

## Enhancing Creativity of Generation Z Through Project-Based Learning

**Anda Juanda\*, Anton Sudrajat**

UIN Siber Syekh Nurjati Cirebon, Indonesia

Email: andajuanda300@gmail.com\*, antonsudrajat@syekhnurjati.ac.id

### Keywords

*Creativity, Gen-Z,  
Project Based  
Learning,  
Entrepreneurship  
Education*

### ABSTRACT

The development of creativity, especially among Generation Z students in high school, must be fostered through entrepreneurship education using an innovative and creative learning model: the Project Based Learning (PJBL) model. The purpose of this study is to test the effectiveness of the PJBL learning model in enhancing the creativity development of Generation Z students. The design of this study is a one-group pretest–posttest design. The sample in this study consisted of 125 State High School students representing four areas: Cirebon, Indramayu, Kuningan, and Majalengka Regencies, West Java Province, Indonesia. This research employed a creativity questionnaire adopted from Lawson. Data analysis included descriptive statistics, validity and reliability tests, normality tests, and hypothesis testing using the Paired Sample T-Test. Based on the research findings, the PJBL learning model effectively developed the creativity of Gen Z students. After the implementation of the PJBL learning model, the average student creativity score increased to 60.99, with the lowest score being 43 and the highest reaching 72, and a standard deviation of 6.237. Therefore, it can be concluded that the PJBL learning model increased students' creativity by an average of 14.16. The aspects of creativity that improved among Gen Z students include fluency, flexibility, originality, and elaboration.

### INTRODUCTION

An American sociologist named Karel Mannheim (1952) divided generations into Baby Boomers, X, Y, Z, and Alpha. According to Kupperschmidt (2000), a generation is a group of individuals who identify themselves based on similarities in birth year, age, location, and life events that have significant influence during their developmental stages (Nurdianti et al., 2019). A generation, therefore, represents individuals who share temporal and contextual commonalities shaped by historical, social, and cultural experiences that influence their behaviors, values, and personalities (Caspi & Robert, 2021).

Generation Z emerged alongside the rapid growth of social media, which for them has become an integral part of everyday life (Pratiko & Kristanty, 2017). They are also known by various names such as iGeneration, Gen Tech, Wii Generation, Digital Natives, Net Generation, and Plurals. Gen Z possesses a higher degree of global connectivity, communication ability, and instant access to information through the use of digital technology (Muchsin & Hamdi, 2021; Frahani et al., 2021). This technological phenomenon has profound implications for education worldwide. According to the OECD (2019), digital transformation has fundamentally changed how Generation Z learns, processes information, and engages with educational content across both developed and developing nations.

International studies indicate that Gen Z students demonstrate distinct learning tendencies characterized by a visual learning orientation, preference for interactive content, and shorter attention spans compared to previous generations (Turner, 2015; Seemiller & Grace, 2016). The UNESCO report on digital learning (2020) emphasizes that educational systems worldwide must adapt to these technological natives by integrating innovative pedagogical strategies that utilize their digital fluency while cultivating critical thinking and creativity skills. In the context of global creativity development, research by Henriksen et al. (2018) across multiple countries reveals that Gen Z's technological immersion presents both opportunities and challenges: while technology provides unprecedented access to information and creative tools, it may also lead to superficial engagement and diminished deep creative thinking. This global phenomenon highlights the need for educational interventions that harness Gen Z's technological competencies while promoting substantive creativity through structured, project-based learning approaches that align with their learning characteristics.

Technology is deeply embedded in the daily lives of Gen Z (Qurniawati, 2018; Wijoyo, 2020; Sutapa et al., 2023; Ardi et al., 2023). According to Basuki, Gen Z in Indonesia currently constitutes approximately 33% of the population and primarily comprises high school students. Technology plays a vital role in developing the creative potential of Gen Z; however, its excessive or unregulated use can have negative impacts. Research findings indicate a correlation between smartphone addiction and decreased academic performance (Alotaibi et al., 2022). Several surveys, especially those conducted in developed countries, reveal various characteristics and behavioral tendencies of Gen Z, including the following:

1. They spend about 7.5 hours interacting with digital devices (including time when "multitasking", for example, texting while listening to music via iTunes, time spent almost 11 hours enjoying content and interacting with digital devices).
2. Data from a 2009 poll showed that 22% of Gen Z teens logged into social accounts more than 10 times daily.
3. About 75% of Generation Z teenagers have their own mobile phones, 25% use social media, 54% for texting, and 24% for instant messaging.
4. About 25% of adolescents use posnel to have intimate conversations with their close friends for hours between midnight and 5 am, (Wibawanto, 2018; Grendi, January, 2023).

