A Correlationstudy Of Students Achievement In Basic Science Subjects And Their Performancein Nigeria Institute Of Leather And Science Technology (Nilest) Zaria

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Abstract: Attempts are made in this paper to investigate the relationship between the student's achievement in basic science subjects (chemistry, physics, biology) and theirperformance in Leather Technology courses (leather chemistry, physical Testing, Hide/skin improvement). In order to establish if their achievement in ordinary level (O/L) science subjects is a pointer to good performance in Leather Technology core- courses.The production of Leather is long and complicated process and certainly not one, can be embarked upon without specialized skills. These are the reason for the inclusion of sciences courses in Leather Technology programmes. Correlational research design was adopted to systematic investigate the performance of students in leather technology core courses in relation to their achievement in O/L science subjects using Spearman's Rank order correlation coefficient. The results revealed positive correlation between O/L science subjects and leather technology core courses. It is empirically established from the study that students with good basic knowledge of science perform better in leather based course. The role of basic science subjects in leather technology programmes cannot be over emphasized, for it forms the basis for studying of Hides/ Skins processing. Therefore, it was concluded that basic science taught in secondary schools should be specialized toward students' needs/ career.

KEY WORDS: Basic Science subjects; Leather Technology Core course; Students Performance; Students Achievement; O/L (ordinary level) & A/L (advance level).

Introduction

Science has contributed immensely to influence development in Technology. Similarly, Technology has influenced developments in Science according to [1]. There are two forms of sciences: Pure Science and Applied science- Pure science studies the universe and how its apart operates, while the applied science puts the results of basic research to practical use[2]. The relative emphasis between pure and applied work can vary greatly, yet both kinds are always required in any technological development. Science is usually described as the study, which is carried out in order to advance the frontiers of knowledge of our understanding of observable natural phenomena, which occur around us. Basic sciences are sometimes designated as pure fundamental research. The accumulation of this kind of information is not supposed to be of immediate benefit or to enable man to increase his influence over the things happening around him. It provides knowledge for its own sake and its main contribution is to enable a clearer understanding of the environment according to [3]-[4]. Technology is called applied or mission – oriented, it is a purposeful human activity which involves designing, making products as diverse as clothing, foods, machines, structures, electronic devices, and computer systems, collectively often referred to as "the man made world". It can also mean the special kind of knowledge which technologists use when solving practical problems, it draws on resources of many kinds including scientific and other branches of knowledge[5]. There are strong connection between science and Technology; however we should recall according to [6]. that science is the foundation upon which technological

and industrial developments are built. This is the reason for the introduction of basic science to primary and secondary schools. Rudiments of science was first introduced in Nigeria when church missionary secondary school was established in 1859, what existed between 1859-1920 was teaching of only biology related subjects like philosophy, psychology and methodology of time. It was no longer adequate for the school and economic realities of the period. The change was felt in Nigeria with the introduction of general science in the secondary school. Later, the three branches of science- biology, chemistry and physics were introduced for the last three years in secondary school in the 1950's [7]. The secondary school science syllabus used in the colonial era, according to [8]. were science, planned for English children in English Grammar School. It was noted that, there was no objectives stated in the syllabus because it was an examination syllabus rather than a teaching syllabus. The content of the syllabus then was descriptive and unfamiliar to Nigerian students. Environmental experience was not stressed and there was no emphasis on laboratory work and acquisition of scientific skills. With the attainment of independence, there was a clamour for a total review of the science curriculum with detained account of the needs and -aspiration of Nigerians as well as the experimental background of the learners.[9], [7]. From the educational point of view, science has progressed by breaking down complex subjects of study into component parts [10]. so that today there are numerous branches. The tools that have made impressive growth spurt in science are contemporary advances in physics, chemistry, biology, mathematics and their

