

# An Analysis of the Validity, Practicality, and Effectiveness of the Project-Based Creativity (ProCity) Model in Enhancing the Science Process Skills of Architecture Students

Ernawati<sup>1</sup>, Mursalin<sup>2</sup>, Frida Maryati Yusuf<sup>3</sup>, Masri Kudrat Umar<sup>4</sup>,  
Abdul Haris Odja<sup>5</sup>, Trifandi Lasalewo<sup>6</sup>

<sup>1,3</sup>Postgraduate Program, Universitas Negeri Gorontalo, Indonesia

<sup>2,4,5</sup>Faculty of Mathematics and Natural Sciences, Universitas Negeri Gorontalo, Indonesia

<sup>6</sup>Faculty of Engineering, Universitas Negeri Gorontalo, Indonesia

Corresponding Author: Frida Maryati Yusuf

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## ABSTRACT

This study aims to develop and evaluate the Project-Based Creativity (ProCity) learning model to enhance the Science Process Skills (SPS) of architecture students in the Anthropometric Drawing Studio course. This research was conducted in the Architecture Study Program, Faculty of Engineering, Universitas Negeri Gorontalo, involving third-semester vocational-track students from classes A, B, C, and D. The research employed a Research and Development (R&D) method with a quantitative descriptive approach utilizing the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). Data were collected through observations of instructional syntax implementation, student and lecturer response questionnaires, student activity observation sheets, and science process skills tests based on cognitive indicators C4–C6. The results indicate that the Procity model demonstrates high levels of validity, practicality, and effectiveness in enhancing students' motivation, creativity, engagement, and science process skills. This model effectively fosters a collaborative and innovative learning environment, facilitating

improvements in analytical skills, data processing, and the visual-verbal communication of design outcomes. Recommendations include strengthening facilitation strategies for students with low engagement and promoting interdisciplinary collaboration as essential components for the model's sustainable development. The Procity learning model is feasible to be adopted as an innovative learning model to support the quality of project-based architectural education.

**Keywords:** Project-Based Creativity, Creativity, Architectural Education, Anthropometric Drawing Studio

## INTRODUCTION

Science Process Skills (SPS) are a critical component of higher education, including in the field of architecture. SPS encompasses the abilities to observe, classify, interpret data, formulate hypotheses, and design experiments, skills that are essential for understanding and solving complex real-world problems (Suryaningsih, 2017; Mutmainnah et al., 2019). However, in practice, university-level instruction often remains predominantly theoretical,

providing limited opportunities for students to develop creativity and actively engage in the learning process. As a result, students' critical thinking, problem-solving abilities, and creative capacities have not been optimally cultivated.

In the context of architectural education, the ability to draw and develop design concepts constitutes a core competency (Ferial et al., 2023). The design process is not merely oriented toward visual outcomes; it also serves as a means of thinking, exploring ideas, and systematically communicating concepts (Handayani et al., 2024). The Architectural Design 1 course in the Architecture Study Program at Universitas Negeri Gorontalo serves as a key platform for honing these essential skills. However, internal program data from the past three academic years indicate a consistently high failure rate: 45% in 2020/2021, 40% in 2021/2022, and a rise to 55% in 2022/2023. Observations and interviews with course lecturers reveal that one of the primary factors contributing to this high failure rate is students' low level of process skills, particularly in systematically and reflectively carrying out the design stages.

This issue highlights the need for improvements in the learning approach, particularly one that fosters active student engagement. One potential solution is the implementation of a project-based learning (PjBL) model. This model has been proven effective across various disciplines, as it trains students to solve real-world problems, think critically, collaborate, and produce tangible outcomes (Kokotsaki et al., 2016; Fini et al., 2018; Kunusa et al., 2023). However, the application of PjBL in the context of architectural education presents specific challenges, particularly in integrating the development of creativity with science process skills in a balanced and measurable way.

The author developed the Project-Based Creativity (Procity) learning model, a derivative of PjBL specifically designed to strengthen students' creativity while simultaneously fostering science process

skills in order to address these challenges. This model is structured to align with the unique characteristics of architectural education, which demands visual exploration, divergent thinking, and critical reflection in crafting innovative and contextually responsive design solutions.

This article specifically aims to analyze the validity, practicality, and effectiveness of the Procity model within the learning context of the Architecture Study Program at Universitas Negeri Gorontalo. The validity assessment was conducted by subject-matter experts to evaluate content relevance, construct alignment, and coherence among the model's components. The practicality assessment involved both lecturers and students as end users to evaluate the feasibility of implementing the model in classroom settings. Meanwhile, the effectiveness was measured through the improvement in student learning outcomes, particularly in terms of Science Process Skills (SPS), following the application of the model. Empirical findings from these three aspects are expected to make a meaningful contribution to the advancement of more active, creative, and contextually relevant innovations in architectural education.

## **MATERIALS & METHODS**

### **Research Setting and Duration**

This study was conducted in the Architecture Study Program, Faculty of Engineering, Universitas Negeri Gorontalo, specifically involving third-semester students from the vocational track. The learning activities took place in the Studio Gambar Laboratory during the 2023/2024 to 2024/2025 academic years.

### **Research Method and Approach**

This study is a Research and Development (R&D) project aimed at developing the Project-Based Creativity (Procity) learning model to enhance the Science Process Skills (SPS) of architecture students. The research employed a quantitative descriptive approach using the ADDIE development

model (Branson et al., 1975), which consists of five stages:

1. **Analysis:**

A needs analysis was conducted through a literature review, interviews, and observations to identify problems in architectural studio learning, particularly related to students' low mastery of science process skills (SPS). The contextual analysis included student characteristics, course content, and the targeted competencies.

2. **Design:**

Based on the analysis results, the syntax of the Procity model was designed by integrating the project-based learning approach with elements of creativity. The design phase also included the preparation of learning tools such as course syllabi (RPS), modules, worksheets, and evaluation instruments.

3. **Development:**

The learning product was developed in the form of an initial prototype. Validation was conducted by subject matter experts, instructional experts, and studio practitioners. Revisions were made based on the validators' feedback to produce a model ready for trial implementation.

