STUDENT PERCEPTION OF BAMBOO ARCHITECTURE (PROCESS OF ARCHITECTURAL EDUCATION IN INDONESIA)

Wiwik Dwi Susanti [1]*, Fairuz Mutia[1], Dian Purnama Solin [1]

[1] *Universitas Pembangunan Nasional "Veteran" Jawa Timur, Surabaya, Indonesia*

Abstract: *In Indonesia, bamboo is an easy-to-find building material. In addition to being valued as a plant, bamboo is also used as an alternate material in building. One example of how bamboo is evaluated from both a strength and an aesthetics perspective is the development of bamboo as a substitute material in architecture. In order for the educational system, one of which is UIA, to produce professional architects in the future, architectural education is one of the systems that will do so. The International Union of Architects has three examinations, including knowledge, design, and skills, through the APTARI Association of Indonesian Architectural Higher Education, an association for all architectural higher education in Indonesia. The bamboo architecture learning system is tested using these three factors as parameters. The research methodology combines quantitative analysis with qualitative design using the JMP 17 software to produce an overview of the UIA-related education system.*

Keywords: *Knowledge, perception, bamboo architecture, design, abilities.*

Wiwik Dwi Susanti *

E-mail: wiwikds.ar@upnjatim.ac.id

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Introduction

Many different types of bamboo can be found in Indonesia. Out of the 1620 species of bamboo that come from 80 different nations worldwide, 176 kinds are found in Indonesia. As a result, Indonesia is home to 10% of all bamboo species worldwide. In actuality, Indonesia is home to 105 endemic species of bamboo. 50% of the bamboo that grows in Indonesia is endemic, and the community has consumed half of this quantity [1]. According to scientific studies, indigenous Indonesian populations, particularly the Javanese, Dayak, Balinese, and Papuan communities, have close social, economic, and cultural ties to diverse types of bamboo [2].

Currently, there are changes and shifts in the characteristics of bamboo use in architecture, particularly in the context of vernacular architecture that has evolved traditionally in society. This is an interesting topic to bring up because it involves not only technological advancements, design innovations, and the physical level of architectural forms, but also the vernacular architecture that has developed traditionally in society. When compared to wood, bamboo has a number of advantages, including a quick growth cycle. Because of its elasticity and excellent ornamental value, bamboo may be curled and used as a building construction material in five years [3]. The many varieties of bamboo must also be taken into account when designing because some varieties of bamboo can only flourish in particular environments. Ordinary people still typically believe that bamboo is a weak, outdated, and unpractical material. Bamboo is typically associated with home furnishings, temporary structures, and construction supports [4]. In some places, some individuals even believe that homes made of bricks and concrete signify a middle-to-upper class of socioeconomic standing, whilst homes made of bamboo are said to signify a middle-to-lower class. Currently, bamboo is regarded as one of the sustainable building materials that is pertinent to the problem of global warming. As a result, bamboo is viewed as a material that offers a sustainable solution to issues with strength, durability, and beauty. The general public still has very little awareness of bamboo, and some still believe that it is a cheap material that only makes boring shapes. Even the community's bamboo has a tendency to allow bamboo plants age, weather, or turn into useless piles of trash that float out to sea [5].

Architectural education, which creates future architects, is crucial in ensuring that students have knowledge and understanding of bamboo in light of the changing qualities of bamboo use in architecture [6] beginning with the preservation, processing, and design development processes. To ensure that students are conversant

with the subject of bamboo, it is necessary to review the educational process in Indonesia's architecture education system. The learning process will be more successful if students are already familiar with the subject of bamboo. The quality of architectural education recommended by APTARI, the association of Indonesian architecture institutions, which refers to UIA including design, knowledge, and skills, is related with an efficient learning process. Based on these standards, instruction in bamboo architecture is provided through a trial process (workshop), followed by design. In order for students to be able to come up with answers to issues in the future, the learning process must be balanced with creative values.

Perception theory is used in the analysis process because it is seen to be the best way to find out information about the bamboo learning process that has been carried out and because perception is connected to student opinions on bamboo. Fundamentally, perception is a process that takes place as a person watches another person or an object. Understanding of information shared by others who are conversing, connected, or working together, so involving everyone in the perceptual process [7]. Perception is not something that merely happens to someone; there are undoubtedly outside influences [8]. There are a number of factors that influence perception, including structural factors (which are physical stimuli) such as those related to touch, smell, sight, taste, and hearing, functional factors (which are factors that are personal), situational factors (that the word that is mentioned first will direct the next judgment, or how adjectives affect the judgment of a person), and personal factors (personal factors that influence people's perceptions of us or vice versa are experiential factors) [9]. It is intended that by adopting a perceptual method, we will be able to map the process of ideal learning for students. We also work to meet the demands of students in order to support the learning process in accordance with UIA standards.

Methods

A qualitative study approach is used to understand how bamboo building is perceived. The qualitative approach is a research technique that generates descriptive data from persons or activities that can, either in the form of written or spoken language. Data collecting is a strategy or approach that researchers can use to gather information, and data collection instruments are tools that researchers choose and employ during data gathering tasks to make these tasks more organized and simple [10].