application in the precise skills of engineering. In the process science has received contributions from and made contributions to many other disciplines in humanities. Even elementary knowledge of science can profoundly alter and improve the situation to the benefit of both individual and society. The benefit of science can only be valued, if it is socially oriented and its significance reflected in educational sphere i.e. the teaching of science has to equip the learner with adequate knowledge and skills to cultivate scientific outlook in order to survive with the contemporary technological world. In other words, it should make learners competent to reflect their knowledge in their everyday life as related to such problems of our developing nations. Science today is not the same science of fifty or even ten years ago, today accelerated pace of research aided by new instruments and techniques have initiate new discoveries. An adequate presentation of the dynamic state of modern science is therefore a formidable task and challenge worthy of our best teachers. The teaching of science needed for secondary schools must gear towards student's actually practicing science and scientific approach, through the use of investigative teaching. If need be, the science curriculum should be rewritten to meet the needs of the society through relevance in its content, method, processes and application [8]. this indeed will bring technological development. For science and technology calls for a continuous supply of those who have an understanding of its processes, for no man can do a job well, unless he understands all the processes involved. Understanding comes through education, but understanding of science must not remain merely an aim of education, it must become part of it. It was in recognition of this that Technical Education was introduced according to[4]. Technical education is that aspect of education which leads to the acquisition of practical and applied skills, as well as basic scientific knowledge with the aim of providing trained manpower, who can apply scientific knowledge to the improvement and solution of environmental problems for the use of conveniences of man, according to the [11]. Technical and vocational education in Nigeria, offers many trades and courses, among them is Leather and Leather products Technology offered in Nigeria Institute of Leather and Science Technology (NILEST) formally known as (CHELTECH) Zaria, as the only specialize institute of its kind in Nigeria. The distinction between science and Technology is similar to that of concept of basic science in relation to Leather Technology, thus, the curriculum of the institute is developed for ordinary and advanced levels, apart from the trade subject, and the curriculum is deeply rooted in the science. The reasons for the inclusion of science courses in the Leather Technology curriculum is because, the production of leather is a long and complicated process and certainly not one, can be embarked upon successfully without specialized skills [12]. Most of the work of elucidating the chemical properties and physical structure of these fibers has been the task of the scientists of two separate industries that are concerned with wool and those concerned with the leather [13]. Another aspect, which is sometimes forgotten by the practical tanner, is that, in leather manufacture almost every question, which is raised, seems to depend on the solution of difficult problems of physics, chemistry and biology. For example,

the structure and chemical behaviours of complex material as the proteins, carbohydrates, vegetable tannins and basic chromium salt [14]. Today Leather manufacture utilizes a very broad range of scientific knowledge, which must be thoroughly understood by the modern student, if he is to master the subject and also to free himself from the constraints imposed by the burden of a long empirical tradition. Hitherto, the student has obliged to acquire such knowledge of pure science especially these whom are likely to have a direct bearing on his technology. In view of the above, this paper attempt to investigate, the role of basic science subjects to the achievement of students in Leather Technology programmes, in order to establish if their achievement in ordinary level (O/L) science subjects is a pointer to good performance in Leather Technology core- courses.

Objective of the study

The objectives of this study are to:
Investigate the relationship between students O/Level achievement in basic science subject (Chemistry)and their performance in Leather Technology core course (Leather Chemistry).

Assess the relationship between students O/Level achievement in basic science subject(physics) and their performance in Leather Technology core course (Leather Physical Testing).

Determinethe relationship between the students O/Level achievement in basic science subject (Biology) and their performance in Leather Technology core course (Hide/Skin improvement).

Research Question
Is there any relationship between achievements of students in O/Level science subject (chemistry) and their performances in Leather Technology core- course (leather chemistry)? To what degree do achievements of students in O/Level science subject (physics) correlate with their performances in Leather Technology core- course (physical Testing)? What is the relationship between achievements of students in O/Level science subject (chemistry) and their performances in Leather Technology core- course (leather chemistry)?

Null Hypotheses
There is no significant relationship between students' achievement in O/L chemistry and their performance in Leather Chemistry. There is no significance correlation between students' achievement in O/L physics and their performance in Leather Physics testing. There is no significant relationship between students' achievement in O/L Biology and their performance in Leather Manufacture.

Significance of the Study
It is hoped that the result of this study will be of benefit to all science teachers and individuals who are concerned with designing and implementation of basic science curriculum for planning educational programmes and courses that have clear and defined purposes and continuous improvement. So that the science teachers

especially in secondary school, teaches their subjects with aim to provide consistently relevant, trust worthy and accurate ability for self-relevance i.e. making science subject that is applicable to the need of the students now and future, and lays a foundation upon which they can build their future careers.

Methodology

Correlational research design was adopted for this study, which involve systematic investigation of relationship association of significance between two or more variables. Population The population of this study comprised of all ND students only, which consist 57 studentsof 2010/2011 and 2011/2012 sessions in Nigerian Institute of Leather and Science Technology.