4. **Implementation:**

The revised Procity model was implemented in real classroom settings involving classes A, B, C, and D. Observations of syntax implementation, student activities, and responses from students and lecturers were collected to assess the model's practicality and effectiveness.

5. **Evaluation:**

Evaluation was conducted to reflect and analyze the results of the previous four stages. It was implemented during both the development and implementation phases. Formative evaluation was carried out throughout the development process to monitor and improve the learning model. Summative evaluation took place at the end of the implementation phase through the analysis of student activity

data, SPS (Student Performance Sheet) test results, and response questionnaires. The effectiveness of the model was measured using statistical tests (normality test, t-test, and N-Gain) and the level of learning mastery achieved by the students.

### Data Collection Techniques

The instruments used included the following:

1. **Practicality Instruments**

- Lesson implementation observation sheet, based on the Procity model syntax (introduction, core activities, and closing).
- Student and lecturer response questionnaires, consisting of 19 statements, were measured using a Likert scale.

2. **Effectiveness Instruments**

- Student activity observation sheet, assessed by three independent observers based on specific learning activity indicators.
- Science process skills test, consisting of 10 open-ended questions targeting cognitive levels C4 (analyzing), C5 (evaluating), and C6 (creating). This test was developed based on SPS indicators, including observation, measurement, prediction, data collection and processing, experiment design, analysis, presentation, communication, and conclusion-making.

### Data Analysis

#### 1. Practicality Analysis of the Model

##### a. Lesson Implementation Data

The practicality of the learning model was analyzed by summarizing the results of observations made by three observers using a 1–5 rating scale. The percentage of implementation was calculated using the formula:

$$\% \text{ Implementation} = \frac{\text{Number of steps implemented}}{\text{Number of steps planned}} \times 100 \%$$

The average implementation score was derived from the individual percentages provided by each observer and categorized

based on Sugiyono's (2009) scale, ranging from very good to very poor. The model was considered practical if it reached at least the good category.

### b. Student Response Questionnaire

The data were analyzed using a Likert scale (scores 1–5). The average percentage was calculated using the formula:

$$\% \text{ Response} = \frac{\text{Score obtained}}{\text{Maximum possible score}} \times 100 \%$$

The results were categorized according to the criteria set by Sugiyono (2009). The model was considered to have received a positive response if the average score fell within at least the good category.

## 2. Effectiveness Analysis of the Model

### a. Student Activity

Student activity was observed throughout the learning sessions and analyzed using the following formula:

- **Class and Indicator Scores Averages**

$$\% \text{ Indicator} = \frac{\sum \text{average score per item for each indicator}}{\sum \text{total items for each indicator}} \times 100\%$$

- **Normality Test:** Conducted using the Kolmogorov-Smirnov ( $\alpha = 0,05$ ). The data were considered normally distributed if  $D_{count} > D_{table}$

- **N-Gain Analysis** (Hake, 2002):

$$\langle g \rangle = \frac{\% \text{ actual gain}}{\% \text{ Potensial gain}} = \frac{\% \text{ skor post test} - \% \text{ skor pre test}}{100 - \% \text{ skor gain pre test}}$$

Category:

High Gain ( $\geq 0,7$ ), medium (0,3–0,7), low ( $< 0,3$ )

- **Paired t-test:** Paired sample t-test was conducted to examine the significance of improvement between pre-test and post-test scores.  $H_0$  was rejected if  $t_{count} > t_{table}$  ( $\alpha = 0,05$ ).

- **Mastery Learning:**

$$\% \text{ Mastery} = \frac{\sum \text{Number of students achieving the minimum required score}}{\sum \text{Total number of students}} \times 100\%$$

## 3. Model Characteristic Analysis

- **Social System & Reaction Principles:**

$$\% \text{ teramati} = \frac{\text{Number of observed indicators}}{\text{Total of observed indicators}} \times 100\%$$

- **Support System**

The support system was analyzed descriptively based on observational data collected.

$$P = \frac{\sum R}{\sum N} \times 100\%$$

$P$  : Percentage of student activity

$\sum R$  : Total frequency in each observed category

$\sum N$  : Total frequency across all observation categories

The criteria for activity levels referred to Ratumanan and Laurens (2003), which classify activity into five categories ranging from inactive to very active. The model was considered effective in terms of student engagement if the activity level reached at least the active category.

### b. Science Process Skills Test

The analysis involved several stages:

- **Individual Score**

$$AP = \frac{\text{Total score obtained}}{\text{Total maximum score}} \times 100$$

Details: (AP = Achievement Percentage)

## RESULT AND DISCUSSION

The development of the Procity learning model followed the stages outlined in the ADDIE framework, namely Analysis, Design, Development, Implementation, and Evaluation.

## **Analysis Stage**

### **a. Learning Analysis**

The initial analysis was conducted through interviews with lecturers responsible for the Anthropometric Drawing Studio course (Architectural Design 1) in the Architecture Study Program at Universitas Negeri Gorontalo. The findings revealed that students faced significant challenges in mastering science process skills (SPS), including the ability to observe, analyze, design, and evaluate systematically, skills that are fundamental in architectural education. The student's inability to integrate theory with practice has contributed to the low quality of learning outcomes and a rising failure rate over the past three academic years.

This situation underscores the urgent need for instructional innovation. The proposed solution involves the development of Project-Based Learning into a more refined model, Project-Based Creativity (Procity), which not only emphasizes project execution but also actively fosters student creativity throughout the learning process. In the context of architectural education, creativity is a critical component for producing designs that are not only innovative and functional but also aesthetically compelling and responsive to local cultural and environmental contexts.

The Procity model aligns with the mission of Universitas Negeri Gorontalo to enhance the quality of technology-based education and to produce professional and innovative graduates. Students are engaged in real-world projects that are supported by digital tools, including 3D design software and online collaborative platforms. Thus, students develop not only technical proficiency and critical thinking skills but also sensitivity to both global and local issues, preparing them to meet the complex demands of the contemporary architectural profession.

