

ISSN 1840-4855

e-ISSN 2233-0046

Original scientific article

<http://dx.doi.org/10.70102/afts.2026.1836.792>

AESTHETICISM BETWEEN KNOWLEDGE & EXPERIENCES IN ARCHITECTURAL EDUCATION

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Received: June 08, 2026; Revised: July 16, 2026; Accepted August 25, 2026; Published: September 29, 2026

SUMMARY

One of the essential aspects of education in architecture is aesthetic knowledge, which impacts creativity, the thinking process, and the evaluation of architectural quality. However, not many empirical studies were carried out in order to understand the development of aesthetic knowledge for architecture students of various levels. The current study analyzes the relationship between aesthetic experience and aesthetic knowledge for undergraduate architecture students using the Aesthetic Experience Questionnaire (AEQ). This method focuses on four components of the aesthetic experience, such as emotion, culture, perception, and flow experience, using a quantitative survey of 55 second-, third-, and fourth-year architecture students. The collected data were analyzed using Cronbach's Alpha, McDonald's Omega, descriptive statistics, and one-way ANOVA in order to measure the reliability of the test and to compare the aesthetic knowledge between the different educational levels. The overall reliability of the questionnaire was high, with Cronbach's Alpha = 0.822 and McDonald's Omega = 0.812. In the descriptive analysis, it is seen that the overall aesthetic knowledge of the second, third, and fourth year students developed respectively in the sequence of 3.833, 3.899, and 3.987. There were no significant differences among the academic years according to the ANOVA test ($F=0.722$, $p=0.491$) since there was no significant difference in students' aesthetic knowledge development across years. This research study is innovative since it makes a quantitative analysis of aesthetic knowledge development at different academic levels on the basis of an aesthetic experience model. The findings of the study stress the importance of curriculum development that includes experiential and reflective design-based learning approaches.

Key words: architectural education, aesthetic knowledge, aesthetic experience, design studio, architectural curriculum, student learning, visual perception.

INTRODUCTION

Education in architecture cannot be separated from aesthetics because it is vital for students to know how to design meaningfully based on aesthetics. In addition to technical knowledge, the architecture students need knowledge of aesthetics to improve their imagination, visual perception and design thinking [3]. With aesthetic knowledge, students can design buildings that not only meet functional requirements but also are beautiful and culturally significant. Aesthetic knowledge is developed theoretically and experientially [4]. Aesthetic knowledge can be attained through design studios, architecture history and theory classes, studying the existing architectural structures and the feedback provided by instructors [5][6]. It is important for the instructor in this case to pass on knowledge and design experience to the students [7][8].

Aesthetic experience is one of the important aspects that aid in the formation of aesthetic knowledge. This process has four important dimensions namely: emotional, culture, perception and flow experience [9][10]. Emotional experience is the students' emotional response towards the architectural space; cultural experience is the social and historical value that students are able to grasp; perceptual experience is the students' ability to observe and understand architectural form and shape and flow experience is the deep level of concentration that the students undergo when designing. These dimensions enable students to develop good designing skills and aesthetic knowledge. The most important field where students will be able to apply their theoretical knowledge is the architectural design studio [12]. Students will continue developing more experience and aesthetic knowledge as they proceed through each academic year. However, it still remains to be seen if the present-day architecture curriculum takes care of the continued development of aesthetic awareness of its students during their academic period [13].

Although a good number of researches exist concerning aesthetics and architectural learning, very few have been done on how aesthetic knowledge changes from one academic level to another [14]. Besides understanding the relationship between aesthetics experience and architectural learning, it is equally vital to help educators to assess their curriculums to see how effective they are, and the areas where improvements are needed [15][16]. This study attempts to determine the relationship between aesthetics experience and aesthetic knowledge of undergraduate architecture students in their second, third, and fourth academic years in college [17][18]. Four aspects of the aesthetic experience; emotion, culture, perception, and flow experience are measured using the Aesthetic Experience Questionnaire (AEQ). The collected data will then be analyzed using reliability, validity test, and one-way ANOVA.

These findings from the study can provide useful information on how to improve architectural education. If students do not show improvement in the area of aesthetic awareness throughout the program, then this may indicate that there should be some modification in the curriculum to include more aesthetic awareness in the design studios and aesthetic theory classes. Improved emotional, cultural, perceptual, and creative learning can improve design capabilities of the students.

Key Contributions of the Research

- Assesses aesthetic knowledge during various academic levels through the comparison of architecture students at years two, three, and four through Aesthetic Experience Questionnaire (AEQ).
- Considers the link between aesthetic experience and aesthetic knowledge in four aspects: emotion, culture, perception, and flow experience.
- Suggests ways to enhance the architectural curriculum in order to enhance aesthetic education.

The remaining part of this paper is arranged as follows. Section II provides an overview of the literature review on aesthetic knowledge, aesthetic experience, and architectural education. This section III describes the methodology employed in this research, which includes the research design, the questionnaire, and the process of data collection and statistical analysis. Section IV presents the results of the experiment and the statistics of the data obtained. The implications of this research for

architectural education are explained in Section V. Section VI highlights the key findings of this research, its contributions, and future directions for further research.

