Exploration of Mathematics Stakeholders' Orientation towards Mathematics Values in the South-West, Nigeria

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Abstract
Mathematics is important to almost everybody for daily activities and for achieving some purposes. So Mathematics is a compulsory subject which every student must offer in school. The students' performance in Mathematics had improved. In comparison of students' performance in Mathematics, there was a marginal improvement of 1.06% improvement in performance of candidates: This is because in 2019 and 2020, 64.18% and 65.24% obtained credits and above in Mathematics respectively. Although in the last two years, there was improvement in the students' performance, still these studies must be carried for the sustenance of the improvement. In view of this, the researchers hereby tried to gather the opinions of the Mathematics stakeholders. A total of fourteen (two university lecturers, two secondary school teachers and ten secondary schools) respondents were interviewed. Atlas.ti 8 software package for analysing qualitative information was used to analyse the collected data. The outcome of the analysis revealed that the Mathematics stakeholders' views and orientation are mostly positive while only few are negative. The results of the analysis may later guide the Mathematics Stakeholders on how to effectively assist the Mathematics students improve their orientation towards Mathematics values, to enhance the sustenance of the students' better performance in Mathematics.
Key Words: *Mathematics, Orientation, Stakeholders, Values, Views*

Introduction

Mathematics is valuable to an extent that almost everyone or everything in existence involves Mathematics in the daily activities. Absence of Mathematics may cause chaos and complication because Mathematics enhances the prediction of how things work and applies to every life, field and profession (Krishnan, 2016). Mathematics is almost everywhere and highly important for effective daily activities. It provides foundational knowledge and skills for other school subjects like art, economy or science. Even, virtually every student studies Mathematics, either directly or indirectly (Analytica, 2020).

Mathematics is valuable to creatures. Seemingly, human beings and everything God created has an innate element of Mathematics that reflects in the development of everybody on earth. For instance, the counting of complete months of pregnancy makes a baby to be born. From cradle to grave, such a child grows with the counting of hours, months and years. Time and season involve calculation that can be said to have been embedded in the nature. So naturally, the nature of each season (autumn, spring, summer and winter) of the year have been mathematically deposited with the manifestation when the calculated time comes. Likewise, it is impossible for rain to fall throughout the year, it will only begin and stop at the set period. Then, dry season will begin. All these are of calculation in Mathematics.

Likewise, Mathematics is to the nature, so it is to everyone and to every nation. Mathematics is virtually important to every human being. Even, it is one of the steering wheel for nation's educational development, improvement and advancement. Mathematics is a pivotal for the development rate of a nation and that a nation may not develop beyond her mathematical knowledge. Probably, the importance of Mathematics to everyone and even the nature makes it to be a compulsory subject in every school setting. Mathematics is important to almost everybody for day-to-day activities and for achieving some purposes.

However, it is not everyone that can easily

access the qualifications required for it to be fully beneficial, especially in academic pursuance (Table 1). The progressive performance of both the school and private candidates in the WAEC examinations between 2016 and 2018 have not been consistent, but fluctuating (Table 1). In 2016 it was 61.57% of the school candidates that passed at credit level and above, while in 2017 the candidates' performance was better 9.56%, as 71.13% passed. But, in 2018, there was a decline by 3.81%, as the candidates obtained 67.32%. Also, the private candidates' obtained 42.39% in 2016 but, the performances declined to 30.27% in 2017 and again became better in 2018 with 12.86% (NBS, 2021).

Table 1. WAEC Results Statistics 2016 - 2018.

West African Examination Council results Statistics for Credits and above in Mathematics						
Year	**WASSCE School Candidates' Examination**			**WASSCE Private Candidates' Examination**		
	Total Number sat	**Credits and above**	**%**	**Total Number sat**	**Credits and above**	**%**
2016	1,543,974	950,730	61.57	172,821	73,267	42.39
2017	1,558,452	1,108,657	71.13	133,258	40,346	30.27
2018	1,571,536	1,058,054	67.32	109,978	47,434	43.13

Data Source: National Bureau of Statistics (NBS).

