Sociological and Mathematics Educational Values: An Intersection of Need for Effective Mathematics Instructional Contents Delivery

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Abstract

Sociological and mathematics educational values are two key components worthy of integration for effective mathematics instructional contents delivery in this era of globalized world. The paper examines values attached to these components and its applicability in an ongoing mathematics classroom. The study employs qualitative methodological technique with interviews as a source of data. 3-service mathematics teachers teaching mathematics in different senior secondary schools participated in the study. The findings reveal that mathematics teachers are aware and had minimum understanding of these components of values inculcation in their mathematics teaching and learning. Suggestions are offered on how to improve sociological and mathematics educational values for effective mathematics instruction.

Key word: Sociological, Educational, Mathematical and Values.

Introduction

The role of sociological and mathematics educational values in facilitating understanding of mathematics teaching and learning cannot be over emphasized. This is because; it enables mathematics teachers and learners of mathematics to have a holistic view about mathematics procedural and instructional contents delivery which is distinctive from mere abstractions of ideas and principles. These components permit mathematics teaching and learning within the framework of practical sensation of what mathematics can offer to the overall living standard of individuals and society. Values generally and indeed in mathematics education can be said as a deeply held view of what we belief to be important and worthwhile (Fall, 2009). Values are regarded to be desirable, essential and are held with high esteem by a particular society in which a person lives. Furthermore, values give meaning and strength to an individual's character or behavior and it occupy a central place in an individual life. Values reflect one's personal attitude and judgments, decisions and choices of action, behavior and relationships, dreams and vision (Pathania, 2011). Additionally, values influence our judgment, feelings and actions and guide us to do the right things. Values are term to be the guiding principles of life that contribute to the all round development of an individual, that is socially, physically, mentally, emotionally and spiritually. (Pathania, 2011). She further reiterated that values give a direction to life and thus bring joy, satisfaction, peace and add quality to life. Thus, one might say that any human activity, thought or idea, feeling, sentiment or emotion, which promotes self development of an individual, constitutes a value. A value system is the backbone of the society and usually varies from one society to another and from time to time.

However, every society abides by certain moral values and these values are accepted by all the societies as "Global values" or "Universal values" (Rescher, 1969 & Pathania, 2011).

Sociological mathematical values refer to those values of openness and mystery of mathematical knowledge in relation to societal needs. The usefulness of these values in comprehending mathematics teaching and learning is glaring in the sense that it usually unveils the connection between mathematical theories, principles and relations and to the practical needs and aspiration of societies. The classification of these values include: joyful atmosphere for mathematics teaching and learning, equality in treatment of mathematics students' "social justice", project based mathematics learning in which ultimately promotes the value of "friendships" among students, freedom of expression of mathematical ideas "democratization" and among other positive social tendencies (Bishop, 1998 & 1999).

Mathematics educational values are relatively link to the kind of values in the mathematics classroom which include: the norms and practices of teaching school mathematics as advocated by mathematics teachers, textbooks, and societal beliefs and possibly by the school philosophy. These types of values reflect both mathematical and educational and it is expected of mathematics learners to display these values in their problem-solving workings. For instance, emphasizing for accuracy, showing procedural and logical mathematics problem solving, application of theories and principles in a similar different context, verification of mathematical solution …etc (Bishop et al., n. d. & Chin et al., 2001).

Of course, sociological and mathematics educational values in mathematics classroom do not exist mutually exclusive of one another. They are interwoven in nature. A process of inculcating mathematics educational values usually result consciously or unconsciously in inculcating sociological mathematical values which is usually emanated from the socio-cultural context of a classroom (Bishop et al., n. d. & Chin et al., 2001).

Then, a question may be asked why inculcation of values in mathematics teaching and learning? Inculcation of values in mathematics teaching and learning projects the mirror image of mathematics outside the classroom setting, in the sense that it give the learners the rightful ownership of what they learned in the classroom. On the other hand inculcation of values in mathematics brought about the sensation of universality of mathematics as a subject. It used to acquaint the learners with fundamentals absolute values of truth, usefulness and beauty of mathematics. According to Pathania, (2011) values ascertained path and control of the rudiments of what is desirable and distinguishing it from undesirable elements for the purposes of decision making in mathematics classroom.

