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The need for effective study skills under the 21st century: a case of USA and KENYA

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Abstract

The current world is operating in an economy that values creativity and innovation for scientific and technological development. Education gives people appropriate skills and knowledge they need to address their social problems. Mathematics and Science education is at the centre of this and needs to be at the forefront to connect the present to the future. The fact that a new generation of learners is in our classrooms requiring a paradigm shift in pedagogy is indisputable. Teaching in the same old way and emphasis on examinations, grades, certificates as well as lack of basic facilities have affected learning by generation Y students. As a result, Kenya like the United States of America faces a myriad of problems despite the fact that the youth is a reach reservoir for development. More than 50 per cent of the world's gold reserves, diamond, manganese, chromium, and cobalt are in Africa yet Africans live in the poorest situations imaginable. The United States, despite being the most powerful nation on the planet has, in general, have poor test scores in mathematics if results of international comparative studies are anything to go by. This paper argues in addition to poor teaching methods, strategies, and techniques, the assumption that students know how to study mathematics once in secondary school, college, and university and the failure to teach the same is partly to blame since year after year, students either drop out, receive poor grades, fail to attend classes and or don't take mathematics seriously. Millennials therefore need to be taught study skills in mathematics to ensure quality mathematics learning for creativity and innovativeness in the citizens. This will ensure education empowers Kenya, Africa, and the United States for global competitiveness. In particular, this paper intends to address the following current issues in Kenyan and Unites States schools: 1. Describe the Millennial Student, 2. Ramifications for Kenya and the United States, 3. Kenyan and United States curricula, 4. How to teach effective study skills, 5. What is needed of educators, and 6. What to do in the future.

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Abstract. The current world is operating in an economy that values creativity and innovation for scientific and technological development. Education gives people appropriate skills and knowledge they need to address their social problems. Mathematics and Science education is at the centre of this and needs to be at the forefront to connect the present to the future. The fact that a new generation of learners is in our classrooms requiring a paradigm shift in pedagogy is indisputable. Teaching in the same old way and emphasis on examinations, grades, certificates as well as lack of basic facilities have affected learning by generation Y students. As a result, Kenya like the United States of America faces a myriad of problems despite the fact that the youth is a reach reservoir for development. More than 50 per cent of the world's gold reserves, diamond, manganese, chromium, and cobalt are in Africa yet Africans live in the poorest situations imaginable. The United States, despite being the most powerful nation on the planet has, in general, have poor test scores in mathematics if results of international comparative studies are anything to go by. This paper argues in addition to poor teaching methods, strategies, and techniques, the assumption that students know how to study mathematics once in secondary school, college, and university and the failure to teach the same is partly to blame since year after year, students either drop out, receive poor grades, fail to attend classes and or don't take mathematics seriously. Millennials therefore need to be taught study skills in mathematics to ensure quality mathematics learning for creativity and innovativeness in the citizens. This will ensure education empowers Kenya, Africa, and the United States for global competitiveness. In particular, this paper intends to address the following current issues in Kenyan and Unites States schools: 1. Describe the Millennial Student, 2. Ramifications for Kenya and the United States, 3. Kenyan and United States curricula, 4. How to teach effective study skills, 5. What is needed of educators, and 6. What to do in the future.

Keywords. Kenya, United States, millennials, education, globalization, study skills, empowerment.

Theme: Nurturing the Future Generation of Mathematics Researchers in African Universities
Sub-theme: Teaching Mathematics Study Skills to Millennial Students.

> Vaughan Monroe: "It now costs more to amuse a child than it once did to educate his father"

Objective:

Each generation of students entering college has their own set of distinguishing qualities. The purpose of this article is to introduce the characteristics associated with the millennial

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generation and compare how students learn in Kenya and the United States. In addition, we examine key treats among millennials and how we as educators, by the teaching of study skills, can help students become better learners and thinkers.

