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An Appeal in the Case involving Conventional Teaching: Emphasizing the Transformation to Enhanced Conventional Teaching in Mathematics Education

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Abstract

The conventional teaching methodology has severally been condemned as inefficient, rigid and outdated by scholars and researchers who are intent on furthering the course of new instructional approaches. Often, educationists evade the simple confrontation of what the supposed duty of a good teacher is. This discourse took on the issues surrounding conventional mathematics teaching with a focus on the adaptability of the instructional approach to encompass present-day technology and cultural augmentation. The conventional job of the teacher was considered in detail as a task of society building, a mission of re-invention, and a position of accountability. The submission of this appeal was that the current global best practice in the field of mathematics education should dictate what amounts to conventional teaching.

Keywords: Conventional teaching, Mathematics education, Quality teaching, Cultural augmentation, Technology augmentation

Introduction

If “conventional teaching” were to be a worldwide movement, it would have been right to conclude that it has been condemned over and over across a wide range of jurisdiction. A simple perusal through copies of quasi-experimental research work in many educational departments, research centres and institutions will almost always affirm that students taught instructional content conventionally are always underperforming compared to those taught the same content via a different methodology. This pattern of findings is certainly becoming sacrosanct, with outcomes easily predicted even at the proposal stage of the research. A lot of educationist believed they are getting closer and closer to clarifying the specific ways people learn. But a handful of critical educators are skeptical of this generalization and are designing backward to determine what the role of teacher is (Donnelly, 2014; Wiggins & McTighe, 2007). Also findings from global comparisons of educational systems are throwing more light on several determinants of educational success (Boylan *et al.*, 2016).

The term “teaching method” refers to the general principle, pedagogy and management strategies used for classroom instruction (Teach.Com, 2016). Teaching methods are general techniques for organizing instructions and implementing curriculum. These methods and strategies are often rooted in educational theories which predict behaviours under certain pedagogical conditions. Over the years, educationists have come to group teaching methods into two primary categories or “approaches”, namely teacher-centered and student-centered. The formal comprise traditional teaching approaches which are generally teacher-directed and follow cookbook steps of activities and demonstrations (Harris & Johnson, 2001) while the later refers to methodologies that actively involved the learner in the design and implementation of classroom instruction. The traditional approach, often referred to as “chalk and talk” method, involves direct instruction by the teacher whose primary role is to pass knowledge to students and conduct testing and assessment. Student-centered approaches consider the teacher as a facilitator and a guide who allows students to play participatory role in their own learning process (Teach.Com, 2016). The student-centered approach employs strategies such as inquiry, cooperative learning, and peer instruction.

Debates about the two broad approaches to learning have been ongoing since the late 1960s and early 70s when teachers began to experiment with more innovative styles of teaching (Donnelly, 2014). Many practitioners condemn direct instruction for many obvious reasons and for the prospect of non-traditional strategies such as active, collaborating and problem based learning. The chief complaint seems to be the fact that classroom management styles are traditional and focus is often on rules and expectations.

The voices from the other side of the debates, however, have been presenting increasing evidence to buttress the indispensability of the traditional (or conventional) approach to teaching. In this regards, Donnelly (2014) emphatically stated that new-age education techniques, where teachers facilitates instead of teach, and praise students on the basis that all must be winners in open classrooms where what children learn is based on their immediate interests, leads to underperformance. A rallying point for the conventional teaching approach is the fact that great mathematicians, scientists, economists and politicians who had helped in shaping the course of human history for good, were all product of this foundational approach to classroom instruction. Adding to the body of evidence in favor of traditional teaching is the real-life examples of

functional education systems from countries such as Korea, Finland and China, which are built on rich culture and traditions and delivered via an enhancement of the conventional approach to teaching.

Certainly, the argument for and against conventional teaching will continue, and such criticisms are the basis of enhancements and modifications which, in turn, are favorable to the overall development of education across the globe. Irrespective of the pedagogical school of thought, what is certainly clear is the expected end product of the teaching and learning process. If effective teaching is that which leads to improved students achievement using outcomes that matter to their future success (Coe *et al.*, 2014), then teaching is successful only when it cause learning related to purpose. Therefore the teacher's role, behavior and strategies must stem deliberately from established mission and goals, the curriculum, and agreed-upon learning principles (Wiggins & McTighe, 2007). Also, if over the decades the trends in teaching methodologies have been skewing towards active engagement and away from mechanical classroom routines, then it should be safe to say that present-day teaching approaches are appropriately normal and should be regarded as the convention of the present time.

