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# An Ethnographic and Demographic View of Students Learning Styles and Performance in Architectural Design Studio (A Study in Jos, Nigeria)

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## Abstract

The field of Architecture requires imaginative thinking and innovative problem solving to design building structures. In order to create an inclusive and dynamic environment for architectural education, it is useful to recognise the contributions of students to the different learning styles that foster creative processes across all age groups. Age represents a multifaceted aspect of demography that harnesses diverse experience, knowledge, skills, and perspectives. This study considers the effect of age on the learning styles adopted by students in architectural design studio as ongoing concerns for student output in design continues to question how students learn and how their ways of learning differ from one another. This study juxtaposes two separate sequential studies which identify and seek to understand learning styles and preferences of second- to fourth-year Architecture students in the University of Jos, Plateau state; and to ascertain how awareness of this various learning styles can improve the communication between instructors and design students in design studio. A quantitative review of data generated using the Kolb's Learning Style Inventory (LSI) and analysed through descriptive statistical methods showed the preferred ethnographic means and demographic spread of students learning style preferences in each sample using tabulated descriptions and graphical descriptions on the basis of the Kolb's Learning Style Theory. The study ascertained that the age and preferred learning style of a student can determine how well he/she performs in design studio. It also concluded that there are significant differences between performances of students of every pair of learning styles. The results of this study strongly suggest that recognising the association between learning styles and age-based performance in design studio will lead to both more perceptive teaching and also more responsive learning.

**Keywords:** *Age, Architectural education, Design studio behaviour, Learning styles*

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**Background to the Study**

Traditional architectural education has its foundation in the design studio. Students transform a field of inquiry into a proposition or scheme producing diverse works in analogue and digital media (sketches, CAD drawings, conceptual and scale models, and written work), continually communicating with one another and receiving comments from tutors and critics (Ilozor, 2006). The learning experience combines self-reflected knowledge from other disciplines, and consciously developed into an acquired design skill combining knowledge and intelligence, amongst other hard skills (Demirbas & Demirkan, 2003). Students have different strengths and preferences in the ways how they take in and process information, which is to say, they have different learning styles. While various research has explored the impact of personality traits, educational approaches, and cultural backgrounds on creative learning, the role of age in shaping design skill amongst architecture students is an area which needs closer examination.

There are still many unknown facets to design studio learning in the midst of the different ethnographic and demographic factors among design students. The curriculum of contemporary design education is studied under fundamental courses that provide the basic knowledge necessary for the formation of design. There are also technology-based courses which provide the scientific basis for the formation of design. There are artistic courses which strengthen the base of expression and the presentation techniques related to design. Finally, there are design studio courses, which are a synthesis of the previous three categories (Demirbas, 2001; Uluöglu, 2000). Design studio courses are the pedagogical scaffoldings of design education.

The bulk of educational theories proposed so far have classified learners into different learning styles and the Kolb's (1984) Experiential Learning Theory (ELT) has been widely used to explore the learning styles of undergraduates. In this theory, learners are classified into four types according to their preferences of cognitive stages of learning: Accommodators, Divergers, Assimilators, and Convergers. Age is a representation of a multifaceted construct that include different stages of life, experiences, knowledge, and perspectives. Architecture students come from diverse age groups – from post-secondary individuals to graduates from tertiary institutions pursuing a career change – each of whom comes with differing perspectives which may impact their approach to learning how to design.

The aim of this study is to examine the age-based effect of learning styles on the performance of selected students in design studio for the purpose of making instructors more aware of learning styles for flexibility in teaching and improve the communication between them and their design students. The identification of learning styles is based on Kolb's Experiential Learning Theory. The specific objectives of the study are to identify the age-based learning preferences among architecture students; ascertain how awareness of age-based learning styles may impact design output among architecture students; and to contribute evidence-based discourse on the appropriateness of adapting age-based learning styles in the neuromyths of learning style theories.

**Literature Review**

Prior to the advent of formal architectural education nearly 300 years ago, architecture was taught as an apprenticeship under a Master or "Maestre. The establishment of the Parisian Ecole des Beaux-Arts in 1975 paved the way for the Bauhaus in 1919 which relied on an educational foundation that integrated the visual artistic architectural creativity of the Ecole with mathematical structural engineering. The goal was to take complete novices through the united disciplines of the architectural profession (Salama & El- Attar, 2010; Olotuah, 2001, 2006).