Sample

ND I and ND II students were selected purposefully for the study based on the assumption that they are just fresh students coming from secondary school, it was hoped that their O/L basic science subjects knowledge are still effective. Thus, purposeful random sampling techniques were used to draw a sample of 30% of the population from NDI and ND II.

Table I: Population and sample

Class		Population	Sample
2011/2012	ND I	20	6
2010/2011	ND II	37	11
Total		57	17

InstrumentforDataCollection

The students O/L science subject grade results and their Leather Technology core – courses grade result were the only instruments used for this study. The O/L science subjects grades in chemistry, physics and biology results of the sampled students were extracted from the students files, while their grades in 3 major Leather Technology courses such as Leather Chemistry, Leather Physics Testing and Hide and Skin Improvement, were collected from departmental records containing students result for 2010/2011 session.

Method of Data Analysis

The students O/L grades results in chemistry, physics and biology were standardized, using nine grades in digits, 1 – 9 and letters represent a qualitative designation. The grades were paired and ranked along the students grades in Leather based courses. Spearman rank order correlation coefficient was used for the computation of the grades, since the data available were in ordinal state of measurement and the number of the scores/grades are fewer than 30.

The formula $r = 1 - \frac{6 \in D2}{N(N2-1)}$

Where r = spearman correlation coefficient between the paired variables.
$\sum D^2$ = the sum of the squared different between ranks.

N = Number of paired ranks.

The coefficient of correlation lies between -1 and 1 Negative correlation signifies inverse relationship, while positive correlation signifies direct relationship. The value of correlation coefficient near to unity (1) indicates a high degree of a correlation and near zero (0) indicates a negligible correlation.

Results and Discussion

Table 2: The Institute grading of students raw scores

Grade	Interval of Raw Scores
A	80 – Abv
AB	70 – 79
B	60 – 69
BC	50 – 59
C	40 – 49
CD	30 – 39
D	20 – 29
E	10 – 19
F	0 - 18

Table 3: O/Level grading of students result.

Grade	Interval/Qualitative	
A1	75 – 100	Excellent
A2 (B2)	70 – 74	very good
A3 (B3)	65 – 69	Good
C4	60 –64	Credit
C5	55 – 59	Credit
C6	50 – 54	Credit
P7 (D7)	45 – 49	Pass
P8 (E8)	40 – 44	Pass
F9	0 – 39	Fail

Table 2 and 3 shows the interpretation of grades for the Institute examination results and O/Level results of the students.

Research Questions

Is there any relationship between achievements of students in O/Level science subject (chemistry) and their performances in Leather Technology core- course (leather chemistry)? To what degree do achievements of students in O/Level science subject (physics) correlate with their performances in Leather Technology core- course (physical Testing)? What is the relationship between achievements of students in O/Level science subject (chemistry) and their performances in Leather Technology core- course (leather chemistry)? The data analysis to the above questions is presented in table 4.

Table 4: *Pairing of Students achievement (grades) in O/L basics science subjects and their performance (grades) in Leather Technology core courses.*

S/N	O/L Biology vs. Hide/skin Improvement		O/L physics vs. Leather physical Testing		O/L chemist vs. Leather chemistry	
1	C5	BC	C6	C	C6	D
2	C4	AB	C5	B	D7	BC
3	C5	BC	D7	B	C5	D
4	C5	B	C4	BC	C5	D
5	A1	B	C5	B	C4	BC
6	B3	B	C5	BC	C4	C
7	B2	AB	B2	BC	B2	C
8	B3	AB	C4	B	B3	B
9	C4	B	C4	B	C5	C
10	C4	B	C4	B	B2	C
11	B2	B	C4	B	C4	C
12	B2	A	C5	BC	C4	B
13	C4	AB	C5	B	D7	CD
14	C4	BC	C5	BC	C6	D
15	B3	AB	C4	AB	C6	BC
16	C5	C	D7	B	E8	D
17	B3	B	B3	B	B2	C

A critical observation of the students grade results from table 3 above shows that, the students' performance in O/L Biology range from A1 to C5, while their grades in Hide/S kin improvement range from A to C, indicating good performance. The students O/L grades in physics range from B2 toD7, while their grades in Leather physical Testing range from AB to C. Performance of students at O/L chemistry range from B2 toE8, while their performance in Leather chemistry range B to D. This results reveal that perfect relationship exist between student O/L grades in Biology and Hide/Skin improvement at A/L; while there is little or imperfect relationship exist between O/L physics and leather physical Testing; O/L chemistry and leather chemistry. These shows the extent of relationship that exists between O/L Students grades in basic science subjects and their performance in leather Technology core courses.

