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# EXPLORING GENDER DISPOSITION OF ARCHITECTURE STUDENTS IN DESIGN STUDIO

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**Abstract**

This study explored gender disposition of architecture students in design studio based on technical, sequential, precise and confluent processes using a survey of 69 final-year undergraduate and postgraduate students at Ahmadu Bello University Zaria, Department of Architecture. Data was analysed in SPSS v21 for descriptive statistics, Chi square, Independent samples t tests and Correlations. Results reveal non-significant differences for gender influence on design ($\chi^2$= 3.037, df=1, n 66, *p=0.081*), implying females are not disadvantaged in design related issues. Males showed higher tendencies to employ all learning processes in design. Females tend to employ Technical and Confluent processes, indicating males are more balanced in approach to design. Design processes inversely relate to grades received, suggesting work performed in studio may inadequately be reflected in grades received in design studio.
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## 1. INTRODUCTION

Gender related issues pertaining female professionals have a long-standing tradition in the Construction Industry (CI) [1] and architecture as a profession [2]. Females have frequently been noted to be disadvantaged in design and construction related disciplines as well as in architecture owing to several related reasons. First, construction related jobs are traditionally skewed in favour of males [3] [4]. Secondly, societal perception of construction and design jobs being unfit for women is partly entrenched by cultural, environmental and religious values where women stay at home and take care of the family [5]. Thirdly, females are perceived to be best suited for service jobs while men are traditionally accorded science and technology based careers and vocations [5] [6]. Although these perceptions are changing, an openly masculine culture in the CI where male values of long working hours often away from home, intensive labour output and high competitive environments is entrenched [1]. Consequently, several studies focus on modalities towards retaining females in construction and architecture [7] [8] [9] [10] [11].

In Nigeria, one strategy of retaining women in construction addresses low admission and attrition rates in university enrolment and other related issues in construction education such as experiences of students with respect to gender as well as role staff and mentors play in construction education [12] [5]. However, few studies address gender issues related to design within higher education such as Schools of Architecture [13]. This is important because design is a fundamental activity in construction and core of architecture education [14]. Investigating whether females differ in disposition from males in the most basic architectural activity of design is important to gain an understanding of ways both genders approach design process right from architecture school. Disposition in the context of this study refers to the predominant tendency towards design process in studio. This can proffer an explanation of gender skews especially in developing countries where gender prejudices are arguably higher compared to the more liberal climate in developed countries. The study poses the following research questions:

1. Are there significant gender differences in learning disposition of architecture students in design processes?

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2. Are there significant relationships between design processes and design grades of architecture students?

## 2. LITERATURE REVIEW

**Design process and learning styles**

The principal aim of architecture education is to prepare students for practice in order to solve design problems through construction and coordination. This usually involves a systematic approach where design thoughts are translated to paper (or other media) prior to construction. According to [15], architects employ various processes and stages in architectural design. These include but are not limited to identifying a need, researching the problem, creating and analysing a brief, generating ideas and possible solutions to the problem, synthesising, selecting a preferred solution as well as writing a specification. Alhough design process appears linearly progressive, [16] notes in reality, architectural design process is rarely so. Such thinking suggests, again apparently logically, that design proceeds from the general to the specific, from ‘outline proposals’ to ‘detail design’. Actual study of ways designers work reveals this to be rather less clear than it may seem [16]. This idea is collaborated by studies in practice where designers often analyse, synthesise and appraise both problem and solution simultaneously [17]. Within academia, learning in architectural design studio (ADS) involves receiving and processing information, with most important learning experiences based on self-reflection [18]. This process could often be linear and generalised in what [19] described as analysis-synthesis paradigm. “Students are often unable to translate the results of the first analystic phase into successful design and are led to believe that an optimal solution will signify the end of the process . . . it is assumed that a creative leap will translate the program into the design” (p. 17). This is often not the case. To mitigate this problem, [19] propesed a Process Oriented Model based on the design process in ADS and teaching styles to address various learning styles of students. Design process component of the model integrates analytical understanding of the problem at hand through exploration and information gathering with creative decision making through interpretation of how the design problem has been understood, followed by developing a schematic design. Teaching style component adopts tenets of Multiple Intelligence and Split Brain theories. Multiple Intelligence Theory according to [19] posits that several methods of learning including logical, visual and verbal exist while Split Brain Theory recognises different but complementary ways of processing information. Specifically, Split Brain Theory postulates a linear sequential style capable of producing patterns in the left side of the brain in rational deductive ways while the right side constructs patterns in a spatial-relational style involving inductive intuitive activities (Figure 1). Students are thus involved in this interrelated mode of analysis, synthesis and evaluation throughout ADS. Subsequently, [13] related Salama’s Process Oriented Model to learning styles of students in ADS using the Learning Combination Inventory (LCI).