### **b. Student Characteristics Analysis**

Interviews and observations revealed varying levels of cognitive ability among students. A small number demonstrated

quick comprehension and active participation in discussions, while the majority showed moderate to slow understanding of course material. Academic evaluations over the past three years have also consistently recorded a high and increasing failure rate: 45% in 2019/2020, 40% in 2020/2021, and 55% in 2022/2023. These findings underscore the need for a more adaptive and contextually relevant learning approach. The learning model must align with andragogical principles, which emphasize student autonomy, experiential learning, and active engagement in solving real-world problems. A learning process that encourages the exploration of ideas, development of design solutions, and presentation of final outcomes proves more effective in enhancing students' science process skills. Through the Procity model, students are not only expected to complete projects but are also challenged to cultivate reflective, creative, and collaborative thinking skills, which are essential for the architectural profession. This model shifts the focus from merely achieving results to emphasizing the cognitive processes and actions that holistically shape professional competencies.

## **Design Phase**

### **a. Social System**

The Procity instructional model is structured to foster active interaction between students and lecturers, as well as among students themselves, within a democratic, open, and collaborative environment. The learning atmosphere is intentionally designed to encourage idea exploration, critical discussion, and teamwork in context-based projects that utilize anthropometric data. In this model, lecturers no longer function as the sole source of information but instead act as facilitators who guide students through the learning process.

This social system is characterized by four main components:

#### **1. Enhancement of Collaborative Skills**

Students are trained to work in teams, express ideas, accept feedback, and make

collective decisions through collaborative discussions, design planning, and data collection.

## 2. Multi-directional Interaction

The model promotes the active exchange of ideas among students, lecturers, and peers, fostering a dynamic and mutually supportive learning culture.

## 3. Democratic and Creative Learning Environment

Students are given autonomy in selecting their design approaches and final presentation formats. Lecturers provide constructive feedback that does not limit students' creative processes, thereby creating a space that nurtures innovation.

## 4. Development of Commitment and Professional Responsibility

Through real-world projects, students learn to act professionally, reflect on their learning processes, and develop applicable design solutions.

This social system aligns with the principles of Student-Centered Learning, as mandated by the Ministry of Education, Culture, Research, and Technology Regulation No. 53 of 2023. In this framework, students take an active and responsible role in their learning process, bridging theoretical knowledge with practical application while cultivating deep emotional and intellectual engagement. As a result, the learning experience becomes more meaningful, fostering graduates who are adaptive, creative, and well-prepared to face the demands of the professional architectural field.

### b. Reaction Principle

In the Procity model, the reaction principle refers to the lecturer's role in actively and reflectively responding to the dynamics of student learning. Rather than merely delivering content, lecturers serve as facilitators who guide students' thought processes in an open and supportive manner. Instead of directly labeling student responses as right or wrong, the lecturer encourages constructive dialogue, fosters healthy discussions, and helps students learn from their mistakes.

Lecturer responses are tailored to each phase of the learning process, from addressing student curiosity during problem formulation to provide formative feedback during exploration and experimentation. During presentations and reflection sessions, lecturers offer appreciation for student ideas and encourage students to evaluate their own experiences independently. Thus, the reaction principle in Procity serves as a pedagogical tool that nurtures critical, creative, and collaborative thinking through sustained and meaningful interaction between lecturers and students.

## Development Phase

### a. Practicality of the Procity Learning Model

The Procity (Problem-Creativity) learning model has proven to be practical for implementation in the Anthropometric Drawing Studio course. The instructional syntax, which includes the presentation of phenomena, problem formulation, information gathering, project design, monitoring, and reflection, was executed effectively and could be clearly understood and applied by both lecturers and students. Students actively engaged in idea exploration, problem-solving based on anthropometric data, and the development of design proposals tailored to user needs.

The practicality of the model was evaluated through two stages: a limited trial involving a small group (Class A, 18 students) and a broader trial involving a larger group (Classes B and C, totaling 41 students). Observations focused on three key aspects: the implementation of the instructional syntax, classroom atmosphere, and time management, each assessed throughout three class sessions.

#### 1. Limited Trial Results (Class A)

The results of the limited trial indicate that the overall average implementation of the Procity model reached **90.00%–90.91%**, categorized as **very good**. The implementation of the instructional syntax improved from **90.59%** to **92.94%** by the third session, with time management

consistently maintained at **100%**. The only relatively lower aspect was the classroom atmosphere (80%), suggesting that students

were still in the process of adapting to a more creative and independent learning approach.

**Table 1. Summary of Limited Trial (Class A)**

Session	Syntax Implementation	Classroom Atmosphere	Time Management	Total Average
1	90.59%	80.00%	100.00%	89.09%
2	91.76%	80.00%	100.00%	90.00%
3	92.94%	80.00%	100.00%	90.91%

## 2. Broad Trial Results (Classes B and C)

In Class B, the average implementation improved from 80.91% in the first session to 90.91% by the third. The core syntax component showed significant improvement, rising from 74.55% to 87.27%. Meanwhile, the classroom atmosphere remained consistently high (90%), and time management held steady at 80%.

In Class C, the initial performance was already high (90.00%) and remained stable in subsequent sessions. The implementation of both the initial and core syntax stages was excellent (above 94%), yet the final stages (analysis and reflection) plateaued at **80%**, indicating a need to strengthen students' synthesis and presentation skills. Time management in Class C was highly optimal, consistently at 100% across all sessions.

**Table 2. Summary of Broad Trial (Classes B and C)**

Class	Session	Syntax Implementation	Classroom Atmosphere	Time Management	Total Average
B	1	78.82%	90.00%	80.00%	80.91%
	2	85.88%	90.00%	80.00%	86.36%
	3	91.76%	90.00%	80.00%	90.91%
C	1	91.76%	80.00%	100.00%	90.00%
	2	92.94%	90.00%	100.00%	92.73%
	3	92.94%	90.00%	100.00%	92.73%

Based on the above data, the Procity learning model demonstrates clear practicality when applied to project-based architectural education. Lectures were effectively managed, and students demonstrated active engagement and improvements in creative and applied thinking. While certain aspects, such as classroom atmosphere and the final reflection phase, still require enhancement, the overall results indicate that the model is highly feasible for broader implementation in developing design skills grounded in anthropometric data.

