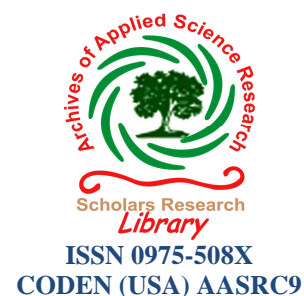




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## The effects of students' background on academic performance in an architecture school in Ghana

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### ABSTRACT

The Architecture Department of the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, enrolls students with background in General Arts, Visual Arts, Science, and Technical Drawing. These students are faced with challenges in design studio during their early years in the course. It has been observed that students, depending on their background, either excel or would have to put in a lot of effort in order to perform well in design studios. Consequently, the aim of the study is to contribute to an improved method of teaching and the realization of students' needs at design studios. Architectural design studio grades have been monitored within a period of four years for years 1 to 4 at the undergraduate level. The total number of students at the undergraduate level is 328. Data of 315 students was used in the study (the number excludes 13 students on deferment and those withdrawn). The data was accessed at the examinations office of the architecture department. Mean studio grades of students' performance are analysed and presented per class. Moreover, two classes (Years 3 and 4) were asked to rank the various background groups because of their long-term stay in the programme. The process led to 50% of the students (74 out of 148) giving their votes. The results show the rank of students' background in conjunction with their performance. Students with Visual Arts and Technical backgrounds performed better (mean studio grades of 64.3% and 61.7%) than the General Science and General Arts groups (mean studio grades of 60.9% and 60.7%). The paper concludes by making recommendations on preliminary courses (sketching and geometry) for students with interest in reading architecture. Tutors are advised to apply different learning styles to weaker groups.

**Keywords:** Architecture, Design Studio, Academic Performance, Students

### INTRODUCTION

In this era of globalization and technological revolution, education is considered as a first step for every human activity [1]. Architectural education is a multi-faceted field, due to the complexity of social and cultural aspects associated with it [2]. All theory lessons learnt are supposed to be applied in a major course component called the design studio. Consequently, a design studio seeks to create an environment in which students work on individual design projects while tutors move from student to student, offering formative feedback on the projects and reviewing the work in progress as illustrated by a set of architectural drawings and models [3].

The Architecture Department of the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, enrolls students with background in General Arts, Visual Arts, Science, and Technical Drawing. Most of the students are faced with design challenges because of their background. The aim of the paper is to analyse the performance of students, based on their background at design studios. The results should contribute to an improved method of teaching and the realization of students' needs (based on their background) at design studios.

Architecture is a multi-disciplinary field, including within its fold, for instance, mathematics, science, art, technology, social sciences, politics, history, and philosophy [4]. It is also argued that architectural education has a long history, just as the profession itself [3]. Moreover, the profession was based on an apprenticeship model of

education. Further, [5] highlighted that architectural education is not simply a vocational education by training. The course teaches students to have a complete understanding of problems in the built environment and to provide genuine solutions to the analysed problems. The process of analysing and synthesising design problems takes place in design studios.

Numerous studies have been published on how academic performance is related to students' background [6, 7, 8, 9, 10 and 11]. The main conclusion has been that there are various learning needs to match students' background.

In Ghana, students who are interested in Architecture should have passes in three core courses (English language, Mathematics and Integrated Science) and three elective courses (Elective Mathematics is however compulsory). The main programmes are Visual Arts, General Arts, General Science and Technical. The options from the Technical programme are Technical Drawing and Engineering Science, Building Construction, Woodwork, and Metal Work. The Visual Arts programme has General Knowledge in Arts (History and General Concepts of Art), Graphic Design and Picture Making as options. The General Arts programme offers Economics and Geography as the main choices. The key alternatives in the General Science programme are Chemistry and Physics.

By and large, in most countries in Europe and North America, the preferred choice by most architecture schools is students with diverse educational backgrounds, and with a wide range of skills and knowledge. Furthermore, students ought to have had lessons in Geometry, Physics and courses in Calculus (algebra and trigonometry).

The quality of students' performance is a concern for educational institutions. In architecture, one needs the right background in order to perform well in design studio. It is stated that "architecture is as much background as it is foreground" [12]. Moreover, [2] expresses design studio as the most dominant subject with the highest credit hours per week and it is meant to provide students with expertise and knowledge necessary to produce innovative, creative and competent design solutions. In addition, [13] stated that there is the need to think about the future (futuristic designs) in architectural education. Generally, creative and explorative designs (in architecture) do not have to be difficult, but [7] argues that coming up with a design solution is very complicated and tends to confuse students. In addition, [7] states that the process based teaching (forward and backwards) in design studio can be a tricky task for students who have not been exposed to the process in their secondary education. The background of students is as important in being able to analyze and think critically with respect to studio design [14, 15 and 16]. Tracking students' performance is a preventive process and could be applied at early stages in order to identify poor performers and hence apply different learning styles [14]. Students' academic background may impact positively or negatively on the design process and eventually on performance.