Furthermore, the students' progressive performance instability continues in Mathematics, because in 2019, there was a decline with 3.14% in the school candidates' performance. But there was a marginal improvement of 1.06%'s improvement in performance of candidates: Because in 2019 and 2020, 64.18% and 65.24% obtained credits and above in Mathematics respectively (Olusegun, 2020). The results, therefore, revealed that some students' performance in Mathematics still requires improvement, while the factors responsible for the progressive instability of the Mathematics students' performance demands attention.

In the quests for consistency in the students' better performance in Mathematics, many researches revealed that there are numerous factors that are responsible for the underperformance of students in Mathematics. Some of the identified causes among public post basic institution students in Nigeria include negative attitude towards Mathematics, anxiety and fear of Mathematics, inadequate qualified Mathematics teachers, poor teaching methods, inadequate teaching materials, over-crowdedness of students in the class. It was recommended that these problems can be solved by developing positive attitude, motivation and proper guidance toward Mathematics, using proper methods of teaching the subject, provision of relevant teaching materials, additional classrooms and furniture, provision of libraries and mathematical laboratories (Sa'ad, Adamu & Sadiq, 2014).

Meanwhile, much has not been done in the area of Mathematics value or orientation, because the fluctuating and declining conditions of students' achievement in Mathematics may be as a result of the fact that even if Mathematics is very efficacious, people have diverse opinions or beliefs towards the subject. Such opinion may be because of disparity in people's or the stakeholder's orientation towards Mathematics. The stakeholders are the contributors or those who have to perform a responsibility or the other. A stakeholder is a party that has an interest in an organisation and can either affect or be affected by the nature or settings of such organisation (Fernando and Brock, 2021). There are four types of stakeholders. These are the users, governance, influencers and providers. So, Mathematics stakeholders are the government, teachers, parents or the users like

the students are the most important stakeholders of Mathematics stakeholders.

Also, diversification of people's experience or knowledge of how valuable the subject is. A closer look into the issues of values in Mathematics may be a means by which student's achievement in Mathematics may be improved.

According to Shetty (2018), conducting qualitative research requires recruiting the right respondents for the study. These should be only those participants who match the audience specifications. An appropriate study design must be chosen. Ethnographic research is one of the common methods used in qualitative research. The sample size should be large enough to sufficiently describe the phenomenon of interest and address the research question at hand. A large sample size risks of having repetitive data must be avoided. A sample size as little as 10 can be extremely fruitful and still yield applicable results.

Mathematics Values

There are numerous educational Mathematics values which must be considered seriously from this perspective. Such values show the increasing importance of the subject in schools and in social life (Nik Pa &Tapsir, 2013). In Ngwakwe (2018), Denga (2003) perceived values as what represent reasons, beliefs, virtues or convictions that guide people's action. But, Advanced Dictionary (2021) defined value as the quality that renders something (as Mathematics) desirable or valuable. It also means an ideal accepted by some individuals or group (like Mathematics Stakeholders) which is highly regarded or thought much of. Mathematics is loaded with values (Bishop, 1998 & Ernest, 1991 in Seah, 2016; Clarkson et al. (2000).

Values related to the pedagogy of Mathematics are the ones that are of the context of activities and decisions that can enhance Mathematics teaching and learning, through practice and group works (Seah, 2016). Values are conceptualised three areas, which are practical, disciplinary and cultural values (Legner, 2013). But, Swadener & Soedjadi (1988) categorised values into two, which are aesthetic and ethical. Aesthetic values are beauty concepts but ethical values are about concepts which can be expressed as good or bad. Ethical values are interested especially in good and bad sides of a behavior; they form a wholeness with education. They cooperate with education and so they make society formation possible.

Although Mathematics can be understood as being laden with objective values from human culture, such values are not reducible to either subjective beliefs about Mathematics or logically necessary properties of Mathematics (Dede, 2006).