LITERATURE REVIEW

Al-Rqaibat et al. [19] investigated the application of hybrid digital technologies in architectural education and their effect on students' creativity, cognition, and design skills. In this research, expert architects and architecture students have been interviewed and surveyed using questionnaires in order to evaluate the effects of using a combination of conventional designing process and digital media [1]. It is found from the findings of this research that the use of various digital tools in the process of architectural learning increases the students' capacity of visualizing the design concepts, facilitates design exploration, and improves involvement in the design process. Furthermore, it was concluded from the findings that although digital technologies played an important role in improving the learning process, but they were not sufficient enough in solving all the design problems. Thus, it was necessary to integrate digital technologies with a suitable teaching framework.

Alamasi et al. [20] examined the effect of Generative Artificial Intelligence (GenAI) on Architectural Design Education through a series of supervised design studio experiments with undergraduate architecture students. The performance of the students in digital design and assisted design using AI was compared with respect to creativity, quality of design, and efficiency of completion of the assignment [11] [17]. From the results obtained in the study, it was observed that the students who used GenAI were capable of generating more creative and beautiful architectural designs, as well as completing their assignments within shorter periods. Furthermore, the AI students were capable of exploring a wider range of design options with good conceptual thinking skills. The studies stressed that AI is just a tool for educating, but not a replacement of creativity, and suggested a framework of instructional structure for use of AI in architecture education.

Ummihusna & Zairul [21] researched the role of immersive learning technologies including virtual environment (VE) and interactive visualization system (IVS) in the architecture education field to improve the spatial comprehension and experiential learning. It was expected to explore the value of the immersive technologies in the architectural design education field and their capability to immerse the students into the virtual architectural spaces before actualization of designs [2]. As a result, it can be concluded that the main difference between the exposure to the traditional learning and the immersive learning is the fact that the last one increased the spatial visualization, design comprehension, and confidence of the students in assessing the architectural solutions. The researchers stated that virtual environment allows for learning in a new manner and they recommended the usage of virtual environment in the architectural design studio.

The goal of Özeren [22] was to introduce digital storytelling as an innovative way of teaching that would contribute to developing conceptualization and communicational skills of architecture design undergraduate students. As a result, it was revealed that the introduction of storytelling approach allowed students to build links between architectural concepts, experiences of users, and spatial narrative. This means that the use of narrative approach allowed them to think critically as well as to develop their design communication and creativity skills. Thus, according to the findings of the presented study, one can claim that the introduction of storytelling approach is an effective way of teaching as it allows achieving reflective learning, collaboration and explains design concepts.

Labib et al. [23] studied the opinions of architecture students regarding the use of GenAI in educational processes through a cross-sectional survey methodology in which they conducted a survey among different architecture courses. They analyzed students' opinions regarding their attitude to AI-assisted learning concerning the fields of creativity, design efficiency, idea generation and effectiveness in education. The findings proved to be positive for most students in terms of their attitude towards GenAI as it helped in conceptualizing ideas fast, served as an alternative for designs, and helped in solving problems creatively in architectural assignments. However, the respondents expressed their worries about overdependence on AI, lack of originality, and loss of critical thinking skills. Hence, the studies recommended a balance between the use of artificial intelligence, ethical principles, faculty guidance, and changes in the curriculum.

Cognitive-Social-Technical Framework of the Use of Artificial Intelligence in Architecture Education and Practice was introduced by Lee et al. [24]. The research does not concentrate on the concept of the replacement of architects with artificial intelligence technologies. On the contrary, the idea is based on the utilization of such technologies as an intelligent assistant for collaboration, design reasoning, and decision making. Cognitive process, social interaction, and technology form this framework; all the elements of the framework are favorable to human-oriented architectural education. Studies note that the future of architectural education must include teaching students to work with AI technologies, keeping creativity, professionalism, and responsibility. They provide tips on how to reform architecture education in view of new design environment triggered by AI technologies.

Table 1: Recent studies on architectural education and digital learning technologies

References	Methodology	Dataset / Simulation Environment	Research Gap
Al-Rqaibat et al. [19]	Mixed-method approach using interviews with architects and questionnaire surveys of architecture students.	Architecture students and professional architects using hybrid digital design tools.	Focused on digital tool adoption but did not investigate the progressive development of aesthetic knowledge across different academic stages.
Alamasi et al. [20]	Experimental study comparing conventional design methods with AI-assisted architectural design projects.	Undergraduate architecture students using Generative AI (GenAI) in supervised design studios.	Evaluated AI-supported creativity but did not examine how aesthetic experience influences long-term learning outcomes.
Ummihusna & Zairul [21]	Experimental evaluation of immersive learning technologies for architecture education.	Virtual Reality (VR)-based architectural design and immersive learning environment.	Concentrated on spatial understanding and experiential learning without assessing students' aesthetic knowledge development.
Özeren [22]	Educational case study integrating digital storytelling into architectural design studios.	Undergraduate architectural design studio using digital storytelling activities.	Improved communication and reflective learning but did not measure aesthetic knowledge using quantitative analysis.
Labib et al. [23]	Cross-sectional survey analyzing students' perceptions of Generative AI in architecture education.	Architecture students from multiple institutions using AI-assisted design tools.	Focused on students' perceptions of AI rather than evaluating aesthetic learning progression across educational levels.
Lee et al. [24]	Conceptual framework proposing AI integration into architectural education.	Cognitive-social-technical framework for AI-supported architectural education.	Proposed a theoretical framework without empirical validation using architecture students.
Abusafieh [25]	Experimental interdisciplinary learning approach combining architecture with music visualization.	Architecture students participating in interdisciplinary design activities.	Improved creativity and reflective learning but did not analyze the relationship between aesthetic experience and aesthetic knowledge.