Architectural education in Nigeria can be traced back to the colonial era when architecture was primarily taught within the framework of engineering programs (Akpakpan et al, 2019). The first programme in Nigeria started with the establishment of the Nigeria College of Arts, Science and Technology Ibadan, Oyo state in 1952. It was relocated to Zaria in Northern Nigeria in 1955 and in 1962, the first Department of Architecture was established at the Ahmadu Bello University (ABU) Zaria (Arayela, 2001). This was then followed by the University of Nigeria, Nsukka and University of Lagos, Akoka. Presently, about 30 schools were accredited for undergraduate and 15 schools for post graduate architecture programmes.

The curriculum of architecture in Nigerian schools of architecture is designed according to a hybrid of the British and American architectural education systems. The design studio is a core subject in architectural education, all other supporting architectural courses provide contributions towards design learning. In the course of designing, the designer is learning about the problem, the solution, and relationships between them (Cross, 2011; Stotsky, 2012). Most architecture students interact with the design studio as they would an apprentice workshop: a physical and social space whose sole purpose is to investigate design through informal modes of exchanging insights, developing communicative abilities as well as their problem-solving skills and sensitivities (Cikis & Cil, 2009). This testing ground for the student to allows them to demonstrate control and command over their creative abilities: beginning with a basic and elemental design project beginning typically from the second year of study, the students then progress into much more complex building projects.

Studies show there are several ways of learning, that is to say that individuals differ in their preferred way of absorbing, collecting and retaining information. Various learning styles have been investigated and numerous theories and multiple models attempting to describe how people think and learn have been proposed; among them are the Dunn and Dunn Model, the VARK Model, Felder-Silverman Model and Kolb's Experiential Learning Theory. With sufficient evidence that individuals differ in how they prefer to take in, process, and acquire new information, the educational implications of such preferences have been a source of great debate among researchers and educators over the years (Pashler et al., 2009).

Selected studies have found validity in using learning styles in education: critics say there is inconsistent evidence identifying students individual learning style and teaching for specific learning styles produces better performance (Newton & Salvi, 2020; Thomas, 2021; Whitman, 2023). However, advocates of learning styles assessment in instruction believe that

learning styles can be measured and used as a valuable teaching tool inside the learning environments (Sims et al, 1986; Cornwell & Manfredo, 1994; Mainemelis et al., 2002; Rutz, 2003; Sternberg et al., 2008). According to these researchers, by identifying students' learning styles and matching them to teaching methods, learning can be greatly boosted. Hence, these scholars opine that modifying instruction to students' individual learning styles can indeed lead to better learning results in instruction (Iliff, 1994; Kayes, 2002; Willingham, 2005).

Kolb Experiential Learning Theory (ELT) has the greatest bearing on design learning as it uses the Learning Style Inventory (LSI) to help determine the learning preference of an individual based on innate characteristics and past experiences. From these foundations, Kolb has developed a learning theory in which learning is modelled as a four-staged cycle comprised of Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualisation (AC), and Active Experimentation (AE). The ELT portrays two bipolar dimensions from the four stages in the learning cycle namely the perceiving (vertical axis) and the processing (horizontal axis). It suggests that the CE dimension is dialectically opposed to AC, and likewise RO to AE. From their life experience and innate characteristics, individuals will develop preferences for one or two particular phases of the four-learning cycle. Therefore, a combination of scores on the two dimensions classifies learners into one of four learning styles namely: Accommodating (CE and AE), Diverging (CE and RO), Converging (AC and AE) and Assimilating (AC and RO) (Kolb & Kolb, 2005).