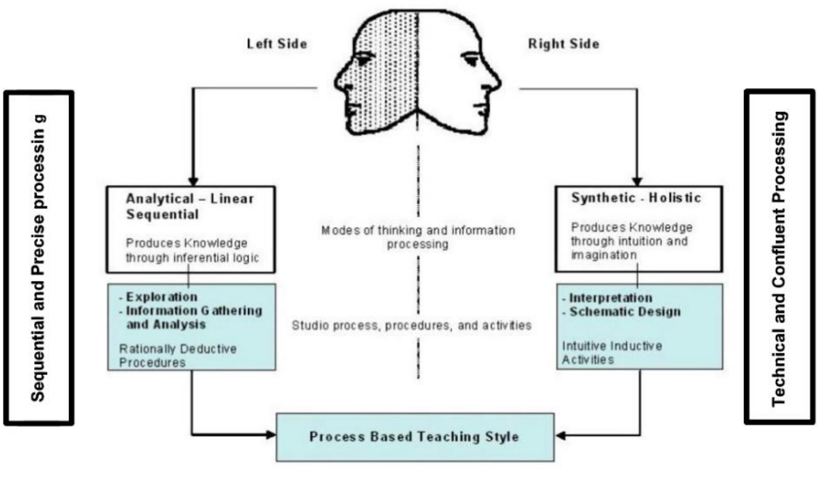


Figure 1: Salama’s Process Oriented Model to LCI. *Source:* [13]

LCI based on Kolb's learning cycles [20] is one of few learning style approaches to focus on learner's inherent disposition [13]. Administered as a questionnaire, LCI measures four learning tendencies namely Precise, Technical, Sequential and Confluent processing [21] [22] [23] [23] [24] [25] [13].

Precision processing (PP) is associated with accuracy, detail and information [24]. Precise learners need to be kept informed and express themselves in correct and detailed ways. Such learners learn best when there is a lot of detailed information, time to cross check work as well as opportunities to ask many questions [21]. The overriding characteristic of PP is certainty. Sequential processing (SP) is associated with order, structure and organisation. [24] notes sequential learners need to clear instructions, practical lessons and clear expectations. They learn best with clear, step-by-step directions, samples to look at, a plan to follow and sufficient time to go over directions [21]. Overall, sequential processing aims at establishing well-organised links with previous learning experiences [20]. Technical processing (TP) is associated with relevance, hands-on learning and problem solving [20]. Learners in this category exhibit the need for practical application, preferring projects to writing tasks. Learning under this category is best when individuals work alone, have opportunities to exhibit skills and learn from real world experiences usually on projects rather than pen and paper assignments. In other words, TP is characterised by controlling one's learning processes. Confluent processing (CP) is characterised by innovation and taking risks. Such learners require open-ended options, creativity, capability to create unique ideas and solutions to problems. CP involves intuition and non-conventional methods.

**Gender disposition in the architectural design process**

Studies investigating gender dispositions relate to ways learners learn with reference to ADS and design using LCI. [20]'s study found most learners employ different processes at different times of the design process in ADS, further suggesting learners adapt to preferences and value systems of schools and tutors in studio over time. On average, the study found males showed a slight preference towards TP. This finding is consistent with results from [26] where men showed significantly higher tendencies to employ TP. Indeed, students in technical disciplines such as engineering employ TP on a first order level [24] compared to findings from Humanities [26]. Tendency of males specifically in ADS to show preference towards TP is supported by [13] where overall, masculine oriented students employed PP and TP at first level while both genders employed SP at first level of learning. This implies students rely on step-by-step instructions according to established protocols in ADS. This finding differed from [20] as well as [26] where females females tend to employ SP more over males. In design based studies discussed so far, no gender differences were found for PP. [13] however found gender differences for CP, with significantly higher proportions of males employing this category at first level. With reference to architectural design, this implies more males and students with masculine tendencies have a flair to be intuitive as well as generate new ideas and design solutions. [13] notes "This is quite understandable if one considers the more independent and exploratory nature of males than females" (p. 132). Generally, males had a better balance in disposition for all processes of learning over females in schools of architecture studied.