The interdisciplinary teaching method that involves the reflective learning approach through architecture education and the visualization of music was proposed by Abusafieh [25] to enhance the student's comprehension about basic design approaches. In this study, the possibility of using musical ideas such as rhythm, harmony, repetition and balance within the course of architectural design was investigated to encourage creativity and reflective thinking among the students. Based on the findings of experiment, it was found that the students who were taught through interdisciplinary learning possessed a better comprehension about abstract design knowledge, more confidence in creativity and better critical

reflection skill compared to the students who received education in the traditional manner.

Overview and summary of recent studies are listed in table 1. It is evident that most of the studies have concentrated on the issues related to creative education, design thinking, immersive learning, AI-assisted education and student engagement through innovative educational methods. Although these studies have found out that aesthetic learning can be improved concerning design performances and learning processes, they do not pay much attention to the process of developing students' aesthetic knowledge in a systematic manner. Moreover, there has not been any study on the change in the level of students' aesthetic experiences at different academic levels through a valid instrument from the quantitative perspective. Hence, the present study was aimed at bridging this research gap by examining the relationship between aesthetic experience and aesthetic knowledge among architecture students of different academic levels through statistical analysis and Aesthetic Experience Questionnaire (AEQ).

METHODOLOGY

Research Design

In the current study, the methodology employed was quantitative research, which was meant to determine the relationship between aesthetic experience and aesthetic knowledge in a sample of students of under graduation level of architecture. The objective of the research was to establish if there exist changes in aesthetic knowledge in students in different academic levels. Cross-sectional survey methodology was applied since it enabled the gathering of information from the students at all academic levels in a single go. Four different dimensions of aesthetic experience were considered in the current study namely emotion, culture, perception and flow experience. These dimensions were selected based on the Aesthetic Experience Questionnaire (AEQ) formulated by Csikszentmihalyi and Robinson. A questionnaire was constructed in a structured way and was used to obtain information from the students of architecture on the 5-point Likert scale ranging from strongly disagree to strongly agree. The information obtained was analyzed in order to determine their aesthetic knowledge and to make comparisons amongst them in different academic years.

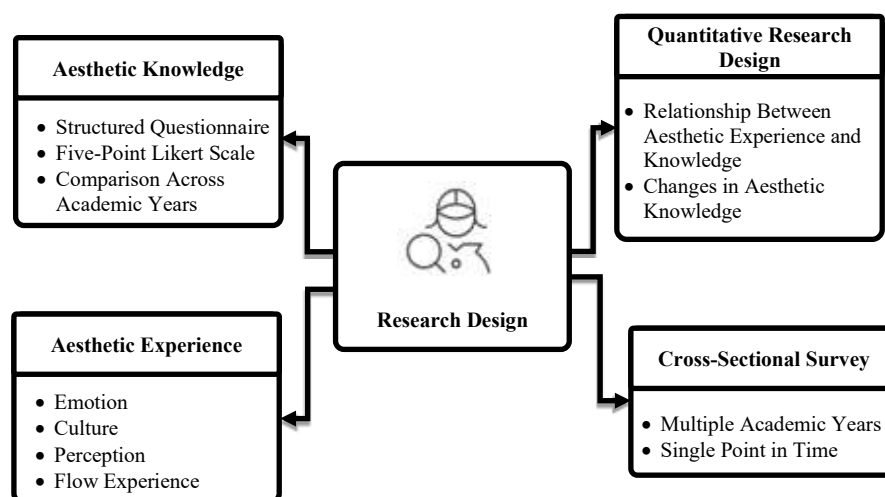


Figure 1: Conceptual framework of the research design

The general design of the research used in assessing the knowledge of the field of aesthetics of architecture among the undergraduate students is shown in figure 1. The research uses the quantitative method in the cross-sectional research design where the subjects include the students of the academic years VII, VIII and IX at SANDRIDGA 302 Pre-BD Kalijuri campus, Kuching, Sabaragamuwa, Galle, and Matara districts of Sri Lanka. Structured questionnaire using the five-point Likert Scale was employed in collecting the data. The study examines the relationship between aesthetic experience and aesthetic knowledge on the basis of four dimensions of emotion, culture, perception and flow experience. The outcomes of the data collection are analyzed in terms of the change in students' aesthetic knowledge throughout the process of learning through the comparison of students' responses in different academic

years. This research design provides an organized approach to collecting, structuring and analyzing data for analysis in order to evaluate the effect of aesthetic experience in the teaching of architecture.