In addition to the negative effects mentioned above, the results of Phangadi's research (2018) explained that Gen Z adolescents addicted to smartphones can develop mental illnesses due to several environmental and social factors. These mental illnesses include depression, schizophrenia, autism, and bipolar disorder. Moreover, because they frequently log on to the internet, they may access adult content and inappropriate websites. Phangadi further concluded that there has been an increase in the number of individuals experiencing mental disorders across Indonesia, particularly in Jakarta. This increase is attributed to factors such as globalization, social disparities, a shortage of professionals in the psychiatric field, insufficient government attention, and inadequate infrastructure to support public mental well-being.

The research also highlights further negative effects of technology. Rousydiy (2020) and Ardi et al. (2023) reported that Gen Z tends to be prone to stress, depression, instant gratification, individualism, and low leadership, communication, and independence skills, including entrepreneurship. In relation to entrepreneurship as a form of soft skill that must be developed and nurtured in schools, current educational practice places greater emphasis on academic achievement, while soft skills essential for entrepreneurship development are often neglected. This neglect negatively affects students' entrepreneurial motivation and spirit.

Several research findings underscore the problem of weak entrepreneurial capacity. Data from the Ministry of Cooperatives and SMEs show that Indonesia's entrepreneurship ratio still lags behind other ASEAN countries. As of 2023, Indonesia's ratio stood at about 3.4%, lower than Singapore (8.76%), Thailand (4.26%), and Malaysia (4.74%), and well below the average of developed countries at 14% (Rousydiy, 2020). This disparity underscores the urgent need for educational interventions specifically targeting entrepreneurial skill development among Indonesian youth.

The economic implications are substantial. The World Economic Forum (2020) reports that countries with higher entrepreneurship ratios demonstrate greater economic resilience, innovation capacity, and youth employment levels. In contrast, Indonesia's low entrepreneurship ratio correlates with high youth unemployment and limited economic mobility, particularly among recent high school graduates. The Asian Development Bank (2021) emphasizes that effective entrepreneurship education can increase youth entrepreneurial intentions by 40–60% and actual business creation rates by 20–30%. This evidence highlights the critical importance of developing effective pedagogical approaches, such as Project Based Learning (PJBL), to foster entrepreneurial creativity among Indonesian Gen Z students.

As of March 2022, according to the Socio-Economic Survey (Susenas) by the Central Statistics Agency (BPS), 68.82 million people were categorized as belonging to Gen Z, with 54.79% concentrated on the island of Java, particularly in West Java (Andriana et al., 2020; Hendrastomo, 2023). An overview of unemployment rates among the younger generation can be seen in the following data. The number of unemployed high school graduates belonging to Gen Z remains significant (Incorporated, 2019; Ardi et al., 2023). According to Susenas data, entrepreneurial participation among Gen Z youth remains low.

Gen Z individuals—those born between 1995 and 2010 who are of high school age in Indonesia—face increasing challenges in obtaining employment after graduation, particularly those who do not pursue higher education. They compete directly with vocational school graduates, who have an employment absorption rate of 85% within three months after graduation. Furthermore, as of February 2025, the Open Unemployment Rate (TPT) in West Java reached 6.74%, with high school graduates being significant contributors to the national unemployment rate (Central Statistics Agency of West Java, <https://jabar.bps.go.id>).

Addressing these issues requires a systemic solution involving families, schools, and community education. One key aspect to reconsider is the school system, as schools serve as the center of cultural transformation to equip the younger generation with essential life skills (Ansyar, 2022). To develop Gen Z's life skills in the field of entrepreneurship, learning activities must align with the characteristics of Gen Z—who live in the Industrial Era 4.0 (Lumbanraja, 2019; Juita et al., 2024). Gen Z students represent a crucial opportunity to advance education, particularly in meeting industrial demands that call for the development of an entrepreneurial spirit (Rijal et al., 2023; Dewa, 2023).

Substantial research evidence demonstrates the effectiveness of Project Based Learning (PJBL) in developing creativity among Gen Z students, both internationally and within Indonesia. A meta-analysis by Kokotsaki et al. (2016), examining 82 studies across 15 countries, found that PJBL significantly enhanced student creativity (effect size  $d = 0.71$ ) compared to traditional instruction. Specifically concerning Gen Z, Guo et al. (2020), in a longitudinal study conducted across several Asian countries, demonstrated that PJBL increased creative thinking scores by 34% among secondary school students.

In the Indonesian context, several studies have explored the impact of PJBL. Rahayu and Festiyed (2018) found that PJBL improved creative thinking skills by 45% among Indonesian high school students in science subjects, while Winarni et al. (2020) reported significant improvements in entrepreneurial creativity through PJBL in vocational education settings. However, research specifically examining PJBL's effectiveness in developing Gen Z creativity within entrepreneurship education remains limited, particularly in the West Java region. Most existing Indonesian studies focus on specific academic subjects (such as science or language) rather than entrepreneurship education, and few address Gen Z's unique learning characteristics and creativity dimensions (fluency, flexibility, originality, and elaboration) within the PJBL framework.