The gathering of qualitative data through observation, questionnaires, and documentation during data collecting. Primary data come from sources like questionnaires designed specifically for architecture students, which give data to data collectors directly. In addition to using surveys, interviews and literature reviews were also used to obtain data. In the process of obtaining information for architectural design, data collection was done to learn more about student preferences for bamboo architecture. Students in the Architecture S1 education program at UPN "Veteran" Jawa Timur served as the study's sample group. The total student population in the third, fourth, and fifth years, with an average of about 99 people, was used to calculate the number of samples. According to statistics, a bigger sample size is predicted to produce better findings. The obtained mean and standard deviation have a high likelihood of resembling the population mean and standard deviation when the sample size is large. This is due to the fact that statistical hypothesis testing has anything to do with the quantity of samples. A large sample is preferable, but a small sample that was chosen at random can still accurately represent the population [11]. According to this justification, 80 to 100 students are chosen as samples because the sampling rate for a population under 1000 is approximately 30%. This study uses a number of (UIA) criteria. The International Union of Architects is an international group made up of national architectural associations that collaborate to bring together architects from all over the world. Criteria for graduating architects that are customized for the use of bamboo materials, are the subject of this study. The questionnaire was constructed based on 3 selected criteria which were judged most relevant to the topic of bamboo materials, with a combination of open-ended questions and closed-ended questions. These requirements are divided into 3 categories, namely:

a. Design
   - ability to engage imagination, think creatively, innovate and provide design leadership,

- ability to gather information, define problems, apply analyses and critical judgement and formulate strategies for action,
- ability to think three-dimensionally in the exploration of design,
- ability to reconcile divergent factors, integrate knowledge and apply skills in the creation of a design solution.

b. Knowledge
- Cultural and Artistic Studies,
- Social Studies,
- Environmental Studies,
- Technical Studies,
- Design Studies,
- Professional Studies.

c. Skill

The three data points obtained from questionnaires will be quantitatively analyzed with JMP 17 software and then rendered in a descriptive manner. Data gathered from the outcomes of respondents' answers are tested using data analysis techniques before being evaluated. As a result, descriptive quantitative analysis was utilized in this study, which means that no general conclusions were intended as a result of the analysis of the data that had already been collected [12].

Results and Discussion

The samples taken were UPN "Veteran" Jawa Timur architecture students who were still enrolled and enrolled full-time, specifically from the classes of 2022, 2021, 2020, and 2019 (Fig.1). Using the 99 students that responded as responders.

