the 21st century, faced with complex and diverse problems, acquiring knowledge and the ability to combine and reconstruct knowledge newly is necessary. It is the creative problem-solving ability that is essential at this time. Among the core competencies of university students, creative problem-solving ability is a very important factor. Creative problem-solving ability is closely related to the creative personality and creative thinking

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process. Creative personality refers to the personality traits of a creative person and can be expressed by interest, interest, and attitude toward creativity.

The recent demand for a diversified and open society is shifting the focus of university education from the teacher-centred approach to the learner-centred innovative approach. Innovative approaches include team-based, problem-based, project-based, and flipped learning. Project-based learning is receiving attention because of the growing importance of a learner-centred learning environment.

Project-based learning involves solving a project, acquiring knowledge, and practising specific activities to express the project outcomes in various ways. Through this learning method, learners learn independently by questioning and discussing with other students to solve problems they organize in real-life situations [1].

Creativity contributes not only to personal growth but also to the development of society, so it has been recognized as an essential task of education for promoting the creativity of university students. Therefore, in the 21st century, creativity or creative problem-solving ability is the core competency of university students. Attention to creativity, interest, and a creative attitude can show a creative personality. In particular, creativity can be defined by the universal personality traits commonly shared by creative people [2]. Creativity education courses for undergraduates in Malaysia are primarily liberal arts, and previous studies report that creativity lectures affect creative attitudes and exchange relationships among team members [3]. A study applying PBL to a learner-centred learning method in nursing major subjects reports that creative thinking, creative motivation, and creative attitude are effective for problem-solving ability [4]. A study applying the flipped classroom approach reports that the approach improves self-efficacy, critical thinking, and communication of undergraduate nursing students [5]. Creative problem-solving classes improve undergraduate nursing students' creative ability and creative problem-solving leadership [6]. The action-learning approach is effective in developing and enhancing the creative problem-solving ability of nursing students [7], and project-based classes enhance undergraduates' creative thinking, creative tendency, and problem-solving ability [8].

It is essential to have the ability to approach and solve problems that occur during diverse and complicated nursing practices creatively by breaking away from the norms. Nurses must be able to solve problems by interacting with their coworkers and experts in other fields. Accordingly, the purpose of this study is to examine the effect of project-based learning on the creative personality by applying project-based learning to nursing education to increase the teamwork competence of students for solving problems together through creative thinking.