Furthermore, comparative studies evaluating PJBL effectiveness across multiple Gen Z cohorts in various Indonesian regions are notably lacking in current literature. This gap is particularly important because Gen Z's digital nativity and learning preferences may interact differently with PJBL methodologies compared to previous generations, thereby necessitating generation-specific empirical evidence.

One of the learning models considered relevant to developing Gen Z's entrepreneurial abilities is the Project Based Learning (PJBL) model. The advantages of this learning model are as follows:

1. Develop 21st century skills such as: critical thinking, collaboration, communication and creativity effectively because students are actively involved in the learning process through contextual and meaningful projects.
2. Motivate students to learn through real experiences, exploration, and teamwork so that lessons become more in-depth and relevant to daily life.
3. Assisting students in developing *soft skills*, such as: leadership, time management, and problem-solving skills that are important to face future challenges, (Dewi, 2022; Darmawan, *et al.*, 2023).

The novelty of this research lies in its systematic examination of Project Based Learning (PJBL) effectiveness specifically for developing Gen Z creativity within entrepreneurship education contexts in Indonesia—an area where empirical evidence remains limited. While numerous international studies have investigated PJBL's impact on student creativity in general, and several Indonesian studies have explored PJBL in various subject domains, this research addresses critical gaps in the existing literature.

First, it specifically focuses on Gen Z students, whose distinct learning characteristics, digital nativity, and patterns of creative expression differ fundamentally from those of previous generations examined in earlier PJBL studies. Second, this study measures creativity across four comprehensive dimensions—fluency, flexibility, originality, and elaboration—within entrepreneurship education, thereby providing nuanced insights into how PJBL influences each aspect of creativity. Third, the research is conducted across four distinct regencies in West Java (Cirebon, Indramayu, Kuningan, and Majalengka), offering regional diversity and enhancing the generalizability of findings within the Indonesian context. Fourth, unlike previous studies that primarily examined PJBL in science or language education, this research focuses on entrepreneurship education—a critical domain for addressing Indonesia's youth unemployment crisis and low entrepreneurship ratio.

The unique contribution of this study is its empirical demonstration of whether and how PJBL can effectively cultivate entrepreneurial creativity among Gen Z students, thereby informing evidence-based pedagogical approaches for nurturing Indonesia's entrepreneurial generation. The research bridges theoretical frameworks of creativity development with practical applications in addressing Indonesia's pressing educational and economic challenges.

This study aims to test the effectiveness of the PJBL learning model in enhancing the creativity development of Generation Z students within entrepreneurship education settings. The research addresses the central question: Does PJBL significantly improve Gen Z students' creativity across multiple dimensions (fluency, flexibility, originality, and elaboration)? The findings are expected to provide empirical evidence for educators and policymakers on effective pedagogical approaches to develop Gen Z creativity, contribute to addressing Indonesia's youth unemployment challenges through strengthened entrepreneurial education, and inform curriculum development strategies aligned with Gen Z learning characteristics. Furthermore, this research offers practical implications for educational institutions seeking to implement innovative teaching models that foster creativity and entrepreneurial competencies essential for success in the 21st century.

## Generation Z

A generation can be defined as a period of time in which children are born and grow, become adults and begin to have offspring of their own. From this, the terminology of social generation was found which was divided into several categories. The division of generations has been put forward by many researchers with different labels, but in general it has the same meaning. Since the emergence of Generation Theory until now, several generations have been known with the following terms:

1. Generasi Baby Boomer, 1946-1964,
2. Generation X, born 1965-1980,
3. Generation Y, 1995-1994.

4. Generation Z, born 1995-2010,
5. Generation Alpha, born 2011-2025.

Based on the generational classification above, one of the generations often discussed in schools is Generation Z. They are known as digital natives or the net generation, and also as digital nativists—a generation born during a rapidly advancing digital era in which technology has become deeply integrated into daily life. Gen Z regards social media as an ordinary aspect of their environment. They differ from older generations categorized as digital immigrants—those born before the digital era had developed fully (Pratiko & Kistany, 2020; Hope, 2016; Lajnef, 2023; Gentina, 2020). Even though Gen Z tends to be addicted to social media, lack socialization, and struggle with focus (<https://www>, 2017), they also possess several strengths: (1) Gen Z embodies the undefined ID, valuing self-expression and individuality; (2) Gen Z is described as the communaholic generation, characterized by inclusivity and a strong interest in community involvement supported by technological sophistication; (3) Gen Z is known as the dialoguer—a generation that believes in the importance of communication and dialogue; and (4) Gen Z is referred to as the realistic generation, tending to make pragmatic decisions, being creative and innovative, and enjoying collaboration with others (Agarwal & Vaghela, 2018).