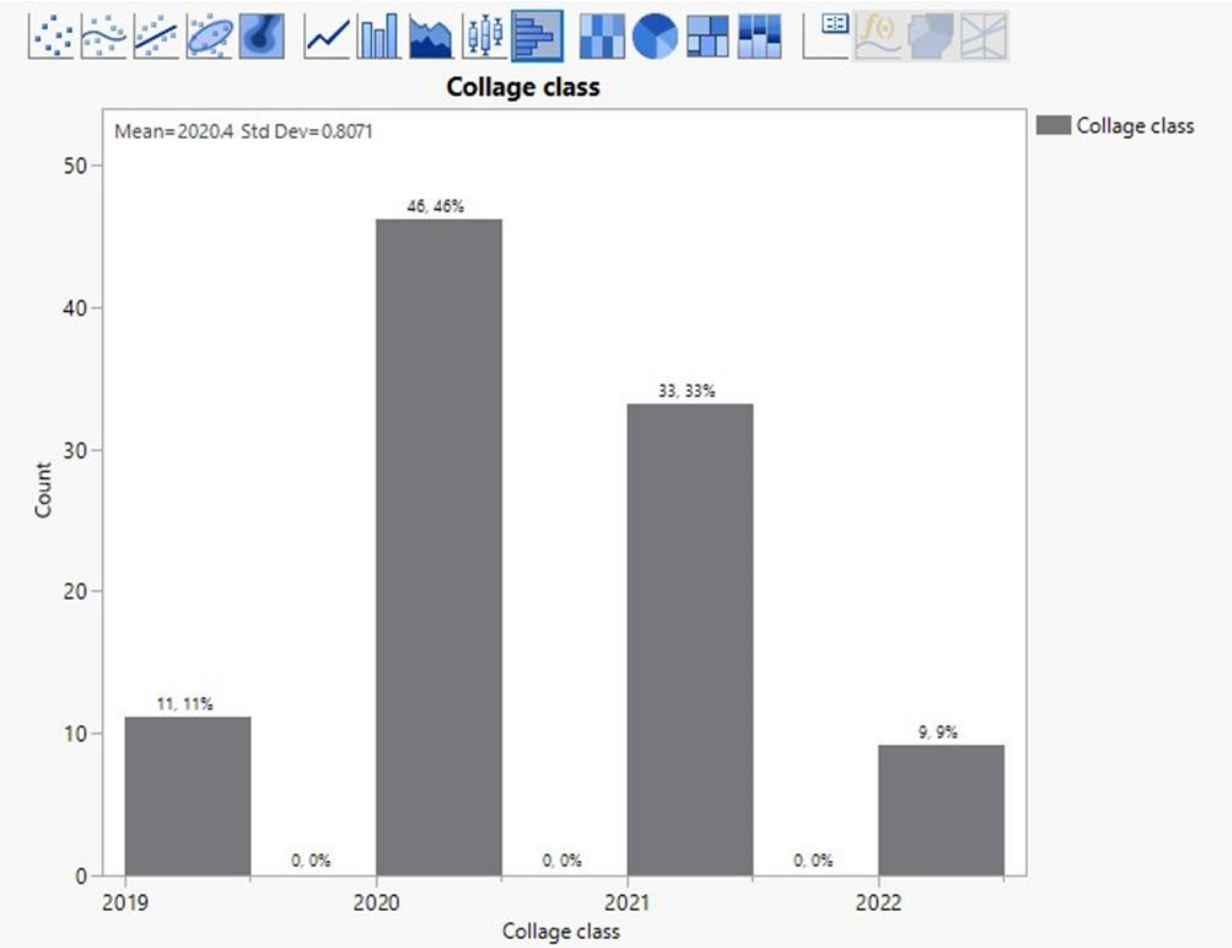

Fig. 1. *The distribution of respondents*

Based on distribution analysis, which was used to get the results, the majority of respondents were 46 students from the class of 2020. The 2020 class has completed three design and structural courses that allow students to use bamboo as a material as part of the architecture study program. In addition to serving as the primary material, bamboo may also be used in conjunction with other materials like wood, concrete, and others. Analysis of students' impressions of bamboo architecture includes design, knowledge, and skills, the three UIA components[1].

Design

Design criteria according to UIA include:

- ability to engage imagination, think creatively, innovate and provide design leadership,
- ability to gather information, define problems, apply analyses and critical judgement and formulate strategies for action,
- ability to think three-dimensionally in the exploration of design,
- ability to reconcile divergent factors, integrate knowledge and apply skills in the creation of a design solution.

The four criteria in the questionnaire were converted into two questions about students' capacities for designing and carrying out research or engaging in research based on these design criteria.

Student exposure to bamboo material

Through design and research projects, students gain experience with bamboo architecture. Students must create architectural drawings as part of their coursework in the design studio class, commencing with a site analysis, consideration of culture and sociocultural factors, and the development of design concepts that are related to structure and construction. The design is then shown at the conclusion in both two- and three-dimensional architectural drawings. While conducting research, students carried out an analysis process and chose approaches relevant to the topic at hand. The thorough and organized analysis approach helps students fully comprehend bamboo architecture. According to UIA guidelines, a student has met the Skill criterion if they have ever developed and explored bamboo architecture based on these two experiences.

Experience has shown that 6.8% of the 2022 and 2019 classes, 36.47% of the 2020 class, and 29.38% of the 2021 class have students who have created employing bamboo architecture. The 2020 class has made greater use of bamboo construction. The 2022 and 2019 batches, however, hardly ever use bamboo construction. The studio and structural tasks for the class of 2020 required students to incorporate bamboo architecture, so they did (Fig.2).

Designing bamboo can be learned through research or design

According to the findings of the quantitative investigation, students learn the most through design rather than research. 38.4% of the class of 2020 students selected design, compared to 2.4% of those who selected based on the findings of their research experience. In the class of 2021, research is the subject chosen by 3.1% of students, while design is selected by 30.3%. According to the findings of the quantitative analysis, the design process - rather than research - is where most students' experience with bamboo architecture comes from. Students get research experience through engaging in research projects led by lecturers or by conducting their own independent studies. Currently, research students are expected to complete their Final Assignments in full as well as serve as an output product for several courses. This encourages students to become more aware of current architectural issues and to use critical thinking to identify the best solutions (Fig.3).

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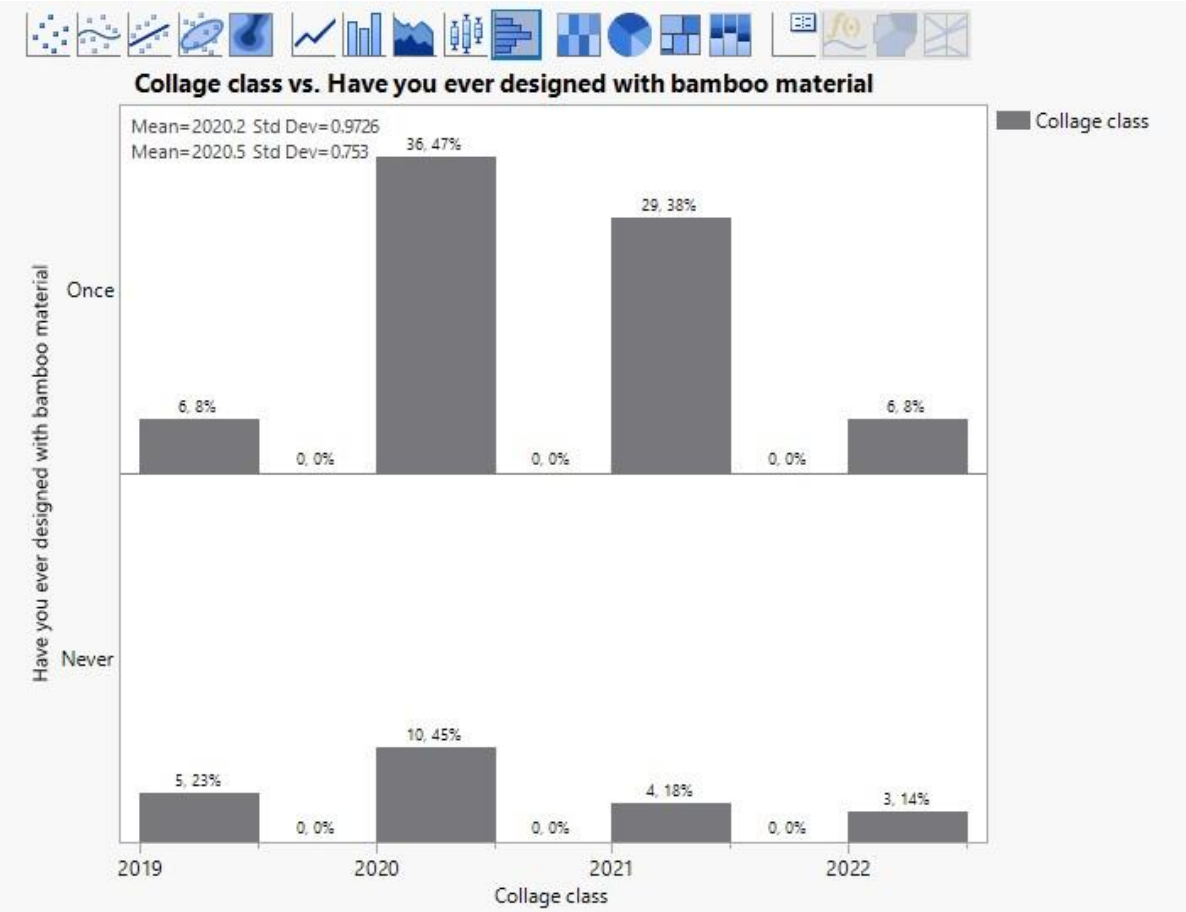

