



ISSN 2278 – 0211 (Online)

The Importance of Values and Valuing Driven Force in Enhancing Students' Academic Performance in 21st Century Mathematics Learning

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Abstract:

It is a common knowledge that any task which does not have value cannot be treasured. Valuing plays a significant role in every task. The value attached to a task determines how much effort to put in for its accomplishments. This paper therefore examines the place of valuing in mathematics instruction. Valuing in mathematics instruction is examined extensively to x-ray its potency towards enhancing all-encompassing instruction with value-oriented pedagogical approach. One of the most important aspects of values and valuing lies in the fact that it supports the development of cognitive states. It is evident that attending to the cognitive and affective development of mathematics, learner alone is not sufficient to bring about meaningful learning. In this paper, it is observed that facilitating the valuing of relevant attributes in mathematics learning by the learners themselves is a crucial component of mathematics pedagogy, for this in cognitive functioning and nurturing of affective states that would ultimately impact on the quality of learning. It is therefore recommended that mathematics teachers should endeavor to plan classroom instruction in mathematics under the attributes of connection, understanding, communication and recall reflecting intrinsic valuing and also the attributes of application and relevance as the extrinsic aspects of valuing in mathematics.

Keywords: Value, pedagogy, cognitive and affective development

1. Introduction

In human history, value plays significant roles in all walks of life. It is the measure of value place on a task that determines the magnitude of efforts to put in towards its actualization. A task that does not have value would never attract man's serious attention. Purpose to some extent is synonymous to value and when the purpose of a thing is not known, abuse is inevitable.

Mathematics is the bedrock of science and mother of all inventions. It occupies a prominent position in the art of science, technology and medicine. Akinsola (1999) observed that mathematics is the language of science. Technological advancement rides on the wings of Mathematics. In the realm of arts and humanity, it features prominently. The past and the present events are put together to plan or project into the future using dates and simple statistics, a sub-discipline of Mathematics. Developments in the urban and mega cities today occur through the utilization of pure and applied mathematics. Today, communication is made easy through the application of complex analysis. Automatic teller machine and e-banking came to stay via the application of mathematics. Research evidence abounds that the values of mathematics are immeasurable and unquantifiable.

As it were, diverse efforts have been made by mathematics educators to ensure effective classroom instruction. Different methods, strategies and techniques have been put in place that could enhance optimal learning outcomes in the subject, especially at the primary and post-primary school levels. It is an indisputable fact that these efforts have yielded positive results to an extent. However, research findings indicate that vast majority of students in secondary school could not identify the values of mathematics. Then, it becomes necessary for a shift in paradigm. Value identification of mathematics would go a long way in repositioning students with better disposition towards mathematics learning in this 21st century.

2. Values and Valuing in Socio-cultural Context

What we value reflect years of learning and influence of our historical experiences and social interactions as members of the cultures we belong. Indeed, the notion of cultures has been regarded as “an organized system of values which are transmitted to its members both formally and informally” (McConatha and Schnell, 1995, p. 81).

Activity theory provides a useful theoretical framework also in that it explains how the mediation gets internalized within cultures, giving the learner a particular identity that characterizes him or her in culturally unique ways. In particular, the Cultural Historical Activity Theory (CHAT) embodies the construct values very well. CHAT represents the third generation of the activity theory approach to understanding learning and education while the first and second generations were associated with Vygotsky’s socio-cultural theory of teaching and learning, in which students participate in negotiation and co-construction of knowledge. Haenen et al (2003), and Leontiev’s activity theory, the set of specific consider the relationship between a subject (typically an individual human) and the object (Kaptelinin and Nardi, 2012), in this third generations interpretation of the activity theory, Engstrom’s activity system model extended Leontiev’s original concept of subject – object interaction to become a three – way interaction between ‘subject’, ‘object’ and ‘community’.