## **APPROACH**

The study being presented has the objective of analysing students' background in design studio (core course with 14 credit hours) at the Department of Architecture, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. Until recently, the Department has been the only institution in Ghana where Architecture could be studied. The findings should help educators to realize the need to apply diverse teaching styles in design classes. Students would also get to know the performance of the various background groups, consequently, an idea of the effort needed for the course.

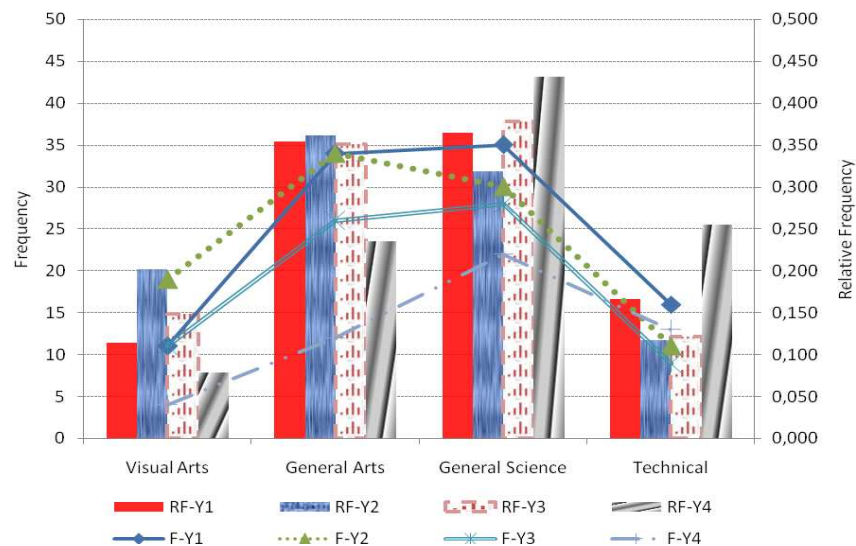
In the determination of the performance of the students, the cumulative studio grades (core course) of years 1 - 4 were used as an indicator. For year 4, the performance of their first three years was factored into the calculation of their mean studio grades. Similarly, years three and two followed the same approach. Only the first semester results of the year one class could be used because the second semester was still in progress. Out of a total number of 328 students at the undergraduate level, data of 315 students formed the core of the study (the number excludes 13 students on deferment and those withdrawn). The data was accessed at the examinations office of the architecture department.

The study used descriptive method of analysis such as frequency and relative frequency distribution plots, mean, mode, and quartile values. Besides, rankings based on performance of the various students' background were generated. Finally, students' opinions on the performance of the various backgrounds were sought through a questionnaire. Two classes (Years 3 and 4) were asked to rank the various groups because of their long-term stay in the programme. In the process, 74 out of the 148 students, representing 50% of the students (Years 3 and 4) gave their votes. The results have been tabulated and graphed using MS Excel application.

## RESULTS AND DISCUSSION

The results and discussion of the analysis of studio grades for the undergraduate programme in architecture (Years 1 – 4) are presented.

The illustrated frequency and relative frequency distribution of the students' background (see Fig. 1) demonstrates the ratios of students per class.



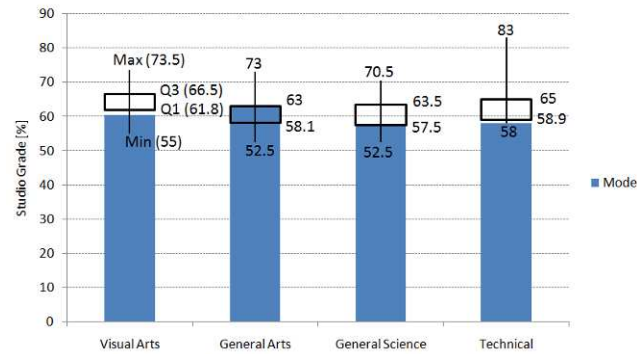
**Fig 1 Frequency (F) and Relative Frequency (RF) distribution of students' background (Years 1 (Y1) to 4 (Y4))**

Generally, General Arts and General Science students outnumber the Visual Arts and Technical group (about 3:1). The exception is year four, where about 43% of the class have General Science as background. The reason for the high student ratio for General Science and General Arts could be linked to the number of students who take the various courses at the secondary school level. More students enrol in General Arts and General Science than the Technical and Visual Arts. Generally, discussions with students revealed that some secondary schools do not even offer Visual Arts or Technical programmes. Subsequently, every academic year at the Department will have more students with General Arts and General Science as background.