Fig. 2. *Student exposure to bamboo material*

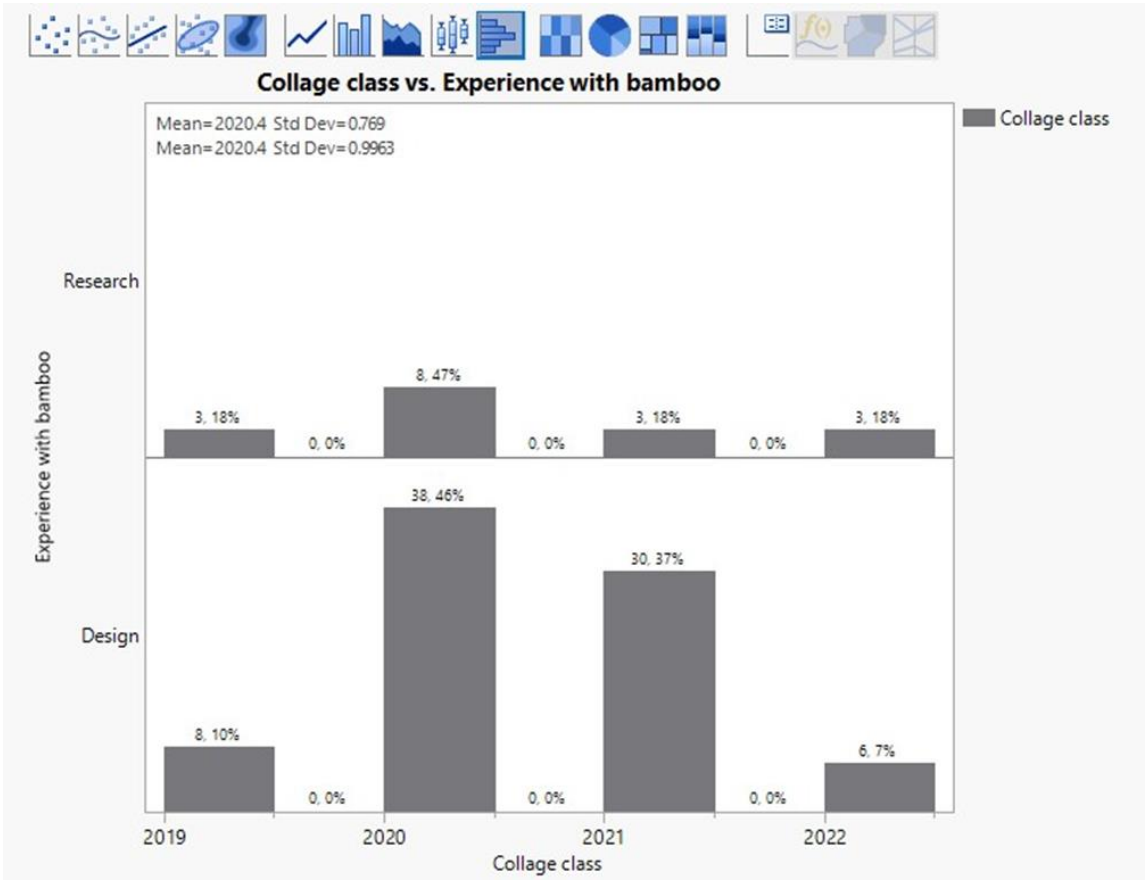

Fig. 3. *Designing bamboo can be learned through research or design*

Knowledge

Knowledge criteria according to UIA include:

- Cultural and Artistic Studies,
- Social Studies,
- Environmental Studies,
- Technical Studies,
- Design Studies.

Based on these knowledge requirements, students' understanding of bamboo architecture is evaluated in numerous areas, including cultural (bamboo culture), structural, and environmental factors, design, and technical (workshops, lectures, and comparative studies) elements. The four questions that are attached to the questionnaire demonstrate the student knowledge that was attained based on the five UIA criteria.