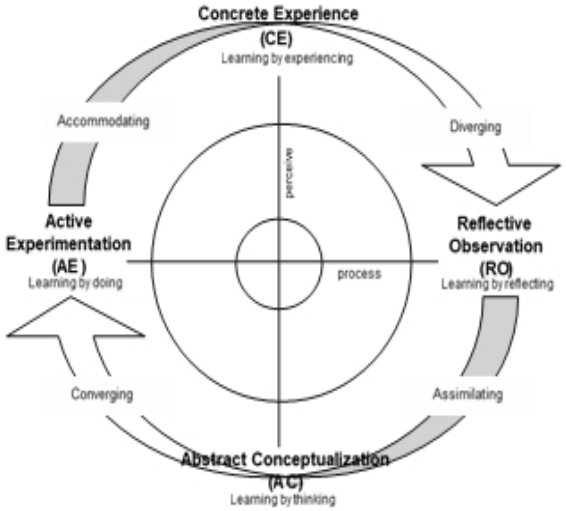


**Figure 1:** Four learning phases of Experiential Learning Theory
**Source:** Kolb, 1984

Accommodating learners perceive through Concrete Experience (CE) and process through Active Experimentation (AE). Accommodators learn primarily from "hands-on" experience, are prone to risk-taking, and enjoy finding out new experiences. They solve problems using a trial-and-error method rather than analytical abilities. Also, these learners rely on others for information, work well with others to do assignments, to set goals, to do field work and to test various approaches for design alternatives (Kolb & Kolb, 2005). Diverging learners observe

through Concrete Experience (CE) and perform by Reflective Observation (RO). They are less concerned with theorems and generalisations. Their approach to problem solving is less systematic and more creative in comparison to the other learning styles. These learners when working in-groups listen to the suggestions of others and accepting of critiques from them.

Converging learners perceive through Active Conceptualisation (AC) and process by Active Experimentation (AE). Convergers are prone to finding practical use to theories and ideas and are good at solving problems and making decisions. Kolb suggests they prefer to shun social and interpersonal issues and interact better with technical tasks. Assimilating learners perceive through Active Conceptualisation (AC) and transform by Reflective Observation (RO). They prefer to experience their world through symbols and manipulate information through abstraction (Demirbas & Demirkan, 2003). They are more concerned with abstract ideas rather than practical applications. These learners prefer readings, discourse and exploring systematic models (Kolb & Kolb, 2005).

In summary, Accommodators understand facts and evidence from concrete experience and process it from active experimentation. Divergers understand facts and evidence through concrete experience and convert it through reflective observation. Convergers understand facts through abstract conceptualisation and convert it through active experimentation, Assimilators understand evidence from abstract conceptualisation and convert it through reflective observation. There have been some empirical studies which suggest that there are disciplinary differences in learning styles and that the dominant style in architects is the accommodator learning style (Kolb & Kolb, 2005). Demirbas and Demirkan (2003), evaluated the effects of learning style preferences on the performance of design students using Kolb's ELT; they found that accommodating students were the least frequent among the learning styles and majority of the students were assimilators and convergers and that there were statistically significant differences between the performances of students with different learning styles in different stages of the design process.

A study in China found biased correlation between the academic success of students with different learning styles; the research concluded that students who were convergers were less successful in the architectural design studios than assimilators (Kvan & Jia, 2005). In another study, Demirbas and Demirkin (2007), focused on the learning styles and their relationships with gender and scores related to four artistic, technical, basic and design courses and new students total grade point average in three consecutive semesters. In this study, the convergent and assimilating learning styles were the students' preferences. Although the relationship between gender and learning styles was not significant, male students scores were higher in technical courses than the females. There was significant difference in students' design scores with divergent and convergent learning styles.

In a study in Nigeria, the design students learning styles were measured in the first and final years of their education by using the experimental model of Kolb's learning style (Akinyode & Khan, 2016). The results indicated that the dominant learning style of most first year design students were diverging (44%). In addition, the prevailing styles of students in the final year of

the study were diverging (50%). One study on the learning styles of students in the University of Jos found that the distribution was greater in the diverging and converging learning styles which contradict previous research findings which showed that architectural students tend to fall within the accommodating and assimilating learning styles (Dassah et al, 2018).

As another fundamental aspect of human development, age plays a vital role in various domains of life; and it refers to the number of years a person has lived since birth is considered a key demographic characteristic. The idea of age encompasses not only the physical aspect but also psychological, social, and cultural dimensions. Having an understanding on the background of age includes considering its implications across different context and disciplines. From a designers' perspective, age has been known to affect development stages and creative potential (Goldschmidt & Tatsa, 2005), level of exposure to design influences (Gautam & Blessing, 2009), diverse perspectives and problem-solving approaches (Oxman, 2004), and adaptability and flexibility (Goldschmidt & Tatsa, 2005). While age has been beneficial to learners in gaining experience, wisdom, knowledge and reasoning skills, some researchers argue that ageing has been known to slow down wit, decrease information processing speed, reduce specific cognition, cause a decline in concentration to set goals/tasks, hinder multitasking abilities, forget contextual incidences, and diminish long-term memories (Young, 2020; Hilton et al, 2021). This present study examines not only students in their design environments but also the impact of responders' age (and its attendant features) on learning styles in design studio modules.