Previous Study

The pertinent importance of values in mathematics teaching and learning cannot be over exaggerated in the sense that values have become part and parcel of who we are as individuals. The reflection of values occurs virtually in everything we say or do even our physical appearance and possessions, reflects something we valued. It is a common misconception among people that mathematics is a value-free subject. This might be because of the assumptions that mathematics usually has one right answer and one best way of finding solution to a problem (FitzSimons et al., 2000ab).

The Bloom taxonomy of educational objectives with reference to the affective domain discourses the complexity of situating values into peer representation and internalization in education and mathematics education in particular (Krathwohl et al., 1964). According to Bishop, (1988) viewed values in mathematics education as the deep affective qualities which education fosters through the school subject of mathematics. The internalization and cognization of these affective qualities such as belief and attitude largely depended on individual and his/her the cultural affiliation. However, the inculcation of sociological and educational mathematical values occurs through the scenery of mathematics and acquired mathematics teaching experience (Bishop et al., 2010). It was asserted that cognitive and affective abilities of mathematics learners usually develop through inculcation of these values and consequently provides a wider scope of perceiving and interpreting mathematical worldviews (Buxton, 1981 & Fasheh, 1982 & Martin, 2000).

Furthermore, the realization of mathematics teaching and learning as value-laden school subject does not meant that, there are clearly identified set of mathematical values that every mathematics teacher adhered to or any other forms of ideas on how to convey values in mathematics classroom.

In fact, it was asserted that there were limited empirical researches conducted on mathematical values inculcation (Mcleod, 1992 & Fitzsimon et al., 2000a)

Researches such as: Wilson (1986) wrote little about values in mathematics teaching. However, Bishop, (1988); (1991) and (2001) Bishop and Clarkson, (1998); FitSimon et al., (2000ab) and Bishop et al., (2010) had contributed to western mathematical ideology on values education and mathematical enculturation in the western cultural society. Therefore, this study will use the framework of the effective domain and values education generally by (Raths et al., 1987; Tomlinson & Quinton, 1986). On affective aspects of mathematics education (McLeod, 1992; Thompson, 1992; Sosniak et al., 1991). And on the social and cultural aspects of mathematics education (Wilson, 1986 & Bishop, 1988; 1991 & 2001).

Objective of the Study

The aim of this study is to investigate sociological and mathematics educational values inculcation in mathematics teaching and learning among secondary school mathematics teachers in the North Eastern Region of Nigeria.

Central Research Question

What are the attitudes and perceptions of secondary school mathematics teachers towards inculcation of sociological and mathematics educational values in mathematics classroom teaching?

Research questions

The study intends to investigate the following:

Q1: How mathematics teachers' understood the concept of values inculcation in mathematics teaching and learning?
Q2: What are the awareness levels of mathematics teachers' concept of values inculcation?
Q3: What are the levels of perception of mathematics teachers with regard to the inculcation of sociological mathematical values?
Q4: What are the views of mathematics teachers in relation to the inculcation of mathematics educational values?
Q5: What are challenges constraining inculcation of sociological and mathematics educational values in mathematics classroom?
Q6: How can mathematics teaching be improve with respect to the inculcation of sociological and mathematics educational values?

Interview Questions

IQ1: What is your understanding about mathematical values inculcation?
IQ2: How do you inculcate values in your mathematics teaching?
IQ3: How do you perceive inculcation of sociological mathematical values in your teaching?
IQ4: How do you inculcate educational mathematical values in your mathematics teaching?
IQ5: What are the challenges constraining your ability to inculcate sociological and mathematics educational values?
IQ6: What are your suggestions on how to improve inculcation of sociological and mathematics educational values?

Methodology

This section of the study presents the design, the participants, the instruments and data collection procedure.

Research Design

This study uses purposeful sampling for its data collection from three service mathematics teachers who were teaching mathematics in secondary school in the North Eastern Region of Nigeria. The participants of the study served between7-10years of teaching mathematics in their respective schools. Face-to-face interview were used as the technique of data collection of the study. The selection of participants of this study were on the basis of longer tenure ship in the teaching of mathematics as a profession and it is assume that the longer in-service the better experience they had about mathematical knowledge and inculcation of values in their teaching. Furthermore, it was also believe that qualitative methodological technique for investigating a phenomenon usually resulted in obtaining an in-depth data (Creswell, 2008).