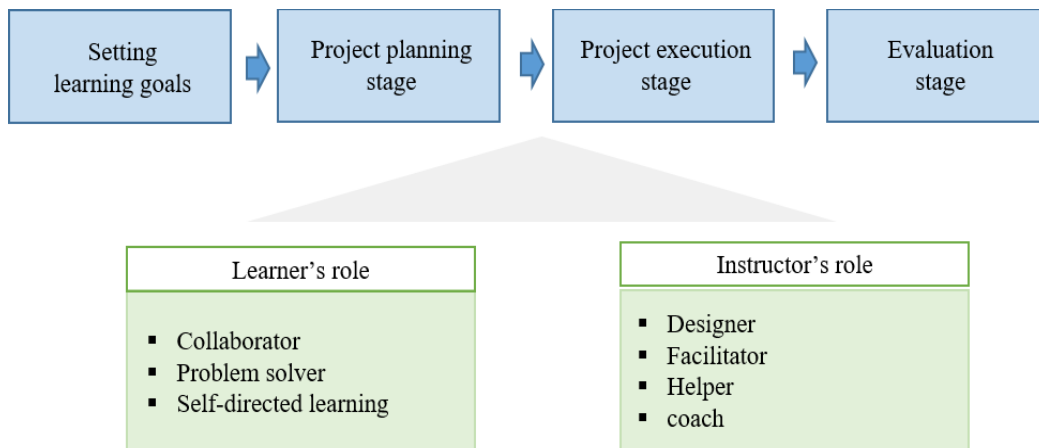


Figure 1. Project-based learning process

## 2. Literature Review

### 2.1. The role of creativity in nursing education

Creative problem-solving and critical thinking are essential for nurses as they face complex and dynamic challenges in patient care. Creativity in nursing education has gained increasing attention due to its potential to foster innovative approaches to problem-solving and enhance adaptability in clinical settings. According to Treffinger et al. [2], creativity is linked to motivation, cognitive style, and attitudes, which are necessary for generating novel solutions in healthcare environments. In nursing education, developing a “creative personality” — curiosity, self-confidence, and imagination — can significantly impact students' ability to approach clinical problems effectively [4]. However, while creativity is widely recognized as vital in nursing, there is a lack of consensus on effectively cultivating these traits in nursing students. Some studies suggest that traditional lecture-based teaching methods do not sufficiently encourage creative thinking [3], highlighting the need for more interactive, learner-centred approaches.

### 2.2. Project-based learning in nursing education

Project-based Learning (PBL) has been increasingly adopted in nursing education to promote active learning and problem-solving. This approach emphasizes applying knowledge in real-world contexts, encouraging students to work collaboratively to address practical problems. PBL has enhanced students' ability to work in teams, communicate effectively, and approach problems creatively [8]. Research by Shin and Kim [4] revealed that nursing students who engaged in PBL demonstrated improved teamwork and creative problem-solving abilities, suggesting that this approach is conducive to developing essential nursing competencies. In a study by Choi [6], it was found that PBL significantly improved students' creativity and leadership skills, further supporting its role in enhancing creative problem-solving in nursing education. Similarly, Jouzi et al., [5] reported that nursing students who participated in PBL activities showed greater self-efficacy and critical thinking, critical components of creativity and problem-solving.

### **2.3. Creative personality and its impact on problem-solving**

A creative personality, defined by curiosity, independence, humour, and imagination, fosters creativity and innovation in nursing practice. Studies have demonstrated that individuals with creative personalities are more likely to exhibit high levels of resilience, adaptability, and confidence when solving complex problems [7]. According to Kim and Kim [10], a creative personality is positively correlated with improved teamwork and communication skills, essential in nursing practice. Furthermore, Carson et al. [12] research emphasizes that shared leadership within teams can also contribute to fostering creativity. This aligns with the findings of Liu et al [9], who suggested that creativity is not only an individual trait but can be nurtured in collaborative environments, making PBL a promising approach for nursing students.

### **2.4. PBL and its influence on creative personality**

Several studies have specifically examined the impact of PBL on the creative personality of nursing students. According to Chan [8], PBL activities significantly enhance creativity by encouraging students to engage in real-world problem-solving and self-directed learning. This approach contrasts with traditional, passive learning methods, which may not allow students to apply creative thinking in a collaborative setting actively. Similarly, Bulfone et al. [11] found that PBL-based courses significantly improved creative traits such as imagination and self-confidence in nursing students, aligning with the findings of this study. Moreover, recent research by Bulfone et al [11] emphasized the positive effect of PBL on creative problem-solving skills, which is crucial for nurses expected to develop innovative solutions in clinical practice. The ability to work collaboratively and think critically during PBL activities can prepare nursing students for the unpredictable and often high-pressure environment of healthcare.

### **2.5. Methodological approaches in PBL research**

Research on PBL in nursing education employs various methodologies, ranging from qualitative case studies to quantitative experimental designs. Most studies, including those by Lim [1] and Choi [6], utilize pre-and post-test measures to assess the effectiveness of PBL in improving creativity and problem-solving abilities. These studies often incorporate standardized tools, such as the Creative Personality Scale-Revised (CPS-R), to measure changes in students' creative personality traits. While these quantitative methods are useful for identifying statistical relationships, several studies suggest that qualitative approaches, such as interviews and focus groups, could provide deeper insights into how PBL fosters creativity [3]. Additionally, longitudinal studies are needed to explore the long-term impact of PBL on nursing students' creative problem-solving abilities. Although the existing literature demonstrates the positive effects of PBL on creativity and problem-solving in nursing education, several gaps remain. First, while most studies focus on short-term effects, more research is needed to explore the lasting impact of PBL on nursing students' creativity beyond the academic setting. Longitudinal studies could provide valuable insights into how PBL prepares students for real-world nursing challenges.