Information about bamboo

As one of the many trees that flourish in Indonesia, bamboo is no longer restricted to use as a building material. As a sustainable and local material, bamboo is associated with architecture in the minds of students. 61.6% of students, according to the results of the questionnaire analysis, saw bamboo as having a connection to architecture, while 28% saw it as having a connection to tradition and the remaining percentage as having a connection to art.Students' erceptions of bamboo architecture are relevant to the field of architecture since bamboo is no longer regarded as a low-cost material but rather as one of the materials capable of producing stunning and unusual forms. This is connected to the many bamboo architectural items that are popular among students (Fig.4).

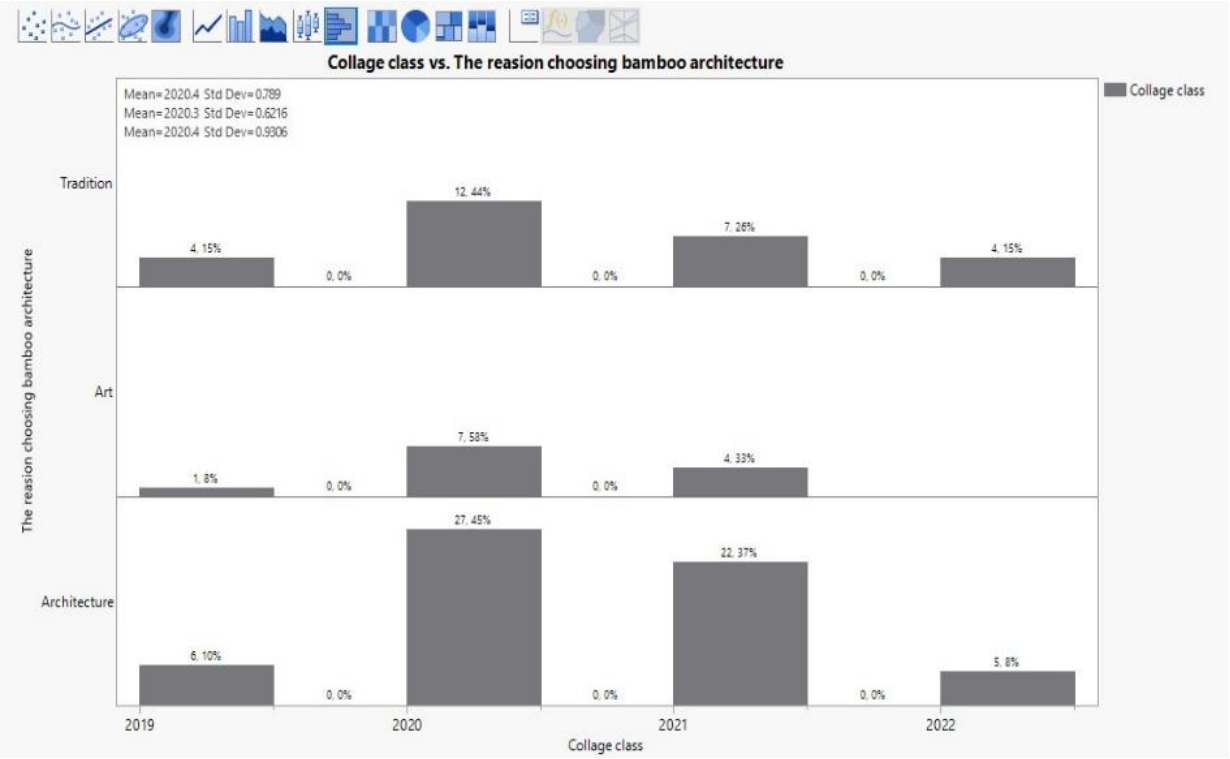

Fig. 4. *Information about bamboo*

The role of bamboo in architectural structures

Bamboo is one of the structural building materials available today that combines outstanding strength and aesthetic appeal [13]. Making bamboo is currently quite popular as a material for building. This is evident from the varied purposes for which bamboo is used in Indonesian architecture. One of the various applications of bamboo architecture is the commercial one. Yellow bamboo, tamarind Mediterranean, and Kapal Bambu

restaurant are a few examples of commercial structures that utilise effstudio bamboo architecture. The quantitative analysis's findings indicate that students' perceptions of bamboo architecture are identical to those of commercial structures by 52.4%, while residential functions account for 29.4%, educational functions for 16.6%, and residents account for the remaining functions. Commercial buildings have a role that depends on the aesthetic appeal of the facade, which is something that bamboo materials may explore. Another factor in choosing bamboo materials is the appearance of nature (Fig.5).