Data collection procedure

he general approach to this study is to develop a greater understanding about what are mathematical values in mathematics education. How mathematical values are inculcated in mathematics classes. How aware are mathematics teachers with regard to values inculcation in mathematics teaching and learning and what are the challenges constraining inculcation of mathematical values. A semi-structure interview questions were used for the purpose of data collection of this study. This was because, it is usually allows greater freedom in the sequencing of questions, and allows flexibility in the amount of time and attention given to different participants as compared to structured interviews (Creswell, 2008). On the other hand, in a structured-interview, the questions are standardized open-ended or closed, with fixed responses. Participants fit their experiences and feelings into the researcher's categories. In addition to, this study is not ethnography or participant-observation research but rather a phenomenological study type of investigation based on natural responses, experiences, and perceptions of the selected participants (Creswell, 2008). Furthermore, the purpose of the face-to-face interview is to find out things that cannot be directly observed. For example: feelings, thoughts, intentions or ideas about an issue at hand that is how mathematical values are conveyed in mathematics classes. It was also asserted that non-verbal cues for example body language and facial expressions usually provide messages which help in understanding the verbal responses. Thus, face-to-face interviews offer the possibility of checking interesting responses and allow the interviewer to investigate underlying principal topic of the study (Creswell, 2008).The data collected for this study will be transcribed and subjected to inter-rater reliability test. Three raters will be selected based on their expertise and longer tenure ship in the mathematics teaching profession to validate the transcribed interviews for the study.

Data Analysis

This section concerns more on the data analysis of the study. The data of this study was collected through face-to-face and one-to-one interview procedure. Thereafter, the data was transcribed using software called "Express scribes". Furthermore, the data was coded into a coding template for the purpose of producing the main ideas, themes and sub-themes of the transcribed interview questions. It is noteworthy that there were instances of incomplete sentences, incoherent thoughts with facial expressions, gestures, and postures, which cannot be translated into the transcribed text. Thus, the study focused on transcribed words as the basic medium for the data analysis. The researcher acknowledged that the transcription of the interviews can reduce and simplify complex personal thoughts of the participants if crucial non-verbal data are not interpreted accurately or par halves may diffuses the main ideas of the interviews.

However, in order to reduce this drawback, the transcribed interviews were subjected to the respective participants for judgment on the accuracy and precision of the transcribed interviews. Three raters, both of whom are mathematics educators assigned the main ideas of the transcribed interviews based on the selected discourse units to affirm the researcher's interpretations. The reliability index based on the raters rating of the main ideas is calculated by finding the percentage of agreement with each of the rater using the formula below:

$$\textbf{Reliability} = \frac{\textbf{Number of Agreement}}{\textbf{Total Number of Agreement} + \textbf{Disagreement}} \times \textbf{100\%}$$

Table 1: Inter-rater Reliability Index for the Interview Questions

Participant	**Total No. of discourse units**	**Total No. of discourse units agreed**	**Total No. of disagreement with(rater 1)**	**Inter-rater Reliability Index (%)**	**Overall Reliability Index (%)**
Participant I	96	87	09	90.63%	91.06%
Participant II	75	70	05	93.33%	
Participant III	65	58	07	89.23%	
Participant	**Total No. of discourse units**	**Total No. of discourse units agreed**	**Total No. of disagreement with(rater 2)**	**Inter-rater Reliability Index (%)**	**Overall Reliability Index (%)**
Participant I	96	89	07	92.71%	93.23%
Participant II	75	71	04	94.67%	
Participant III	65	60	05	92.31%	
Participant	**Total No. of discourse units**	**Total No. of discourse units agreed**	**Total No. of disagreement with(rater 3)**	**Inter-rater Reliability Index (%)**	**Overall Reliability Index (%)**
Participant I	96	88	08	91.67%	91.41%
Participant II	75	70	05	93.33%	
Participant III	65	58	07	89.23%	

The percentage of reliability index based on the agreement of the main ideas with rater 1, 2 and 3 are within the acceptable range of 90% and above. The overall reliability index percentage of rater 1, 2 and 3 within the respective three participants of the study are 91%, 93% and 91% respectively.

Research Question One

How mathematics teachers' understood the concept of values inculcation in mathematics teaching and learning?