It is in view of this normalization of instruction that this discourse seek to emphasize the transformation of general teaching into an enhanced conventional teaching, particularly in mathematics education. This consideration takes note of the contextual pressures on teachers' work in contemporary educational policy, educational systems and within schools (Lingard, Hayes & Mills, 2003), and posits that good teaching is inarguably a blend of many strategies, methods and approaches, all knitted together to bring about quantifiable student gains. The discussions presented here are tailored towards strengthening the position of the mathematics teacher as a trustworthy stakeholder in mathematics education who should be encouraged to assess prevailing situation, plan instruction, access materials and direct interactions in the classroom for the optimum growth and development of the learner. This study first considered what seems to be wrong with conventional teaching and then attempted to redefine the term "conventional" as a function of general concurrence. The conventional duty of the teacher was considered next and followed by discussions on the changes leading to enhanced conventional teaching in mathematics education.

What was "Wrong" with Conventional Teaching

Every teaching strategy is a tool in the hand of the teacher. The tool on its own, no matter how robust, does not perform wonders. Consequently most of the misgivings about conventional teaching arose out of specific cases that exemplify a teacher's inefficiency and not the method *per se*. Such cases raise the concern that the high share of total teaching time devoted to conventional teaching has a detrimental effect on overall student learning, but often there exists no empirical support for this concern (Schwerdt & Wuppermann, 2009). The implication is that policies designed to reduce the amount of traditional teaching styles in schools contains little potential for raising overall achievement levels, particularly in mathematics.

Essentially, the elements of drills, rote memorization and inability to cater for everyone, are the feature that relegate conventional teaching as being an outdated mode of instruction. These features, according to Harris and Johnson (2001) may not provide students with valuable skills or even with a body of knowledge that lasts much beyond the end of the term. There are also concerns

that the techniques employed within the traditional approach tend to encourage “studying to the test” among students who are only required to “regurgitate” as a display of proficiency. The lack of inquiry and problem-solving in this conventional approach has driven educationist into propounding many new inquiry-based and problem-based instructional strategies.

In reality, the often highlighted features of conventional teaching do not cut across board for all classrooms implementing the approach. These features tend to be the over-emphasizing of the cons over the pros of the approach without giving the practicing teacher the benefit of the doubt. Such generalization has led to educational policies that attempt to control teachers through conceptualizing them as mere technicians who require taming and has resulted in restructuring that was done to teachers rather than with teachers (Lingard, Hayes & Mills, 2003).

However, modern thinking in mathematics education is beginning to reconsider the underlying framework of the traditional approach to teaching. These thought patterns, as summarized by Donnelly (2014) are such that:

- i. Based on the stages in the education of the child, in areas like English and Mathematics, teachers need to be explicit about what they teach and make better use of whole-class teaching.
- ii. Even when sitting and listening, children are internalizing what is being taught. Learning can occur whether they are active or passive.
- iii. Research suggests that memorization and rote learning are important classroom strategies, which all teachers should be familiar with.
- iv. Teachers need to encourage re-reading and highlighting, to memorize key ideas such as times table until children can recall such ideas automatically.
- v. Instead of taking the time, energy and resources to customize what is being taught to the supposed individual learning style of every child in the classroom, it is more effective to employ more explicit teaching strategies and spend additional time monitoring and intervening where necessary.
- vi. Depending on what is being taught, what has gone before and what is yet to come, whether students are well versed in a particular area of learning or are novices, and even the time of the day, teachers must adapt their teaching to the situation and be flexible.

It is thus glaring that a conventional teaching situation which is open to adaptive learning experiences geared towards improved learning outcomes is as good as any well promoted non-traditional teaching approach. Evidently, the particular approaches, methods, and resources employed are not primarily subjective “choices” or mere matters of style. They logically derive from desired student accomplishments and concurrent understanding of the learning process (Wiggins & McTighe, 2007).