## 3. MATERIALS and METHODS

Sample for the study consists of final year undergraduate and first year masters degree students at Ahmadu Bello University Department of Architecture who have undergone all variances of undergraduate design studio. Total population of the two classes in 2017/18 academic session was 241. Sample size, obtained from [27] was calculated as N/1+n ($e^2$), where N is the population and *e* margin of error taken as 0.05. This yielded a sample of 150. Questionnaires were distributed to willing respondents, with 69 (46%) completed forms retrieved and employed for analyses. The questionnaire was was designed in two sections to elicit data pertinent to demographics as well as learning processes in ADS. The first section requested data related to gender, level, age and last grade in design. The second section comprised 18 design processes obtained from [15] which were classified under four learning processes discussed in literature. These relate to dispositions of learners as original template employed generic statements not specific to architectural design processes. This study attempts to evolve a LCI template for use in ADS based on [19] Process Oriented Model and [13] interpretation of learning styles (Figure 1). Respondents were requested to rate degree they employed 18 design processes in ADS on a 5-point likert scale, with 1 being strongly disagree and 5 strongly agree. Respondents were also asked whether gender influenced design process. Data from questionnaires were analysed and presented using descriptive and inferential statistics.

Descriptive statistics from both sections provide an over view of pertinent characteristics of the sample as well as most commonly employed design processes employed by respondents. The former are presented as simple counts (N) and percentages (%). Ranking of design processes employed means (M), standard deviations (SD) and Relative Agreement Index (RAI) which is a ratio of actual scores (AS) and maximum possible scores ($PS_{max}$) for each of the 18 processes.

To address the first research question regarding gender differences in learning process of architecture students, means of all four processes were analysed using Independent samples t-tests in SPSS v.21 as distributions were significantly not different from normal distributions across gender. A chi square test was performed to ascertain if overall, gender influenced design. To address research question two regarding relationship between design processes and grades, correlations of mean values of all four processes with respondents' grade in design were computed. Finally, Cronbach's alpha for the four processes and overall items were computed to ascertain reliability of the questionnaire. Results from these analyses are presented hereunder.

## 4. RESULTS and DISCUSSION

### Results

Data from the demographic section of the questionnaire, presented in Table 4.1 revealed males form 60% of the sample, with 66% of all respondents aged 21-25. This fits profiles of architecture students within this cohort from similar studies [28] [29]. Gender skew heavily in favour of males is an established characteristic of respondents in Architecture Schools especially in Northern Nigeria. On average, design grades for males were more evenly spread across grades A through F implying a more normal and balanced distribution. Females had grades concentrated between B and D grades. Consequently, females recorded an averagely higher mean value (M 2.85) compared to males (M. 2.55). Grades in design however recorded relatively large amounts of missing data as 31% of males and 20% of females did not report their last grade in design. This had implications for analysing relationships between design processes and design grades in Table 4.4.

**Table 4.1: Demographic profile of respondents**

| *Variable* | | *%* | *n* | *Variable* | | *%* | *n* | *Variable* | | | *%* | *n* | *Variable* | | *%* | *n* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gender** | Male | 60 | 42 | **Age** | 18-20 | 7 | 5 | **Grade in design** | Male | A | 12 | 5 | Female | A | 0 | 0 |
| | Female | 36 | 25 | | 21-25 | 66 | 46 | | | B | 19 | 8 | | B | 24 | 6 |
| | Missing | 4 | 3 | | 26-30 | 16 | 11 | | | C | 29 | 12 | | C | 44 | 11 |
| **Level** | 400L | 50 | 35 | | 30+ | 10 | 7 | | | D | 7 | 3 | | D | 12 | 3 |
| | 500L | 49 | 34 | | Missing | 1 | 1 | | | F | 2 | 1 | | F | 0 | 0 |
| | Missing | 1 | 1 | | | | | | Missing | | 31 | 13 | Missing | | 20 | 5 |