Additionally, there is limited research on how different types of PBL (e.g., individual vs. group-based projects) influence creative personality and problem-solving abilities. Exploring these variations could help educators design more effective PBL curricula tailored to the needs of nursing students. Finally, while many studies focus on creativity, there is a lack of

research on integrating other critical competencies, such as leadership and ethical decision-making, into PBL activities for nursing students. Future studies should investigate how PBL can address multiple competencies simultaneously, preparing students for complex roles in healthcare.

The reviewed literature provides strong evidence that project-based learning is an effective approach for fostering creativity and improving problem-solving abilities in nursing students. By encouraging active engagement and collaborative learning, PBL helps students develop the creative personality traits necessary for addressing the challenges they will face in clinical practice. However, further research is needed to explore the long-term effects of PBL and to identify the most effective strategies for integrating creativity with other essential nursing competencies.

### **3. Materials and Methods**

#### **3.1. Design of study**

This study has a single-group, quasi-experimental design that measures differences before and after project-based learning to examine the effect of project-based learning on the nursing student.

#### **3.2. Participants**

G\*Power 3.1 was used to calculate the number of samples. The number of samples for the one-tailed independent t-test calculated using the significance level ( $\alpha=.05$ ), power ( $1-\beta=.95$ ), and effect size ( $f=.5$ ) was 34. Before conducting this study, students were informed that the course for developing and assessing health programs is based on project-based learning, and only the students who agreed were selected as the participants. Participants were 71.5% female and 28.6% male, with an average of 22.6 years old. An orientation was held before class started to explain the teaching process, learning method, assessment method, and roles of the professor and students to the participants.

#### **2.3 Measurements**

Creative personality refers to the motivation, attitudes, values, and cognitive styles that facilitate creative thinking and behaviour, general characteristics shown by creative persons, and the stable and core attitude of an individual needed to manifest creativity.

The Creative Personality Scale-Revised (CPS-R) measures creative personality [9]. This tool comprises eight sub-factors (Curiosity, Self-confidence, Imagination, Patience, Humor, Independence, Adventure, and Openness) and 30 questions total. The tool had Cronbach's  $\alpha$  of .82.

Table 1. Composition of creative personality

Sub-factors	Definition	Number of questions
Curiosity	Curiosity is the tendency to question and pay attention to surrounding objects and phenomena.	4
Self-confidence	Self-confidence refers to thinking positively about one's creative capability and existence.	5
Imagination	Imagination refers to the tendency to enjoy imaginary situations.	4
Patience	Patience/attachment refers to the tendency to finish a task despite hardships.	5
Humour	Humour refers to the tendency to generate funny actions or thoughts.	4
Independence	Independence refers to the tendency to solve problems alone regardless of what others think and assess.	2
Adventure	Adventure refers to the tendency to challenge tasks at risk of failing.	2
Openness	Openness refers to the tendency to accept new experiences and thoughts.	4

## 2.4. Nursing intervention

The experimental treatment of this study is the 'Development and Evaluation of Health Programs' course that applied project-based learning. This three-credit course for fourth-year nursing students was operated for 15 weeks. Among three hours every week, one hour was spent on learning themes for project team activities, and two hours were used to engage in team activities led by team leaders. The learning objective of this course is to write a health project proposal. The participants were provided with basic data related to the local community. They worked as a team of four or five members to conduct 15 sessions of team activities such as data collection, field surveys, and discussions.

This course presented examples of each theme for developing health programs so that each team can practice cooperative learning. After educating the participants on the learning themes before cooperative team activities, teams had discussions to solve problems associated with the given task for 90 minutes while the professor advised teams. Team members divided roles during team activities to find data, keep records, or prepare for the presentation. After the team activities, students presented their activities for 30 minutes, and the professor supervised Q&A and feedback sessions. After class, students were asked to write and submit a work journal and reflection paper describing their team activities.

## 2.5. Data collection

Data were collected from August 23 until December 22, 2019. Project-based learning was operated for 15 weeks on 42 students who signed up for the 'Development and Assessment of Health Programs' course and agreed to the purpose of this study. Creative personality was measured before and after applying project-based learning to verify the learning effect.