Data Collection and Participants

The present research was conducted in the Department of Architecture and the second, third, and fourth year undergraduate students of the department were chosen as participants in the research. There were 55 students who willingly took part in completing the survey. The sample consisted of male and female students who have diverse academic background and hence represents a typical representative sample of the architectural field in the selected levels. The Aesthetic Experience Questionnaire (AEQ) was used as an instrument to obtain data, where 14 measurement items are classified into four dimensions namely, emotion, culture, perception and flow experience. The validity and reliability of the questionnaire were conducted using the Cronbach's Alpha and McDonald's Omega tests. This will help ensure the consistency and accuracy of the questionnaire measurement that is used for data analysis. Data were gathered using the Likert scale 5-point system and all the data were provided thoroughly before analysis.

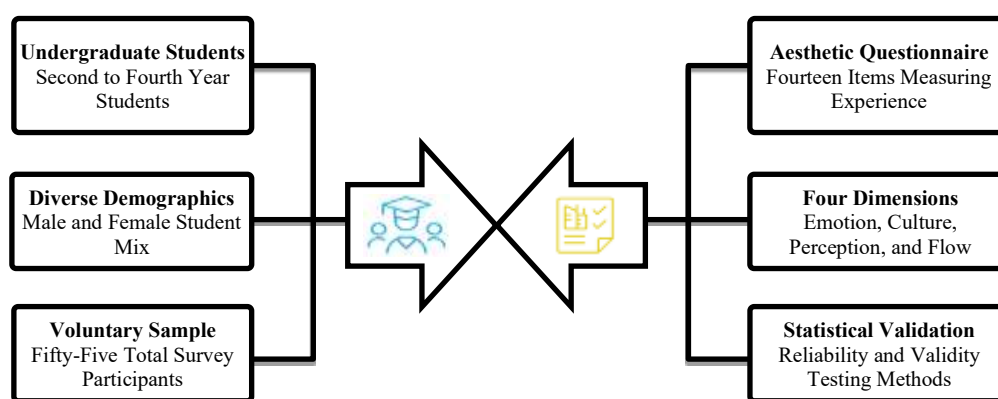


Figure 2. Participant selection and questionnaire design framework

Process of choosing the participants and questionnaire development for this study are illustrated in figure 2. The study has been conducted using 55 undergraduate students of Architecture in the 2nd, 3rd and 4th year from diverse groups consisting of male and female students. Aesthetic Experience Questionnaire (AEQ) has been used to collect the data and it is a 14-item scale used to measure the aesthetic experience of the students voluntarily. It is based on the structured approach and measures emotions, culture, perception and flow experiences on four dimensions. Reliability and validity were performed prior to analysis of the collected data in order to ensure its quality. This framework provides a systematic introduction to the participants of the study, data collection instrument and validation of the instrument for measuring the aesthetic knowledge in architectural education.

Data Analysis

The information collected via the use of questionnaires was analyzed using SmartPLS 4 and SPSS version 28. For the purpose of ensuring the reliability of the measurement tool, first, the reliability analysis was performed using the two measures: Cronbach's alpha and McDonald's omega. In order to determine the construct validity, the correlation coefficient between each item and its corresponding dimension was determined to ensure that each item is a valid indicator of the respective dimension. Descriptive statistical analysis of students' response for each dimension of aesthetic knowledge was conducted through the calculation of descriptive statistics, including the arithmetic mean, standard deviation and relative importance of the respective variables. Finally, one-way Analysis of Variance (ANOVA) was used to examine whether there exist any significant differences between Year 2, Year 3 and Year 4 students in respect to their aesthetic knowledge. The level of significance was set to 0.05. Through the use of statistical analysis, the relationship between aesthetic experience and knowledge could be evaluated.