**Methodology**

This study utilises a quantitative research approach requiring a statistical interpretation of numerical data (MacMillian & Schumacher, 2001). The study also involved a qualitative ethnographic approach to appraise how the students' design studio behaviour affected their learning styles. The design for this study is the descriptive method of research which is appropriate for inferring the observed learning styles and for exploring possible relationships between preferred learning styles and selected characteristics of the population such as age (Durrheim, 2004; Ahuja, 2010). The samples were selected by purposive random sampling of second- to fourth-year students in the Department of Architecture, University of Jos from two separate yet sequential studies. The reason for selecting these is based on the assumption on the longitudinal research of Kolb and Kolb (2005) that shows increasing movement in learning style from a reflective to an active orientation through higher education years over two academic sessions. In the first study in 2021, a sample of 50 students were invited to participate in the study of which 41 students filled the questionnaires correctly and returned them accordingly. This represents a response rate of 82% which fulfils statistical requirements for a valid survey. In the second study in 2023, a total of 70 students were invited to participate in the survey in which 58 responses were recorded giving a response rate of 82.9%.

From the first study, four learning processes, namely Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualisation (AC) and Active Experimentation (AE), were obtained using a total of the students' responses ranked from 1 (least compatible) to 4 (most compatible) options for each question. The students were then classified into one of four

learning styles namely divergent, accommodating, assimilating and convergent styles which were juxtaposed against graded design studio performance. In the second study, students were asked to rank the perceived influence of their ages on developmental stages and creative potential, level of exposure to design education, diverse perspectives and problem-solving approaches, and adaptability and flexibility. The compared findings are presented using simple percentages, tables, graphical descriptions (graphs and charts), and descriptive statistical methods.

**Data Presentation and Discussion**

The sample from the 2021 comprised of 32 male students (78%) and 9 female students (22%); the 2023 study had 38 male students (65.5%) and 20 (34.5%) female students. In the 2021 study, 19 students (46.3%) were aged between 18-21 years old, 16 students (39.1%) were aged between 22-25 years old, and 6 students (14.6%) were aged between 26-30 years old. None of the respondents were aged 31 years old or older. In the 2023 study, 18 students (31.1%) were in the 18-21 years old range, 17 students (29.3%) were in the 22-25 years old range, an additional 17 students (29.3%) were aged between 26-30 years old, and 6 students (10.3%) were aged 31 years or older. By implication, the sample was made up of mostly male students (70.7%) and a reasonably young demographic (also 70.7%) below 25 years old. By administering a questionnaire modelled after the Kolb's Learning Style Inventory (LSI) test to students about their design studio activity and performance in the 2021 study, the specific distribution of learning styles was obtained and summarised in Table 1 below:

**Table 1:** Summary of responses to Kolb's Learning Style Inventory (LSI) test (2021)

| No. | Question | Frequency | Percent (%) | Cumulative Percent |
|---|---|---|---|---|
| 1. | **When tasked with a new design project...** | | | |
| | I like to try out new methods /approaches | 5 | 12.2 | 12.2 |
| | I like to watch and observe others work | 16 | 39.0 | 51.2 |
| | I like to spend time analysing the design problem | 8 | 19.5 | 70.7 |
| | I like to get practical with any design project | 12 | 29.3 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 2. | **I get my design inspiration from...** | | | |
| | My intuition/gut feeling | 17 | 41.5 | 41.5 |
| | Observing others work carefully | 12 | 29.2 | 70.7 |
| | Studying about a variety of building theories and ideologies | 8 | 19.5 | 90.2 |
| | Visiting building construction sites | 4 | 9.8 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 3. | **During design studio...** | | | |
| | I get involved in discussion | 10 | 24.4 | 24.4 |
| | I am quiet and reserved | 17 | 41.6 | 66.0 |
| | I tend to reason logically | 4 | 9.6 | 75.6 |
| | I imagine design problems in real life situations | 10 | 24.4 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 4. | **I design...** | | | |
| | Spontaneously | 8 | 19.5 | 19.5 |
| | From observations | 10 | 24.4 | 43.9 |
| | Rationally | 13 | 31.7 | 75.6 |
| | Practically | 10 | 24.4 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 5. | **I approach design with...** | | | |
| | An open mind | 5 | 12.2 | 12.2 |
| | Careful observations | 14 | 34.1 | 46.3 |
| | Logical thinking | 7 | 17.1 | 63.4 |
| | Practically | 15 | 36.6 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 6. | **When I am designing...** | | | |
| | I am an intuitive person | 7 | 17.1 | 17.1 |
| | I am careful and observant | 10 | 24.4 | 41.5 |
| | I am thinking reasonably, looking for arguments | 16 | 39.0 | 80.5 |
| | I am an experimental person | 8 | 19.5 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 7. | **I design based on...** | | | |
| | Personal experiences | 2 | 4.9 | 4.9 |
| | Observations | 12 | 29.2 | 34.1 |
| | Rational Theories | 9 | 21.9 | 56.0 |
| | Real-life scenarios | 18 | 44.0 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 8. | **When I design...** | | | |
| | I feel personally involved in things | 8 | 19.5 | 19.5 |
| | I take my time before designing | 20 | 48.8 | 68.3 |
| | I like to work with ideas and theories | 5 | 12.2 | 80.5 |
| | I like to see results from my work | 8 | 19.5 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 9. | **I produce my best designs when...** | | | |
| | I can follow my intuition | 9 | 21.9 | 21.9 |
| | I take down criticisms from others work | 11 | 26.9 | 48.8 |
| | I analyse the design problem thoroughly | 7 | 17.1 | 65.9 |
| | I can carry out experiments | 14 | 34.1 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 10. | **For any new design project...** | | | |
| | I rely on my gut feeling | 18 | 44.0 | 44.0 |
| | I take my time before starting the design project | 12 | 29.2 | 73.2 |
| | I refer to existing theories and rationale | 8 | 19.5 | 92.7 |
| | I start working immediately | 3 | 7.3 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 11. | **When a design brief is given...** | | | |
| | I like to follow my intuition | 12 | 29.2 | 29.2 |
| | I like to observe others work first | 17 | 41.5 | 70.7 |
| | I like to evaluate the brief | 8 | 19.5 | 90.2 |
| | I like to start working on my design | 4 | 9.8 | 100.0 |
| | *Total* | 41 | 100.0 | |
| 12. | **I produce my best designs when...** | | | |
| | I am working with others | 3 | 7.3 | 7.3 |
| | I take my time to think before designing | 14 | 34.1 | 41.4 |
| | I am working with reasonable theories | 9 | 21.9 | 63.3 |
| | I can try things out and practice | 15 | 36.6 | 100.0 |
| | *Total* | 41 | 100.0 | |

**Source:** Adetula (2021)

Each of the learning styles are weighted thus: concrete experience (CE) – 1, reflective observation (RO) – 2, abstract conceptualisation (AC) – 3, and active experimentation (AE) – 4. The deductions made from the combination of scores on the two dimensions, (AC-CE) and (AE-RO) then classifies learners into one of four learning styles namely divergent, accommodating, assimilating and convergent styles given on Table 2.

**Table 2:** Overall distribution of learning styles of students in the sample

| Learning style | Second year | Percent (%) | Fourth year | Percent (%) | Total | Average Percent (%) |
|---|---|---|---|---|---|---|
| **Divergers** | 3 | 15.8 | 2 | 9.0 | 5 | 12.4 |
| **Accommodators** | 4 | 21.1 | 4 | 18.1 | 8 | 19.6 |
| **Convergers** | 5 | 26.3 | 7 | 31.8 | 12 | 29.1 |
| **Assimilators** | 7 | 36.8 | 9 | 40.9 | 16 | 38.9 |

**Source:** Adetula (2021)

The results showed that among the students that participated in the study, the distribution tended to be greater in favour of assimilating (36.8%, 40.9%) and converging (26.3%, 31.8%) learners. Among assimilating learners, the dominant learning preferences are learning by observation (RO) and learning by experiencing (CE), while converging learners tend to prefer learning by thinking (AC) and learning by doing (AE). The analysis continued with a comparison of the student preferred learning style with their performance in design studio programmes. Records were obtained from a public scoring system during a jury (or crit) of the sampled students at the conclusion of the academic session. The weighted scoring system used during the jury exercise assesses the student concept formulation techniques, functional requirements, presentation techniques and oral presentation skills. The grading system used ranked the students from A to F (A being a distinction and F being the failing grade). The ordinal scale for grading is as follows: A (70-100%); B (60-69%); C (50-59%); D (45-49%); F (0-44%). From the records, 1 student (2.4%) from the sample earned an A-grade, 8 students (19.6%) earned a B-grade, 15 students (36.6%) earned a C-grade, 16 students (39%) earned a D-grade, and 1 student (2.4%) earned an F-grade. The distribution of the grades earned amongst the four learning styles is shown on Figure 2.