## 3. Effectiveness of the Procity Learning Model

### a) Limited Trial Results

#### 1) Improvement in Student Learning Outcomes

Student learning outcomes were assessed through pretest and posttest scores, analyzed using SPSS 26.0 and the N-Gain formula. The average pretest score was 76.51, which increased to 81.37 in the posttest. Statistical analysis yielded a t-value of 10.224 with a p-value of 0.000 ( $< 0.01$ ), indicating a statistically significant difference between pretest and posttest scores. However, the average N-Gain score was only 0.21, which includes the low category of learning gains.

**Table 3. Average Student Learning Outcomes (Limited Trial)**

Test	Average Score
Pretest	76.51
Posttest	81.37
N-Gain	0.21 (Low)

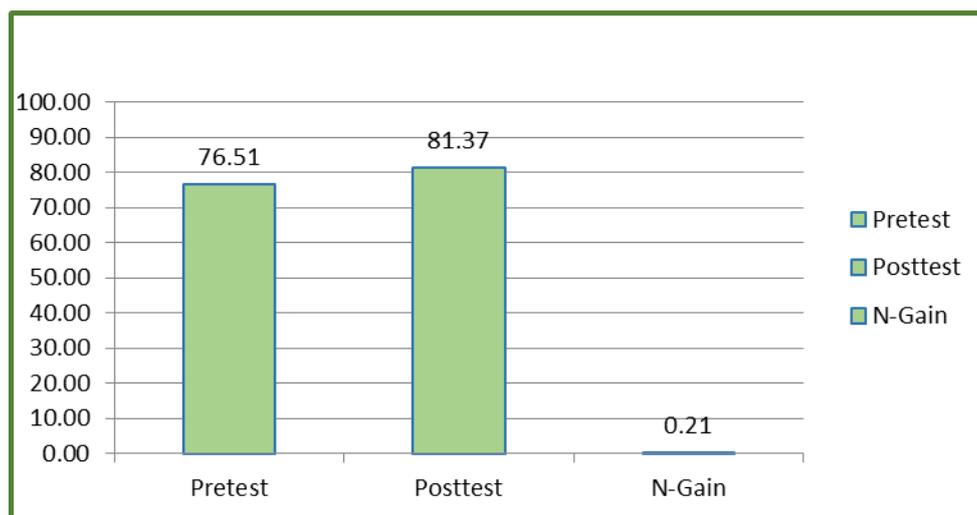


Figure 1. Comparison Chart of Pretest and Posttest Scores

## 2) Student Learning Activities

Student activities were observed over three learning sessions. The average percentage of observed activity showed a positive upward trend, from 74.11% in the first session to

82.56% in the third. Notably, student engagement in activities such as discussion, problem formulation, and conclusion-making improved significantly over time.

Table 4. Average Student Activity per Session

Session	Average Activity	Category
1	74.11%	Good
2	78.11%	Good
3	82.56%	Good-Very Good

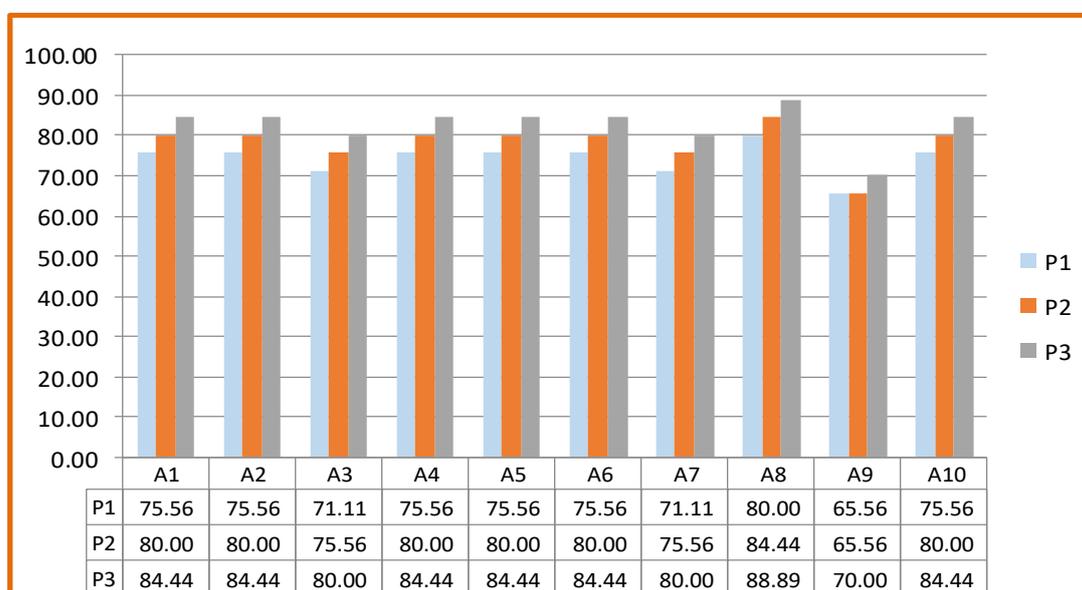


Figure 2. Student Activity Trend Chart

## 3) Student Responses to the Procity Model

Students' responses to the Procity learning model yielded an average score of 73.74%, placing it in the good category. The majority of students reported feeling happy,

motivated, and more engaged with the course. However, aspects related to practice questions and discussion activities were rated only as fair.

**Table 5. Summary of Student Responses to the Procity Model**

Aspect	Score (%)	Category
Enjoy attending the class	78.89	Good
Ease of understanding the material	80.00	Good
Activeness during class	77.78	Good
Student Worksheets not difficult	57.78	Fair
Practice questions not difficult	60.00	Fair
Discussions not difficult	53.33	Fair
Overall Average	73.74	Good

Source: Processed Data, 2025

Based on the available data, the Procity model has proven to be effective in enhancing student learning outcomes and engagement, while also receiving positive feedback from students. However, specific weaknesses remain, particularly regarding the perceived difficulty of assignments and discussions, indicating a need for further improvement in those areas. Overall, Procity is a viable and applicable approach for studio-based practical learning, as it successfully facilitates collaboration, problem-solving, and the development of students' creativity.