Mathematics education values have been classified into three namely, Epistemological Values, Social-Cultural Values and Personal Values (Sam & Ernest, 1997). The three different ways of considering Mathematics are through the general educational values and embedded values of Mathematics education. The embedded values are rationalism, objectivism, control, progress, openness and mystery (Bishop, 1996 in Seah, 2016). Seah and Bishop (2000) declared that the most important element of raising Mathematics learning and teaching qualities are the values in the subject. There is need for a closer study of values in Mathematics through the measurement of students' general knowledge and orientation towards Mathematics values.

Orientation

It has been proved categorically that *the most successful organisations on the planet are the value-driven organisations (Barrett, 2010). This implies that through students' value (orientation) towards Mathematics, their performance may be improved and or even be excellent. But before this can be possible,* it may be necessary for the development of an effective scale (tool) that can differentiate among the students in terms of the degree to which they possess orientation towards Mathematics.

Orientation can be in two-way (Direct and Indirect). *Direct orientation is when somebody or a student has basic beliefs in relation to a particular subject like Mathematics. Orientation is a predisposition in favour of something.*

Orientation is a person's basic beliefs, attitudes, or feelings in relation to a particular subject or issue (Oxford, 2021). Indirect orientation is when another person like the teacher, parent or counsellor is acquitting the student(s) with the existing situation or environment (Merriam, 2021). There are different types of orientation. One of them is societal orientation that involves physical consequences, psychological well-being, social relationships, economic contribution, and environmental consciousness, performance orientation, learning orientation (Varey, 2012; Martin, 2017; Kang & James, 2007).

There are social values in sociology, which are implicit guidelines that provide orientation to individuals and corporations to conduct themselves properly within a social system. These values also provide the boundaries between what is right and what is wrong, what is permissible, prohibited, illegal, desirable, legitimate or punishable (Varey, 2012). Student brings belief (orientation) systems to bear on the problem situation. A learner should consider evaluating what kind of orientation (learning oriented or grade oriented) they have. The students that are interested in appearing competent or better than others, regardless of their achieved level are grade oriented. But the earning-oriented students are mainly interested in learning and mastering content or a given skill (Ismail, 2016). So, students value Mathematics differently. It may be because of what the students have heard or experienced about the subject. There are differences in the Mathematics definitions by the students. This is as a result of their views or orientation towards the Mathematics values.

The degree of some students' orientation towards Mathematics may be very low to the extent that it may disallow their profitable mobilisation and motivation for better performance in Mathematics. In another instance, some students' interaction with the society may perhaps have positive impact on the students' level of mathematics orientation and definitely allow the expected improvement. There may be need for students to be guided by their teachers, parents, and other educational stakeholders in solving the problem of negative orientation of the Mathematics values by creating the positive phenomena for the orientation. Such guidance may be easily done if a tool is available to diagnose the specific state of the students' orientation.

Statement of Problem

It was disclosed that from 2016 to 2020, Mathematics candidates' better performance in the West African Examinations Councils (WAEC) had been inconsistent. So, there is still a lot to be done by the educational researchers to enhance stability of the better performance in Mathematics. Some researchers like Olaoye, Odinko, Okwilagwe, Olanloye and Atanda had carried out some studies on institutional support and teacher performance, effects of Teacher Development Programme on Mathematics, Relationship between common entrance scores and achievement Mathematics. Still, recent students' performance revealed that more studies are required for the steady improvement of Mathematics students' achievement in Nigeria and not much studies have been conducted in the area of Mathematics values or orientation. Then, this study therefore was used to gather the opinions of Mathematics stakeholders towards Mathematics values.

Research Question: What are the Mathematics Stakeholders' orientation towards Mathematics values?

Methodology

A qualitative research method through phenomenology design was used for the study. The participants used for the study, who were considered as the Mathematics stakeholders in this study, are the Mathematics lecturers, teachers and students. An appropriate study design must be chosen. Ethnographic research design, which was one of the common methods used in qualitative research was chosen and considered to be appropriate for the study. The sample size considered to be large enough to sufficiently describe the phenomenon of interest (value orientation), is 15, because a sample size as little as 10 can be extremely fruitful, and can yield applicable results (Shetty, 2018). A purposeful random sampling

technique was used to select two lecturers from two federal universities, two public secondary school teachers and ten students from both the basic and post-basic institutions of the South-West geopolitical zone of Nigeria. Purposeful sampling technique was used, so that the appropriate respondents that will support and make the purpose for the study to be accomplished was used.