Rankings of the 18 items revealed architecture students employ all four design processes (Table 4.2) in line with findings from [20] and [13]. Females are however more likely to employ CP and TP more than males who employ all four processes as illustrated by results from the first eight variables ($M \geq 4.0$, $RAI \geq 0.77$) Two items, reliance on structures and instinct record overall mean values below 3.50. Reliance on instinct was the lowest rated variable across both genders (M 3.44). Females (M 3.20) are less likely to utilize knowledge of structures in design than their male counterparts (M 3.59).

In response to research question one, results from Chi square tests (Table 4.3) revealed although males (n 27) are more likely to agree gender influences design process than females (n 11), both males and females do not significantly differ regarding this opinion ($\chi^2 = 3.037$, df=1, n 66, $p=0.081$).

This finding reflects results from with non-significant t–tests across four categories of learning dispositions for design process computed for both genders (Table 4.4). In essence, males and females did not significantly differ in opinion that gender influences learning disposition in architectural design process. It is worthy to note males record higher means in all processes except confluent process where means between genders are similar (M 3.77, Table 4.4). This is incongruent to findings from literature as males were more predisposed to CP [13] while females more predisposed to SP [20] [26].

**Table 4.2: Ranking of design processes by respondents**

| *Design processes* | *Overall* | | | | | | *Means by Gender** | |
|---|---|---|---|---|---|---|---|---|
| | **Category** | **N** | **Sum** | **Mean** | **RAI** | **Rank** | **Male** | **Female** |
| I utilize the knowledge of building components and methods | PP | 70 | 301 | 4.3 | 0.86 | 1 | **4.33** | 4.28 |
| I take things step by step | SP | 70 | 279 | 3.99 | 0.8 | 2 | **4.02** | 3.92 |
| I visualize my design in 3D | CP | 69 | 275 | 3.99 | 0.8 | 2 | 3.88 | **4.08** |
| I design by referring to examples | SP | 70 | 277 | 3.96 | 0.79 | 4 | **4.00** | 3.92 |
| I consider a wide range of alternatives before coming up with a final design | TP | 70 | 274 | 3.91 | 0.78 | 5 | 3.81 | **4.08** |
| Thoroughly explore and interpret the design problem before I actually design | CP | 69 | 267 | 3.87 | 0.77 | 6 | 3.83 | **3.96** |
| I come up with my own interpretation of every design brief | TP | 70 | 270 | 3.86 | 0.77 | 6 | **4.00** | 3.56 |
| Immediately I get a brief, I start coming up with design ideas even before I carry out any analysis | CP | 70 | 269 | 3.84 | 0.77 | 6 | **4.00** | 3.60 |
| I do not discard my first idea. Instead, I keep working on it to make it better. | PP | 69 | 262 | 3.80 | 0.76 | 9 | 3.68 | **3.92** |
| I usually split the design process into stages/phase | SP | 68 | 258 | 3.79 | 0.76 | 10 | 3.73 | **3.96** |
| I have reasons for every line I draw in my designs | TP | 69 | 260 | 3.77 | 0.75 | 11 | **3.80** | 3.76 |
| I consider all issues before I arrive at a final design | TP | 70 | 262 | 3.74 | 0.75 | 11 | **3.93** | 3.44 |
| I take more time evaluating the sketches I have before I stick to one | PP | 70 | 261 | 3.73 | 0.75 | 11 | **3.76** | 3.64 |
| I am aware about the mistake I sometimes make | TP | 70 | 255 | 3.64 | 0.73 | 14 | 3.55 | **3.80** |
| I often refer to past designs in my designs | PP | 68 | 246 | 3.62 | 0.72 | 15 | **3.75** | 3.48 |
| I follow the same set of procedures in all my design | SP | 69 | 248 | 3.59 | 0.72 | 15 | **3.66** | 3.52 |
| I utilize the knowledge of structures actively during design | PP | 69 | 239 | 3.46 | 0.69 | 17 | **3.59** | 3.20 |
| I rely on intuition (instinct) in my design | CP | 69 | 239 | 3.46 | 0.69 | 17 | 3.44 | 3.44 |