**b) Results of the Extended Trial**

The extended trial to assess the effectiveness of the Procity learning model was conducted among students of the Architecture Program at the Faculty of Engineering, Universitas Negeri Gorontalo, with a total of 41 students divided into two classes: Class B (23 students) and Class C (18 students). The trial specifically focused on the Architectural

Design 1 course, particularly in the anthropometric drawing studio component.

**1) Improvement in Student Learning Outcomes**

The evaluation results indicate a significant improvement in student competence before and after the implementation of the Procity model. This improvement was measured through pretest and posttest scores and analyzed using SPSS 26.0, including normality testing, homogeneity testing, and the paired samples t-test.

In Class B, the average pretest score increased from 70.64 to 83.03 on the posttest, with an average N-Gain score of 0.42, indicating a moderate improvement. The t-test results showed a tcount = 18.395 with a significance value (p) of 0.000, exceeding the ttable = 2.819). This indicates a statistically significant difference (p < 0.01), confirming that the application of the Procity model had a strong positive impact on learning outcomes.

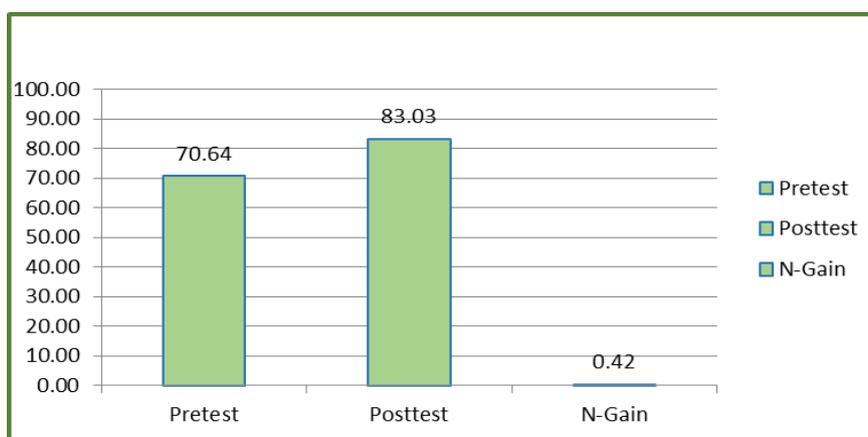


Figure 3. Diagram of Mean Pretest, Posttest, and N-Gain – Class B

Meanwhile, in Class C, the average pretest score increased from 75.93 to 84.94, with an

N-Gain of 0.37, which falls into the high category. The paired t-test yielded a t-count

of 14.346 with a significance value (p) of 0.000, exceeding the t-table value of 2.898, indicating a similarly significant difference as observed in Class B.

These findings reinforce that the implementation of the Procity model, anchored in project-based learning and integrated with creativity development and problem-solving, effectively improves student learning outcomes in the anthropometric drawing studio course. Both Class B and Class C demonstrated significant gains in learning outcomes, supported by statistical analyses that met the assumptions of normality and homogeneity, as well as t-test results confirming the effectiveness of the intervention.

The model has proven successful in promoting active engagement, conceptual mastery, and critical thinking skills, making it highly relevant for application in university-level architectural design education.

**b. Enhancement of Student Engagement Through the Procity Learning Model in the Anthropometric Drawing Studio**

The implementation of the Procity learning model in the anthropometric drawing studio

at the Architecture Study Program, Universitas Negeri Gorontalo, demonstrated a consistent increase in student engagement across both Class B and Class C. Observations were conducted by two independent observers throughout three instructional sessions. The findings reveal that the Procity model, structured around phases such as phenomenon presentation, problem formulation, ideation, data analysis, and conclusion presentation, effectively stimulates active student participation.

**1. Observation Results for Class B**

The average student activity in Class B demonstrated a positive trend, increasing from 80.00% in the first session to 83.57% by the third session. All observed activities fell within the “Good” category, with several reaching the “Very Good” level. The most dominant activity was attentively listening to the lecturer’s explanation, which consistently scored 100% across all three sessions. Significant improvements were also noted in peer-to-peer discussion, which rose from 80.00% to 90.43%, and in student responses to other group presentations, which increased from 60.00% to 80.00%

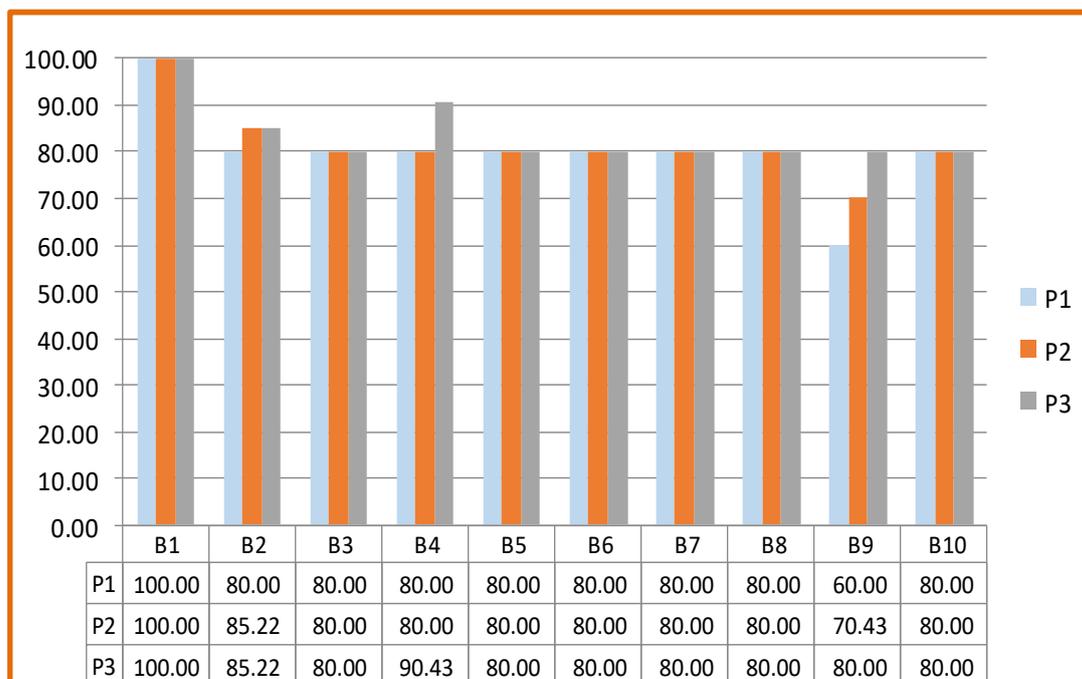


Figure 4. Student Activity Trend in Class B

## 2. Observation Results for Class C

Class C exhibited a similar upward trend in student engagement, with the average activity score increasing from 78.44% in the first session to 83.44% in the third session. The most notable improvement was in attentively listening to the lecturer's