An interview guide containing a two open-ended items was used for the exploratory study of the development of students' value (orientation) towards Mathematics. These items asked that: (1) what are your views about Mathematics? (2) What are your orientations towards Mathematics value? These were targeted towards extracting the Mathematics stakeholders' Mathematics value orientation. A pen-like video recorders and audio record were used to record the respondents' responses and thereafter transcribed. A research assistant was used to monitor the recordings and jot down some information as much as possible. Atlas.ti 8 software package was used to analyse the collected data.

Results

The result of the analysis of the data collected through interviewing of the Mathematics Stakeholders is as shown in Figure 1.

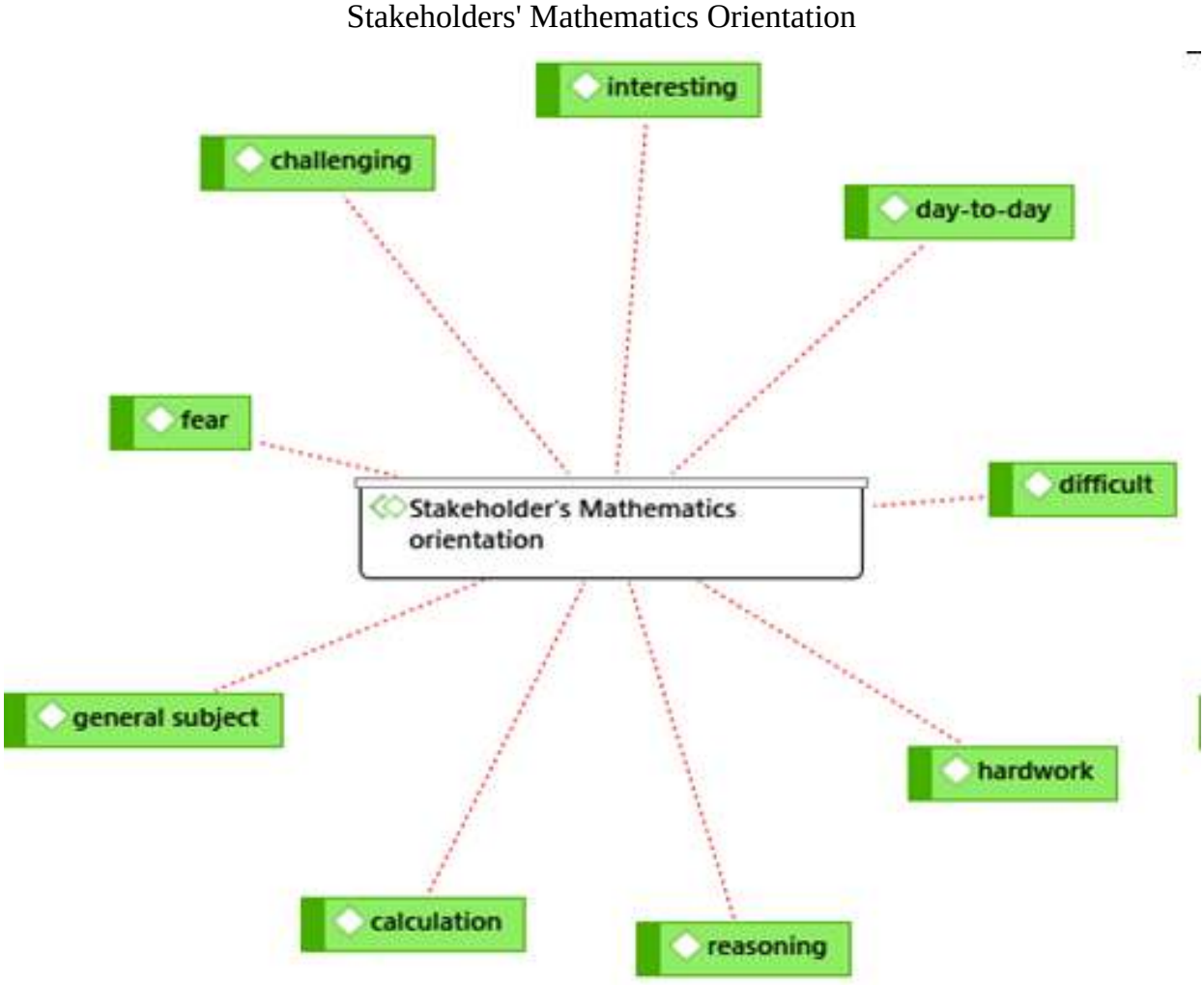

Figure 1: Stakeholders' Orientation towards Mathematics

Discussion

The results of the exploratory research through interviewing of some Mathematics stakeholders revealed that Mathematics is a general subject that cannot be avoided by anybody because it is for everyday-life transactions. It involves daily activities in which students should be involved constantly. There are cogent reasons for the daily endeavours in which Mathematics is involved for the students. It was revealed that it will let the students be equipped with the necessary Mathematics skills. Such skills may enhance the students' relevance in future. Consequently, this may be one of the reasons for Mathematics to be one of the compulsory subjects all over the world. It was also discovered through the Stakeholders that Mathematics is all around us because the day-to-day activities involve calculations and Mathematics is not just a subject. Mathematics learning is also continuous, people do not stop learning Mathematics; it is from cradle to grave. It must us be noted that Mathematics is accumulative, so learners have to know A before knowing B.

Although Mathematics is challenging, it cannot be avoided. It is lucrative. It helps in the power of reason. It enables people to know how to calculate something in the society. Without Mathematics, people may not be able to calculate. It makes people valuable and makes someone versatile in all areas of life or studies. It is a fundamental discipline for science and technology development. With all these benefits of Mathematics still, it has been viewed also by the stakeholders that the subject is difficult to comprehend. The cause may be because of the way some teachers teach Mathematics which makes it difficult for the students to comprehend or understand it. Also, mere seeing figures, some students may be scared and lose confidence in themselves before anything was even done, which makes Mathematics to be difficult for them to understand.

