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Effects of Good Mathematics Background on the Study of Building Technology in Ahmadu Bello University, Zaria

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ABSTRACT:

The alarming rate of failure in calculation oriented building technology courses calls for prompt attention as this often affects students' attitude and performance in such programs. This research work seeks to study the effect of good mathematics background on the study of building technology. One hundred and forty questionnaires were distributed with one hundred and twenty of them adequately filled and returned giving a percentage response of 85.7%. The opinion of the respondents was analyzed using a computer based software "Statistical Package for Social Sciences" (SPSS) using simple percentages and tables for easy understanding. The result of the research shows that students fear of calculation orientated courses stem from their poor mathematics background leading to poor performance in such courses. It was also found that some other pedagogical factors contributed to this poor performance. These include undue concentration on the fast-learners to the disadvantage of the slow-learners, teachers' inability and unsuitable learning period as well as inappropriate teaching method. Based on the findings, it was recommended that lecturers should be made to go through teacher training courses to qualify as teachers before they teach in university degree programs and that refreshers course should be organized for students already in the university but are having challenges with mathematical courses.

INTRODUCTION:

Learning is the seeking of truth and better understanding in matters surrounding the cosmos. It occurs through questioning and interpreting the wisdom and knowledge of others. Learning skills and knowledge are acquired by interpreting the statements of others, testing or examining the knowledge or wisdom of those reputed (by themselves or others) to be wise, showing those who are not wise due to ignorance, exhorting others to philosophy and examining the lives of others (Benson, 2000). "Given the long list of disadvantages of the teacher-centred approach to teaching, most developed countries have now changed over to the learner-centred approach, which actually promotes better learning" (Mkpa, 2003:7).

However, learners at different levels of education have in the past years exhibited multidimensional forms of challenges in the study of mathematics (Ani, 2011: 96-101; Anumudu, 2010:151; Tobias, 2008). Mathematics is the tool to keep balance in our life. It is the mother science of the abstract world. Mathematics is ironically seen as the confusing course that causes headaches to many students and undergraduates in different parts of the globe. Scholars have defined mathematics in different ways. Some of them opined that

mathematics is the science of space, number, quantity and structure as well as measurement of shapes (Lesi, Kayode-Isola, Bajulaye & Adegbamigbe, 2010: 159). For another person, mathematics is considered as the most important science, and its development affects the development of science in all of its kind; medical, physics, biology, technology, and more. The importance of mathematics is being an essential, creative, and powerful discipline recognized globally (Yasukawa, 1995).

This paper thus seeks to indentify and establish the causes and the status of the students in the Department of Building Ahmadu Bello University with the following identified problems: Reoccurring failure of students in calculation oriented courses and the reasons for undergraduates'

i) Failure to understand the mathematical terms when used in the explanation of concepts in a course

ii) Challenges in the teaching of calculation-oriented courses in the study of building technology

OBJECTIVES:

The aim of this work is to study the effects of a good mathematics background in the study of building technology as a profession. The following are the set out objective of the work:

i. An articulation of literatures on the relevance of learning mathematics to the study of building technology as a profession.

ii. To establish the relationship between mathematics, especially as a language of communication in the study of building technology.

iii. Identify some causes of difficulty in calculation oriented courses in the study of building technology as a profession.

iv. Suggest ways of combating the phobia for calculation oriented course and ways of making these courses more appealing to the students.

SCOPE:

The scope of this research work is confined to effects of learning mathematic only to the study of building technology. Other subjects are not considered. For the purpose of the research work the sample under study is limited to students in the building profession only with particular reference to students in Ahmadu Bello University, Zaria. The result of the research is also limited to the opinion, observation and interview of students of the Building Department.

BUILDING TECHNOLOGY AS A PROFESSION AND ITS ACADEMIC CONTENT

Building construction is responsible for roughly seven percent of the Gross Domestic Product in the United States each year. In many ways, the state of the national economy hinges on the strength of building construction and home improvement industries. Success of these critical industries relies on the leadership provided by a highly sophisticated and skilled work force.

Graduates of the Building and Construction Technology program help provide the required leadership and vision through their understanding of this technically competitive field. The study of science, technology, business and design serve as the base for the development of a society. Building and Construction Technology professionals are multifaceted.