explanation, which rose sharply from 74.44% to 100%. Peer discussions also showed a marked increase, from 80.00% to 94.44%. Additionally, the activity of responding to other groups' presentations improved from 70.00% to 80.00%.



Figure 5. Student Activity Trend in Class C

The consistent increase observed in both classes demonstrates that the Procity model effectively fosters active engagement, collaborative communication, and student creativity, particularly within the context of project-based studio learning. Students became more critical in problem formulation, actively participated in discussions, and were involved throughout the entire learning process. These results suggest that the Procity model provides a viable alternative instructional approach for fostering the development of 21st-century skills, including critical thinking, teamwork, and communication, in architectural education.

### c. Student Responses to the Procity Learning Model in Classes B and C

The Procity learning model, implemented in the Architectural Design 1 course in the Architecture Study Program at Universitas Negeri Gorontalo, underwent large-scale trials in two different classes: Class B and Class C. Student responses to this model

were collected through questionnaires designed to assess their perceptions regarding its effectiveness, engagement, and ease of learning.

The student responses to the Procity learning model in Classes B and C of the Architecture Study Program demonstrated a generally positive trend. Students in Class B provided an average score of 76.70%, which falls under the good category. The highest-scoring indicators reflected strong enthusiasm toward the learning process, including enjoying the lectures (82.61%), increased activity during class (82.61%), a positive perception of the Procity model (83.48%), and motivation to share knowledge (83.48%). However, certain aspects still require attention, particularly regarding the difficulty in answering questions on the Student Worksheet (62.61%), the perceived challenge of practice questions (63.48%), and the difficulties in responding to discussion prompts (60.87%). These findings

suggest that while the Procity model successfully enhanced interest and participation, students still need technical support, especially in tackling exercises and engaging in academic discussions.

Meanwhile, student responses from Class C reflected similar outcomes, with an average score of 75.73%, categorized as good. The highest-rated indicators suggested that the Procity model provided an enjoyable and engaging learning experience, including increased activeness during class sessions (83.33%), a positive sentiment toward the learning model (83.33%), and a sense of

pride in exploring a new approach (81.11%). However, challenges similar to those observed in Class B were also present, such as difficulties in completing the Student Worksheet (61.11%), the perceived complexity of practice questions (67.78%), and uneven levels of active participation (68.89%). These findings indicate that while the Procity model effectively boosts motivation and student engagement, certain technical aspects of its implementation still require refinement to support learning outcomes better.

**Table 6. Average Student Responses in Classes B & C to the Procity Model**

Response Aspect	Class B (%)	Class C (%)	Category
Average Response	76,70	75,73	Baik
Enjoy Participating in the Course	82,61	81,11	Baik
Active During Lectures	82,61	83,33	Baik
Ease of Completing Worksheets	62,61	61,11	Cukup Baik
Practice Questions Not Difficult	63,48	67,78	Cukup Baik
Active Participation	74,78	68,89	Baik

The implementation of the Procity learning model in both classes demonstrated consistent effectiveness in delivering a positive, interactive, and meaningful learning experience for architecture students. This project-based approach not only enhanced student motivation and understanding of spatial anthropometry concepts but also encouraged greater collaboration. Nevertheless, technical aspects such as practice exercises and worksheet completion still require refinement. This presents an opportunity to adapt instructional formats further to support the success of diverse student profiles.

### Implementation Phase

The Procity learning model was designed to integrate creativity, collaboration, and problem-solving in a project-based learning framework. This study aimed to examine the

effectiveness of the model in enhancing students' scientific process skills in the anthropometric drawing studio course, part of the Architectural Design 1 curriculum. Effectiveness was assessed across three dimensions, one of which was student learning outcomes.

The study was conducted in two classes: (1) Class D of the Architecture Study Program, Faculty of Engineering, and (2) the D-IV Vocational Architecture of Building Construction Program, Universitas Negeri Gorontalo.

#### a. Student Learning Outcomes

The improvement in students' scientific process skills was measured using pretest and posttest instruments, which were analyzed through statistical tests (SPSS 26.0). The results indicated a significant increase in both classes.

**Table 7. Average Pretest, Posttest, and N-Gain Scores of Students**

Study Program	Pretest	Posttest	N-Gain	N-Gain Category
Architecture (Class D)	73.85	88.25	0.55	Fair
<b>D-IV Architectural Building Construction (Vocational)</b>	79.15	89.68	0.51	Fair

The data indicate that although vocational students began with higher initial scores, both groups experienced significant improvements in scientific process skills following the implementation of the Procity model. The paired samples t-test produced a t-count far exceeding the t-table in both groups (e.g.,  $t = 7.310$  with  $p = 0.000$  for Class D), confirming that the differences between pretest and posttest scores are statistically highly significant.

Meanwhile, the independent samples t-test indicated no significant difference between the two groups ( $p = 0.589 > 0.01$ ), suggesting that the observed improvements were primarily due to the instructional intervention rather than natural factors or initial ability differences among students.

The consistent application of the Procity model effectively enhanced students' scientific process skills in both academic and vocational architecture programs. This improvement was evident in the increase in scores and the stability of results across groups. These findings demonstrate that Procity is an adaptable and effective model suitable for various educational contexts, particularly in vocational architectural education.