The mean grade of the first year students in Table 1 and Fig. 2 show that the students with Visual Arts and Technical backgrounds have higher mean scores (64.2% and 63.5%). The students with General Arts and Science backgrounds have a mean score of 61%. The standard deviation is however higher at the students with Technical background (6.2). Furthermore, the quartiles (Q1 to Q3) do not show a wide dispersion. The differences are within a range of 6%.

**Table 1- The mean studio grade and standard deviation (St. Dev) of students (Year 1 (Y1) to Year 4 (Y4))**

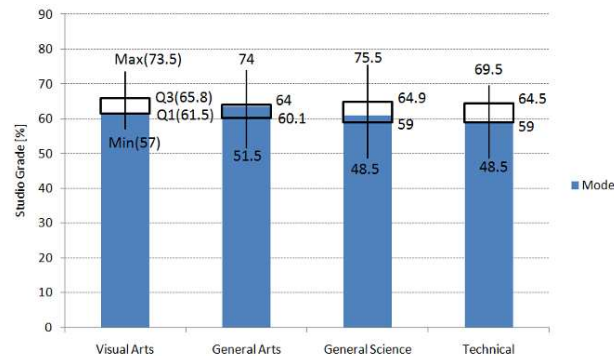
	Visual Arts		General Arts		General Science		Technical	
	Mean [%]	St. Dev	Mean[%]	St. Dev	Mean [%]	St. Dev	Mean [%]	St. Dev
Y1	64.2	4.7	61.0	4.8	60.6	4.0	63.5	6.2
Y2	63.8	3.8	62.4	4.6	62.3	5.1	61.4	5.5
Y3	66.4	3.0	59.8	3.5	60.5	4.4	60.7	2.7
Y4	62.8	1.6	59.6	2.9	60.1	4.2	61.0	2.9
Mean per background	64.3	3.3	60.7	4.0	60.9	4.4	61.7	4.3



**Fig 2 Plots showing the minimum, 1st quartile (Q1), 3rd quartile (Q3), maximum, and mode of mean studio grades of Year 1 students**

The Visual Arts group performed better than all the other groups in Year one. The result could be linked to the general knowledge in arts (history and general concepts of art), graphic and picture design acquired at the secondary school level. The skills make it easy for them to graphically better convey their messages. The importance of some of the acquired skills (sketching) has been found to help in solving problems and critical thinking [17 and 16]. The highest score (maximum studio grade) is from the Technical group (83%, see Fig. 2). Architecture is a multi-faceted course and various lessons learnt ought to be applied in design studios [2]. The Visual Arts group in Year one seems to be at ease with the programme. Tutors may need to device various learning needs to match students' background [8, 9, and 11].

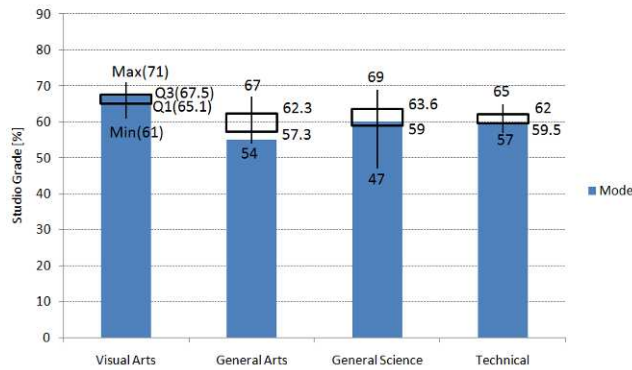
In year two, the highest grade dispersion is seen in the General Science group as compared to the remaining three groups (Fig. 3).



**Fig 3 Plots showing the minimum, 1st quartile (Q1), 3rd quartile (Q3), maximum, and mode of mean studio grades of Year 2 students**

The highest mode score is 63.5% for the General Arts group. The overall highest studio grade is 75.5% from the General Science group, but this does not positively reflect in the groups' general performance. Coming out with design solutions may be difficult [7] for the General Arts and General Science groups. Visual Arts has the highest mean score and therefore performed better in the class. General Arts and Science follows with a difference of 0.1% score in-between them (62.4% and 62.3%). The Technical group is about 1% (61.4%) behind in the second years class. The difference in grade between the General Arts and Science groups has been minimal (0.4% in Year one and 0.1% in Year two). This result is consistent in all classes as seen in Table 1. The output of the two General groups is similar. Tutors who offer formative feedback on design projects to students [3] should spend more time with the General Arts and General Science groups.