Graduates are involved in virtually every area of building technology, wood science, corporate management and product distribution, with responsibilities ranging from research and development to the distribution and installation of finished goods. They ensure that the materials selected and used are best suited to the needs of each project in terms of safety, efficiency, and cost effectiveness. It is the experience of integrating scientific and technical understanding with general business acumen that makes graduates of the Building and Construction Technology program uniquely desirable to hiring corporations. In essence, Building technology is the application of engineering principles and technology to building design and construction. Definitions of building technology as a profession may also refer to:

i) An engineer in the structural, mechanical, electrical, construction or other engineering fields of building design and construction.

ii) In informal contexts and formally in some places, a professional synonymous with or similar to a builder in some languages, "builder" is literally translated as "building engineer."

ASPECTS OF BUILDING TECHNOLOGY AS A PROFESSION

The specialized areas of study of building technology include the following programmes:

(i) Management of Construction Projects

(ii) Building Structures and Construction Technology

(iii) Building Services Engineering

(iv) Building Maintenance

(v) Construction Economics

A Builder could be useful in the numerous areas of human endeavours like: construction industry, educational institutes, banks, finance house, insurance, housing corporation, military establishments, oil industry as well as the three tiers of government and their agencies.

METHODOLOGY:

The study is carried out via an intensive appraisal of literatures in the area of interest and with the use of a well structured questionnaire in view to appraise the opinion of both the staff and students on the relevance of mathematics to the study of building technology. The research is meant to appraise the opinion of some students in the Department of Building Ahmadu Bello University, Zaria; to establish their perception of the importance and effect of a good mathematics subject background on their academic performance in the study of Building Technology. The target population for this study includes the following;

i) Undergraduate students

ii) Post Graduate students comprising of those in the service option, construction technology option and those in the construction management option.

The sampling technique adopted in the distribution of the questionnaire was random sampling technique owing to the fact that all the students have same chances to give the right answer. With regards to the sampling size in the distribution of the questionnaire, the sampling size was determined based on the formula below considering the fact that the then targeted population was unknown.

$n= (z^2pq)/d^2$

Where;

n = the desired sample size

z = the ordinate on the Normal curve corresponding to α or the standard normal deviate, usually any of the following determined based on the 'margin error formula'

i. A 90% level of confidence has $\alpha = 0.10$ and critical value of $z_{\alpha/2} = 1.64$.

ii. A 95% level of confidence has $\alpha = 0.05$ and critical value of $z_{\alpha/2} = 1.96$.

iii. A 99% level of confidence has $\alpha = 0.01$ and critical value of $z_{\alpha/2} = 2.58$.

iv. A 99.5% level of confidence has $\alpha = 0.005$ and critical value of $z_{\alpha/2} = 2.81$.

P = the proportion in the target population estimated to have particular characteristic (normally between the range of 0.1 - 0.5)

q = 1.0-p

d = degree of accuracy corresponding to the confidence level and Z selected.

For the purpose of this study, a confidence level of 95% was adopted in an attempt to achieve a reliable data collection. Consequently, the sample size was determined as thus,

z = 1.96, d = 0.0 where p = 0.1, q =0.9

$n= (1.96^2 \text{ X } 0.1 \text{ X } 0.9)/0.05^2 = 138.3$

Hence a total number of one hundred and forty questionnaires were distributed among the students. A well structured questionnaire were employed and administered to students to ascertain their perception and opinion on the relevance of a good foundation of mathematics in the study of Building Technology. The questionnaire was of closed type, which allows for either Strongly Agree (SA), Agree (A), Strongly Disagree (SD), Disagree (D) or Undecided (UD) responses from respondents, especially where there is need to rank the opinion of the respondents. The questionnaires were administered to the students during the 2012/2013 session. The study was conducted during normal morning periods. The questionnaires were answered individually and collected back the day they were administered. The questionnaire items were then scored based on the response for the final analysis.

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DATA ANALYSIS PROCEDURE

Responses from staff and students were collected and analyzed using Statistical Package for Social Sciences (SPSS) and the result of the analysis was presented in simple percentages, pie chart and illustrations where necessary.

For the questions that entails ranking, the numerical scores for the completed questionnaires provided an indication of the varying degrees of the use of the construction documents. To further analyze the data with a view to establish the significance of the variables considered, the Relative Importance Index (RII) was calculated for each document according to their frequency of use as suggested for use by Memon et al, (2006) and Othman et al, (2005). It was calculated using the formulae:

$$RII = \frac{4n5+3n4+2n3+1n2+0n1}{4N}$$

Where;

n1= number of respondents for 'never'

n2 =number of respondents for 'seldom'

n3=number of respondents for 'sometimes'

n4=number of respondent for 'often'

n5=number of respondents for 'always'

N=total number of respondents

RII ranges between zeros to one. The four-point scale ranking was transformed to relative importance indices (RII) for each of the construction contract documents. The weighted average for each item was determined and ranks were assigned to each item, representing the perception of the respondents.