The new theory went beyond a focus on activity systems to emphasis on the interactions between and amongst activity systems, so that learning is meaningful through a process of multi-voicedness, difference, and conflict negotiations. Gummesson (2006) had argued that the main outcome of this process is value co-creation. In the classroom, for example, pedagogical activities take place through the interaction of what students, teachers and indirectly, the wider community value. The interactions have brought together the different things teachers and their students’ value similarly and differently. The co-creation of values can be perceived as the agreed-upon, aligned values that facilitate the continued functioning of the activity systems in interaction, importantly, while the first generation directs the attention to the community within which learning takes place. CHAT considers as the unit of analysis joint activity amongst individuals in the learning environment. In relation to values, thus, we can imagine values not only as being acquired over time, but that the negotiations of values between and amongst activity systems would also lead to values being challenged and refined on an ongoing basis, depending on the opportunities for one’s values to come into contact with values from other activity systems

3. Values and Valuing in Mathematics Education

Values in mathematics and mathematics education were first proposed by Bishop (1998) and Bishop (1998) respectively. For the former, the “three value components of culture – white’s sentimental ideological and sociological components – appear to have pairs of complementary values associated with Mathematics, Bishop (1988b p. 185) namely rationalism, and objectivism, progress and control, mystery and openness.

While Seah and Anderson (2015) conception are rather similar, it is also more explicit in highlighting two aspects of values and valuing in mathematics education. One aspect acknowledges that the values that are being espoused in mathematics education need not stem from mathematics lessons alone, but from the wider socio-cultural context as well, the other aspect that is more explicit stated that the valuing that are inculcated through mathematics education goes beyond being in students’ memories and that it in fact swing back to affect the quality of Mathematics learning. For them, values and valuing reflect the convictions which an individual has internalized as being important and with what an individual value defines for him/her a window through which he/she views the world around him/her. Valuing provides the individual with the will and determination to maintain any course of action chosen in the learning and teaching of mathematics. They regulate the ways in which a learner’s/teacher’s cognitive skills and emotional dispositions are aligned to learning/teaching in any given education context (pg 169).

4. Values and Valuing as Involving both Cognition and Affective Domain

Seah and Anderson (2015) stated that values are neither cognitive nor affective construct. Instead, valuing is regarded as being both cognitive and affective in nature. By implication it could be inferred as the process and act of valuing that involve reasoning and thinking. Similarly, Rath (1987) conception regards successful attainment of a value as involving all six criteria namely.

- Choosing freely
- Choosing from alternatives
- Choosing after thoughtful consideration of the consequences of each element
- Prizing and cherishing
- Prizing through affirming others
- Acting repeatedly in some pattern of life
- Clearly, the choosing components involve reasoning while the prizing components involve affective domain.

5. Values and Valuing Driving Force as Related to Mathematics Performance

Research evidence indicated that mathematics performance is related to students valuing. In addition to the Nuffield Foundation – commissioned report (Askew et al, 2010) which highlighted the role of cultural values. Also, Jerrin (2014) sub-divided by broad divergent ethnicity into high performing and low-performing. Based on the aforementioned facts, it could be assumed that the factors underlying the differences existed beyond the school level, with their different emphasis and valuing on different aspects of school.

Schukajlow (2017) in his study demonstrated a similar relationship between student valuing and mathematics performance on problems related to real life scenarios and problems which were not Schukajlow, (2017) had flagged this

for further investigations, and it represents existing research effort into understanding how values might be used to further enhance the mathematics learning experience of young children. He further asserted that such an association between valuing and mathematics performance is important and even more so given that what are being valued also affect the cognitive processes and affective states that in turn influence the quality of mathematics learning. Organization for Economic Co-operation and Development (OECD, 2017) submitted that the extent to which the educational aspirations of students and parents are the result of cultural values or determinants of these, and how such aspirations interact with education policies and practices in an important subject that merits further study.