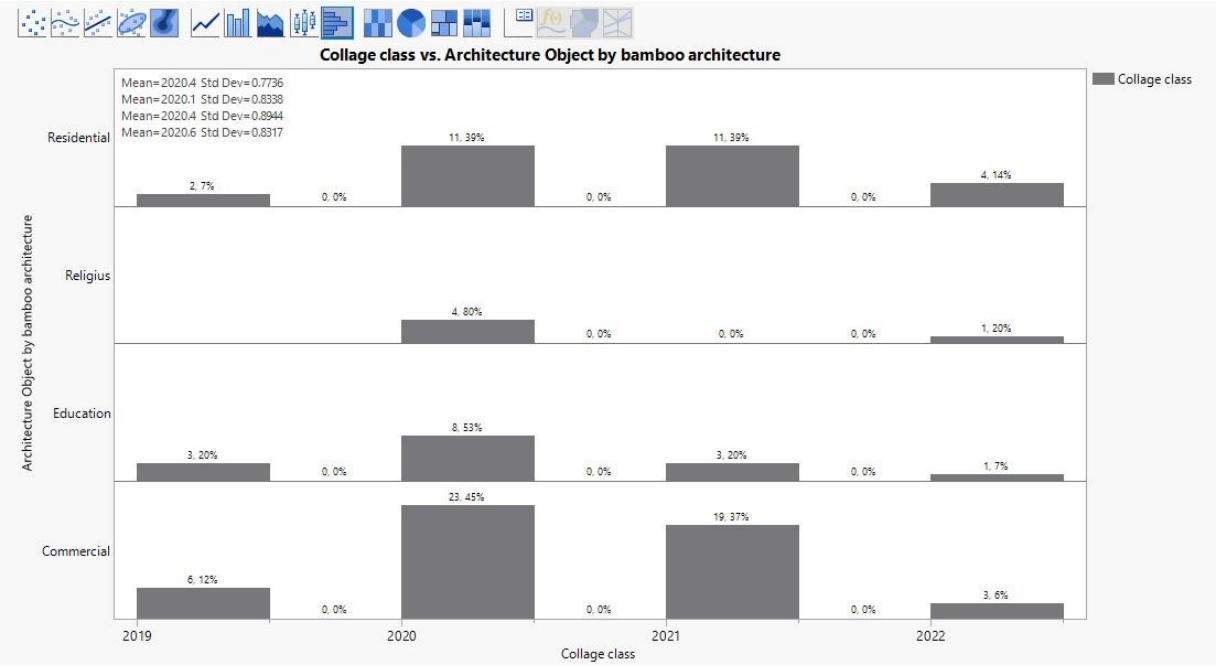

Fig. 5. *The role of bamboo in architectural structures*

An efficient method for learning bamboo architecture

The bamboo architectural learning process that was taught in class needs to be evaluated, and student preferences for the learning method that is thought to be appropriate and beneficial for students are required.

According to students, the most effective learning approach involves workshops, which account for 24.5% of learning, followed by class study (12.5%), research, and comparative studies. The fact that students actively participate in the planning process makes workshops an effective teaching strategy. Students are actively taught how to practice bamboo joints on a real scale during the course. Because students are intimately involved in the creative process on a real scale, this workshop is typically longer than 1 day and as long as 3 days. Students believe that providing material in class is the second approach to be effective. To be able to give students a deeper grasp of bamboo architecture, the course material is not only theoretical but also continues with discussion sessions (Fig.6).

Research is also one of the methods chosen by students which is considered effective in providing an understanding of bamboo architecture. Through research students can carry out analysis related to bamboo architecture both assessed from cultural, construction, aesthetic and social aspects. So by doing research on bamboo architecture, it will provide a lot of in-depth understanding regarding bamboo architecture for students.

Knowledge of bamboo among students in environmental studies

Bamboo is regarded as one of the unique materials because it is not only used as a material but also has a strong connection to culture and the arts. According to the findings of the quantitative research, 61.6% of students believe that bamboo is a component of architecture. In the design process, students enjoy experimenting with bamboo. Regarding its connection to culture, students believe bamboo to be a material that is closely tied to Indonesian culture by 27.8%. The Gila bamboo dance and bamboo puppetry are two cultures that are strongly tied to bamboo [14]. Other cultures in Indonesia also use bamboo for instruments like the angklung and the flute (Fig.7).