I. Introduction

A new generation of learners has immersed themselves in the classroom. Our old ways of teaching are no longer suitable to serve their interest. They are infatuated with technology, impatient, and give up quite easily on tasks that appear challenging. They bring unique learning style preferences and worldviews to class (Monaco and Martin, 2007). The challenge is for today's teacher to attract and engage this generation of learners, particularly in Mathematics and the Sciences. There is a general concern by employers, educators, and the general public that today's students are leaving school and colleges without the necessary skills needed for survival, the world of work, and global competitiveness (Mugo, 2013; World Bank, 2013). Quality of education programs offered at schools and universities is thus questionable as graduates are unable to meet the demands of 21st century jobs (Mugo, 2013; Wanga, 2013). Global innovative and competitiveness indexes reveal Kenya and the rest of Africa trail behind comparative regions such as Southeast Asia, Latin America, and the Caribbean; an indication all is not well in our classrooms and institutions (World Bank, 2013). Furthermore, Africa trails behind other regions in its use of ICT and the gap is large in the basic building blocks for competitive economy such as infrastructure, education, governance, and institution. Despite being the most powerful nation under the sky, American students' poor test scores in international comparative studies on mathematics and sciences (TIMSS, PISA and OECD) is of great concern (Stigler & Hiebert, 1999; Stevenson & Stigler, 1992). Why is this so? What is the overall impact of this?

From a college professor's point of view, there is an assumption that students know how to study when first starting their college careers (Kiewra, 2009). The reality is, however that, many students don't know how to study mathematics. Despite a number of measures and reforms such as the introduction of calculators and SMASSE (Strengthening of Mathematics and Science in Secondary Education) project in Kenya, the score card in mathematics has persistently made depressing reading (Birgen, 2004; Owiti, 2012). Application of technology in the teaching of mathematics in the United States seems not to be working any better than the talk and chalk in Japan and China (Stigler and Hiebert, 1999; Stevenson and Stigler, 1992). Besides, transitioning from high school learning to college or university learning seem a major jump and semester after semester, students either drop out, receive poor grades, don't attend class, and or don't take studies seriously (www.mathtutor.ac.uk). Why is this true? Though no known research in either Kenya or the US relates the poor performance in mathematics to ineffective study skills, several studies have indicated that an effective route to improving self-efficacy in mathematics is by teaching specific learning strategies (Peter and Gareth, 2010). The authors believe therefore that lack of students' learning of effective study skills in mathematics and teachers' view of the same as remedial and their failure to think twice about teaching it could be behind the poor performance in the subject (Kiewra, 2009).

II. Who are Millennials?

The millennial student is a learner characterized by a need to have immediate feedback, a sense of entitlement, lack of critical thinking skills, unrealistic expectations, high level of parental involvement, and an expected "how to guide to succeed" in and out of the classroom (Monaco & Malissa, 2007). They want to spend less time on tasks and reach success with little effort. They are over "babied" by parents with little free time at childhood. This has decreased opportunity

for independent creative thought and decision making skills and as a result, provide challenges for teachers and educators.

They are team oriented and less comfortable working independently for fear of higher risks of personal failure. Consequently, they prefer working cooperatively on projects and participate within collaborative group settings (Monaco & Malissa, 2007). They are confident and highly optimistic but less committed, have big dreams and expectations with an unclear path on how to reach the level of success they are so confident of. This confidence stems from easy attainment of success in early years of education (primary schools) with very little effort (multiple choice questions) and their ability to work with various technologies (Monaco & Malissa, 2007). They are less committed to their work and quickly become frustrated when they do not achieve an A or B grade. They have access to each other and information 24/7 through the internet, text message, face book and twitter but still can't make use of the same technologies for academic excellence (Olszewski, 2013). They have been technology stimulated and demand this counteractively as they go through their studies. They feel pressured to constantly perform to impress on their would be judge, acquire good grades and certificates, and as such have perfected on a number of academic frauds to achieve the end (Wachira, 2012):

- *Giraffing*- where a student sticks out the neck to see another student's answer sheet.
- *Lateral connection*- implemented through a sitting arrangement whereby the bright candidate is flanked on both sides by weaker candidates who peep on their work.
- *Nothing-nothing*- where empty biro pens are used to trace information on a blank white piece of paper. Seeing this on the table, one would think there is nothing on the paper, but closer observation reveals well loaded with facts about the examination.
- *Mwakenya (dubbing and tattoos)*- where a candidate, mainly female, writes information on thighs where she can easily adjust to read and copy.
- *Missile catch*- where answers are written on a piece of paper, squeezed, and thrown to a colleague during the examination.
- *Body aids*- such as use of slippers with answers, under-pants, handkerchiefs and use of coded sign language to communicate during examinations particularly in multiple-choice examinations.
- *Table top guide*- where anticipated answers are written on desks before an examination starts. Mostly, formulas, diagrams and maps are written in short form.
- *Use of tokens*- These are short notes on the mathematical set, razor blades, rulers, handkerchiefs and other items for referencing during examinations.
- *Coms*- where calculators that facilitate multiple entries are used. Quite often such special calculators are put in casings of ordinary calculators and might look ordinary and escape invigilators.
- *Direct access*- this is whereby an examiner helps candidates during examinations.
- *Mercenary service*- involves another person writing the examination for the other i.e in 2011 KCSE some university students were arrested sitting examinations for private candidates.
- *Rank zeroxing*- which happens when a candidate collects and copies a colleague's answers word for word.
- *Contract*- This occurs when a student's grade is influenced with the assistance of a friendly lecturer. It can occur when a lecturer is paid money or sex for marks to enhance grades.
- *Time out*- This is where a student pretends to be suffering from diarrhea and visits the toilet several times to read prepared answers.

