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INTERFACE OF MATRIX METAPHYSICAL INTO EPISTEMOLOGICAL IDEALS AMONG STUDENTS' TEACHERS AT SS LEVELS

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ABSTRACT

Study was conducted to find out the extent to which students' teachers transformed the metaphysical nature of matrix into epistemological ideals vis-a-viz their disciplines. As a survey study three universities in the south-western part of Nigeria were involved in the study though strictly the education programme. Out of total number of 815 students' teachers, 99 students' teachers in mathematics-physics, mathematics-chemistry and mathematics-economics that were going from their 300 level to 400 levels were involved in the study. The main instrument was the topic on matrix that has to do with equation related ones in m by n. though with reliability coefficient value of 0.73 via the split-half method. Statistical tool used for the study was One-way Anova and Scheffe Post-Hoc analysis at 5% level of significance. Findings showed that the classroom teaching of the selected topic in matrix from its metaphysical ideal into its epistemological ideal was based on the disciplines of individual students' teachers involved. It was discovered that there was significant difference in the performance among the disciplined students' teachers on metaphysical transformations into epistemological values of matrix of students' achievement test [Fcal>Fval, df=(2,97), P< 0.05], and the hypothesis was rejected. Study found that there was no significant difference in the performances among the disciplined students' teachers of mathematics-physics and mathematics-chemistry on metaphysical transformations into epistemological ideals of matrix [Fcal<Fval, P> 0.05], but there was significant difference in the performances among the disciplined students' teachers of mathematics-physics and mathematics-economics as well as mathematics-chemistry and mathematics-economics on metaphysical transformations into epistemological ideals of matrix [Fcal>Fval, P< 0.05]. The implications of the research as well recommendations were highlighted in the paper.

INTRODUCTION

If what we preach to the young ones in a classroom is actually translated to what we practice in real life situation the whole earth would have become a paradise to live. Young ones minds are very flexible to an extent that whatever they learn at tender ages seems to have a long lasting effect on their future behaviour and manners. This is to say that the experiences which children gather over the years seem to have greater effect than what books alone could produce. Students' knowledge of mathematical concept goes along way to determine the extent to which they could manipulate such concept and use in further assimilation of other areas of their daily need instead of stereotype examination knowledge's sake. Metaphysics is a branch of philosophy that concerned with the nature

of ultimate reality. It concerned with describing the most general traits of reality and would presumably characterize any universe whatever. Because these traits are not peculiar to this universe, but common to all possible universes, metaphysics may be conducted at the highest level of abstraction. *Metaphysics* is believed to have originated in Rome about 70 BC by Andronicus of Rhodes in his edition of the works of Aristotle. In the arrangement of Aristotle's works by Andronicus, the treatise originally called *First Philosophy,* or *Theology,* followed the treatise *Physics.* Hence, the *First Philosophy* came to be known as *meta* (*ta*) *physica,* or "following (the) *Physics,*" later shortened to *Metaphysics.* The word took on the connotation, in popular usage, of matters transcending material reality. In the philosophic sense, however, particularly as opposed to the use of the word by occultists, metaphysics applies to all reality and is distinguished from other forms of inquiry by its generality. As related to matrix it tries to explain the general traits of reality of array of numbers which most students have inclination towards but its short interface knowledge understanding.