Fig. 6. *An efficient method for learning bamboo architecture*

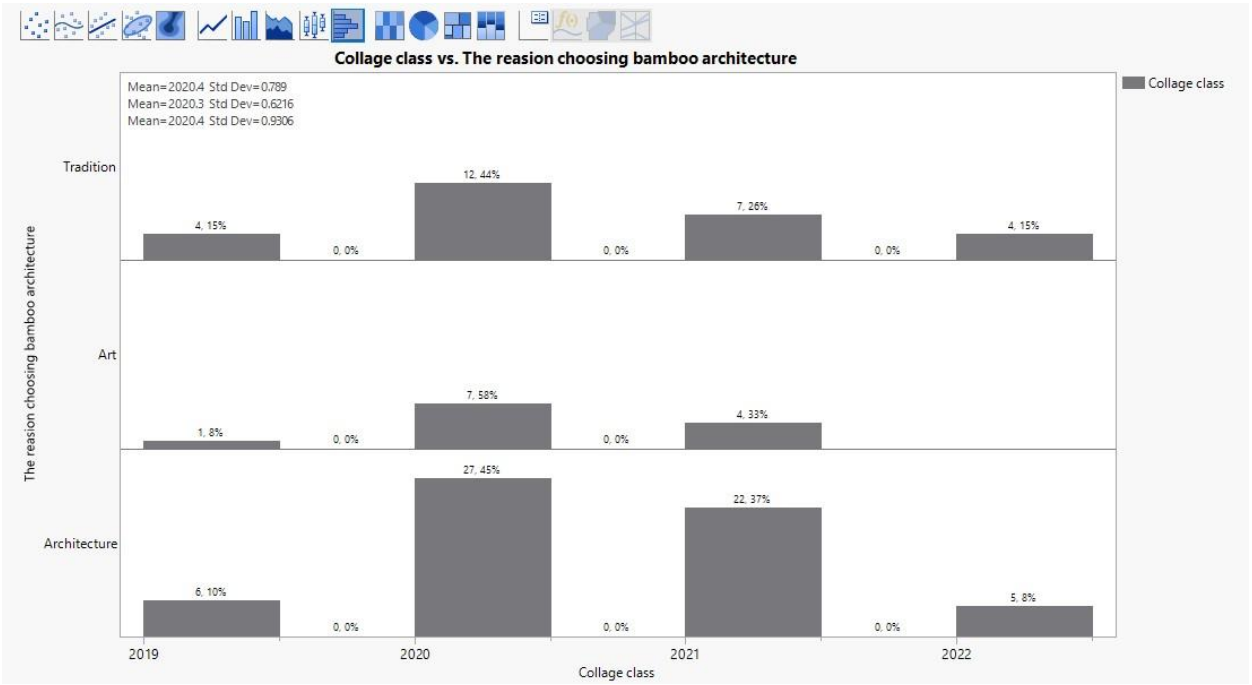

Fig. 7. *Table knowledge of bamboo among students in environmental studies*

The fact that bamboo is a 41% sustainable material also contributed to the students' decision to use bamboo for their projects. Students believe that bamboo may be used as a building material to address climate change issues and the idea of the SDGs. In addition, bamboo is a locally produced, abundant, and available resource in Indonesia. If employed as a building material, this variety will provide aesthetic value (Fig.8).

Skill

How to convey the design of bamboo building is stressed in the UIA competency criterion. According to the findings of the quantitative data research, animation is a successful method for communicating design outcomes by 48.7%, while mockups are no longer a student choice for showcasing bamboo architectural works by 35.2%. While scholarly publications continue to be the best option for showcasing bamboo building (Fig.9).