“Conventional” as a Function of General Concurrence

The traditional teaching approach can be referred to as the conventional teaching method, obviously as a result of popular opinion and widespread usage. If teaching methods are modes of sequencing instruction, then the word “conventional” is the defining adjective differentiating the

teaching method from others. The English Dictionary Offline, an educational application from CrumpledApps gave four keys renditions of the term “conventional” as:

- i. formed by agreement or compact; stipulated;
- ii. growing out of, or depending on, custom or tacit agreement; sanctioned by general concurrence or usage; formal;
- iii. based upon tradition, whether religious and historical or artistic rules;
- iv. abstracted, removed from close representation of nature by the deliberate selection of what is to be represented and what is to be rejected.

(CrumpledApps, 2015)

These definitions, particularly the first three, indicate that what is “conventional” is predetermined and agreed upon. In reference to teaching methodology, it is not difficult to see “who” or “what” stipulates what is conventional. The best choices in this case from the prevailing definitions are “general concurrence” and “tradition”. The emphasis here is that conventional teaching should be seen as growing out of the general concurrence and traditions of the day. Such line of reasoning indicated that the current general practice in the field of mathematics education should dictate what amounts to conventional teaching and not the prejudice expressed when teachers and teacher education academics privilege one particular approach to the detriment of all others (Donnelly, 2014).

The term “conventional” does not indicate any sense of being adamant to change as many people may have erroneously thought. Instead “conventional” derives from common usage and formalization. The traditional roots of conventional teaching do not imply a stereotypical acceptance of ancient routines in the classroom. The approach should be seen as based on common practice which accumulated overtime. In this respect, conventional approach should be viewed as a conglomeration of flexible and adaptable strategies and techniques, affirmed as beneficial in both research and real-world settings. It should be normal for the mathematics teacher to stimulate student’s interest by bringing into his class elements of play, game, technology and reflective discussion. By adopting reliable and transparent assessment strategies, a conventional mathematics class can integrate portfolio, tours, reflective journals, project and debates into classroom deliberations and still remain conventional (Anyor & Abah, 2014).

The adaptive nature of the conventional model of teaching makes it serve as a base for improvement of classroom instruction. As the mathematics teacher makes progressive judgment based on feedback received via assessment and evaluation strategies, opportunities are provided for enhancement of quality. An enhancement may require asking students to individually come up with a brief researched biography of an ancient mathematician who contributed to the concept being discussed. Cultural artifact can be called to play to sustain learner engagement and stimulate critical thinking (Abah, 2016). These active add-ins does not structurally result from any specific non-traditional teaching model, but could deliver enriched and personalized learning, even in a conventional classroom.

Consequently, if the teacher’s job is “teaching to cause a result” (Wiggins & McTighe, 2007) and such result indicating students’ progress emerges from the conventional approach to teaching, then it should be duly affirmed that old apprehensions of the approach are no longer tenable. The

convention of the present era is to plan instruction that will assist students into developing critical thinking skill with regard to the subject at hand (Harris & Johnson, 2007). Based on the time and generality of good educational practice, mathematics teachers must reposition to understand their teaching styles and need to always create and maintain a balance between teaching preferences and students' learning preferences (Teach.Com, 2016). This fact should underscore current labelling of the conventional approach to teaching.

What is the Conventional Duty of the Mathematics Teacher in the 21st Century?

The mathematics teacher performs an encompassing duty in the design and implementation of mathematics instruction. To better understand this study, the framework provided by Mortimer Adler in *The Paideia Proposal*, as reviewed by Wiggins and McTighe (2007), provides a concise guide. Adler presents three broad categories of instructional roles for teacher, namely, didactic (or direct) instruction, facilitation of understanding and related habits of mind, and coaching performance.

In this framework, the teacher's primary goal is to inform the learner through explicit instruction mediated through demonstration, modeling, lecture and convergent questions. The expected learner actions in this teacher role are to receive, take in, and respond. In facilitating learner's understanding, the teacher seeks to help students construct meaning and come to an understanding of important ideas and processes. As a result of this facilitation, learners are expected to construct, examine, and extend meaning. The teacher facilitates understanding through concept attainment, discussion, Socratic seminar, simulation and guided inquiry.