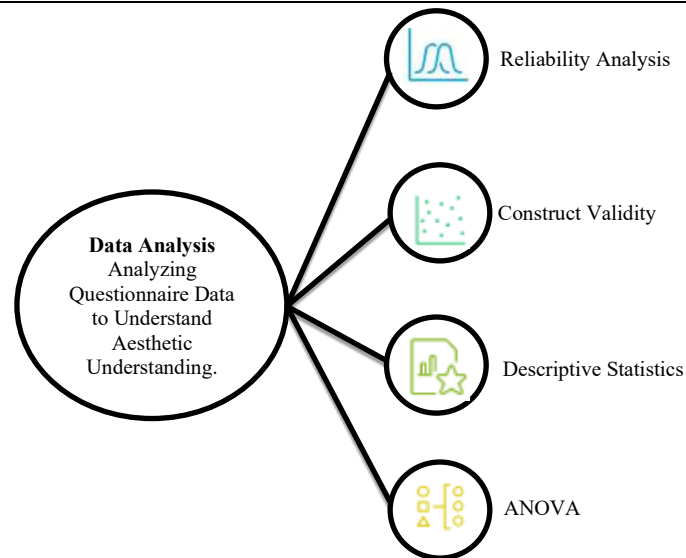


Figure 3. Statistical data analysis framework

The statistical data analysis model for the evaluation of the aesthetic knowledge of the students in the undergraduate architecture program is presented in figure 3. To perform an evaluation of the data collected with the help of the Aesthetic Experience Questionnaire (AEQ), four consecutive statistical analysis techniques were employed. First of all, the internal consistency of the measurement tool was measured through Cronbach's Alpha and McDonald's Omega Reliability analysis. Then construct validity was measured to check whether the dimension of the aesthetic experience defined by the AEQ was properly measured. At this stage, the analysis of the descriptive statistics, such as Mean and Standard Deviation, was performed to evaluate the students' responses concerning the four factors: emotion, culture, perception, and flow experience. The one-way Analysis of Variance (ANOVA) analysis was finally used to test the statistical significance of differences in the level of aesthetic knowledge of second, third, and fourth year architecture students.

Overall Aesthetic Knowledge Score

The overall aesthetic knowledge of a student is computed as the average of the four dimensions of aesthetic experience, namely emotion, culture, perception, and flow experience.

$$AK = \frac{EM+CU+PE+FE}{4} \quad (1)$$

Where (AK) refers to the total score of aesthetic knowledge, (EM) stands for the emotion score, (CU) is the culture score, (PE) is the perception score, and (FE) stands for the flow experience score.

The equation 1, total score of the aesthetic knowledge is defined as the average of the four dimensions of aesthetic experience, namely, emotion, culture, perception, and flow experience. All these four dimensions are contributing equally to the total score, and hence this equation gives an insight into the level of aesthetic knowledge of the students. Higher the value of (AK), the more is the level of aesthetic knowledge of the students.

Mean Score Calculation

The mean value of each questionnaire item is calculated to determine the average response of all participants.

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i \quad (2)$$

Equation 2, arithmetic mean is employed to determine the average response of the students on each of

the questionnaire items and each of the aesthetic dimensions. This is an easy way to estimate the general level of response of the participants. The mean values obtained can be used to ascertain the significance of the various dimensions before performing inferential statistics such as one-way ANOVA.

EXPERIMENTAL RESULTS

The following part highlights the result of the experiments that have been conducted based on the answers provided by undergraduate Architecture students in Aesthetic Experience Questionnaire (AEQ). The gathered information was subjected to analysis to examine the aesthetic knowledge of students in the four areas mentioned above. For the purpose of establishing the reliability and validity of the measurements instruments to be used, the reliability and validity tests of the questionnaires were done prior to conducting the hypotheses test. This was followed by descriptive statistical analysis as well as one-way Analysis of Variance (ANOVA) test in order to determine if there exist any significant differences between students' responses to questions for their second, third and fourth academic year. The results can indicate the efficacy of the architectural curriculum in developing students' aesthetic knowledge.

Experimental Setup, Dataset, and Parameter Initialization

The research was carried out through experimentation where the questionnaires were collected from 55 under-graduate architecture students in the 2nd, 3rd and 4th year of their education. The data collection instrument was Aesthetic Experience Questionnaire (AEQ), consisting of 14 items, which were categorized into four dimensions (Emotion (EM), Culture (CU), Perception (PE), and Flow Experience (FE)). Every statement was measured on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The collected data was pre-processed and analyzed using SmartPLS 4 and SPSS 28th version software. Cronbach's Alpha and McDonald's Omega were used for determining the reliability of the questionnaire while correlation analysis was used for assessing the construct validity. The mean and standard deviation were calculated to analyze the answers of students according to the descriptive statistical measures. Finally, the one-way Analysis of Variance (ANOVA) test was carried out at 5% level of significance ($p < 0.05$) to examine whether there are any differences in students' level of aesthetic knowledge among the different academic years. Table 2 summarizes the experimental design.

Table 2. Experimental setup, dataset, and model parameter initialization

Parameter	Specification
Research approach	Quantitative survey
Participants	55 undergraduate architecture students
Academic levels	Second, Third, and Fourth year
Data collection tool	Aesthetic Experience Questionnaire (AEQ)
Number of questionnaire items	14
Dimensions evaluated	Emotion, Culture, Perception, Flow Experience
Response scale	Five-point Likert scale (1–5)
Reliability analysis	Cronbach's Alpha, McDonald's Omega
Validity analysis	Construct validity (correlation analysis)
Statistical software	SmartPLS 4 and SPSS 28
Statistical tests	Descriptive statistics and One-way ANOVA
Significance level	$p < 0.05$

Performance Metrics

The performance of the proposed research study was analyzed through descriptive and inferential statistics so that reliability and validity could be ensured in the questionnaires. Arithmetic Mean was used to find out the average score provided by the participants for each item and each aesthetic dimension of the questionnaires.

Standard Deviation

The equation 3. shows standard deviation was calculated to measure the variability of participants' responses around the mean value.

$$SD = \sqrt{\frac{\sum_{i=1}^n (Xi - X)^2}{n-1}} \quad (3)$$

Where (SD) denotes the standard deviation, (Xi) is the individual response, (X) is the mean score, and (n) is the total number of observations.