Based on the transcribed interviews, the participants show an average level of understanding about mathematical values. All the three participants concurred on the idea that the concept of values inculcation in mathematics teaching and learning is something to do with how mathematics teacher teaches mathematics with optimum clarity and understanding of the main purpose of school mathematics. They are with the views that,

Participant I: *…the concept of values inculcation in mathematics teaching and learning, a…a…is the ability of mathematics teacher to effectively shows to his students the usefulness and application of the school mathematics learning to the outside world. That is to say how mathematical conceptual understanding better our livelihood as individual and groups.*

Participant II: *"To my understanding…a…a…a…the concept of mathematical values inculcation in the teaching of mathematics should be related to the real life applications of the mathematical ideals and principles of mathematical problems solving. It should be a means of showing the values attached to the subject not just the mere abstractions of mathematical ideas and principles".*

Participant III: *…"I believe mathematics is real like any other school subject, unlike other assumption that mathematics is just like pre-served antiquities which just need dusting and being pass from generation to another. What makes it real is concept of values in it. For example, we use mathematics in quantifying quantities such as the amount of food items we consume, in erecting houses for our living"….*

Therefore, based on the above verbatim quotations of the transcribed interviews of the three participants of the study revealed that they had a moderate idea about the concept of values inculcation in mathematics teaching and learning. They believe that the concept of values inculcation in mathematics is much related to how mathematics educators teach mathematics in their respective classes. The participants' responses concurred with the previous studies such as: Bishop, (1988); (1999); Bishop and Clarkson, (1998); Bishop et al., (2010); Liman et al., (2011ab); Ball and Bass, (2003ab) which stated that, the pedagogical theories and knowledge of mathematics which we have formulated and accumulated, and the range of curriculum statements and guidelines informed and empowered us in understanding better how students can learn mathematics more productively as well as how teachers can facilitate that process more effectively.

Research Question Two

What are the awareness levels of mathematics teachers' concept of values inculcation?

The participants' verbatim transcribed interviews revealed that mathematics teachers were aware about concept of values inculcation in mathematics teaching and learning. This was because, they were with assertion that,

Participant I: *…* "*a good mathematics teacher should have values people will like him and student will also like him. Mathematics teacher should imbibe the culture of openness that will accord him some respect. But most importantly should know his subject-matter"…*

Participant II: *If you want to be a good mathematics teacher you should have values before you can now teach, if you really want, you want students to like your subject, like in my own case students always like me, they continue to come to me when they have problems.*

Participant III: *…"Well, values are crucial not only to mathematics teaching, but also to the general wellbeing of an individual. A mathematics teacher should have positively impacted on his students the culture of liking mathematics as a subject through various actions such as: giving real life examples of mathematics applications or being a role model to your students…etc"…*

These affirmed the Fitzsimons et al., (2000a) findings that characterization of values represents the point reached, where an individual "responds very consistently to value-laden situations with an interrelated set of values, a structure, and a view of the world" (p. 35). Ultimately, the characterisation by a value or value complex is reflected in an individual's consistent philosophy of life. In other words, in order to consciously adopt a particular value, people need to be aware about a phenomenon, respond to it willingly, become committed to it, organise value system to accommodate it, and eventually it may become part of one's worldview. This assertion indicated the roles of values system in mathematics teaching and learning processes and on the same vein shows the important of values in school system. As such there is need for its emphasis not only in mathematics teaching and learning but also in our general educational system.

Research Question Three

What are the levels of perception of mathematics teachers with regard to the inculcation of sociological mathematical values?

From the transcribed verbatim interviews, the participants asserted that classroom mathematics teaching and learning should enjoy not only the rudiments and mathematical abstractions of ideas and ideals but also the uses of sociological phenomenon that can facilities the better understandings of mathematics educational knowledge. They were with views that,

Participant I*: 'What I do in my teaching, whatever topic, I come to teach, I will teach it how its, whatever I teach, I try to relate to the students immediate environment or to the real-life situation. Of course, we should be able to inculcate some aspect of values through this relationship other things in the course of mathematics such as…., a,…a,…a,…a, even relating to the students real-life",…*

Participant II: *… the mathematics we are teaching should be linked to the day-to-day problems, especially when we come to things like addition, multiplication or something like that, some aspect of mathematics should be linked to the actual, what is happening in day-to-day,….*

Participant III: *… mathematics teaching and learning should lend itself to the uses of social and practical examples, such as: in teaching profit and loss mathematics teachers should link the teaching to the real life scenario of buying and selling. Another social and practical examples can also be useful in the teaching the concept "Fractions". In fact if we want our mathematics teaching to have values we must link our teaching to the real world that is to the day-to-day problems*

This affirmed the findings of Yackel and Cobb, (1996); Gutstein, (2003); Seah, (2007) and Bishop et al., (2010) which showed that sociological mathematical values inculcation is an integral part of effective mathematical contents delivery.