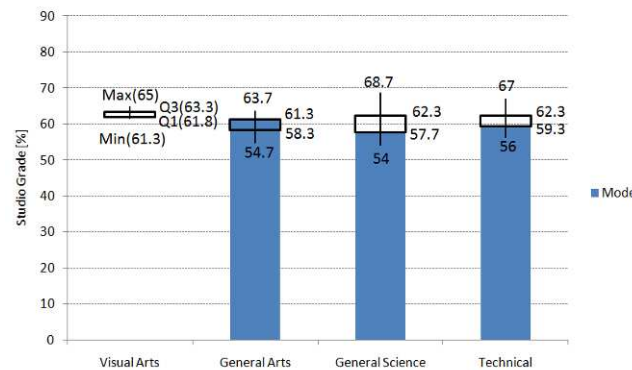
The results in Year three follow the same pattern as that of the first years (Visual and Technical groups better). The quartiles show a close dispersion of studio grades for the two best groups (see Fig. 4).



**Fig 4** Plots showing the minimum, 1st quartile (Q1), 3rd quartile (Q3), maximum, and mode of mean studio grades of Year 3 students

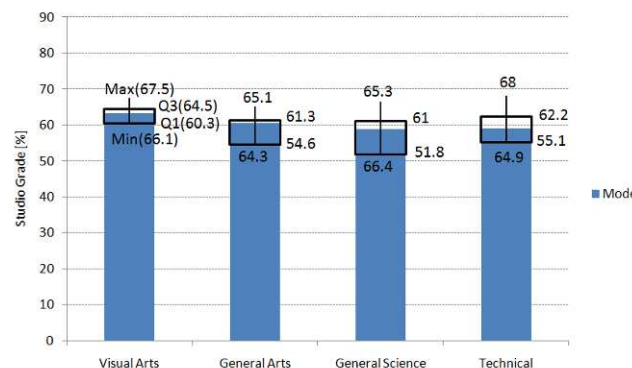
The mode for Visual Arts (67.5%) is very high as compared to the rest of the class (55% to 60%). The groups' good performance could be related to their ability to better understand design problems and provide a genuine solution to the design challenges [5]. Art or sketching is generally known to help in analysing problems and critical thinking [17, 15 and 16]. The ability to sketch with ease is to the advantage of the Visual Arts and Technical groups. The improvement on the mode of teaching and the provision of answers to students' needs towards a good class performance could be supported by the Visual Arts and Technical groups.

Table 1 and Fig. 5 illustrate the good performance of the Visual Art group in Year four. A close dispersion of studio grades can be observed for all the groups except General Science.



**Fig 5** Plots showing the minimum, 1st quartile (Q1), 3rd quartile (Q3), maximum, and mode of mean studio grades of Year 4 students

The General Arts and General Science groups have the same mean studio grades and have been ranked 3rd. A stronger relation to better performance is observed for the Visual Arts and the Technical group (see Fig. 6 and Table 2).



**Fig 6** Plots showing the minimum, 1st quartile (Q1), 3rd quartile (Q3), maximum, and mode of mean studio grades of students (Years 1-4)

**Table 2- Rank of best performing background based on students' mean studio grades (4 points allocated to best group and 1 to least group per class) and votes by Years 3 and 4 (Y3 and Y4) students**

Background	Year 1	Year 2	Year 3	Year 4	Total	Rank (grades)	Rank (students)
Visual Arts	4	4	4	4	16	1 <sup>st</sup>	1 <sup>st</sup>
General Arts	2	3	1	1	7	3 <sup>rd</sup>	4 <sup>th</sup>
General Science	1	2	2	2	7	3 <sup>rd</sup>	3 <sup>rd</sup>
Technical	3	1	3	3	10	2 <sup>nd</sup>	2 <sup>nd</sup>

The rankings of the students in Years 3 and 4 on which group does better in design studio does not differ from the mean score ranking. Visual Arts and Technical are the group performing better in studio. General Science and General Arts have similar strengths and challenges (graphic communication) in all the years (Years 1 to 4). Perhaps, the apprenticeship model of education and the application of different learning styles [14 and 3] should be enforced to help the weaker groups.

## CONCLUSION

The understanding of students' background in relation to performance at design studios is important. This pioneer study should form the basis of literature in studying Architecture students' performance in Ghana. The study which used studio grades as performance indicator showed that Visual Arts and the Technical groups encounter less difficulty in studying Architecture (mean studio grades of 64.3% and 61.7%). The groups which need most attention are the General Science and General Arts groups (mean studio grades of 60.9% and 60.7%). Tutors are advised to concentrate on the weaker groups by helping them to improve on graphic communication (sketching) since that is a key factor in Architectural education. Aspiring Architecture students from the weaker groups should develop skills in Art before enrolling in the programme. Moreover, the Department of Architecture could probe the institution of a preliminary course where aspiring students may learn geometry and sketching before beginning their programme. This would help give them a good start in the course. Moreover, the least background number (Visual Arts and Technical) are the ones performing well. The possibility of enrolling more students from the best groups should be investigated.

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