Cronbach's Alpha

The equation 4. shows internal consistency of the questionnaire was evaluated using Cronbach's Alpha, which measures the reliability of the questionnaire items.

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum_{i=1}^k \sigma^2 i}{\sigma^2 T} \right) \quad (4)$$

Where α refers to the coefficient of Cronbach's Alpha, k denotes the total number of items on the questionnaire, $\sigma^2 i$ is the variance of each item and $\sigma^2 T$ denotes the variance of the total score. A high value of Cronbach's Alpha means the higher internal consistency of the measuring tool. Statistical performance criteria give a sound foundation for assessing the quality of data collected before descriptive analysis and one-way ANOVA.

Reliability and Validity Analysis

Reliability and validity tests on Aesthetic Experience Questionnaire (AEQ) were conducted before the hypotheses were tested. To conduct the reliability test, Cronbach's Alpha and McDonald's Omega measures were employed while for the validity test, the correlation between the items of the questionnaire and the dimensions of the questionnaire was studied. As a result, the measures for reliability demonstrated that the questionnaire had satisfactory internal consistency since all of them were more than 0.70. Besides, the validity test results revealed that there were acceptable correlations between the items of the questionnaire and the dimensions of the questionnaire.

Table 3. Reliability assessment of the aesthetic experience questionnaire (AEQ)

Dimension	No. of Items	Cronbach's Alpha	McDonald's Omega
Emotion	4	0.815	0.842
Culture	3	0.712	0.713
Perception	4	0.837	0.836
Flow/Immersion Experience	3	0.737	0.736
Overall Aesthetic Knowledge	14	0.822	0.812

All dimensions have reliability values higher than 0.70, implying good internal consistency of the questionnaire, as shown in the table 3. The highest value of Cronbach's Alpha among all dimensions was recorded for the Perception dimension (0.837), followed by Emotion dimension (0.815). Culture and Flow Experience dimensions had also achieved the required level of reliability (Culture – 0.712; Flow Experience – 0.737). The Cronbach's Alpha reliability value of the whole aesthetic knowledge scale was 0.822 and the McDonald's Omega was 0.812, implying the reliability of the questionnaire in measuring students' aesthetic knowledge. The construct validity also shows that all the questions of the questionnaire were significantly associated with the dimension of each of them.

Descriptive Statistical Analysis

Students' aesthetic knowledge was tested through descriptive statistical analysis during the second, third and fourth academic year. Arithmetic mean, standard deviation and the relative importance for each of

the aesthetic experience dimensions and aesthetic knowledge as a whole were calculated. Descriptive statistics provide a preliminary picture of the student's reaction before performing inferential statistics. Response Strength Matrix demonstrates that arithmetic means between 3.4 and 4.2 mean a high degree of agreement which illustrates the positive perception of the students towards their aesthetic knowledge.

Table 4. Descriptive statistics of aesthetic knowledge across academic years

Dimension	Second Year (Mean $\pm$ SD)	Third Year (Mean $\pm$ SD)	Fourth Year (Mean $\pm$ SD)
Emotion	4.000 $\pm$ 0.412	4.132 $\pm$ 0.366	4.025 $\pm$ 0.601
Culture	4.025 $\pm$ 0.601	3.956 $\pm$ 0.415	3.941 $\pm$ 0.445
Perception	4.167 $\pm$ 0.367	3.883 $\pm$ 0.550	4.147 $\pm$ 0.266
Flow Experience	3.975 $\pm$ 0.343	3.756 $\pm$ 0.511	3.726 $\pm$ 0.530
Overall Aesthetic Knowledge	3.833 $\pm$ 0.253	3.899 $\pm$ 0.252	3.987 $\pm$ 0.213