Coaching seeks to support the learner's ability to transfer their learning to succeed in complex and autonomous performance. The teacher achieves this through feedback, conferencing and guided practice, while the learners are expected to refine skills and deepen understanding.

Specifically, 21st century skills as necessitated by the present knowledge society and economy, are expressed in ways of thinking, ways of working, tools for working and skills for living in the world. According to the Assessment and Teaching of 21st Century Skills (ATC21S) Consortium (2013), skills expressed in ways of thinking include creativity, critical thinking, problem solving, decision making and learning. Communication and collaboration are particular to ways of working since Information and Communications Technology (ICT) and information literacy are necessary tools for working. Skills for living in the world include citizenship, life and career skills, and personal and social responsibility. It is thus the duty of the mathematics teacher to optimize available resources in sequencing learning experience targeted at fostering these skills.

In showing that focusing on certain teacher's approaches, skills and knowledge can improve student outcomes, Coe *et al.* (2014) summarized six components of great teaching. Coe and Colleagues maintained that good quality teaching will likely involve a combination of these attributes manifested at different times. They are

- i. Pedagogical Content Knowledge: The most effective mathematics teachers have deep knowledge of the mathematics they teach. As well as a strong understanding of the material being taught, mathematics teachers must also understand the ways students think about mathematical concepts, be able to evaluate the thinking behind student's own methods, and identify student's common mathematical misconceptions.

- ii. Quality of Instruction: This entails specific practices, like reviewing previous learning, providing model responses for students, giving adequate time for practice to embed skills securely and progressively introducing new learning.
- iii. Classroom Climate: Good mathematics teaching covers quality of interactions between the teacher and the students by creating a classroom that is always demanding more, but still recognizing students' self-worth.
- iv. Classroom Management: This refers to a mathematics teachers' ability to make efficient use of lesson time, to coordinate classroom resources and space, and manage students' behavior with clear rules that are consistently enforced.
- v. Teacher Beliefs: This is an explanation of why teachers adopt particular practices, the purposes they aim to achieve, their theories about what learning is and how it happens and their conceptual models of the nature and role of teaching in the learning process.
- vi. Professional Behaviors: These are behaviors exhibited by teachers such as reflecting on and developing professional practice, participation in professional development, supporting colleagues, and liaising and communicating with parents.

(Coe *et al.*, 2014)

The job of the mathematics teacher, as must have been observed so far, is multi-faceted. The duty of the teacher certainly goes beyond covering of content, engaging learners with interesting activities, and teaching to the test. It is a task of society building, a mission of re-invention, and a position of accountability.

The Transformation to Enhanced Conventional Teaching in Mathematics Education

In view of the influence of emergent pedagogical theories and the impact of technology on education, modern teaching methodologies can best be viewed as an acceptable enhancement of conventional teaching. Digital technologies have profoundly changed notions of literacy, knowledge and communication, altering the cultural construction of life in contemporary society and impacting the classroom (Grushka & Donnelly, 2010). Conventional classrooms are rapidly adapting to the demands of the time by seeking augmented teaching, imbibing elements of modern technology and culture into daily mathematics instruction.

The current knowledge revolution is not about how much information is available. It is about how fast knowledge can travel through vast, connected networks of people and how, it can grow exponentially (Speer III, 2012). This digital revolution is being fueled by increasing broadband penetration and ubiquity of smartphones, particularly among the new genre of learners who are successfully imbibing the trendy culture of leisure and school work. Tons of digital content are being turned out by different outlets daily over the internet, with the Computer Science Corp (2012) forecasting an annual increase of 4300% by the year 2020, when the information super-highway will be holding an estimated milestone traffic of 35 zettabyte of data. The opportunities provided mathematics education by this information flow has expanded growth possibilities for all students, a fact the enhanced conventional teaching is currently riding on.