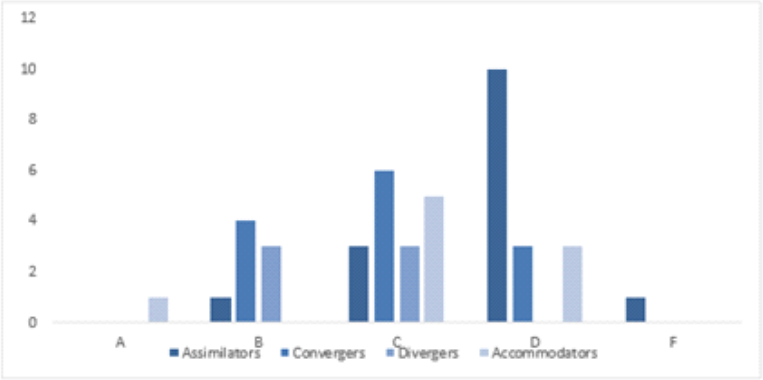


**Figure 2:** Grade distribution by learning style among observed students (Adetula, 2021)

The results show an uneven distribution among the four learning styles. Assimilators (39% of the population) were found to receive proportionally larger C- and D-grades than other learning styles. All the bottom performers in the jury were also Assimilators. Convergers (29.3% of the sample), earned mostly B-, C- and D-grades in comparison to Divergers (12.2%) who were mid-level performers with B- and C-grades. In this study, Accommodators (19.5% of the sample) were the only group to receive an A-grade but of note, were observed to receive C- and D-grades, featuring as both top- and mid-performing students in the jury exercise. However, in the sample observed, more Assimilators are middle- to bottom performers and most top-performers are Accommodators. Divergers and Convergers are typically middle performers in design studio.

This study then relies on the influence of the age of the students to shed more light on the role played by learning styles in the architectural studio and further strengthen the discussion on architectural student overall performance. From the successive study conducted in 2023, the findings on age-related effects on student learning styles focuses using four key indices, namely: creative potential through the developmental stages, level of exposure to design influences, ability to solve problems through diverse perspectives, and situation-responsive adaptive skills. Table 3 shows the student responses to the influence of their age on the development of creative potential:

**Table 3:** Student Responses to Influence of age on their creative Development (2023)

| | Not at all Influential % | Influential % | Very Influential % | Extremely Influential % |
|---|---|---|---|---|
| **Gender** | | | | |
| Female | 25.0 | 30.0 | 40.0 | 5.0 |
| Male | 13.3 | 39.4 | 39.4 | 7.9 |
| **AGE** | | | | |
| 17-25 | 14.3 | 28.5 | 37.2 | 20.0 |
| 26-30 | 17.3 | 36.2 | 25.8 | 20.7 |
| 30-above | 0.0 | 50.0 | 16.2 | 33.8 |
| **Level** | | | | |
| 100 | 0.0 | 66.7 | 33.3 | 0.0 |
| 200 | 25.0 | 50.0 | 0.0 | 25.0 |
| 300 | 12.5 | 50.0 | 12.5 | 25.0 |
| 400 | 4.6 | 44.3 | 34.8 | 16.3 |

**Source:** Sunday (2023)

The findings indicate that an average of 52.8% of the students in the sample opined that their age had a significant influence on their creative potential. The significant attributes of age that were perceived to be advantageous to students include increased opportunity to garner more hands-on experience (32.7%), development of cognitive skills (13.8%), accumulation of knowledge (25.9%), and heightened wisdom (27.6%). These findings were gender neutral, exclusive of the age ranges of the respondents, and evenly distributed among the learning styles. No responses were recorded of those who observed traditional age-related redundancy

in learning abilities, however a small group of respondents expressed concern that their ability to cope with the dynamism of creative design activity would regress as they aged. On average, only 10.5% of the respondents held that age was uninfluential in the development of their creative potential: the lowest number of respondents in this category being 4th year students. This standpoint may not be unconnected to the students' higher level of design skill which is presumed to have transitioned over the years of training. The random distribution of responses is further observed among the students as 3.5% strongly disagreed, 43.1% disagreed, 44.8% agreed and 8.6% strongly agreed that age was generally considered a factor in the development of creative potential through learning styles and strategies.