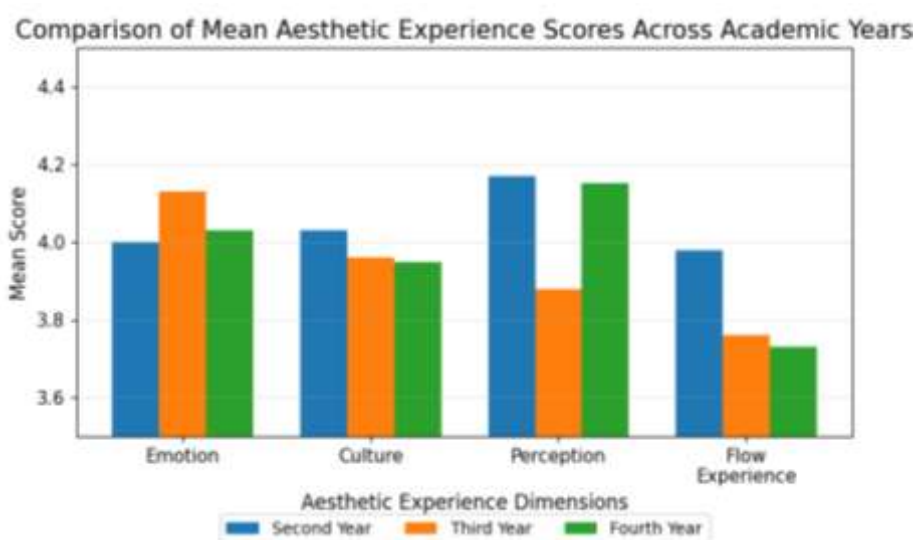


Figure 4. Comparison of mean aesthetic experience scores across academic years

As can be seen from table 4 and figure 4, the period of academic years 2013, 2014, and 2015 demonstrated quite a high level of aesthetic knowledge among the students of architecture. A little bit higher mean score was found in the comparison of the second and third year (+0.066) and in the third and fourth year (+0.096). Therefore, the increase in students' aesthetic knowledge through the course of studies is quite low. Among the students of the second and fourth year, the dimension of Perception showed the highest mean score (4.167; 4.147, respectively), whereas among the students of the third year the highest mean score was recorded in the Dimension of Emotion (4.132). Mean scores for Flow Experience were the lowest ones, ranging between 3.726 and 3.975 depending on academic year. Based on the descriptive analysis, the level of students' aesthetic experience can be considered quite high.

One-Way ANOVA Analysis

In order to analyze if there were any significant differences in terms of aesthetic knowledge of the students from the second, third, and fourth years of architecture, one-way Analysis of Variance (ANOVA) was employed. This analysis was carried out on each of the four dimensions of aesthetic experience (emotion, culture, perception and flow experience) as well as on the overall aesthetic knowledge score. The level of significance adopted for this study was 0.05. Results obtained from this analysis showed that the p-values for all the dimensions analyzed were more than 0.05 indicating that there was no significant difference among the three academic years. Therefore, it can be concluded that the knowledge as well as the experience of aesthetics remained constant throughout the period of architectural studies by these students.

Table 5. One-way ANOVA results for aesthetic knowledge across academic years

Dimension	F-value	p-value	Interpretation
Emotion	0.355	0.703	Not Significant
Culture	1.779	0.18	Not Significant
Perception	1.879	0.164	Not Significant
Flow Experience	0.161	0.852	Not Significant
Overall Aesthetic Knowledge	0.722	0.491	Not Significant

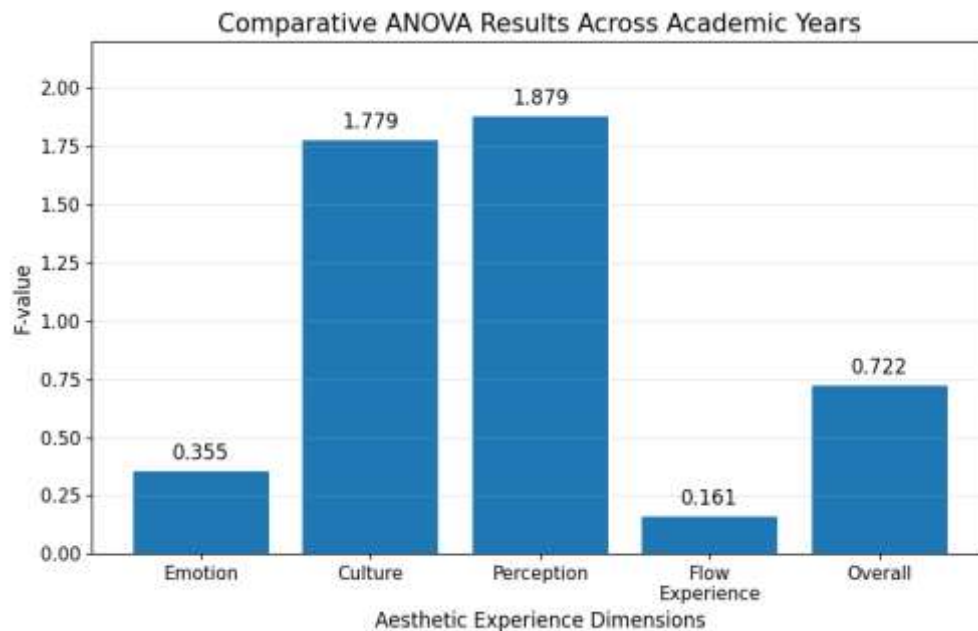


Figure 5. Comparative ANOVA results across academic years

One way Analysis of Variance for all four dimensions of aesthetic experience and also for the overall scores of aesthetic knowledges are provided in table 5 and figure 5. The highest value of F was recorded for the dimension of Perception (1.879), then Culture (1.779), and finally Flow Experience (0.161). However, all the results concerning the p-values were above 0.05, which indicates that there were no statistically significant differences between the second, third, and fourth-year students. For the overall aesthetic knowledge, $F = 0.722$; $p = 0.491$, which showed that academic progress had no significant impact on students' aesthetic knowledge. Thus, the results show that students maintain their aesthetic experience on the same level during the whole academic period, whereas the existing curriculum should be developed incrementally at various academic stages.