Table 5: *Correlation Coefficient and Hypotheses*

Subjects vs. courses	Correlation (r) coefficient	Significance of correlation	t cal	t critical	Decision
O/L Biology vs. H/S improvement	0.80	High	3.528	1.895	rejected
O/L physics vs. leather physical Testing	0.50	Moderate	1.528	1.895	accepted
O/L chemistry vs. leather chemistry	0.54	Moderate	1.698	1.895	accepted

Table 5 above shows the significance of correlation coefficient ® and testing of the null hypotheses for correlation between O/L biology and H/S improvement; O/L physics and Leather physical Testing; O/L chemistry and Leather chemistry. It is very clear from the above result that the degrees and significance of correlation between O/L biology grades of the students and their A/L H/S improvement grades is high; The calculated is greater than t critical at 0.05level of significant with df=N-2.Thus the null hypothesis1 that stated there is no significant relationship between O/L student biology and their performance in Hide/skin improvement was rejected. The degree and significance of correlation between O/L physics and Leather physical Testing is moderate at 0.05 ®.The null hypothesis testing shows t calculated 1.528 lower than t critical 1.895 at 0.05 significant level with df =N-2.Thus the null hypothesis that stated there is no significant relationship between student O/L physics and their Leather physical testing was retained. Significance of correlation between O/L chemistry grades and leather chemistry shows moderate correlation ® of 0.54, thus the null hypothesis was accepted, that there is no significant relationship between O/L chemistry and leather chemistry, since the t calculated 1.698 is lower than t critical 1.895 at 0.05 level of significance, when df=N-2.

Findings
From the analysis of the grades results of the O/L basic science subjects and the students A/L Leather Technology core courses, it shows that high correlation coefficient ® exist between O/L Biology and Hide/Skin improvement,

which is applied Biology, it is clear that the students good achievement in Biology is a pointer to their good performance in Hide/Skin improvement as a Biology basedcourse. Similarly students with at least a credit in O/L physics performed better in leather physical Testing which is also applied physics ,though only moderate high correlation exist ,but the students' performance is better than their performance in O/L physics ,this may be due to effective teaching and learning process in the institute. The correlation coefficient between O/L chemistry and leather chemistry as applied chemistry is moderately high, but the performance of the students seems to be lower than other subjects/courses in this case, the reason for these calls for further investigation. It is also clear that the student's poor performance at O/L affect their performance in leather chemistry. The null hypotheses 2and3 wereaccepted, while only hypothesis 1 was rejected. Thus the study is established on the premise that achievement of student in O/L basic science subjects is a pointer to their success in leather Technology programmes.

Summary of the Findings and Conclusion
Based on the empirical analysis of data obtained from this study, the following findings were made from the study:-
− In the study a positive, high and moderate correlation exist between the student O/L basic science subjects (Biology; Physics; Chemistry) and their performance in Leather Technology core course.

- it has been established from the study that students with good grades in O/L basic science subjects performed better in leather core courses.
- it was clear that the roles of O/L basic science subjects in the leather Technology programmes cannot be overemphasized, it has formed the basis for studying the Hide/Skin processing. Therefore the science based courses taught in secondary schools should be generalized towards the need of the students' career and future/ environment.

Recommendations

In the light of the above findings, the following recommendations are made:

- The basic sciences should be reflected in educational sphere. Teachers must know something of the limitation of the subjects as taught in many schools today.
- There should not be dichotomy between what the students need in the field of science and what is provided. For students, the science taught should have greater emphasis on function and its relevance to technology. Emphasis should be on functions rather than the structure alone. Students should not just memorize the facts without understanding the principles.
- There must be an attempt for integration i.e. attention must be given to the link between Biology, Physics, Chemistry.
- Examination bodies should shift emphasis from the test of factual knowledge to understanding principles. Emphasis should be on conceptualization and the ability to demonstrate basic meanings and relationship of one concept to another. This will enable the teachers to prepare the students for a successful adulthood rather than emphasizing on reading to merely passing examination.

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