The model promotes active critical thinking, creativity development, and collaborative project-based learning, factors that directly

contribute to strengthening students' scientific abilities in tackling design problems.

#### b. Observation Results on Student Activities in the Implementation Classes

The implementation of the Procity learning model in the Architecture and D-IV Architectural Building Design (Vocational) programs at Universitas Negeri Gorontalo demonstrated a significant increase in student engagement across sessions. Observations were conducted over three sessions by two independent observers, focusing on indicators of active student participation.

#### 3. Class D – Architecture Program

In Class D of the Architecture Program, the average student activity increased from 80.44% (categorized as good) in the first session to 86.00% (very good) in the third session. Students consistently paid full attention to the lecturer's explanations, scoring 100% across all sessions. Student-to-student discussions also saw a notable improvement, rising from 80% to 100%, while the ability to respond to other group presentations increased from 64.44% to 80%. These findings indicate enhanced critical engagement and collaborative interaction.

**Table 8. Average Student Activity Percentage per Session**

No	Class	Session 1	Session 2	Session 3	Final Category
1	Architecture (Class D)	80,44%	83,56%	86,00%	Very Good
2	D-IV Architectural Building Design (Vocational)	80,91%	83,82%	88,00%	Very Good

The Procity model, which emphasizes syntax such as problem identification, project design, and data analysis, effectively fosters active engagement and the development of critical thinking skills in the anthropometric drawing studio.

#### 4. D-IV Architectural Building Design Program (Vocational)

The recapitulation of student activity implementation in the D-IV Architectural Building Design vocational program during classroom learning activities, using the Procity learning model, is illustrated in Figure 6 across three sessions.

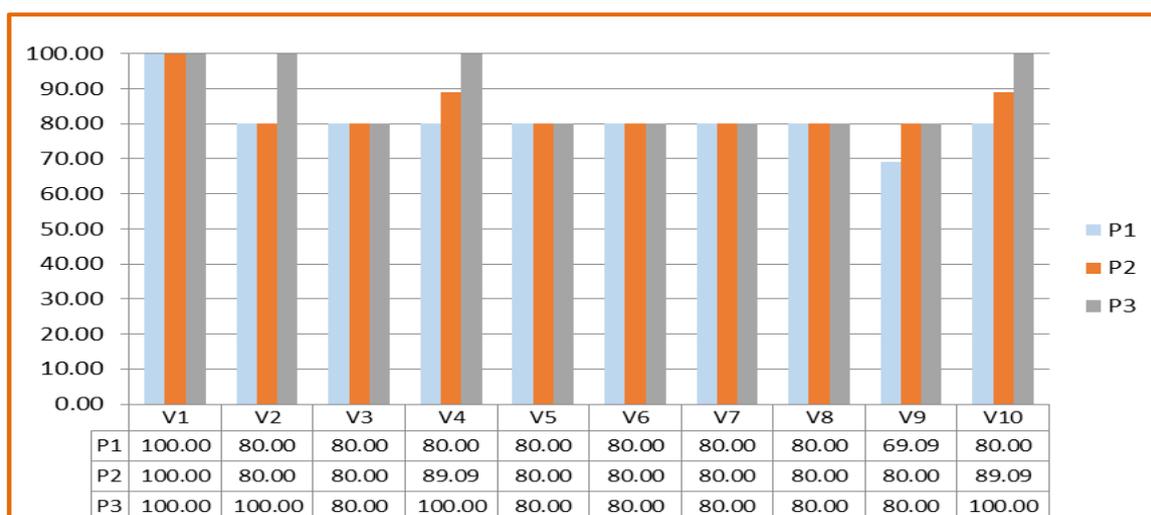


Figure 6. Progression of Student Activity in the D-IV Architectural Building Design Vocational Program

Figure 6 illustrates that student activity during the experimental class conducted in Class A of the D-IV Architectural Building Design Program at the Vocational School of Universitas Negeri Gorontalo in the studio course on anthropometric drawing using the Procity learning model yielded highly positive results. In the first session, the average student activity percentage reached 80.91%, falling into the good category. Students demonstrated full attention, with 100% actively listening to and following the lecture's explanations. Furthermore, activities such as problem formulation, project design based on novel ideas, peer discussions, and data collection and analysis were executed effectively. These activities indicate that students began adapting well to the Procity model's learning stages, particularly in designing creative experiments from multiple perspectives. Overall, this first session laid a strong foundation for fostering creative and collaborative thinking among students. In the second session, there was a noticeable increase in student activity, with the average percentage rising to 83.82%, maintaining the good category but showing an upward trend. Peer discussion activities experienced a significant increase, reaching 89.09%, as did behaviors relevant to the learning process, which also rose to the same level. This indicates that students were not only more actively engaged in interacting with one another but also began to show emotional

involvement and attitudes aligned with creative project-based learning. Activities such as problem formulation, completing tasks based on student worksheets, and data collection and analysis remained stable within the "Good" category. These results suggest that the Procity-based PjBL model is effective in gradually enhancing students' active participation, curiosity, and collaboration from one session to the next. A more substantial improvement was observed in the third session, where the average student activity reached 88.00%, placing it in the very good category. Peer discussion and behavior relevant to the learning process both achieved 100%, reflecting optimal engagement levels. Additionally, the ability to formulate problems also rose to 100%, indicating a deepening understanding among students of the creative, process-oriented nature of the Procity learning model. The activity of responding to peer group presentations also improved and remained steady at 80%, suggesting that students were increasingly confident and critical in providing constructive feedback on their peers' work. Overall, the implementation of the Procity-based project-based learning model in this experimental class proved effective in enhancing student activity, creativity, and collaborative skills, making the model highly promising for broader application in project-oriented design learning within the D-IV

Architectural Building Design Program at the vocational level.