Integrating technology in education is a very sophisticated, multifaceted process, and, just like any other innovation, it should not be introduced without piloting its different components (Haddad & Draxler, 2002). Innovations must be substantiated for appropriateness, suitability,

classroom implementation, learning effectiveness, and cost benefit ratio. Clark-Wilson, Oldknow and Sutherland (2011) listed mathematical digital technologies readily adapted into enhanced conventional classrooms to include dynamic graphing tools, algorithmic programming languages, dynamic geometry tools, spreadsheets, data loggers, and computer algebra system. Computer algebra systems such as Mathematica, Maple, MuPAD, MathCAD, Derive and Maxima have potential to facilitate an active approach to learning, to allow students to become involved in discovery and consolidate their own knowledge (Kumar & Kumaresan, 2008). In this regard, Abari (2014) observed sustained interest and improved achievement after augmenting instruction in senior secondary mathematics with Geogebra. Dynamic geometry systems (DGS) like Cabri, the Geometers sketchpad (GSP) and others, seem to give new dimensions to school geometry with a clear invitation to experiment with and explore geometrical constructions and connections (Age, 2016).

Another dimension of the enhanced conventional teaching approach is the room for historical and cultural augmentation. Mathematics as a discipline is a tool of the society, crafted to aid human existence. The teaching of the subject is, therefore, expected to inculcate in learners certain modes of thinking that are quite important in the building of society and nation. Culture reflects how people live, behave, dress, eat, drink, rear children and maintain social relationship. Thomaskutty and George (2004) observed that culture is greatly determined by the scientific and technological advancement of the society, which in turn depends upon the progress and development of mathematics. Evidently, mathematics instruction that is relevant should help in the preservation and transmission of cultural traditions.

The obvious implication of this ethno-mathematics view is that at the basic education level, mathematical communication should reflect children's perspective of reality, a reality that arise out of the cultural practices of the people. The enhanced conventional teaching paradigm delivers mathematics instruction that is a knitted sequence of experiences that are rooted in the history and culture of learners. In bringing out realities out of abstract mathematical concepts, the conventional teacher may call to mind several cultural artefacts which can easily be blended into classroom instruction. Abah (2016) posited that local games and other historical snippets can be deployed by the teacher in an enhanced conventional mode to readily extract relevant mathematical relationships.

Enhanced conventional teaching, which is a blend of adaptive approaches strategies and methods, links techniques and learning objectives based on the bloom's taxonomy of learning objectives. Enhanced conventional teaching will assist the mathematics teacher in developing and directing students in logical steps of learning by planning towards the development of learners in the cognitive, affective and psychomotor domains. The flexibility of the mechanism involved stands to lead students to engage in higher order of thinking such as analysis, synthesis and evaluation (Harris & Johnson, 2001). The possibility of technological augmentation also raises the chance of honing modern bankable skills in students, making the approach the very suitable to the current era. Technological enhancement has the potential to bring efficiency, improve existing processes and outcomes, and results in the transformation of the conventional classroom (Kirkwood & Price, 2014).

Conclusion

This discussion has been able to sustain the viewpoint of conventional teaching in mathematics as a base for improvement. In this perspective, conventional teaching implies an enhancement of instructional delivery which takes into consideration all approaches and techniques that are best suited for specific situations and offer the best prospect for attaining set objectives. The conventional mathematics teacher is that mathematics instructor who is capable of switching seamlessly between strategies in accordance to the demands of the learners and the entire instructional condition. Such dynamism may entail a balanced blend of technology, history, culture, and indigenous games in line with stated instructional goals.