Youngsters live in a world dominated by reality television and celebrities where success appears to come instantly and without any real effort. This culture of instant gratification could be making today's school children harder to teach mathematics than ever. Overwhelming distractions preventing the millennials from deep study of mathematics, creativity, innovation,

and thinking are impacting negatively on their grades and attitude towards learning (Olszewski, 2013). In Kenya, cases of students committing suicide on failure to attain desired grades in national exams (KCPE and KCSE), teachers being beaten and frog matched by parents and students due to poor examination results are abound. Perhaps these are confirmations that things are not right in our classrooms. In particular, Kenyan millennials are lazy, focus much on grades and certificates, dream big but do not work towards achieving their dreams, are carefree, expect technology to work for them (calculators and computers in mathematics), impatient and give up quite easily. This casts a lot of doubt on the success of president Uhuru's "laptop for every standard one pupil" unless the implementation is well done and study skills are taught.

A large group of students world wide who never achieve in mathematics either lack good study habits or do not understand how to study for mathematics (Dawkins, 2013). A few spend hours each day studying but still don't do well while others because of inefficient study habits or distractions simply do not spend enough time studying mathematics (Dawkins, 2013). This latter group need to be made to realise that they need to take their time if they want to pass mathematics, hence the need for mathematics study skills.

III. How did we get here?

Special education came to the forefront in the 1970s in the United States. Educators believed the best course of action was to change the curriculums and not try to change the student (Hopkins, 2010). However, what if the student needs an alternative way of learning but can still perform just as well as non-special educated student? For example, instead of having classrooms set up in traditional rows, have a diverse educational level group of three or four students assigned to circular tables. This way, students can work together to solve problems, work on homework, and exchange ideas. Teachers must encourage healthy debates instead of passing out worksheets to students where all they need to do is follow patterns to get solutions. Instead, ask questions that motivate discussion. For example, why, in general, does $(a+b)^2$ not equal a^2+b^2?

In Kenya the idea of special needs education started after Kamunge's report of 1988. Currently, there are over 1,100 units and 100 public special schools in Kenya, which include vocational and technical institutions that cater for learners with special needs and disabilities. It is estimated three quarters of Kenyan pupils with special educational needs are in special schools with only a quarter in special units located within mainstream schools. Special education in Kenya faces a number of challenges: Special education has not been fully mainstreamed across the education sector and so there are difficulties exercising the right to education because of the lack of access at all levels. Most regular schools are ill-equipped to deal with special needs learners. There is lack of specialized learning resources, materials and equipment. Teachers with specialist knowledge and relevant skills are in short supply. The Ministry of Education's Quality Assurance and Standards Division does not regularly inspect special education learning institutions. Where quality assurance is undertaken, most officers generally lack expertise to do so. There is lack of equity because many regions are without special needs institutions particularly in ASAL and slum areas.

In the United States, special education is proving to be very difficult to comprehend. Teachers are required, by Federal Laws, to comply with Individual Education Plans (IEPs) and must make accommodations for these students. Of course, if a student needs extended testing time or large font sizes, these are reasonable accommodations. However, many students are sent to their special education teachers when other, non-special education students are taking an assessment in the classroom. A teacher would think their assessment questions would not be altered in anyway, providing the same level of difficulty for all students in the class. However, many special education teachers are writing out examples of problems on the margins of assessments and changing questions. Regular education teachers can't do anything to prevent

this from happening, as we, as a society, must believe all students are "special." When student receives feedback, they are given a high grade. However, what have they really learned? Not the mathematics or, for that matter, any other subject. To lead students along and making them think this is acceptable in high school and even worse, later on in life, is a crime. Thinking about how many students we can work with and help them learn the same material, on the same level of difficulty as non-special educated students, should be the goal of special education teachers. To sit back and not motivate learning is hard to fathom in one of the most powerful countries in the world and a developing nation. Kenya and the United States are taking potential scholars and not providing them with a curriculum necessary for the future. With both countries, special education is robbing students of their true potential and instead of encouraging students to work hard and study, the learning and studying is being done by regurgitation and handholding to give the impression students are learning and advancing.