## 2.6. Data analysis

The collected data were analyzed using the SPSS WIN 23.0 program. The reliability of tools was confirmed using Cronbach's  $\alpha$  value. Descriptive statistical analysis was performed to identify the creative personality of the participants. Changes in the creative personality of the participants were analyzed to verify the effect of project-based learning by performing a

paired t-test. The correlation among the sub-factors of creativity personality was analyzed using the Pearson correlation coefficient.

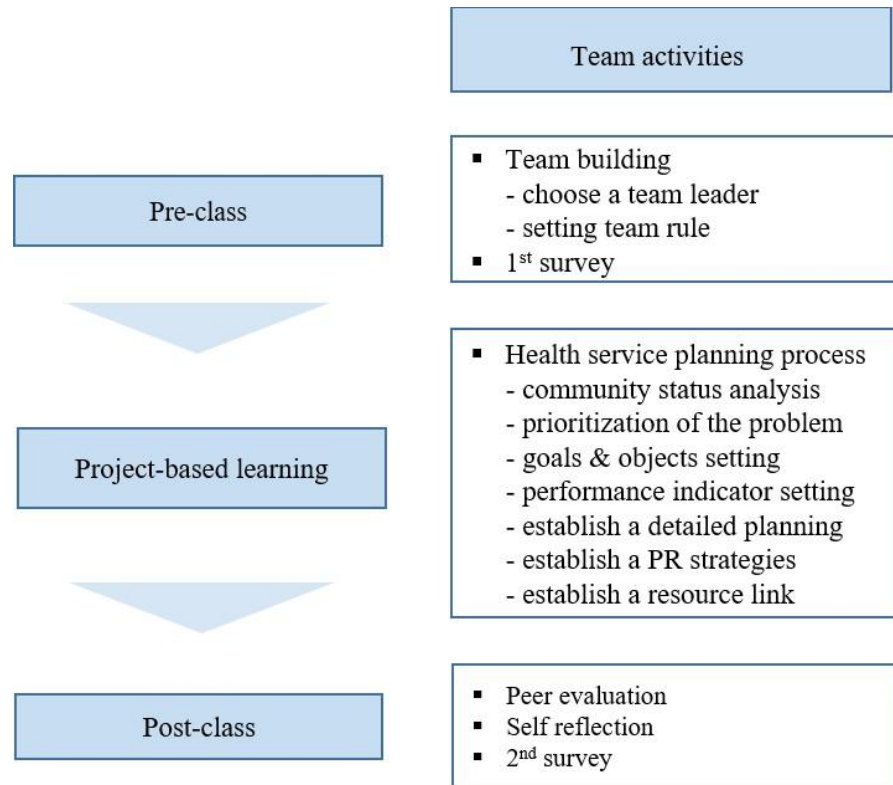


Figure 2. Project-based Learning team activities

## 4. Results

### 4.1. Effect of project-based learning

When project-based learning was applied to undergraduate nursing students, creative personality changes were presented in Table 2.

Before applying 15 project-based learning sessions, the mean score was 2.92 for creative personality, 3.75 for teamwork competence, and 3.61 for self-regulated efficacy. After application, the mean score was significantly improved on the significance level of  $p < .01$  to 3.77 for creative personality ( $t=10.587$ ,  $p=.000$ ). For the sub-factors of creative personality before applying 15 sessions of project-based learning. The mean score was 3.40 for curiosity, 3.67 for self-confidence, 3.69 for imagination, 3.14 for patience/attachment, 3.20 for humour, 3.50 for independence, 3.13 for adventure, and 3.68 for openness. After application, the mean score was 3.74 for curiosity, 4.01 for self-confidence, 3.93 for imagination, 3.52 for patience/attachment, 3.61 for humour, 3.89 for independence, 3.61 for adventure, and 3.82 for openness. The score was significantly improved for curiosity ( $t=2.883$ ,  $p=.006$ ), self-confidence ( $t=2.999$ ,  $p=.005$ ), patience/attachment ( $t=3.998$ ,  $p=.000$ ), and independence ( $t=2.963$ ,  $p=.005$ ).