Results are classified into three categories as follows (Othman et al, 2005) when;

$RII<0.60$ -it indicates low frequency in use

$0.60 \leq RII<0.80$ -it indicates high frequency in use.

$RII \geq 0.80$ –it indicates very high frequency in use.

Data was also presented in graphic form namely pie charts, and tabulations. Descriptive analysis of data relating to rating/frequency, simple percentages were used to analyse data.

DATA PRESENTATION AND ANALYSIS

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This section presents the outcome of the research on the effect of a good mathematics background on the learning of Building Technology at Ahmadu Bello University, Zaria. The data are presented as the mean of the results of analysis of student questionnaire. The analysis of the responses from the questionnaire presented in simple percentages to represent the opinion of the respondents to the questions asked.

Percentage Response:

Table 1.1 below presents a summary of the responses to the administered questionnaires. The table shows that 85.7% of the questions administered were received properly filed, corresponding to a frequency of 120 questionnaires returned. However, only 14.3% i.e 20 of the questionnaires was not returned as shown below;

Table 1.1 Percentage Responses:

Questionnaires	Frequency	Percentage (%)	Cumulative (%)
Questionnaire returned	120	85.7	85.7
Questionnaire Not Returned	20	14.3	100
Total Questionnaire Administered	140	100	

Source: Survey, 2013

Table 1.2 below shows the status of the respondents. It can be seen that 6.7% of the respondents were staff of the department of building whereas 93.3% of the respondents were students at undergraduate and post graduate levels.

Table 1.2 Status of respondents:

Status of respondents	Frequency	Percentage (%)	Cumulative (%)
Staff	08	6.7	6.7
Students	112	93.3	100
Total	120	100	

Source: Survey, 2013

Table 1.3 shows that out of the 120 respondents, 68.4% of the respondents were undergraduate students corresponding to a frequency of 62 respondents whereas 31.6% of the respondents corresponding to a frequency of 38 respondents were post graduate students of the Department.

Table 1.3 level of respondents:

level of respondents	Frequency	Percentage (%)	Cumulative (%)
Undergraduate	62	68.4	68.4
Post graduate	38	31.6	100
Total	120	100	

Source: Survey, 2013

Table 1.4 below represents the gender composition of the respondents. From the table it can be established that 75.8% of the respondents corresponding to a frequency of 91 respondents were male while 24.2% of the respondent corresponding to a frequency of 29 respondents were female. This gives a fair gender composition of the respondents

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Table 1.4 Gender of respondents:

Gender respondents	Frequency	Percentage (%)	Cumulative (%)
Male	91	75.8	75.8
Female	29	24.2	100
Total	120	100	

Source: Survey, 2013

STUDENTS INTEREST IN MATHEMATICS AND CHALLENGES

Following the questions asked on the respondents' interest in mathematics in their secondary school days, Table1.5 shows the respondents' position. From the table, it can be established that 47.5% of the respondents were of the opinion that they had interest in mathematics while about 52.5% of the respondents were of the opinion that they had no interest in mathematics. This is an indication that a high proportion of the respondents had no interest in mathematics.

Table 1.5 respondents' interest in mathematics:

Interest	Frequency	Percentage (%)	Cumulative (%)
Interested	57	47.5	47.5
Not interested	63	52.5	100
Total	120	100	

Source: Survey, 2013

Table 1.6 gives a breakdown of those areas of mathematics that the respondents found challenging that counts for their loss of interest in mathematics. From the table it can be established that 66.7% of the respondents encountered greater challenges in calculus this was followed closely by geometry and trigonometry with a percentage of 15% and then 13.3% for algebra. However, only a minute percentage of 3.3 and 1.7 found construction and arithmetic, and measuration respectively challenging, respectively.

Table 1.6 challenging aspects of mathematics:

Aspect of mathematics	Frequency	Percentage (%)	Cumulative (%)
Mesuration	02	1.7	1.7
Geometry and trigonometry	18	15	16.7
Algebra	16	13.3	30.0
Calculus	80	66.7	99.7
Construction and arithmetic	4	3.3	100
Total	120	100	

Source: Survey, 2013

RELEVANCE OF MATHEMATICS TO THE STUDY OF BUILDING TECHNOLOGY:

In response to the questions as to the relevance of the knowledge of Mathematic to the study of Building technology, it can be established from table 1.7 below that 85% of the respondents were of the opinion that knowledge of mathematics is necessary. Only 15% of the respondents were of the opinion that it was not necessary. This shows that a high

proportion of the respondents were of the opinion that the knowledge of mathematics was very necessary for the study of Building Technology.