They further re-iterated that mathematics teaching and learning cannot be inseparable to the students' cultural environment. They advocated that mathematics teaching and learning with the framework of sociological and educational mathematical values usually widen the scope of thinking and mathematical application of mathematics learners. However, implementation of these wonderful pedagogical ideas in mathematics classrooms has not kept pace with advances in mathematics education. This situation as asserted by Bishop et al., (2010) could be the main reason why mathematics teaching today appears to be so similar to the way it was 40 years ago. Even in educational contexts where schools and teachers attempt to introduce mathematics education reforms, different priorities of or even resistance by students or their parents may thwart the professional intentions (Seah, 2007 & Clarkson et al., 2010).

An example of this scenario was reported by Lubienski (2002) in which more than 82% of the 600 students and their parents surveyed preferred the traditional mathematics instruction over the new Standards-based instruction sequence. More so, even in countries where graphics calculator use is expected of students in formal assessment exercises, it is not difficult to come across teachers who express concerns about student loss of mental computation abilities as a result of the use of technology (Seah, 2007 & Clarkson et al., 2010).

Research Question Four

What are the views of mathematics teachers in relation to the inculcation of mathematics educational values?

Participant I*: …what I think about educational mathematical values is concern with the way we teach mathematics. I think it has something to do with ideological mathematical tendencies of mathematics teachers. A number of mathematics teachers only teach mathematics without ingredient. What I mean is that…a…a…a…traditional ways of teaching mathematics. '*

Participant II: *Educational mathematical values can be an ability of mathematics teachers to cultivate the minds of mathematics learner to the tune of becoming more knowledgeable of the subject-matter. The mathematics we are teaching can only make sense, if it can be educative. That is to say if the learners can derive meaning from the mathematical conceptual teaching.*

Participant III: *…My understanding to the terms educational mathematical values is that those values conveyed by mathematics teachers which are educative in nature. Examples of these values include: mathematical problems solving techniques, application of theories and principles in solving real life mathematics problems such as: measurement of lengths and height…etc…*

From the analysis of the participants' transcribed interviews that revealed the participants moderate level of understanding about mathematics educational values inculcation in their teaching. Their views reaffirmed the findings of White, (1959), Bishop, (1988); (1991); Corrigan et al., (2004) and Liman et al., (2011ab). They were with assertions that effective mathematical contents delivery rest within the confine of mathematical values inculcation such as: educational mathematical values, sociological mathematical values, attitudinal mathematical values, ideological mathematical values, computational mathematical values and motivational mathematical values. In other words, school mathematics is structured and delivered in such a way as to portray the values of the society. Unfortunately, researches such as Seah and Bishop, (2008) revealed that many teachers of mathematics find it difficult to think about values in relation to their pedagogical repertoire. This was because there was hitherto little professional development support in terms of conceptualization of mathematical values. As a result, there is little explicit teaching and discussion of values in the mathematics classroom.

Research Question Five

What are challenges constraining inculcation of sociological and mathematics educational values in mathematics classroom?

With regard to the challenges constraining inculcation of sociological and educational mathematical values in mathematical contents delivery, participants of this study based on the verbatim transcribed interviews stated that,

Participant I*: …difficulties in finding real objects or scenarios to associate mathematics teaching and learning. What happen is that, some of the topic in mathematics themselves, they are very hard for you to get a tangible objects that you can associate conceptual teaching with it, despite how good you are in creativity...*

Participant II: *…there were many challenges such as: lack of conducive environment for mathematics teaching and learning; lack of mathematics teaching and learning materials; lack of refresher workshops, seminars both within and outside school, lack of in-service training, lack of support from the school management in relation to creative and innovative tendencies, over crowdedness of classes…etc…*