**Bold numbers indicate the higher mean between males and females*

**Table 4.3: Crosstabs for influence of gender on design**

| **Gender** | **No (n)** | *%* | **Yes (n)** | *%* | Total (n) |
|---|---|---|---|---|---|
| Male | 14 | *34* | 27 | *66* | 41 |
| Female | 14 | *56* | 11 | *44* | 25 |
| Total | 28 | *42* | 38 | *58* | 66 |

**Table 4.4: T tests and correlations between design processes and design grades**

| | | T test, Design process | | | | Correlation Design process *grade in design |
|---|---|---|---|---|---|---|
| **Design process** | | **n** | **Mean** | **SD** | ***t*** | ***R*** |
| Precision PP | Male | 42 | **3.82** | 0.447 | 0.963 | -0.393** |
| | Female | 25 | 3.70 | 0.494 | | |
| Sequential SP | Male | 42 | **3.86** | 0.573 | 0.24 | -0.045 |
| | Female | 25 | 3.83 | 0.461 | | |
| Technical TP | Male | 42 | **3.81** | 0.475 | 0.751 | -0.341* |
| | Female | 25 | 3.73 | 0.399 | | |
| Confluent CP | Male | 42 | **3.77** | 0.525 | -0.001 | -0.054 |
| | Female | 25 | **3.77** | 0.52 | | |

***p* significant at 0.01, **p* significant at 0.05

In response to research question two, two processes record medium but significant relationships between design processes and grades in design (Table 4.4). These are PP ($r$=-0.4) and TP ($r$=-0.3). However, all correlations were negative, implying that increase in employing design processes resulted in decreased grades in design.

Finally, results from reliability tests revealed very low Cronbach alpha values across all four scales. PP and SP recorded 0.4 each while TP and CP recorded values of 0.2 each. These are well below minimum values of 0.7 [30] in part because of small numbers of items per scale as well as small sample size relative to very large samples ideally employed for reliability tests.

## DISCUSSION

**Males are likely to employ all four design processes; females more likely employ technical and confluent processes**

Results from ranking of individual design processes on Table 4.2 suggests males are more likely to employ all categories of learning dispositions in design while females tend to employ processes related to TP and CP. The tendency of males to employ all processes supports findings from [13] while female propensity to employ TP and CP is inconsistent with findings across most studies employing LCI. [26] for instance note that males have significantly higher levels of TP than females who present a statistically higher tendency towards SP than men. This is consistent with findings submitted by [20]. The reason is not far fetched as females have a greater need to establish priorities and to break tasks down into steps. [20] asserts "Men show a statistically significant ability with technical issues than women, that is to say that men show a greater tendency to develop actions that imply thinking in term of concretion and relevance, acting from real world experiences and feel themselves sufficient enough for solving problems without the need to share information with others" (p. 188).

Diversion of results in the present study regarding females likely to employ TP and CP over males may arise due to several methodological and practical reasons. First, sample for this study comprised older more mature architecture students in their final year and postgraduate levels who are likely to have adapted masculine approaches required to complete architecture school successfully. Consequently, most females may have imbibed male and androgynous dispositions [20] [13] towards TP and CP than average respondents from previous studies. Secondly, design processes assessed are specific to architectural design, not the default LCI template employed by previous studies. Low Cronbach's alpha values attest to this fact, implying a need to revise the questionnaire in future. Furthermore, the LCI template employs a range of scores per process to indicate whether users are likely to employ these strategies on a first level or on a need-to-use basis [23] [21] [20] [13]. This exploratory study did not employ such measures, which may have influenced findings. Thirdly, the relatively small sample size employed for the study may have implied a more skewed sample than is truly representative of a normal distribution in the population, another limitation in this study. Further refinements to the template as well as a larger sample size are neccesary for future studies.