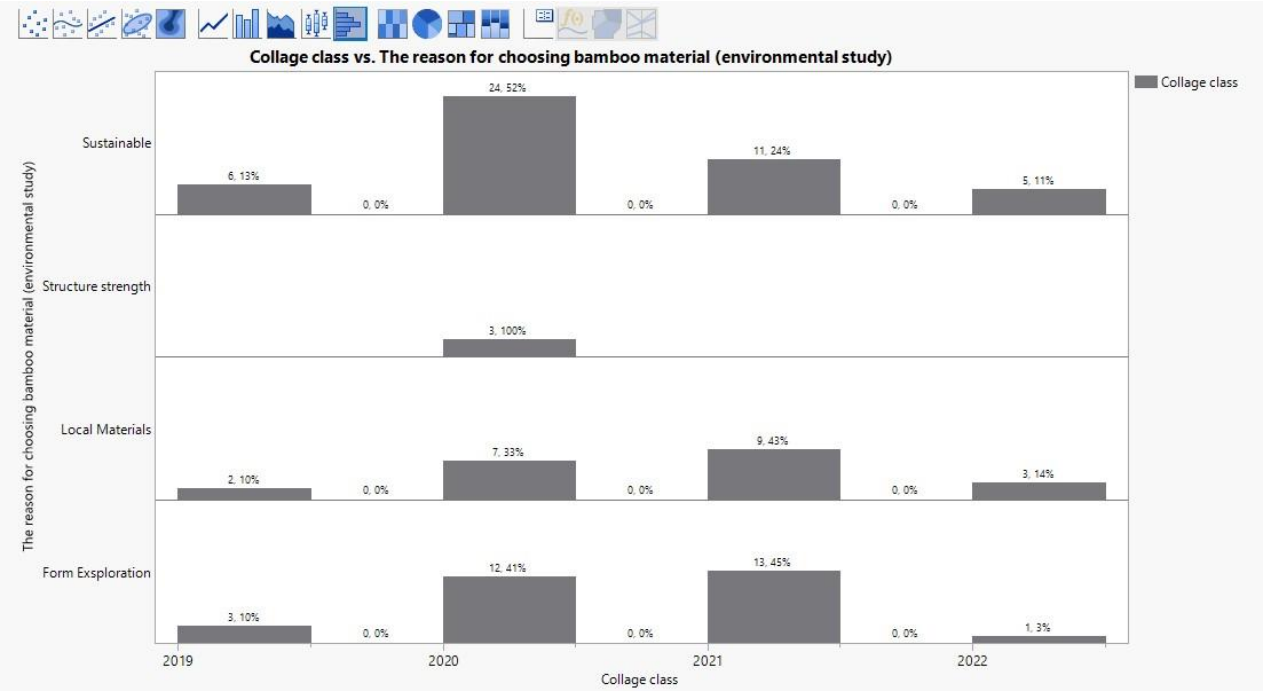

Fig. 8. *The students' decision to use bamboo*

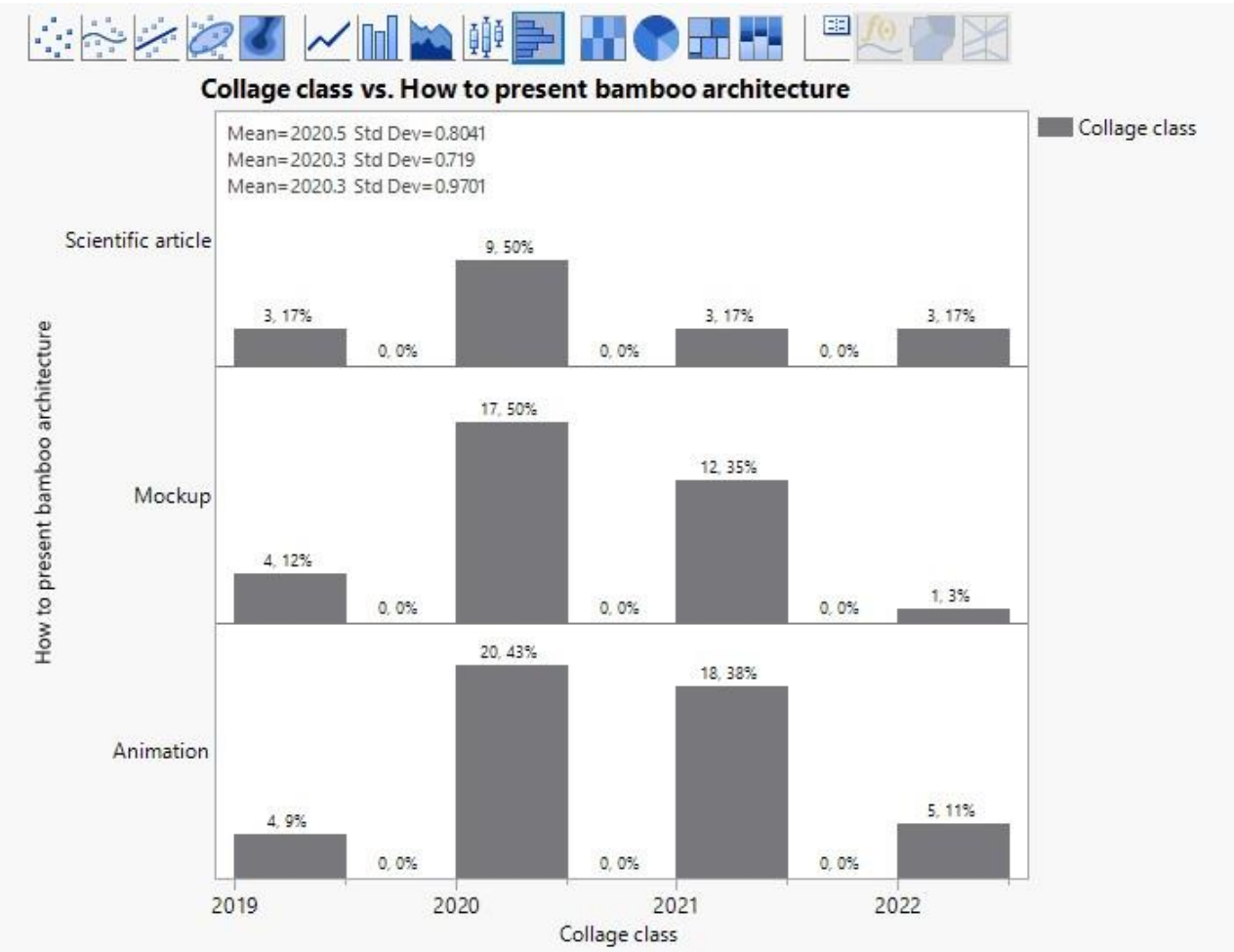

Fig. 9. *Method for communicating design bamboo architecture*

Conclusion

Based on the analysis's findings, it is possible to draw the following conclusions: (1) There are a number of teaching strategies that are appropriate for students, but there are also some lessons that could be improved; and (2) The UIA criteria, which include aspects namely knowledge, design, and skills, are associated with architectural education in Indonesia using a perceptual approach. Due to requests from the Indonesian Architecture Education, which also needed to meet international standards, repairs were made. More precisely, bamboo architecture has a stronger bond with students since it is an original Indonesian material with regional qualities in terms of culture, art, and architecture.

Based on the knowledge component, a workshop-based learning system is an efficient learning method. One of the active learning methods is hands-on practice with instructors who are specialists in the field of bamboo architecture; this method is typically used on a real size in the field. The psychomotor and cognitive capacities of the students can be stimulated by this learning approach. Students can more easily learn about bamboo through study, comparative analysis, and the internet.

In the meantime, students decide to use animation to be able to present the results of their design work from a skill perspective. Students believe that animation is a tool that is simple to use and use. Given that modern digital technology is more in accordance with what people require. When measured from the perspective of design, nearly 50% of students used bamboo materials in their designs. As a result, bamboo is now one of the materials that students prefer for building because of its strength, flexibility, sustainability, and aesthetic appeal. Students evaluate bamboo architecture in terms of its ability to offer both aesthetic value and strength, so that the experience of designing serves as the foundation for the desire to design.

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Wiwik Dwi Susanti, Master of Architecture *(Indonesia, Surabaya) - Universitas Pembangunan Nasional "Veteran" Jawa Timur, Faculty of Architecture and Design, Lecturer at the Department of Architecture, wiwikds.ar@upnjatim.ac.id*
Fairuz Mutia, Master of Architecture *(Indonesia, Surabaya) - Universitas Pembangunan Nasional"Veteran" Jawa Timur, Faculty of Architecture and Design, Lecturer at the Department of Architecture, fairuzmutia.ar@upnjatim.ac.id*
Dian Purnama Solin, Master of Science *(Indonesia, Surabaya) - Universitas Pembangunan Nasional "Veteran" Jawa Timur, Faculty of Enggineering, Lecturer at the Department of Civil Engineering, diansolin.ts@upnjatim.ac.id*