Participant III: *…one of the fundamental challenges we face is our in ability to correct the wrong notion or impression that every potential learner of mathematics can effective do good and excel in mathematics. Majority of mathematics learners to have one forms of phobia or the other about learning mathematics. To many students mathematics learning is for special people. This misconception posed challenges to mathematics teachers in an attempt to inculcate both sociological and educational mathematical values globally and Nigeria in particular.*

All of the aforementioned challenges encountered by mathematics teachers in relation to the inculcation of sociological and mathematical educational values have been affirmed by the findings of Bishop and Clarkson, (1998); Bishop et al., (2010) and Bishop et al., (n.d.) in which they said values inculcation in most mathematics classes were implicitly taught. This might be linked to mathematics learners' attitudes toward mathematics learning, conflicts of cultural perceptions, language barrier…etc. According to Pintrich and Schunk, (2002) mathematics teachers find it challenging to motivate mathematics learners to finish mathematics worksheet and that may ultimately link to the already misconceived ideology that mathematics is a difficult subject and for special learners.

Research Question Six

How can mathematics teaching be improved with respect to the inculcation of sociological and mathematics educational values?

The participants of this study were with views that mathematics teaching and learning can be improved if the aforementioned challenges can be tackled. They said that based on the transcribed interviews.

Participant I*: …suggestion on how improve mathematics teaching with respect to the inculcation of sociological and mathematical educational values can be viewed from two entity. One is the socialization tendency of mathematics teacher. Secondly, mathematics teacher mastery of his subject-matter with requisite teaching methodologies. If mathematics teacher can socializes him/her with learners of mathematics, this will enables mathematics to convey educational mathematical values.*

Participant II: *…well, mathematics teachers should be caring, hoping and ready to accommodate their students learning difficulties in mathematics. They should be approachable. Mathematics teachers should try to organize forum of sharing mathematical ideas between teachers and students and between students themselves. There is also need for mathematics teachers have innovative and creative tendency. This can greatly enhance effective mathematical contents delivery.*

Participant III: *…sociological and educational mathematical values inculcation with respect to effective mathematics teaching and learning can be improved in a way that mathematics teachers should be current that is up-to-date on a latest mathematical conceptual teaching and learning techniques. This can be attained through refresher/train-the-trainer workshops, conferences, seminars, symposiums and mathematics teachers' in-service training for upgrade of their mathematical knowledge…*

According to Lancaster, (2010); Davis and Hersh, (1981) shared similar views with the participants of this study. They said that conferences, seminars, workshops on effective mathematics pedagogical contents delivery is an important starting point for mathematics teachers', as it provides an opportunity for them to clarify their own views on issues/matters related to their repertoires. These forums enables them to compare their own experiences with the experiences of their colleagues, and be aware of the diversity of views held by mathematicians, philosophers, educators, fellow teachers, students and their parents on fundamental issues of mathematics teaching and learning.

Discussions of the Major Findings

The findings on how mathematics teachers can effectively utilize sociological and educational mathematical values in their teaching for effective mathematical contents delivery revealed that mathematics teacher should be an advocate of the following activities: real life application of mathematics, cultivation the culture of openness, emphasis on ideological mathematical values. Furthermore, the challenges associated with lack of utilization of sociological and educational mathematical values in mathematics teaching and learning include: difficulty in finding real objects, lack of socialization tendencies, and lack of mastery of the subject-matter. The participants' of the study also profound suggestions on how to effectively utilize the use of sociological and educational mathematical values for effective conveyance of mathematical knowledge. These suggestions include: mathematics teachers mastery the subject-matter, up-dating knowledge through workshops, seminars, symposiums, colloquiums conferences and in-service training of mathematics teachers.

Openness and Mystery

This refers to the aspect of sociological mathematical values inculcation where by the finding from the assertions of the participants pointed out that mathematics teaching should be linked to the day-to-day problems, especially when it involves operations such as addition, multiplication, solutions of equations, theories and principles applications. Mathematics teaching should be built within the framework of showing the relationships between classroom theoretical and principles application and the usefulness of the ideas in practical context in the society. These processes according to the participants can greatly simplify mathematical contents delivery to the minimum level of understanding. These assertions concurred to the views of (Seah & Bishop, 2000; Bishop et al., 2010; Bishop & Clarkson, 1998) respectively.