Whereas, if the students can identify the Mathematics values, it may enable them to develop and acquire some skills as they learn the subject. For instance, thinking skills can be derived as Mathematics involves students in deep thinking and gives man ability to think fast. Such a skill may be possibly and easily acquired if people can change their orientation towards Mathematics. This may be done if they can believe that Mathematics is not as abstract as people view it to be. Their views towards Mathematics should be that it is a very good subject, simple and interesting but, for hardworking students.

Conclusion

By learning Mathematics, it is possible for students to develop thinking skills, reasoning skills, numeracy skills, comprehension skills, calculation skills and other related skills. Such skills may definitely make them valuable to their world in future. But, it is not every student that has such value (orientation) towards Mathematics. So, some of the students are not given to much learning and understanding of Mathematics, to the extent for them to possess the skills (values) in the subject. Thence, availability of a means through which the students would be aware and know the degree of their value (orientation) towards Mathematics will enhance a better performance by the Mathematics students. The stakeholders may also have understanding of what and how to do it, for improvement of the students' performance in Mathematics.

Recommendation

It was recommended that Mathematics students should be made to be aware of their value (or orientation) towards Mathematics consistently and be appropriately guided for better performance in Mathematics. Mathematics teachers also must be conversant with the state of their students in connection with values in Mathematics. The teachers should determine to produce students that are of high value in Mathematics.

References

Advanced English Dictionary, 2021.

Analytica, S. 2020. Top 10 Importance of Mathematics in Everyday Life.

Atanda I. 2019. Institutional support and teacher performance in Secondary Schools in Akinyele Local Government Area of Oyo State, Nigeria. *West African Journal of Education.* 29, 0043-2997.