### **Creativity**

One of the competencies that must be developed among Gen Z is creativity. The development of Gen Z's creativity aligns with the demands of 21st-century learning, which emphasize (1) critical thinking, (2) communication, (3) collaboration, and (4) creativity (Wirahayu, 2022). Creativity is one of the central competencies receiving considerable attention in Gen Z education. According to experts in creativity, “The optimistic outlook of the humanist bestows a potential for creativity on everyone” (McNeil, 1920; Ornstein & Hunkins, 2022). Creative students can produce diverse innovative works such as literature, art, and robotics. Creativity also helps balance the left and right hemispheres of the brain. The results of creativity can elevate Indonesian education in the eyes of the world (Fitriyani, 2018).

According to Plato, the potential for creativity lies dormant (latent or intrinsic), and it does not develop optimally without education and social influence, as both significantly determine creative growth (Alexyu, 2019; Hosaenai, 2021). Similarly, the German philosopher Jacques Rousseau stated that all children are inherently good, but may become corrupted through their interactions with society: “Social children in their natural state are good, and they become corrupted through their contact with society” (Miller & Seller, 1985). To ensure this creative potential develops—particularly among Gen Z—Medin and Ross (1992) explain that “sometimes creativity seems as if the definition is somewhat circular: creative solutions are those produced by creative people, and creative people are those who come up with creative solutions... for a solution to be creative, it must be both original and relevant.” This statement contextually illustrates that everyone possesses creativity, but its realization requires the development of creative solutions. One such approach to developing Gen Z's creativity is through learning using the Project Based Learning (PJBL) model.

### **Model Project Based Learning**

Research on the PJBL model has shown empirical effectiveness in improving student learning outcomes related to critical thinking, collaboration, and creativity (Moon et al., 2020). These findings align with the advantages of the PJBL model as explained by Blazus & Mahtari (2022), including the development of critical thinking, communication, collaboration, and creativity, as well as the formation of knowledge through experiential learning within a social constructivist framework. Supporting the constructivist foundation of the PJBL model, Numbara Bari E et al. (2022), as cited by Okwelle (2020) and Le Corre (2022), explain the following:

1. To embed learning in social experience (collaboration).
2. To authentic (embed) learning tasks in a realistic context.
3. To encourage awareness of the knowledge construction process (metacognition).
4. To encourage the use of multiple models of representation (video, audio text, etc.)
5. To encourage ownership and a voice in the learning process (student-centred learning).

6. To provide experience with the knowledge construction process (student determine how they will learn).
7. To provide experience in and appreciation for multiple perspective (evaluation of possible and alternative solutions).

The steps of *the Project Based Learning* learning model include several stages, namely: *First*, the teacher conveys the learning objectives that must be achieved after the end of learning, determines the competencies (knowledge, attitudes and skills) that must be possessed by students and the subject matter that is relevant to the current context, as well as all the materials taught must be mastered by the students. *Second*, teachers form learning groups and identify problems that exist in the surrounding environment and society related to learning objectives or learning materials. *Third*, the stages of work where students try to understand concepts and principles related to the teaching material experienced in the learning process. *Fourth*, students display and exhibit projects that have been made to all teachers and schools inviting parents and the surrounding community (Sani (2014; Scott, 2014; Al-Tabany 2014; Alruthaya et al., 2021). The learning model emphasizes student learning activities in an exploratory manner and develops creativity, both creativity and creativity, products or creative works.

## METHOD

This study uses a quantitative research method (Creswell, 1944) with a type of *pre-experimental method*. The design used in this study is *one group pretest-post test design*. This design is used to measure variables depending on a group of subjects that are given treatment for a certain period of time (Borg & Gall, 2003, Ibrahim, 2021). This study compares students' creativity before and after being given a *Project Based Learning learning model intervention*.

### Sampling

A sample of odd-semester high school students for the 2023/2024 academic year in Majalengka, Cirebon, Indramayu, and Kuningan, West Java, Indonesia (Ministry of Education, Culture, Research and Technology, 2023). The sampling technique uses purposive sampling with the criteria of public schools that apply Entrepreneurship Education learning so that a sample of 125 students in grade XI of SMAN with a proportion of 32 students of SMAN 1 Jatiwangi Majalengka, 35 students of SMAN 7 Cirebon, 32 students of SMAN 1 Krangkeng Indramayu, and 32 students of SMAN 1 Cilimus Kuningan.

### Data Measures

The researcher developed a creativity questionnaire based on creativity indicators according to Lawson (1995) which consisted of four indicators: *fluency*: arguing, coming up with new ideas, doing a task faster than others. *Flexibility*: able to make modifications, have independent creations, spontaneity. *Originality*: being able to create/create something new. *Elaboration*: it is not easy to follow existing ideas, but also to detail the idea, then come up with original ideas.