In responding to this call, Wee Tiong Seah (2018) at the 13th international congress on mathematics education, asserted that the guiding assumption is the students' possession or acquisition of relevant valuing which allows each of them to apply appropriate cognitive skills and to develop positive affective states which promote desirable outcomes in mathematics learning whether these be related to measurable performance or to relational understanding.

In addition to being culturally referenced, what is being valued is also invisible and implicit due to the inevitable presence of competing and overriding values, (Seah, 2005), what one values is not articulated in all situations. Indeed, Takuya Baba (Graduate school for International Development and Co-operation) had likened values and valuing to the underground roots of a tree, which are not only invisible and implicit, but also crucial to supporting and nurturing the healthy growth of what is visible of the tree above the ground, such as students' results. This illustration portrays one of the most important aspects of values and valuing, that is, how it supports the development of cognitive functioning and nurturing of affective states. It suffices to say that attending to the cognitive and affective development of mathematics learners alone is not sufficient to bring about meaningful learning. The learner should be motivated to engage, to understand, to learn, and perhaps to achieve as well in the first place. It is vital to facilitate the valuing of relevant attributes in mathematics learning by the learners themselves for this in turn supports the development of cognitive functioning and nurturing of affective states that would ultimately impact on the quality of learning.

6. Implications for Teacher Practice in 21st Century Mathematics Classroom Instructions

Research evidence suggests that student performance in mathematics was related to students' valuing of connections, understanding, communication, and recall. Hattie (2015) asserted that top classroom interventions which refer to school education generally and which also include background variables such as 'home environment' and 'ethnicity' are related to these four attributes. Thus, student valuing of connections, understanding, communication and recall reflect intrinsic valuing, as opposed to extrinsic valuing which would emphasize such valuing as application and relevance.

There are implications here for professional practice in the Mathematics classroom, even though curriculum documents might emphasize these categories of attributes. This is important, because the inculcation of extrinsic valuing can be more appealing to students and can also be easier to convey to them. On the other hand, it is likely the teachers' efforts to prompt students' appreciation and subsequent valuing of intrinsic valuing can actively be derailed by students routinely asking questions such as "when are we going to use this"? This shows that students need to appreciate the utilitarian aspects incorporated within intrinsic valuing. It is therefore vital to consider valuing as the heart and soul of the pedagogical approach or strategy. Mathematics teachers across board should be aware of the underlying treasures of valuing in mathematics instructions.

It is important to realize that teaching students with the new approach or strategy alone is likely not able to attain its intended benefits to mathematics learning. This is in line with Seah (2015) who opined that the professional discourse might need to change from we are learning skill ABC or technique DEF or similar, to one of through this skill ABC or technique DEF, we are learning to value attribute XYZ or similar. In this way, it adds another dimension to how values and valuing play a key role in mathematics lesson planning. Not only is a focus on valuing in lesson planning expected to promote students' cognitive and affective engagement, it also allows teachers to adopt/adapt and reap maximal potential out of teaching approaches or strategies they are introduced to.

7. Conclusion

The relevance of incorporating valuing into mathematics classroom instruction and pedagogical approaches cannot be over-emphasized. It is a known fact that students would keep on asking the question "when are we ever going to use this". The trend of events on contemporary issues on mathematics education for effective instruction in this 21st century should therefore incorporate value and valuing in the subject such that the intrinsic and extrinsic values of the subject could be maximized as it is in operation in the developed nations of the world.

8. Recommendations

- Mathematics teachers should endeavor to incorporate the basic attributes of valuing while planning their lessons in mathematics alongside with the appropriate pedagogical approach.
- The efficacy of students valuing of connecting, understanding, communicating and recall should be put into consideration in mathematics classroom instruction.
- Extrinsic valuing emphasize valuing as application and relevance. This should serve as platform for effective mathematics classroom instruction delivery.
- This study would also serve as pointer to curriculum planers to incorporate both the intrinsic valuing (connections, communications, understanding and recall) and extrinsic valuing (application and relevance) into school curriculum.

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