On the other hand, epistemology as branch of philosophy addresses the philosophical problems surrounding the theory of knowledge. It is concerned with the definition of knowledge and related concepts, the sources and criteria of knowledge, the kinds of knowledge possible and the degree to which each is certain, and the exact relation between the one who knows and the object known. Examining attentively of what I was, and seeing that I could pretend that I had no body and that there was no world or place that I [was] in, but that I could not, for all that, pretend that I did not exist, and that, on the contrary, from the very fact that I thought of doubting the truth of other things, it followed very evidently and very certainly that I existed; while, on the other hand, if I had only ceased to think, although all the rest of what I had ever imagined had been true, I would have had no reason to believe that I existed; I thereby concluded that I was a substance, of which the whole essence or nature consists in thinking, and which, in order to exist, needs no place and depends on no material thing; so that this "I", that is to say, the mind, by which I am what I am, is distinct entirely from the body, and even that it is easier to know than the body, and moreover that even if the body were not, it would not cease to be all that it is. After this, I considered in general what is needed for a proposition to be true and certain; for, since I had just found one which I knew to be so, I thought that I ought also to know what this certainty consisted of And having noticed that there is nothing at all in this, *I think, therefore I am,* which assures me that I am speaking the truth, except that I see very clearly that in order to think one must exist, I judged that I could take it to be a general rule that the things we conceive very clearly and very distinctly are nevertheless some difficulty in being able to recognize for certain which are the things we see distinctly. In this dimension one is not sure of the relationship of metaphysical nature of matrix to have correlation with its epistemological vies of students who are in turn expected to demonstrate such knowledge in a real life situation.

Furthermore, interface could be described as a point at which a connection is made between two elements so that they can work with one another. In computing, different types of interfacing occur on different levels, ranging from highly visible user interfaces that enable people to communicate with programs to often invisible, yet necessary,

hardware interfaces that connect devices and components inside the computer. User interfaces consist of the graphical design, the commands, prompts, and other devices that enable a user to interact with a program. Microcomputers have three basic types of user interfaces (which are not necessarily mutually exclusive). As a borrow concept to the study which tries to explain the concept of matrix as in its reality coupled with the epistemological phases one is not sure if students of mathematics at teachers education programme actually understand the interface of these two concepts relatively to matrix other than sitting in the classroom to listen and copy their lecturers' notes when teaching the concept or in progress. Matrix is a rectangular array of numbers or elements of a ring, which represent systems equations of the first degree in several unknowns. Usually in an enclosed brackets matrix row represents one equation, and the entries in a row are called the coefficients of the variables in the equations.

Historically, Werner Heisenberg (1901-1976) played a large part in the development of *quantum mechanics*, which describes matter in terms of both particles and waves. Prominent contributions to quantum theory is the uncertainty principle, which states that the exact position and velocity of a particle cannot both be known at the same time—the more precisely one value is known, the greater the range of possibilities that exist for the other. Developing the first version of quantum mechanics, called matrix mechanics, Heisenberg (1925) explained the motion of electrons (tiny negatively charged particles) in an atom in purely mathematical terms. His equations showed why electrons behave the way they do, which scientists had been unable to explain before. Heisenberg realized that the laws of classical physics did not govern events on the quantum level. For example, electrons do not follow the laws of classical physics and orbit the nucleus of an atom in a defined path, as planets orbit the Sun. His matrix mechanics predicted that molecular hydrogen should exist in two distinct forms, called ortho-hydrogen and Para hydrogen, and these two forms result from a property of atoms called *spin*, a kind of angular momentum. The prediction that the spin of the two hydrogen atoms was the same in para hydrogen and opposite each other in ortho-hydrogen was confirmed by other scientists, and it contributed to the development of quantum mechanics and the two types of molecular hydrogen. This also assisted in the development of matrix mechanics, which Austrian physicist, Erwin Schrödinger, developed a way to describe particles in terms of the probability that any of their characteristics would be a certain value, and at the same time corroborated Heisenberg's approach to yield the same result.

Mathematics as an encompass discipline, describes the relationships between numbers and other measurable quantities. It expresses simple equations as well as interactions among the smallest particles and the farthest objects in the known universe. It allows scientists to communicate ideas using universally accepted terminology, and in most cases it is truly the language of science. A lot of benefits abound from the results of mathematical research every day. For instance, the fiber-optic network carrying telephone conversations was designed with the help of mathematics. Computers' functionality are as a result of millions of hours of mathematical analysis. Weather prediction, the design of fuel-efficient automobiles and airplanes, traffic control, and medical imaging all depend upon mathematical analysis. For most part, mathematics