### Data Analyses

The data analysis in this study consists of validity and reliability tests on research instruments, descriptive statistics, data normality tests, and to test hypotheses in this study using *the Paired Sample T-Test* with the provision of normally distributed data, but if the data is not normally distributed, it will be analyzed using the Wilcoxon test. SPSS version 25 was used to assist data analysis in this study.

## RESULTS AND DISCUSSION

### Validity and Reliability

Testing the validity and reliability of the creativity questionnaire instrument consisting of 18 statement items given to 30 students of SMAN 1 Sumber Cirebon. The validity test is used to measure the validity or validity of a questionnaire. A questionnaire is said to be valid if the questions on the questionnaire are able to reveal something that the questionnaire will measure. The validity test in this study uses *Pearson correlation* where if the Sig < 0.05, then the statement item in the questionnaire is declared valid (Ghozali, 2016). The results of the validity test in this study show that

all statement items in the creativity questionnaire have a Sig value of  $< 0.05$  so that it can be concluded that the creativity questionnaire instrument developed in this study is declared valid.

Reliability is a tool to measure a questionnaire which is an indicator of a variable or construct. A questionnaire is said to be reliable if a person's answer to a question is consistent or stable over time. In this study, reliability was tested using Cronbach alpha ( $\alpha$ ), a construct or variable is said to be reliable if it gives Cronbach alpha  $> 0.60$  (Ghozali, 2016). The results of the validity test in this study show that all statement items in the creativity questionnaire have a Cronbach alpha value of  $0.907 > 0.60$  so that it can be concluded that the creativity questionnaire instrument developed in this study is declared reliable.

### Descriptive Statistics

Based on *the data of the pre&post test* of student creativity, the minimum, maximum, average, and standard deviation values can be calculated with the following results:

**Table 1. Descriptive Statistic**

	N	Minimum	Maximum	Mean	Hours of deviation
Pre-Creativity	125	27	69	46.83	10.022
Post-Creativity	125	43	72	60.99	6.237

Based on the table above, it can be seen that before being given a *project-based learning* model, the average student creativity was 46.83 with the lowest score of 27 and the highest score of 69 with a standard deviation of 10,022. Meanwhile, after being given a *project-based learning* model, the average student creativity increased to 60.99 with the lowest score of 43 and the highest score reaching 72 with a standard deviation of 6,237. So it can be concluded that after being given a *project-based learning model*, students' creativity increased by an average of 14.16.

### Normality Test

The data normality test is intended to determine whether the data used is normally distributed or not. The normality test in this study uses *the Shapiro-Wilk* method with the test provision that if the Sig value is  $> 0.05$ , the data is declared to be *normally* distributed, while if the Sig value is  $< 0.05$ , the data is declared *not to* be normally distributed. The results of the normality test of creativity data are as follows:

**Table 2. Normality Test**

	Shapiro-Wilk		
	Statistic	Df	Sig.
Pre-Creativity	.982	125	.085
Post-Creativity	.982	125	.105

Note:  $p > 0.05$

Based on the results of the normality test using the *Shapiro-Wilk method* in the table above, it can be seen that the creativity pre-test data has a Sig value of  $0.085 > 0.050$ , then it can be stated that the data is normally distributed, while the creativity post test data has a Sig value of  $0.105 > 0.050$ , then it can be stated that the data is normally distributed. So it can be concluded that *the pretest* and *posttest* data of student creativity are normally distributed.

### Paired Sample T-Test

The use of statistical analysis in hypothesis testing in this study depends on the results of the normality test that has been carried out which states that the data of this study is normally distributed, so the researcher uses the *Paired Sample T-Test* parametric analysis which is a parametric statistical test used to test the difference in average values of the two paired samples. The decision-making in the *Paired Sample T-Test* is that if the Sig value is  $< 0.05$  then the hypothesis is accepted, and if the Sig value is  $> 0.05$  then the hypothesis is rejected. The results of *the Paired Sample T-Test* to analyze

the differences in creativity of Gen Z students before and after the implementation of the *project-based learning* model are as follows:

**Table 3. Paired Sample T-Test**

	N	Mean Difference	Sig
Pre-Creativity	125	14.16	0.000
Post-Creativity	125		

Rating: \*\*  $p < 0.05$

Based on the table above, the results of the *Paired Sample T-Test* show a Sig value of 0.000 < 0.05, then the hypothesis is accepted, which means that there is an effectiveness of the *project-based learning model* to develop the creativity of generation Z students.