Barrett, R. 2010. The Importance of Values in Building a High Performance Culture. https://www.valuescentre.com/mapping-values

Dede, Y. 2006. Mathematics educational values of college students' towards function concept. *eURASIA J. Math., Science Tech. 2*(1),82-102. https://doi.org/10.12973/ejmste/75440.

Fernando, J & Brock T. 2021. Stakeholder? Investopedia. https://www.investopaedia.com/terms/s/stakeholders.asp

Ismail, E. 2016. *What are learning oriented or grade oriented?*

Kang, G. & James, J. 2007. Revisiting the concept of a societal orietation: conceptualization and delineation. *Journal of Business Ethics. 73*(3), 301-318. https://www.jstor.org/stable/25075422?

Krishnan, P. 2016. Life Without Mathematics. https://www.meritnation.con/testprep/hub/life-without-mathematics/

Legner, P. 2013. Value-of-mathematics. https://mathigon.org.

Martin, K., 2017. *Creating a learning orientation versus a performance orientation.*

Merriam Webster's Dictionary, 2021.

Ngwakwe, C.C. 2018. The role of guidance and counselling in value and moral re-orientation among secondary school students in Nigeria. *Journal of Educational research and Development (AJERD).* 5. 2536-6899.

NBS, 2019. *WAEC Results Statistics 2016-2018 @* www.nigeriastat.gov.ng

Nik Pa, N.A &Tapsir, R.2013. Procedia - Social and Behavioral Sciences, 90, 449-457. www.sciencedirect.com.

Okwilagwe, E.A. & Olanloye, A.A. 2018. Effects of Teacher Development Programme on Mathematics and English Teachers' Knowledge and Students' achievement in South-West, Nigeria. *Evaluation Research (ER): A Journal of the International Centre for Educational Evaluation (ICEE).* 3, 2705-3016.

Olaoye, M.I. & Odinko, M.N. 2018. Relationship between common entrance scores and achievement in English language and mathematics among students in upper basic level in Oyo State, Nigeria. *Evaluation Research (ER): A Journal of the International Centre for Educational Evaluation (ICEE).* 3, 2705-3016.

Olusegun, 2020. 2020 West African Examinations Council (WAEC) May/June Results Statistics, https://www.myschoolgist.com/ng/waec-result-checker-may-june-waec-result/

Oxford Dictionary, 2021.

Oxford University Press, 2018.

Sa'ad, T.U., Adamu, A., Abdullahi M. & Sadiq, A.M. 2014. *The Causes of Poor Performance in Mathematics among Public Senior Secondary School Students in Azare Metropolis of Bauchi State, Nigeria.* IOSR Journal of Research & Method in Education (IOSR-JRME): 2320–7388,p-ISSN: 2320–737X Volume 4, Issue 6 32-40. www.iosrjournals.org

Sam, L., & Ernest, P. 1997. *Values in mathematics education: What is planned and what is espoused? British Society for Research into Learning Mathematics*(pp. 37-44. Proceedings) of the Day Conference, held at University of Nottingham.

Seah, W. T. & Bishop, A.J. 2000. Values in mathematics textbooks: A view through the Australasian regions. Paper presented at the annual meeting of the American educational research association, New Orleans, LA.

Seah, W.T. 2016. Values in the mathematics classroom: Supporting cognitive and affective pedagogical ideas, *Pedagogical Research*, (2016), 53-54. http://dx.doi.org/10.20897/lectito.201653

Shetty, S. 2018. Determining Sample Size For Qualitative Research: What Is The Magical Number? https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/s12874-018-0594-7

Swadener, M., and Soedjadi, R. 1988. Values, mathematics education, and the task of developing pupils' personalities: An Indonesian perspective. *Educational studies in mathematics*. www.jstor.org

Varey, R.J., 2012. *Relational orientation in management: Re-visiting the concepts of relationship and communication*. https://www.emeraldinsight.com/doi/abs/10.1108/eb023489