Objectivism and Rationalism

According to the participants of this study based on the transcribed interviews revealed that mathematics teaching should encapsulate ideological scenario and emphasis on gainful knowledge. That is to say attainment of educational mathematical values can effectively occur if mathematics teachers emphasize on the objectivism and rationalism of mathematical contents delivery. According to Bishop, (1988); (1999) and (2001) ideological mathematical values is an important component in the attainment of effective mathematical contents delivery. This was because, if mathematics teachers can dual more on the rationality and objectivity of mathematics and relates that situation to some social phenomenon that can result to a meaningful and fruitful encounter between mathematics teacher and students.

Challenges Associated with Values Inculcation

The participants of this study asserted as part of the challenges they encounter that there are situations whereby mathematics teachers faced difficulties in obtaining the associated objects or scenarios to which mathematics can be related in order to facilitate understanding of mathematics teaching and learning. Furthermore, they were with views that there are number of topics in mathematics which are somewhat difficult to find an appropriate social scenario to link it teaching with, despite creative and innovative tendency of the teacher. They reiterated that it's hard to obtain the inter-related objects or scenarios to link the teaching and learning process.

Another challenges associated with inculcation of sociological and educational mathematical values is the mathematics teachers in ability to attain the socialization attributes. Most of the mathematics teachers prove to be topped and unapproachable. Some mathematics teachers lack the knowledge of the subject-matter. Some lack methodologies of effective contents delivery. Based on the transcribed verbatim interviews the participants also revealed that there are gross inadequacies in the areas of knowledge sharing and mathematics teachers' remunerations through incentives such as: workshops, seminars, symposiums, colloquiums, conferences and in-service programs for up-grade of mathematical knowledge.

The participants also added that the wrong impression about mathematics as a difficult subject conceived by many mathematics students usually hindered effective inculcation of sociological and educational mathematical values. This misconception posed challenges to mathematics teachers' globally and Nigeria in particular. The informants were of the views that these misconception lead to the degrading of the subject as a values free.

Therefore, based on the aforementioned assertions of the participants with regard to the inculcation of sociological and educational mathematical values for effective mathematical contents delivery, we came-up with paradigm for the inculcation of these values in mathematics teaching and learning encounter.