Table 2. The effects of project-based learning

Variables	pre-test M±SD	post-test M±SD	t	p
	2.92±.39	3.77±.31	10.587	.000*
	3.40±.59	3.74±.46	2.883	.006*
Creative Personality	3.67±.60	4.01±.39	2.999	.005*
Curiosity	3.69±.71	3.93±.52	1.592	.119
Self-confidence	3.14±.47	3.52±.38	3.998	.000*
Imagination	3.20±.78	3.61±.63	2.494	.017
Patience	3.50±.68	3.89±.50	2.963	.005*
Humor	3.13±.91	3.61±.81	2.388	.022
Independence	3.68±.47	3.82±.37	1.478	.147

\*:  $p < .05$

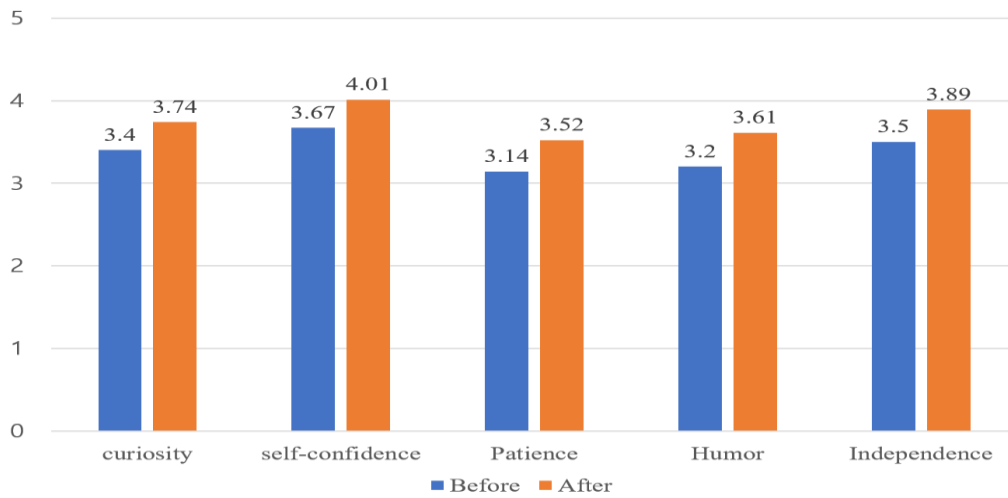


Figure 3. The effects of project-based learning

#### 4.2. Correlation among the variables

Looking at the correlation among the sub-factors of creative personality showed a significant positive correlation between self-confidence ( $r=.390$ ,  $p=.011$ ), imagination ( $r=.482$ ,  $p=.001$ ), and humour ( $r=.371$ ,  $p=.015$ ) (Table 3).

Table 3. Correlation among sub-factors of creative personality

Scale	CP	CP_C	CP_S	CP_I	CP_P	CP_H	CP_In	CP_A	CP_O
CP	1								
CP_C	.692**	1							
CP_S	.701**	.309*	1						
CP_I	.866**	.541**	.598**	1					
CP_P	.490**	.360*	.246	.260	1				
CP_H	.723**	.420**	.400**	.555**	.333*	1			
CP_In	.272	.056	.351*	.260	.044	.040	1		
CP_A	.539**	.256	.234	.421**	.020	.292	.361*	1	
CP_O	.672**	.534**	.382*	.676**	.154	.300	.009	.374*	1

\*\* :  $p < .01$

\* :  $p < .05$

CP: Creative Personality CP\_C: Curiosity CP\_S: Self-confidence CP\_I: Imagination CP\_P: Patience/Attachment CP\_H: Humor CP\_Ind: Independence CP\_A: Adventure CP\_O: Openness



## 5. Discussion

This study explored the effects of project-based learning (PBL) on developing creative personality traits in nursing students, particularly in improving their problem-solving abilities. The results indicated a significant improvement in students' creative personalities across all measured traits, supporting that PBL fosters creativity in educational settings. This aligns with previous research that has demonstrated the positive impact of PBL on critical thinking and creativity in students [1][14].