References

- Abah, J.A. (2016). Recency bias in the era of big data: The need to strengthen the status of history of mathematics in Nigerian schools. *Advances in Multidisciplinary Research Journal*, 2(4), 241-248. Retrieved on 8th February, 2017, from http://media.wix.com/ugd/185b0a_9b1253273fea46768d1d96dcd03f4887.pdf
- Abari, M.T. (2014). *Effect of Geogebra on senior secondary school students' interest and achievement in statistics in Makurdi Local Government Area of Benue State*. An unpublished M.Ed Thesis submitted to the Department of Science Education, University of Agriculture, Makurdi, Nigeria. pp 1-170.
- Age, J.T. (2016). *The effect of Geometer's Sketch Pad on senior secondary school students' interest and achievement in geometry in Gboko Metropolis*. An unpublished M.Ed Thesis submitted to the Department of Science Education, University of Agriculture, Makurdi, Nigeria. pp 1-160.
- Anyor, J. W. & Abah, J. A. (2014). Mathematics curriculum change and assessment models: The quest for an integrated approach. *Benue Journal of Mathematics and Mathematics Education*, 1(3), 11-19. Retrieved on 11th November, 2016 from <https://files.osf.io/v1/resources/szfkf/providers/osfstorage/57ea8b72594d9001f491a1fa?direct=true&action=download>
- Boylan, M., Wolstenholme, C., Maxwell, B., Jay, T., Stevens, A. & Demack, S. (2016). *Longitudinal evaluation of the mathematics teacher exchange: China – England*. London: Department of Education. pp 1-55.
- Clark-Wilson, A., Oldknow, A., & Sutherland, R. (2011). *Digital technologies and mathematics education*. A report from the working group of the Joint Mathematical Council of the United Kingdom, pp 1-32.
- Coe, R., Aloisi, C., Higgins, S. & Major, L.E. (2014). What makes great teaching?: Review of the underpinning research. London: Sutton Trust. Retrieved on 6th February, 2017 from <http://www.suttontrust.com/wp-content/uploads/2014/10/What-makes-great-teaching-FINAL-4.11.14.pdf>
- Computer Science Corp (2012). *Big data universe beginning to explode*. Retrieved on 2nd August, 2016, from <http://www.csc.com/insights/fixwd/78931-big-data-universe-beginning-to-explode>
- CrumpledApps (2015). English Dictionary Offline. Version: 2.0.1
- Donnelly, K. (2014). 'Chalk and Talk' teaching might be the best way after all. Retrieved on 6th November, 2016 from <http://theconversation.com/talk-and-chalk-teaching-might-be-the-best-way-after-all-34478>
- Grushka, K. and Donnelly, D. (2010). Digital technologies and performative pedagogies: Repositioning the visual. *Digital Culture & Education*, 2(1), 84-102.
- Haddad, W.D. & Draxler, A. (2002). *Technologies for education: Potentials, parameters, and prospects*. Paris: UNESCO. pp 1-198.
- Harris, P. & Johnson, R. (2001). *Non-traditional teaching & learning strategies*. Retrieved on 11th November, 2016 from <http://www.montana.edu/facultyexcellence/Papers/activelearn2.html>

- Kirkwood, A. & Price, L. (2014). Technology-enhanced learning and teaching in higher education: What is “enhanced” and how do we know? A critical literature review. *Learning, Media and Technology*, 39(1), 6-36.
- Kumar, A. & Kumaresan, S. (2008). Use of mathematical software for teaching and learning mathematics. *ICME 11 Proceedings*, 373-388
- Lingard, B., Hayes, D. & Mills, M. (2003). Teachers and productive pedagogies: Contextualizing, conceptualizing, utilizing. *Pedagogy, Culture & Society*, 11(3), 399-424.
- Schwerdt, G. & Wuppermann, A.C. (2009). Is traditional teaching really all that bad? A within-student between-subject approach. *CESifo Working Paper*, No. 2634, 1-16.
- Speer III, J.F. (2012). Game changers: Education and information technologies – Preface. In D.G. Oblinger (Ed.), *Game Changers: Education and Information Technology*. Louisville, CO : EDUCAUSE. pp 1-381.
- Teach.Com (2016). *Teaching method*. Retrieved on 6th November, 2016 from <http://teach.com/what/teachers-teach/teaching-methods/>
- The Assessment & Teaching of 21st Century Skills (ATC21S) Consortium (2013). *Assessment & Teaching of 21st Century Skills (ATC21S)*. Melbourne: ATC21S. Retrieved from <http://atc21s.org>
- Thomaskutty, P. G. & George, M. (2007). Mathematics and civil society. Retrieved on 5th November, 2016, from http://math.arizona.edu/~atp-mena/conference/proceedings/Thomaskutty_Math_Civil_Society.doc
- Wiggins, G. & McTighe, J. (2007). *Schooling by design*. Retrieved on 6th November, 2016, from <http://www.ascd.org/publications/books/107018/chapters/What-Is-the-Teacher's-Job-When-Teaching%20%A2.aspx>