The results of the *Paired Sample T-Test* statistical test show that there is an effectiveness of the *project-based learning model* to develop the creativity of generation Z students. The average student creativity was 46.83 with the lowest score of 27 and the highest score of 69. Meanwhile, after being given a *project-based learning model*, the average student creativity increased to 60.99 with the lowest score of 43 and the highest score of 72. After learning PJBL, the creativity of generation Z students increased by an average of 14.16. The increase in creativity of Gen Z's science products matches their learning style. Learning Entrepreneurship education is carried out not with instruction and expository, but also: (1) *less time for exposure and evaluation of ideas/ideas from others in developing scientific creativity*; (2) *lack of feedback in learning physics*; (3) *the instruction given to students in conducting exploration is not in-depth, students are not trained in asking scientific questions and finding answers to these questions independently* (Turiman, et al., 2012; Mynbayeva, et al., 2016).

The next opinion for developing creativity in general is that everyone has an assortment of creativity potential, but often people are unaware and unaware of it (Solso, et al. 2022). The following steps to develop creativity according to Bloom, et al., (2001) are gradually as follows: (1) *remember*, (2) *understand*, (3) *apply*, (4) *analyse*, (5) *evaluate*, (6) *create*.



**Figure 1. Bloom's Taxonomy**

The description of the stages of Bloom's theory above is as:

1. In the *remember stage*, the teacher dialogues with students about the learning objectives, project focus, identification of materials or materials to be made.
2. In the *understanding stage*, all students are expected to understand the results of the dialogue both ideas, ideas, collective decisions, work plans and project designs, such as: making Crafts, Engineering, and Cultivation as entrepreneurship education materials.

3. In *the application stage*, the first and second stages, the teacher observes and supervises the development of students and the progress of the project being worked. Students begin to carry out projects, data collection, conduct experiments, or other activities according to the project's objectives.
4. At the *analysis stage*, all entrepreneurial materials or materials before being produced or made are analyzed first in the school laboratory (nutritional content, hygiene, health, measurement, and so on) For example, making processed cultivation from the sea which is done by SMA Inidramayu; Cirebon High School makes typical preparations from the Cirebon area. Including Jatiwangi High School and Cilimus High School making crafts. Cilimus High School makes works from rattan materials. Jatiwangi High School makes crafts from wood. Before making crafts, all materials are analyzed first so that the crafts are easily marketed.
5. The evaluate, observation, reflection, and assessment of the learning outcomes of students working on projects or making cultivation and crafts by all high school students. Evaluation is not only based on learning outcomes, but also process-based, meaning that product results are improved so that products can be sold in the school environment or the surrounding community.
6. In *the create stage*, students are able to solve problems in daily life (Birgili, 2015). Furthermore, to achieve creative students, they must go through the stages systematically as stated above. The following is an illustration of the creativity of science products of high school students related to the development of Gen Z creativity in entrepreneurship education learning.

Contextually, as Bloom stated above, the aspect of creating is positioned at the highest level. Learning should not only focus on evaluation that emphasizes learning outcomes but must also enable students to create products or creative works. Through these creations, students demonstrate their creative abilities—an essential component of 21st-century learning. Creativity is not exclusive to certain individuals; according to Robert L. Solso et al. (2008), various forms of creativity exist within every human being, though they often go unrecognized or untapped. Furthermore, Solso et al. (2008) explained that the process of generating creative ideas involves four stages: (1) preparation, (2) incubation, (3) illumination/enlightenment, and (4) verification. This theory can be adapted into the Project Based Learning (PJBL) model to develop Gen Z's entrepreneurial creativity.

Stage 1: Preparation. A creative work produced by a person (or student) does not automatically make them creative; it also requires various external and internal stimuli. These include learning from teachers, studying independently, comparing their work with that of others, experimenting, and engaging comfortably in different social environments. Such stimuli act as the building blocks—the stones, bricks, and sand—that help spark creative ideas. In adapting this creativity theory to PKWU learning, teachers serve as stimulators, initiators, and creators who prepare students to learn independently and conduct experiments that foster creativity.

Stage 2: Incubation. The incubation stage serves as a mental rest period during which individuals temporarily step away from their problems. Activities such as spending time at the beach, swimming, hiking, or camping bring happiness and relaxation, freeing the mind from tension and allowing subconscious problem-solving to occur. This incubation process often produces solutions unexpectedly. To cultivate creativity through PKWU learning, teachers and students can visit various sites—companies, craft centers, and tourist destinations—while observing local culinary industries. These experiences provide diverse stimuli that inspire students to engage in innovative and creative activities leading to the production of new products.

Stage 3: Illumination/Enlightenment. The stages of preparation and incubation naturally lead to illumination—the moment when the “light” of insight emerges. At this stage, understanding deepens, joy arises, and creative ideas flow freely, complementing one another. Examples of illumination include the discovery of DNA, the formulation of the heliocentric theory, the writing of novels, and the completion of research projects. Similarly, after engaging in field experiences, students often gain fresh ideas, new inspirations, and renewed enthusiasm for experimentation. They become eager to embark on creative activities and develop innovative products.