Table 1.7 relevance of mathematics to the study of building technology:

Relevance of mathematics	Frequency	Percentage (%)	Cumulative (%)
Relevant	102	85	85
Irrelevant	8	15	100
Total	120	100	

Source: Survey, 2013

Table 1.8 below, shows the ranking of the relevance of Knowledge of Mathematics to the study of Building Technology. From the table, it can be established that the respondents ranked first sound knowledge of mathematics. They saw it as a basis for easy understanding of Building Technology courses. This was followed closely by the need for good knowledge mathematics in structures as an aspect of Building Technology.

Table 1.8: Ranking of the Relevance of Mathematics to the study of building technology

Relevance of mathematic to the study of building technology	Good knowledge in Mathematics facilitate the easy understanding building courses	Mathematics is the language of communication in calculation oriented course	Design in building require a sound foundation in mathematics	Structure in building is purely calculation oriented	Most aspect of building technology require knowledge of mathematics
No of respondents	120	120	120	120	120
Mean	2.66	3.64	3.55	2.66	2.60
Std. Deviation	0.663	1.039	1.079	0.663	0.230
Variance	0.439	1.079	0.903	0.439	0.300
Relative importance indices	0.84	0.47	0.73	0.81	0.790
Ranking	1^{ST}	5^{TH}	4^{TH}	2^{ND}	3^{RD}

Source, Survey 2013

However from the question asked inquiring of the respondents if they encounter challenges in calculation oriented courses, table 1.9 gives the opinion of the respondents. From the table it can be established that 65% of the respondents found calculation oriented course very challenging, while 35% of them do not.

Table 1.9 Challenges' in calculated oriented courses:

Challenges in calculation oriented courses	Frequency	Percentage (%)	Cumulative (%)
Yes	78	65	65
No	44	35	100
Total	120	100	

Source: Survey, 2013

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CAUSES OF FAILURE IN MATHEMATICS

Some of the causes of failure in mathematics identified via literature review were itemized and respondents were required to rank them according to their perceptions. Table 1.10 shows the ranking of the causes of failure in mathematics as opined by the respondents. The ranking is based on the Relative Importance index. From the table it can be established that the respondent opined that the major cause of failure in mathematics is lack of motivation by the class teacher as it ranked the first (1). This was followed closely by short time allotted for the study of mathematics in the school calendar, then the teachers' concentration on the gifted and fast learners. However the least ranked cause of failure in mathematics is that some mathematics teachers are harsh (9), followed by lack of the use of teaching aid by the teachers as it ranked (8) out of the identified causes of failure in mathematics

Table 1.10: Ranking of the Causes of Failure in Mathematics

Causes of failure in mathematic	Bad teaching methods by mathematics teacher	Lack of the use of teaching aid by mathematics teacher	Short time allotted to mathematics in the school time table	Lack of teacher s firm grip of the subject	Initial poor grade of students as a discouraging factor	Teachers concentration on the gifted fast learning students	Lack of assignment being given to students	Lack of motivation by the class teachers	Some mathematic teachers are harsh
No of respondents	120	120	120	120	120	120	120	120	120
Mean	2.66	3.64	2.78	2.65	3.55	2.66	2.60	2.65	2.43
Std. Deviation	0.663	1.039	0.560	0.480	1.079	0.663	0.230	0.951	0.864
Variance	0.439	1.079	0.320	0.230	0.903	0.439	0.300	0.903	0.747
RELATIVE IMPORATANCE INDICES	0.74	0.61	0.87	0.70	0.81	0.85	0.80	0.95	0.50
RANKING	6^{TH}	8^{TH}	2^{ND}	7^{TH}	4^{TH}	3^{RD}	5^{TH}	1^{ST}	9^{TH}

Source, Survey 2013

MEASURES TO IMPROVE INTEREST IN CALCULATION ORIENTED COURSES

From table 1.11 below, 93.3% of the respondents opined that students nursing the intention to study Building Technology should be oriented on the relevance of mathematics. This will go a long way to help them overcome challenges with calculation oriented courses they will encounter in the study.