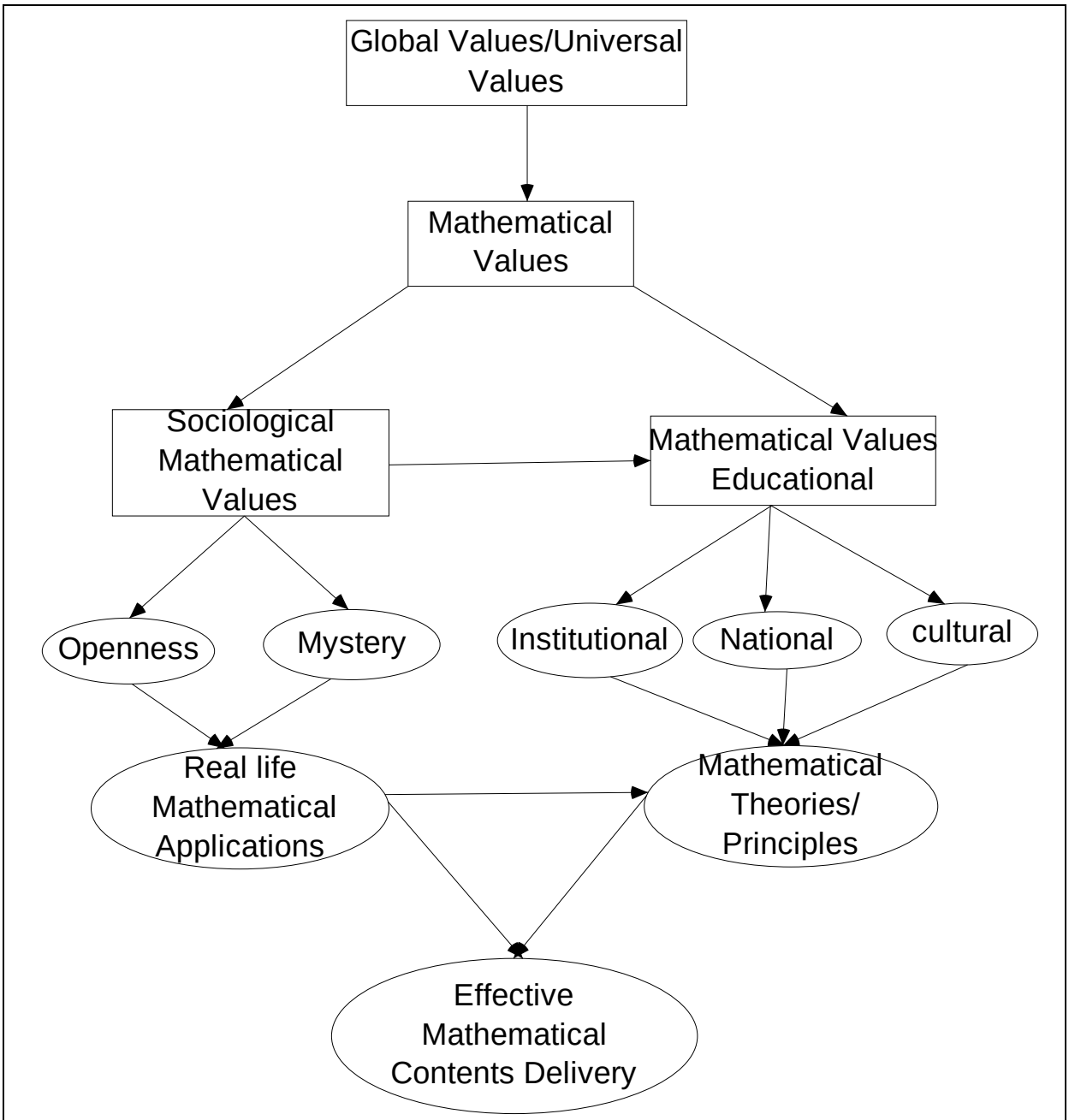

Figure 1: Structural Pattern of Sociological and Educational Mathematical Values

Conclusions and Recommendations

The main objective of this study is to qualitatively investigate the inculcation of sociological and educational mathematical values inculcation in mathematics teaching and learning among secondary school mathematics teachers in the North Eastern Region of Nigeria. It was expected that effective inculcation of these values can result to better conceptualization of mathematical ideals, theories and principles. Therefore, going by the series of qualitative data analysis of this study revealed that mathematics teachers had a fear understanding of the concept of values inculcation in mathematics teaching and learning.

With regard to the awareness level of mathematics teachers in relation to the inculcation of values in mathematical conceptual teaching demonstrated moderate responsiveness about the concept. In relation to the inculcation of sociological and educational mathematical values in mathematics teaching and learning, mathematics teachers showed positive and remarkable procedures and techniques toward realization of the inculcation of these values. Furthermore, the participants also offered suggestions on how improve values inculcation particularly sociological and educational mathematical values in mathematics classroom teaching and learning encounter. They suggested and recommended that socialization tendencies of mathematics teachers can enhance good and interpersonal relationship between learners and teachers of mathematics and that might result in liking and excelling on the subject. The participants also recommended that mathematics teachers should be mindful of mastering their subject-matter, up-dating their knowledge through attending workshops, seminars, symposiums, colloquiums, conferences and above all the overall in-service training. They further reiterated that schools managers should provide such venues to mathematics teachers.

Another suggestion made by the participants of this study was that mathematics teachers should take a giant strive in researching on values in mathematics education with reference to the inculcation of these values in mathematics teaching and learning. They said that this noble acts will make mathematics teaching a head way. It was also part of the suggestions that curriculum planners/designers and mathematics text-books writers should be conscious of values that are embedded on each mathematical module, sub-module and units. These values should be clearly spelled out under the beginning of each module or book chapter.

Finally, this study investigated the inculcation of sociological and educational mathematical values and its effective utilization and realization of a desirable mathematical contents delivery. The study employed qualitative methodological technique with interview as the sources of data. As part of the limitations and delimitations, this study involved only three participants considered to be knowledgeable and experience mathematics teachers chosen from one state of North Eastern Region of Nigeria. Therefore, further study should involve greater number of participants cutting across all the six states in particular and the thirty six states of the Federal Republic of Nigeria in general.

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