**Stage 4 Verification.** The verification stage is to test whether the findings, ideas/solutions are correct or should be improved. This stage is shorter than the previous stage, as it only tests and reviews the results of one's calculations. But in some cases, verification still takes time to conduct further research or review. Various student creations need to be evaluated or verified whether they are in accordance with PKWU's learning objectives to develop entrepreneurial creativity.

#### A PICTURE OF GENERATION Z'S CREATIVITY



**Figure 2. Generation Z's Creativity**

The development of students' entrepreneurial creativity through *the Project Based Learning* (PJBL) learning model is covered in the Problem Based Learning (PBL), *Creative Based Solving* (CPS), *Creative Attitude In Science Learning* (CASL) model, including the Constructivism, Cooperative, and Role Playing learning model. Based on the results of the research on the learning model, it provides a construct to student attitudes, including: (1) *Generating positive attitude as creative individuals*, (2) *Organizing creative learning*, (3) *Guiding creative investigation*, (4) *Forming positive attitude in demonstrating scientific creativity*, and (5) *Attitude evaluation positive and scientific creativity*, (Rahmawati, et.al. 2022).

The paradigm of changing Entrepreneurship Education learning as a reality of increasing Gen Z's creativity based on the results of the research is as follows:

1. The goal of entrepreneurship education is that students have skills in the business sector (Hendy, Nugrahini, 2024).
2. The curriculum is easy to diversify, flexible and adapts to the needs of current students. (Saputra, et al., 2024)
3. The learning carried out by teachers is not enough to teach in the following ways: Sit, Listen, Note, Memorize (DDCH), but is active, creative, innovative and adjusts the characteristics of thinking, skiing and skills of students (Pramudianto, 2015).
4. Learning media is not conventional, but also digital-based (Werdhaningsih, et al., 2018).
5. Dealing with Gen Z students is not with transmission, but also with dialogue and transformative (Reference).
6. Learning-based approaches: *learning by doing* , *cooperative learning*, *role playing*, and *constructivist* (NumbaraBari E, 2022)
7. Based learning outcomes produce creative and innovative products, (Ministry of Education and Culture, 2016; Hidayat 2021; Margaret, 2022; Harie, 2023; Haryati et al. 2020; Fitri et al, 2021).

## CONCLUSION

Everyone has creative potential, including students. Creative potential is inherent but still latent. This potential does not necessarily develop into an actual form rapidly; it requires the right approach and supportive learning environments to nurture it. One of the learning models capable of developing students' creative potential is the Project-Based Learning (PJBL) model, often supported by other complementary learning approaches. Based on the table above, it can be seen that before the implementation of the PJBL learning model, the average student creativity score was 46.83, with the lowest score of 27 and the highest score of 69, and a standard deviation of 10.022. Meanwhile, after applying the PJBL learning model, the average student creativity increased to 60.99, with the lowest score of 43 and the highest score of 72, and a standard deviation of 6.237. Therefore, it can be concluded that after using the PJBL learning model, students' creativity increased by an average of

14.16 points. Other indicators of creativity include completing tasks quickly (fluency), demonstrating the ability to create or modify (flexibility), producing something new (originality), and avoiding conformity to existing ideas while emphasizing original thinking (elaboration)—particularly in the creation of crafts as a manifestation of product creativity.