Table 1.11 Relevance of Departmental Reorientation of Students on the need for a good Knowledge in mathematic in the study of Building Technology

Orientation	Frequency	Percentage (%)	Cumulative (%)
Relevant	112	93.3	93.3
Irrelevant	08	6.7	100
Total	120	100	

Source: Survey, 2013

Still in an attempt to combat the challenges encountered in calculation oriented courses, 91.7% of the respondents were of the opinion that there should be a Departmental mathematics oriented course to help the new students familiarized themselves with some relevant aspects of mathematics .this opinion is represented in Table 1.12 below

Table 1.12 introduction of departmental mathematics refresher course:

Refresher course	Frequency	Percentage (%)	Cumulative (%)
Yes	110	91.7	91.7
No	10	8.3	100
Total	120	100	

Source: Survey, 2013

Also in response to the question of the need for the Building Technology Lecturers to go through some courses in teaching methodology, 85% of the respondents respondent in the affirmative. This evident from Table 1.13 below

Table 1.13 teachers going through education inclined course:

Need for educational incline courses by lecturers	Frequency	Percentage (%)	Cumulative (%)
Necessary	102	85	85
Not Necessary	8	15	100
Total	120	100	

Source: Survey, 2013

Finally, from table 1.14, 62.6% of the respondents opined that the Department was in need of well qualified Graduate Assistants that will help conduct tutorials in such calculation oriented areas, for the undergraduate to help them combat their fear for such courses.

Table 1.14 the need for a graduate assistance to assist in areas of challenges:

Need for Well Qualified Graduate assistance	Frequency	Percentage (%)	Cumulative (%)
Yes	75	62.5	62.5
No	45	37.5	100
Total	120	100	

Source: Survey, 2013

SUMMARY OF FINDINGS

The result of the study reveals that a right or positive attitude of students towards the study of Mathematic is very essential if students are to perform well in the study of Building Technology in the higher institution. Thus, there is need to concentrate all efforts and energy on improving factors that tend to militate against the positive attitudes. The research also revealed some very important fact that account for students' challenges in calculation oriented courses in the study of Building Technology. These facts include:

i. That students even from the secondary level do not have interest in mathematics due to a wide range of facts ranging from bad teaching method adopted by mathematics teaches, to teachers concentrating on gifted students at the expense of the slow learners. These facts account for the loss of interest on the part of the students in any calculation oriented courses. This consequently affects their pursuit in life.

ii. The research also revealed that certain aspect of mathematics which appear to be reoccurring or very relevant or in common use in the tertiary institution like calculus and geometry are usually areas of challenge for the students at the secondary level and thus, require more attention at the secondary level.

iii. The research also reveals that a sound knowledge in mathematics is a basic requirement for excellence in the study of Building Technology owing to the fact that most aspect of Building Technology involves calculation

iv. It was also discovered that a prior orientation of students intending to study Building Technology will be very helpful in combating the fear that students have for calculation oriented courses.

v. The research also reveals that there is a need for refresher courses in Mathematics to help those with poor background in Mathematics before they are admitted into Building Technology

vi. The research also reveals that some of the lecturers need to go through some programme courses in teaching methodology to enhance their teaching

CONCLUSION

Mathematics is fundamental for the advancement of science and technology. All branches of modern scientific and technological discovery as well as discipline depend directly and indirectly on mathematics for its sustainable foundation and analysis. Mathematic is a basic aspect of life and a basic requirement for the study of Building Technology. The strength of a building is measured and interpreted mathematically. Consequently, the poor knowledge and disposition of learners and undergraduates to mathematics affects the overall quality of their technological knowledge quotient. The implication is that measures must then be adopted that will help build students interest in mathematics. Also, excellence in the study of Building Technology in any tertiary institution will require a sound background in mathematics from the secondary level. Government should encourage teaching profession, by encouraging that lecturer without sound mathematical and educational background, should to go through an education inclined course for proper pedagogic training that will empower he or she to train the undergraduate through methodologies that will promote easy understanding.

RECOMMENDATIONS

Based on the findings of this research work, the following are the recommendations will help to improve on the existing situation.

i) Provide ample time, materials, and teacher support for children to engage in play, a context in which they explore and manipulate mathematical ideas with keen interest

ii) Actively introduce mathematical concepts, methods, and language through a range of appropriate experiences and teaching strategies

iii) Ensure that the curriculum is coherent and compatible with known relationships and sequences of important mathematical ideas

iv) Introduction of a mathematics refresher course in the department to tackle area of challenges to the students.

v) Orientation of students nursing the interest to study building technology on the relevance of mathematics to their course of study

vi) Encourage lecturers teaching calculation oriented courses to adopts teaching methodology that will motivate the student and stir their interest in the course

vii) Lecturers and teachers should try to carry the entire class along not concentrating on the gifted or fast learners only.

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