**Non-significant differences for influence of gender over the design process**

Non-significant differences for influence of gender over design processes implies females are not disadvantaged in design related issues. This supports findings from a recent study of career prospects of architecture graduates where respondents from both genders did not differ in perception of influences to pursue a career in architecture after graduation [31]. Indeed, several studies report non-significant gender differences for design and construction related issues such as grades, academic performance and creativity [6] [32] [33]. The implication of this finding is gender as a construct is unlikely to be responsible for females being disadvantaged in design related matters to account for skew in numbers in favour of males. Other factors relating to cultural background, environment, societal expectations and religion likely explain gender skews in construction and design disciplines such as architecture in both school and practice.

**Grades in design are inversely related to ratings of design processes**

Results from correlational analysis present interesting insights into possible relationships between design process, learning dispositions and design grades of respondents. Table 4.4 implies conscious use of learning processes in design relates to design grades negatively. In other words, conscious use of learning processes employed in this study is likely to influence grades in design inversely, which would be counterproductive as processes were designed to enhance learning experiences positively in the first place. Similar to the discussion on incongruent findings regarding TP and CP in preceeding paragraphs, these unexpected findings can be attributed to at least three factors.

First, design processes may not accurately reflect learning processes employed for design in this exploratory study. Further refinement of the questionnaire should address this eventuality. Secondly, respondents may have accurately rated the questionnaire, in which case results truly reflect complaints of students that grading in design is subjective and may not be a true representation of what students have done or worked for. [20] explained a female learner found it hard “to get results that reflected the amount of work” done (p. 29). This highlights the need for clarity in teaching methods and grading criteria based on objective rubrics involving multiple assessment methods as well as timely feedback [34] [14]. Thirdly, the small sample size especially for grades in design is likely to have influenced results as this variable recorded highest percentages of missing data across the sample (Table 4.1). More studies over a larger sample are imperative for generalisation of results.

## 5. CONCLUSIONS and RECOMMENDATIONS

This study assessed gender dispositions in design process of architecture students in studio employing a sample from final year undergraduate and first year postgraduate students at Department of Architecture, Ahmadu Bello University. Findings from the exploratory survey highlight three important tendencies.

First, males and females do not significantly differ in over influence of gender on architectural design process, although more males agreed to this than females. This implies females are not disadvantaged in respect to design related matters as far as students are concerned. Second, males have a higher tendency to employ all categories of processes in design than females who tend to favour TP and CP, contrary to findings from previous studies. This may have been due to long-term conditioning of female students towards masculine and androgynous tendencies in learning processes in order to complete architecture successfully. Thirdly, negative relationships between design grades and categories of disposition to design suggests a review of the instrument or a true reflection of grades not adequately reflecting what students did in a subjective jury grading system. All of these findings beg further investigation for results to be generalised.

Consequently, the study recommends the following measures:

A holistic study into design process in architecture school to establish basic learning processes and approaches individuals employ prior to emersion into the program. Ideally, a longitudinal study across undergraduate and postgraduate years of a cohort of students should highlight strengths and weakness of learning styles. This is important as many departments of Architecture are in transition into faculties. Such feedback is essential for teaching and learning in departments especially in ADS, which is core of the architecture curriculum. Results from this study highlight the need for a more robust instrument to address learning styles in architecture and design.

Closely related is a deeper investigation into mentoring and assessment systems in ADS for departments of Architecture. While several studies have been undertaken in developed and Arab countries, comparatively few studies have addressed effect of assessment and feedback in Nigeria. This is important if issues of fair and objective grading as well as feedback in design studio are to addressed as this is a fundamental aspect of ADS which is at the core of the architecture curriculum.

Finally, a more active system of advocacy and counselling is imperative for both students and parents regarding gender especially as it has been established it does not influence design related issues and females are not disadvantaged in design. Both genders need this enlightenment as females need to be more confident while men can be supportive of female counterparts in such a system. Professionals in Design and Construction Education as well as Guidance Counsellors need to incorporate this message as a matter of priority during public enlightenment campaigns and career talks for pre-university students as a strategy towards improving Higher Education enrolment and mitigating attrition rates. These factors influence low representation of women in the Nigerian Construction Industry.

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