Creative personality encompasses motivation, attitudes, values, and cognitive styles that enable creative thinking and problem-solving. It is the fundamental personality structure that nurtures creativity through traits such as curiosity, self-confidence, and resilience [10]. In this study, students who participated in PBL activities showed significant improvements in these areas, suggesting that the PBL approach nurtures these essential characteristics. Notably, students demonstrated an increased ability to tackle new challenges with curiosity and independence, traits strongly associated with creative individuals [8]. Moreover, these findings are consistent with those of Ahmady and Shahbasi [3] who noted that creativity in nursing education can be enhanced through problem-solving-oriented pedagogies like PBL.

Significant improvements were observed in specific sub-factors of creative personality, including curiosity, self-confidence, patience, humour, and independence. As research by Carson et al. [12] and Baek et al. [13] suggests, individuals with creative personalities tend to be more open to new experiences, resilient in the face of challenges, and confident in their ability to solve complex problems. These traits are crucial for nursing students who must adapt to dynamic clinical environments and collaborate to find innovative solutions to patient care issues. The improvement in self-confidence, for example, is particularly valuable in clinical practice, where nurses are often required to make quick, independent decisions [5].

A creative person's ability to finish tasks despite difficulties, maintain a sense of humour in stressful situations, and stay independent from external opinions enhances problem-solving skills [9]. In nursing, these attributes allow students to approach clinical tasks with a mindset geared toward innovation and resilience. This underscores the necessity of incorporating PBL into nursing curricula to promote the development of these competencies.

The findings from this study emphasize that nursing education needs to shift its focus from merely delivering knowledge to cultivating problem-solving abilities and creativity. As Lufri et al. [15] and Lim [1] noted, developing 21st-century skills such as critical thinking, creativity, and teamwork is essential for nursing students, as they are expected to face increasingly complex clinical challenges. This shift can empower future nurses to address existing healthcare challenges, innovate, and adapt to new and unforeseen problems. In this way, PBL offers a promising pedagogical approach to prepare students for the rapidly evolving healthcare environment.

In conclusion, this study's findings reinforce the growing body of literature supporting PBL as a powerful tool for enhancing creative problem-solving and preparing nursing students for modern healthcare's collaborative and dynamic nature. However, future research should explore the long-term impacts of PBL on creative personality, its correlation with clinical performance post-graduation, and the integration of other competencies essential to nursing practice.

## 6. Conclusions

The effectiveness of learning activities practised through cooperation and sharing among learners has been highlighted in recent studies, reflecting the growing interest in methodologies that enhance self-directed learning by fostering interaction and involvement. This study specifically aimed to investigate the impact of a project-based course utilizing team activities on developing creative personality traits. To achieve this, a project course comprising 15 weekly team sessions was designed and implemented within the context of the 'Development and Assessment of Health Programs' subject. The findings are summarized below.

First, implementing the 15-session project-based learning approach significantly enhanced creative personality traits among participants. Sub-factors such as curiosity, self-confidence, patience/attachment, and independence showed substantial improvement. These findings underscore the value of structured, collaborative activities in fostering creativity-related attributes. Second, correlating correlations among the sub-factors of creative personality revealed a significant positive relationship between self-confidence, imagination, and humour. Participants with a creative personality demonstrated a proactive attitude toward tackling challenges and solving novel problems, with a strong sense of curiosity and a deep interest in their surroundings. Furthermore, these individuals exhibited resilience in completing complex tasks and maintaining independence despite external influences.

A noteworthy observation was the strong association between self-confidence and a positive perception of creativity. This self-assurance was reinforced through the satisfaction participants derived from transforming their team projects into tangible outcomes. These findings suggest that project-based learning fosters the enhancement of creative traits and the motivation to apply such traits effectively in real-world contexts. In conclusion, the results of this study emphasize the importance of project-based learning approaches in developing creative personalities. By encouraging collaboration, fostering curiosity, and promoting independence, such methods can significantly contribute to equipping learners with the skills necessary for innovation and problem-solving in diverse fields.

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