## REFERENCE

- Agarwal, H., & Vaghela, P. S. (2018). Work values of Gen Z: Bridging the gap to the next generation. In *Proceedings of the National Conference on Innovative Business Management Practice in the 21st Century*. Faculty of Management Studies, Parul University, Gujarat, India.
- Alexyu, Y. O. (2019). Development of creativity among Generation Z students in the digital environment. [*Journal name not specified*]. <https://doi.org/10.25198/1814-6457-220-85>
- Alotaibi, M. S., Fox, M., Coman, R., Ratan, Z. A., & Hosseinzadeh, H. (2022). Smartphone addiction prevalence and its association with academic performance, physical health, and mental well-being among university students. *International Journal of Environmental Research and Public Health*, 19(6), 3710. <https://doi.org/10.3390/ijerph19063710>
- Andriana, et al. (2020). Development of entrepreneurial spirit in increasing the number of young businesses. *Journal of Service to the Community*, 2(1).
- Ansyar, M. (2022). *Curriculum essence, foundation, design, & development*. Kencana Prenadamedia Group.
- Ardi, et al. (2023). Preparing Generation Z with character and wisdom in the use of technology through education. *Scientific Journal of Education Vehicles*, 9(7), 53–59. <https://doi.org/10.5281/zenodo.7803836>
- Birgili, B. (2015). Creative and critical thinking skills in problem-based learning environments. *Journal of Gifted Education and Creativity*, 2(2), 71–80. <https://doi.org/10.18200/JGEDC.20154253>
- Caspi, A., & Roberts, B. W. (2021). Personality development across the life course: The argument for change and continuity. *Psychological Inquiry*, 12(2), 49–66. [https://doi.org/10.1207/S15327965PLI1202\\_01](https://doi.org/10.1207/S15327965PLI1202_01)
- Darmawan, et al. (2023). The effect of project-based learning on concept understanding and environmental care attitudes. *JPBIO (Jurnal Pendidikan Biologi)*, 8(2), 196–205. <https://doi.org/10.31932/jpbio.v8i2.413>
- Dewi, M. R. (2022). Advantages and disadvantages of project-based learning for strengthening the student profile of Pancasila independent curriculum. *Curriculum Innovation*, 19(2), 213. <https://doi.org/10.17509/jik.19i2.44226>
- Fitri, L., Yuliana, & Jaya, F. (2021). The effect of project-based learning on student creativity in digital simulation subjects. *JUKANTI: Journal of Information Technology Education*, 4(2), 39–48. <https://doi.org/10.37792/jukanti.v4i2.270>
- Fitriyani, P. (2018). Character education for Generation Z. In *Proceedings of the 7th National Conference of APPPTMA*.
- Frahani, et al. (2021). Online scientific creativity learning in science education during the COVID-19 pandemic. *Journal of Turkish Science Education, COVID-19 Special Issue*, 77–90. <https://doi.org/10.36681/tused.2021.73>
- Ghozali, I. (2016). *Aplikasi analisis multivariat dengan program IBM SPSS 23*. Badan Penerbit Universitas Diponegoro.
- Grendi, H., & Januarti, N. E. (2023). The characteristics of Generation Z students and implementations for future learning methods. *Journal of Education*, 9(2).
- Hendrastomo, G., & Januarti, N. E. (2023). The characteristics of Generation Z students and implementations for future learning methods. *Jurnal Kependidikan*, 9(2). <https://e-journal.udikma.ac.id>
- Hendy, A. R., & Nugrahini, S. W. (2024). Innovative empowerment strategies: Building a creative environment for young professionals. *ADMAN: Journal of Management*, 2(1). <https://doi.org/10.61100/adman.v2i.161>

- Hidayat, A. (2021). *Writing creative narratives with project-based learning models and instrumental music*. Deepublish.
- Ibrahim, A. (2021). *Islamic economic and business research methodology*. Ar-Raniry Press.
- Kahoot! Incorporated. (2019). *Generation Z in the workplace*. <https://workforceinstitute.org>
- Le Corre, J. Y., & Hemchen, T. B. (2022). Managerial control in an online constructivist learning environment. *Knowledge*, 2, 572–586. <https://doi.org/10.3390/knowledge2040034>
- Lumbanraja, et al. (2019). Human resource competencies 4.0 for Generation Z. *European Journal of Human Resource Management Studies*, 3(1).
- Margaret, et al. (2022). Constructivist approaches in entrepreneurship education. *International Journal of Education, Teaching, and Social Science*, 2(1).
- Moon, et al. (2020). Active entrepreneurship education and approaches to learning. *Management Learning*. <https://doi.org/10.1177/095042220975319>
- Mynbayeva, et al. (2016). Experimental study of developing creativity of university students. *Procedia – Social and Behavioral Sciences*, 217, 407–413. <https://doi.org/10.1016/j.sbspro.2016.02.113>
- Nuryati, D. W., Masitoh, S., & Arianto, F. (2020). The influence of project-based learning on students' creativity. *Educate*, 5(2), 98–106. <https://doi.org/10.32832/educate.v5i2>
- Pramudianto. (2015). *Mom & dad as super coach*. Andi Offset.
- Rahmawati, et al. (2022). Creative attitude in science learning models. *IJORER*, 3(6).
- Rijal, et al. (2023). The role of education in fostering entrepreneurial spirit. *ADM MAN*, 1(2), 93–100. <https://doi.org/10.61100/admman.v1i2.28>
- Saputra, et al. (2024). Application of project-based learning in entrepreneurship education. *Journal of Curriculum Development*, 2(1).
- Solso, R. L., Maclin, O. H., Maclin, M. K., & Rahardanto, M. (2008). *Cognitive psychology*. Erlangga.
- Sutapa, I. N. (2023). Innovation to improve critical thinking skills in Generation Z. *Journal of Industrial Engineering*, 25(2), 121–130. <https://doi.org/10.9744/jti.25.2.121-130>
- Yuandana, T. (2023). *Theory and practice of early childhood creativity development*. Bayfa Cendekia Indonesia.