### c. Student Responses to the Implementation of the Procity Learning Model

Student responses to the implementation of the Procity learning model were overwhelmingly positive, both among students in the regular Architecture Program (Class D) and those in the D-IV Architectural Building Design Program (Vocational). Based on questionnaires distributed after the implementation phase, students reported feeling more actively engaged, motivated, and gaining a deeper understanding of spatial anthropometry and space design concepts. Students in Class D demonstrated an average response score of 80.06%, categorized as good. They expressed enjoyment in participating in the learning process (81.11%), reported increased activeness during lectures (80.00%), and felt highly motivated to seek additional information (86.67%). The learning model was also perceived as engaging, stimulating curiosity, and providing a meaningful and enjoyable learning experience.

Meanwhile, vocational students in the D-IV Architecture of Building Design Program reported an average response score of 81.82%, also falling into the good category. They demonstrated a higher level of understanding of the material (89.09%), felt more engaged during the learning process (87.27%), and were highly motivated during the data-gathering phase (90.91%). Although one aspect, such as difficulty in answering discussion questions, received a moderate score (58.18%), overall, the model was considered highly effective in promoting engagement, focus, and collaboration in the learning process.

Overall, the implementation of the Procity learning model has proven effective in enhancing the quality of student's learning experiences through a creative and innovative project-based approach. Students not only demonstrated improved conceptual understanding of the material but also developed stronger collaborative skills, critical thinking abilities, and greater confidence in addressing architectural design challenges.

**Table 7. Average Student Responses to the Procity Learning Model**

Study Program	Average Score (%)	Category	Most Prominent Aspect(s)
Architecture (Regular – Class D)	80,06	Good	Motivated to seek data (86.67%)
D-IV Building Architecture (Vocational – Class A)	81,82	Good	Understanding of material (89.09%) & motivation (90.91%)

### Evaluation Phase

The Evaluation phase in the development of the Project-Based Creativity (Procity) learning model focused on analyzing the model's validity, practicality, and effectiveness in optimizing students' Science Process Skills (SPS) within the studio-based anthropometric drawing course.

#### 1. Model Validity

The validity of the Procity model was assessed through an expert validation process involving five specialists in architectural learning and educational design. The aspects evaluated included model feasibility, instructional syntax, learning tools, modules, media), student worksheets, and assessment

instruments. Based on the experts' evaluations, the Procity model was deemed valid for implementation in project-based learning contexts in architecture. Minor revisions were suggested, particularly in enhancing the alignment between the model's syntactical steps and the development of SPS, such as clarifying instructions for the visual data analysis and creative reflection stages. However, all components met the required standards of validity.

#### 2. Model Practicality

The practicality of the Procity model was evaluated through a limited implementation in Class A of the Architecture Study

Program. Practicality data were collected via observations of syntax implementation, lecturer and student practicality questionnaires, and documentation of the learning process. Observation results indicated that the model was effectively implemented by the lecturer and actively followed by the students. Student responses suggested that most of them benefited from the structured and systematic nature of the activities and noted that the model encouraged critical thinking and active engagement in learning. However, some technical adjustments were necessary, particularly regarding time management for completing the student worksheets and enhancing collaborative interaction among students. Overall, the Procity model was considered practical and ready for broader application.

### **3. Model Effectiveness**

The effectiveness of the Procity model was assessed through a broader implementation in Classes B and C, incorporating pretests and posttests of SPS, activity observations, and student response questionnaires. The analysis results revealed a significant improvement in students' SPS, particularly in observing, processing anthropometric data, designing data-based solutions, and communicating ideas both visually and verbally. Posttest scores consistently increased compared to pretest scores, and observations revealed active student participation during discussions, project work, and peer review sessions. The average implementation of the model's syntax was rated in the very good category, with a positive contribution to enhancing students' creativity and scientific thinking skills. These findings suggest that the Procity model is effective in enhancing SPS while also promoting a collaborative and reflective learning culture.

Overall, the evaluation results indicate that the Project Based Creativity (Procity) model is a valid, practical, and effective instructional approach for architectural education. This model not only enhances conceptual understanding but also

significantly develops students' Scientific Process Skills (SPS) through a creative and contextual project-based approach. Therefore, Procity can be recommended for broader adoption in architecture studio courses, particularly those that emphasize the integration of design, data, and creativity.

### **CONCLUSION**

The implementation of the Project-Based Creativity (Procity) model in anthropometric drawing studio classes yielded consistently positive and significant outcomes across all experimental groups, namely Classes A, B, C, and D of the Architecture Program, as well as the Vocational D-IV Building Architecture Program. Questionnaire results indicated an average student response score ranging from 80.06% to 81.82%, categorized as good to very good. These findings demonstrate that the Procity model effectively enhances student motivation, engagement, and scientific process skills (SPS) across various class settings.

In Classes A, B, and C, where broader implementation trials were conducted, evaluation results revealed significant improvements in students' Scientific Process Skills (SPS), particularly in the areas of collecting and processing anthropometric data, creativity in designing solutions, and visual and verbal communication skills. Students' active participation in discussions, peer reviews, and project presentations also increased, indicating the model's effectiveness in fostering a collaborative and innovative learning environment.

Nevertheless, some students exhibited relatively low responses and suboptimal engagement, particularly in their ability to answer discussion questions in certain classes, including Class D and the vocational program. Therefore, lecturers are encouraged to implement facilitative strategies such as scaffolding, coaching, and peer tutoring to enhance the participation of less active students. These strategies are also expected to foster an inclusive learning environment and boost students' confidence in expressing

their opinions and engaging in innovative thinking.

In addition, the study's findings underscore the importance of providing recognition or rewards to students who demonstrate high levels of creativity and active contributions throughout the learning process. Such incentives can enhance intrinsic motivation while simultaneously reinforcing an innovative and collaborative culture in the classroom.

The implementation of the Procity model is also recommended to be further developed toward cross-disciplinary collaboration, such as involving students from ergonomics, civil engineering, or product design. This approach not only enriches ideas and perspectives within the project but also prepares students to face real-world challenges that demand multidisciplinary teamwork.

In conclusion, the Procity learning model has proven to be valid, practical, and effective in enhancing the science process skills of architecture students across various trial classes. Strengthened facilitation strategies for students with lower engagement, along with the development of cross-disciplinary collaboration, position this model as a strong candidate for sustainable and relevant project-based architectural education at Universitas Negeri Gorontalo.

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