remains behind the scenes as the use of the end results are without really thinking about the complexity underlying the technology in lives. The phenomenal advances in technology over the last century parallel the rise of mathematics as an independent scientific discipline. Towards the 17th century, arithmetic, algebra, and geometry were the only mathematical disciplines, and mathematics was virtually indistinguishable from science and philosophy. Although it was developed by the ancient Greeks for investigating the world yet it was preserved by Islamic scholars and passed-on to the Christian monks during the middle Ages. Mathematics finally became a field in its own right with the development of calculus by Isaac Newton and Gottfried Wilhelm Leibniz during the 17th century along with the creation of rigorous mathematical analysis during the 18th century by Augustin Louis Cauchy and his contemporaries. However, until the late 19th century mathematics was used mainly by physicists, chemists, and engineers. This study was carried out to determine the extent to which the students were able to interface the metaphysical stage of matrix into its epistemological value based on their disciplines.

STATEMENT OF THE PROBLEM

Irrespective of disciplines in the faculty of education in any nation universities students are primarily potential teachers, and this is why their training is diversified to equip them and cope with the rigours they are likely to face in the field later in life. Be as it may be one is not sure if this principle could ensure an adequate dissemination of knowledge acquired in its metaphysical stage to have meaningful epistemological ideal in teaching so that discipline biased does not over-ride the knowledge dissemination to the end-users, and indirectly not be able to see the interrelationship between the two concepts in daily activities. This study was conducted to examine the extent to which the students' teachers were able to interface the metaphysical stage of matrix into its epistemological value based on their disciplines at the training level. As a result, one research question and hypothesis were raised for the study at a significant level of 5%.

RQ_1: What are the observed disciplined students' teachers' performances of the metaphysical transformations into epistemological values of teaching matrix by the mathematics teachers?

Ho1: There is no significant difference in the performance among the disciplined students' teachers on metaphysical transformations into epistemological values of matrix of students' achievement test.

METHODOLOGY

The study was a survey of teachers' handling of matrix in classroom settings with the aim of diversifying the metaphysical concept of matrix into its epistemological values without inclination towards their discipline. Three universities in the south-western part of Nigeria were involved in the study but strictly the Education programme since they were expected to teach at the end of their programme. Though bias of programme was

also taken into consideration as these students' teachers were watched during their teaching practice exercise, yet they were not informed of the rationale behind the observation in order to prevent placebo of activities. A total number of 815 students' teachers were involved in the study with sampled restricted to those who studied mathematics-physics, mathematics-chemistry and mathematics-economics. Within the sampled area a total of 99 students' teachers that were going from their 300 level to 400 level, and whose teaching practice exercise were the final one to become potential teachers were used in the study. Apart from that the supervisors of the affected students 'teacher were contacted via the officers that did the allocation in their various institutions with detailed explanation surrounding the on-going study. The main instrument was the topic on matrix that has to do with equation related ones in *m by n,* and the extrapolative knowledge involved. This instrument had earlier been trial tested on some sandwich degree students that had completed their programme while doing their teaching practice in the earlier teaching practice year, with observation noted on their level of understanding the topic towards knowledge dissemination to their students. The split-half method used to confirm the extent of reliability of the instrument however gave the coefficient value of 0.73, which the study considered to be appropriate and move forward. For the entire sample of students' teachers selected for he study briefing was held through the assistance of their supervisors on the need to teach their SS 2 students the topic as they aware that these students were almost preparing for their external examination, there was need to handle the topic properly and ensure students understand it very well. While the teaching of this topic was in progress the mathematics teachers at the respective place of teaching practice was advised to give close monitoring to these students' teachers with a view to identify the extent to which each students' teacher was able to match the metaphysical and epistemological ideal of the topic vis–a-viz their disciplines. Meanwhile, it should be reiterated here that SS 2 students that they were expected to teach had no discipline bias as that time since the learning of mathematics cut across all levels: Arts, Social Sciences and Sciences. At the end of their teaching question on the same topic was set to reflect the metaphysical and epistemological ideal of matrix, and presented to the students, framed as part of their continuous assessment which constitutes an integral part of their final examination at SS 2. A Marking of this achievement test was done by the mathematics teachers in the selected schools, having been anchored by the marking guide from the researcher. Statistical used for the study was One-way Anova and Scheffe Post-Hoc analysis at 5% level of significance, as the secondary students used were pre-tested on their knowledge of matrix by the selected students' teachers to determine their entry behaviours, and these scores were retrieved from their supervisors, who had earlier been briefed on the rationale behind the study.