DISCUSSION

The findings of this study are helpful in gaining understanding about the formation of aesthetic knowledge among architecture undergraduates and the effectiveness of the current architectural education curriculum. The descriptive statistical analysis indicated that the students from the second, third, and fourth years of academic study were highly knowledgeable about aesthetics in four dimensions of aesthetic experience, including emotion, culture, perception, and flow experience, with no difference in all four dimensions between the three years. The total mean scores indicated that there was some increase in the level of aesthetic knowledge among students from Year 2 with a mean score of 3.833, to Year 3 with a mean score of 3.899, and to Year 4 with a mean score of 3.987. While it could be seen that students' perception of the aesthetics of architecture changed as they studied, the change was quite small, which suggests that the learning environment is quite stable and does not develop aesthetic competence among the learners.

The mean scores were higher on the dimension of perception, reflecting the high perceptual

competencies of the students in terms of observing, interpreting, and evaluating architectural form, space, and visual composition. This research proves the fact that architectural education through the studio-based method, design exercises, and visual analysis is highly successful in improving students' perceptual skills. However, the mean scores of students in flow experience were comparatively low throughout the year. This signifies the fact that students might not get much chance to feel deeply engaged, creative, and immersed in their work during the design exercises. There is a strong relationship between flow, creativity, motivation, and problem-solving, which makes this result significant to emphasize the importance of creating more interactive and experiential learning spaces.

The assessment of the reliability of the instrument also improves the credibility of the study. The Cronbach's Alpha of the Aesthetic Experience Questionnaire (AEQ) was found to be 0.822, while McDonald's Omega was found to be 0.812, with each dimension having a Cronbach's Alpha greater than the acceptable level of 0.70. This shows that the findings of the study confirm the validity and reliability of the questionnaire as a tool for assessing the knowledge of students in aesthetics and that the information obtained through the questionnaire is reliable for statistical analyses. The satisfactory reliability and validity of the instrument also enhance the credibility of the results obtained through the instrument.

Based on the analysis of one-way ANOVA, there were no statistically significant differences between the aesthetic knowledge of students from the second, third, and fourth years ($F = 0.722$, $p = 0.491$). In addition, all p-values for four different aesthetic parameters were > 0.05 , indicating the absence of statistically significant differences between academic years. Even though descriptive statistics revealed a slight increase in mean score with academic progress, it was not statistically significant enough to prove the influence of education on the aesthetic knowledge of students. This finding suggests that students acquire adequate aesthetic knowledge in early years of their architectural studies, and additional years of learning do not contribute to the change in students' aesthetic knowledge. Consequently, the current curriculum maintains the existing level of aesthetic skills of students without making them increasingly proficient.

The absence of statistically significant differences has several implications for the curriculum as well. It is clear that the existing process of education is quite successful in setting the level of aesthetic knowledge; however, continuous aesthetic development should be stressed in educational methods. Experiential learning, reflective design practice, interdisciplinary design, design critique, and design projects are some areas where students can have more opportunities for developing higher-order aesthetic thinking skills and creativity in problem-solving. Also, the implementation of new educational technologies such as virtual reality (VR), augmented reality (AR), AI design tools, and digital learning environments can be quite helpful in enriching the emotional experience of the students, their cultural perception, perceptual skills, and experiencing the flow state during the architectural design process.

Overall, the findings of the study revealed that the architecture education program at the undergraduate level in the city of Bandung possesses good knowledge in terms of aesthetics; however, there is little presence of continuous improvement related to the students' knowledge. Such findings make it clear that there should be an improvement in the curriculum in order to allow the students to have an aesthetic experience, along with its development. In particular, such a process can help students develop their creativity, critical thinking, aesthetic sense, and design skills, which will prepare them for dealing with all sorts of challenges in the field of architecture.

CONCLUSION AND FUTURE WORK

This research explored the correlation between aesthetic experience and aesthetic knowledge of undergraduate architecture students from the 2nd, 3rd, and 4th academic years through the administration of the Aesthetic Experience Questionnaire (AEQ). In terms of the reliability of the questionnaire, it was found that the instrument had good reliability since Cronbach's Alpha for all questions was 0.822 and McDonald's Omega was 0.812. As for the descriptive analysis, it was found that students' aesthetic knowledge had been consistently high with the mean scores of 3.833 (2nd year), 3.899 (3rd year), and 3.987 (4th year). However, in terms of a statistical test for differences in means, it

was revealed that there was no significant difference among the three academic years ($F = 0.722$, $p = 0.491$), which indicated that students' aesthetic knowledge did not significantly increase as the academic years progressed. In conclusion, it can be said that the architectural curriculum already gives importance to aesthetic learning but needs to have more teaching approaches.

The results of this study can be further extended for the future through a wider study conducted in various universities to generalize the results. Studies that would include longitudinal analysis of students throughout their course of study can help understand more about the change in their aesthetic knowledge development process. New technologies in education, such as VR and AR, in addition to AI design tools, can also be considered in future studies to investigate how students experience and perform in the aesthetics of architecture in light of these changes. A combined approach of a quantitative questionnaire along with a qualitative interview or design portfolio evaluation can also be considered in future studies for a holistic perspective of the results of studying architecture on architectural aesthetic knowledge and competence development.

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