The 2023 study findings further observed that 65.5% of the students in the survey believed that their exposure to series of architectural experiences – within and outside the instructional design studios – places significant influences on learning styles. 53.5% of the sample felt that older students who are exposed to more architectural experiences benefit from "significant" or "very significant" influences on their learning styles; however, less than a third of the sample (32%) actually adopted learning styles involving concrete facts and evidence based on hands-on experience typically associated with Accommodators and Divergers. This finding seems to suggest that the respondents are largely aware of the influence of age-experience on creative potential, but fewer respondents practically embrace the stimulus in their design studio activity. 79.3% of the respondents from the 2023 study opined that age-related influences on student learning styles enhanced their abilities to view design problems from diverse perspectives and problem-solving approaches. This, in some way, contrasts the findings from the 2021 study where most of the students (68%) learned as Assimilators and Convergers who form abstract conceptualisation converted by reflective observation or active experimentation, respectively. Though the most statistically frequent group of learners in the sample, these students were more likely to be middle- to bottom-performers in instructional design studios. Although findings from the 2023 study indicate that a significant number of respondents (94%) perceived that their advancing ages over the period of study influenced their ability to learn, retain and apply information with greater flexibility or dexterity, age-related traits were not generally considered the most influential factors on creative output. Figure 3 shows age-related traits such as exposure and learning styles were ranked 2nd and 7th, respectively.

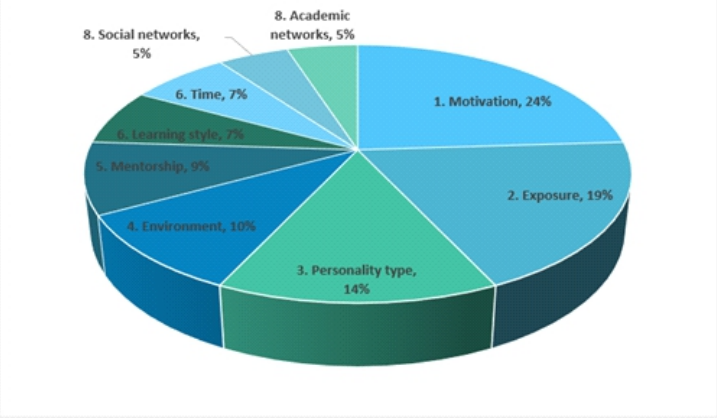


**Figure 3:** Perceived ranking of factors that affect instructional design studio performance (Sunday, 2023)

When asked their perceptions about the support and development provided for diverse learning styles distinguished by age-related traits, 93% of the students desired more pedagogical scaffolding from architectural learning institutions. This could come in the form of mentorship programmes, random groupings of students into interactive focus groups or contextual teaching styles modified to encourage students to develop design situation-responsive skills and express optimism for design education.

**Conclusion**

This study employed the Kolb's Experiential Learning Theory (ELT) based on the Learning Style Inventory (LSI) to explore the effect of learning styles on students' performance in design studio. The study also examined the perceptions of age-based influences on selected learning styles on a sample of second year to fourth year architecture students in the University of Jos, Nigeria. The study findings reveal that not only does design studio learning encompass a wide range of styles, but the study also underscored a significant link between learning styles of students, their ages, and their performance in design studio. The sample was largely made up of Assimilators and Convergers but Accommodators were better all-round performers in the design studio programmes. While more than half of the students surveyed acknowledged the significant impact that age-based influences exert on creative design potential, less than a third of the respondents embraced those influences, and as a consequence, were out-performed by those who do.

The study findings strongly acknowledge the association between learning styles and performance in design studio that ought to lead to both more perceptive teaching and also more responsive learning. This will provide insight into how to address the diverse learning styles of architecture students, especially those whose learning style is often at variance with traditional architectural design curriculum. Design studio programmes ought to give the opportunity to utilise different learning styles and pedagogical support in the instructional design process by providing different experiences that accommodate different learning styles and age-based influences during design process. Subsequent studies and discussions on the relationship between learning styles, age-related differences and design studio performance would be enriched through active experimentation, testing and analysis with specific Learning Design Experiments (LDEs).

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