SUMMARY OF FINDINGS

On the research question raised as to what are the observed disciplined students' teachers' performances of the metaphysical transformations into epistemological values of teaching matrix by the mathematics teachers, variance of observations were reported as to the observation of the mathematics teachers involved. In some schools report had it

that these students' teachers though tried their possible best to disseminate the knowledge based on metaphysical ideal of matrix to the students but not in relation to what students could translate this knowledge into real life situation. For instance it was reported that those teachers that were pure science background but they were teaching this topic taught in line with solving algebraic equation, that students, especially the social sciences and arts found the topic boring to understand. On the other hand, the science students that were taught in the same manner were able to flow with the instructional levels of these students' teachers as most explanation were skewed towards solving one equation or the others.

Apart from this, some mathematics teachers reported that few students' teachers even with their social sciences background were able to relate the topic to the epistemological ideal that make it more and real life sustainable topic for students to appreciate. These mathematics teachers opined that most of these students' teachers were tailored towards the anticipated examination/test to be conducted for these students. Findings showed that the classroom teaching of the selected topic in matrix from its metaphysical ideal into its epistemological ideal was based on the disciplines of individual students' teachers involved. Those in sciences related the concept to pure solving algebraic equations; social sciences students' teachers merely taught the topics in skeletal way as it was mentioned while students received the teaching as it was.

On the research hypothesis that there is no significant difference in the performance among the disciplined students' teachers on metaphysical transformations into epistemological values of matrix of students' achievement test, table 1 below showed the achievement test scores of the entire students that were exposed to the administered instruments

Table 1: ANOVA of Students' performances on metaphysical transformations into epistemological values of matrix achievement test

Source of Variation	df	Sum of Squares	Mean of scores	F. cal	F. val	Significant
Between groups	2	839.84	419.92	3.27	3.07	P< 0.05*
Within groups	97	12466.41	128.52			
Total	99	13306.25	134.41			

* Significance at 0.05

It was discovered that there was significant difference in the performance among the disciplined students' teachers on metaphysical transformations into epistemological values of matrix of students' achievement test [Fcal>Fval, df=(2,97), P< 0.05]. This finding tend to corroborate the reports of the mathematics teachers which stated that the teaching observed in the classroom was at variance to the disciplines of the students' teachers that taught the topic, and as such the hypothesis was rejected.

In a bid to determine the group of students that actually performed well out of the three grouped students' teachers based on their disciplines scheffe post-hoc analysis was computed as shown in table 2 below:

Table 2: Scheffe Post-hoc analysis of Significances of Students' performances on metaphysical transformations into epistemological ideals of matrix achievement test

Disciplined St Teachers(i-th group)	Disciplined Students' Teachers group)	Scheffe's value of significa
Mathematics-Physics	Mathematics-Chemistry	2.469326853
	Mathematics-Economics	6.218567397*
Mathematics-Chemistry	Mathematics-Economics	4.005637821*

* Significance

Table 2 above displayed the level of significance as observed in the achievement scores of students taught by different students' teachers based on their disciplines where it was found that there was no significant difference in the performances among the disciplined students' teachers of mathematics-physics and mathematics-chemistry on metaphysical transformations into epistemological ideals of matrix [Fcal<Fval, P> 0.05], but there was significant difference in the performances among the disciplined students' teachers of mathematics-physics and mathematics-economics as well as mathematics-chemistry and mathematics-economics on metaphysical transformations into epistemological ideals of matrix [Fcal>Fval, P< 0.05]. This explained the fact that knowledge transmission of the topic in matrix to the students was absolutely depended on the disciplines of the teachers that handled the topic in mathematics. This finding corroborated with the work of Azodo (1997). Similarly, the result also acknowledged the assertion made by Ajileye (1998) that there was a need to emphasize the basic concepts of mathematics while teaching. As it has far reaching implications for mathematics teaching. As evident from the study, no fact is too small while teaching mathematics because this small fact helps the students to understand the topic better and equips them on why certain parameters are used during certain instances and another parameter in another instance. It is essential to acquaint practicing teachers and in training the innovative approaches to enhance their effectiveness in the classroom.

DISCUSSIONS

Dimensions which the teaching of mathematics has taken in the contemporary society goes beyond the passing of the prescribed examination, rather it embraces the need for the end-user to apply whatever they have learnt in the classroom to knowledge based which is quite deficient. Study has shown that no matter how good a student might be in mathematics the optimum is often determined by the teachers that are entrusted to disseminate further information to them. This is however depended on the discipline of he teachers that handled the as well. Study showed that majority of the students that were

handled by the science based teachers related the topic to solving algebraic equations alone, and could not go further to extrapolate its knowledge in the other areas of knowledge as in the economics use. This situation was worth mention when one observed the similar situation of the economics biased students' teachers that could not thrive well in the test other than assuming the matrix topic should remained as it was. Apart from that it tried to show that teaching of mathematics, which is compulsory for all students to learn, must not be done by one teacher in case of the discipline of such teacher which might not take into consideration the possible application of such topic in the course of teaching. It should be pointed out that no meaningful academic performances among the students could be achieved if knowledge diversification is disallowed among the mathematics teachers. By extension each mathematics teacher need to come forward in their staff room and brainstorm on each topic vis-a-viz their disciplines, and map out best way to disseminate knowledge to the students in the classroom. Each classroom consisted of an heterogeneous students who pick interest in the way each topic is related to his/her immediate environment.

CONCLUSION

Mathematics teachers dissemination of knowledge from the study has shown that each teacher did according the discipline, and as such not to the interest and understanding of the students. This explains why the perennial dismal academic performance in mathematics in the public examination has always be on increase. A case study at sight was that of released results of the May/June 2012 West African Senior School Certificate Examination (WASSCE) at its National office in Yaba, Lagos, as pointed out by Dr. Iyi Uwadiae, the Registrar of the Council, who made submission of 923, 974 male and 748, 250 female candidates that sat for the May/June 2012 WASSCE...Since each topic constitute an integral part of mathematics teachers examine themselves and identify the areas they could teach effectively, and leave other areas to others to handle for the sake of better knowledge dissemination. Through this concerted effort many gains would be appreciated from students' performances in the public examination where dismal performance has been for long a house hold slogan.

IMPLICATION

The study has far reaching implication in the sense that the nation technological development depend on the quantity of mathematics being offered in the school system. A dismal academic achievement in mathematics is synonymous to underdevelopment of such nation, which is likely to be enveloped with diverse social vices, misery, and poverty just to mention a few. More so, it portends great danger to such society which creates the school to find solution to the macro-society's problems but instead creating more for the society to contend with. Infact it a multiplier effect problem since the solution which education seem to give the society in terms knowledge advancement has turned into problem procreation.

RECOMMENDATION

As earlier mentioned, teaching of mathematics at the secondary school level should be an integrated one where mathematics teachers come together and map out the areas of specializations in accordance to discipline before going into the classroom, which comprises of heterogeneous students. This would make task less tedious for one mathematics to dispense whole knowledge that is not available due to discipline's inclination. Apart from this teachers of mathematics need to update their knowledge from time to time and see the area that needs to brush over otherwise knowledge gained the training ground might become obsolete within timeframe. Hence, no one could claim of giving something one does not possess is synonymous of inadequate knowledge teachers to equip students with demand and use to which these topics in mathematics demand.

SUGGESTION FOR FURTHER STUDIES

Series of similar studies could be conducted among the students' teachers on different topics in mathematics, and as a way of determine where lapse is found. Apart from that, similar studies could be conducted in any nation/school subjects where it has been established that students' performances have been on decline. Infact study of the same nature could be carried out at the elementary school as well other tertiary institutions with a few to ascertain the difficulties experience by the in-service teachers before total collapse of the educational system in general.

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