IV. What this means?

Mathematics and Science education being the single most powerful leverage we have to address the needs of our future is at stake. The generation Y students (millennials), with their unique characteristics that affect what and how students learn, go through education but education never goes through them. They fail to learn what they ought to have learnt by different levels of education (UWEZO, 2010, 2011). This is partly due to distractions, teachers less innovativeness in teaching practices and poor study skills resulting into exam cheatings and students with certificates but without ability to engage in problem solving (The Standard, 2011; Abagi, 2012; Ayiro, 2012; Mugo, 2012). In a survey entitled "where to be born" at the end of 2012, the Economic Intelligence Unit (EIU) ranked Kenya the second worst country under the sun for a child to be born in 2013 (Kiarie, 2013). The annual Global Peace Index (GPI) ranked Kenya in position 120 out of 158 countries while in the Transparency International (TI) corruption index of 2012, Kenya was ranked the 35th most corrupt country in the world. A look at certain global indexes reveals the following for Kenya:

Table 1. Some global indexes of Kenya 2011-2013

Sub indexes	**Kenya's Position**
Global Competitiveness Index (GCI)	106/144
Higher education and Training	101/144
Quality of Education System	37/144
Quality of Primary Education	78/144
Quality of Math and Science Education	76/144
Innovation	50/144
Human development index	143/187

Source: World Bank (2013)

From the Table 1, it is clear Kenya is not among the top ten countries when it comes to innovativeness, quality of education system, primary education, as well as mathematics and science education. Kenya is towards the bottom of the list with respect to human development, global competitiveness as well as higher education and training. In 2009, 22 of the 24 nations identified as having "Low Human Development" on the United Nations (UN) human development index were in Sub-Saharan Africa to which Kenya belongs (www.hdr.undp.org/en/statistics). This state of affairs could be attributed to the fact that millennials are not learning mathematical skills as they should be.

In the United States, high school seniors take the SAT exams, which provide an indicator for college readiness. According to the College Board, critical reading is down by four points (505 in 2000 and 501 in 2010) and mathematics is up by two points (514 in 2000 and 516 in 2010) within the last ten years. Writing has gone down each year since first tested in 2006 (497, 494, 494, 493, and 492). Fifty-seven percent of students who took the SATs did not score high enough to indicate likely success in college. Of course, the SATs are not the only indicator of college readiness as GPAs and other extra-curricular activities are weighed in a college or university decision for admission. As a comparison to the global indexes found in Kenya, the Unites States global indexes are as follows:

TABLE 2. Some global indexes of the United States 2011-2013

Sub indexes	**USA's Position**
Global Competitiveness Index (GCI)	7/144
Higher education & Training	8/144
Quality of Education System	28/144
Quality of Primary Education	34/144
Quality of Math & Science Education	47/144
Innovation	7/144
Human development index	3/187

Source: World Bank (2013)

From the Table 2, the Unites States is among the top ten countries for global competitiveness, higher education, innovation, and human development. However, with being the most powerful country in the world, one would expect to have very high indexes for education. Comparing the quality of mathematics and science education with the United States and Kenya, there is only a difference of 29, in primary education, a difference of 44 in higher education, and in the educational system as a whole, a difference of 9. The latter difference is most striking given the higher rankings of the United States in terms of innovation, human development, the economy, and financial stability of each country. Why the small difference? The answer, we believe is, no matter the country, we live in a world that is constantly changing, much more than in previous generations. The way we as humans interact and have access to technology has changed our outlook for the future. Students are no longer wanting to spend hours reading books and studying on their own. They want the answers now, put as little effort as possible, and study only when they have time around their busy virtual worlds.

V. United States Curriculums

As the United States moved from generation to generation, from the Industrial Age to the new modern era of the Information Age, schools have been teaching students the same way. Classrooms have been set up in rows and the teacher did all the lecturing. Until recently, schools have been under the influence of TTWWADI, which stands for **T**hat's **T**he **W**ay **W**e've **A**lways **D**one **I**t. The world is constantly changing and often times, teachers cannot keep up with this change. As McMain, Jukes, and Kelly point out: "We cannot carry on preparing students for the farms and factories of yesterday while the world jumps to light speed with biotechnology, nanotechnology, neurotechnology, global high speed wired and wireless networks, and incredibly powerful personal portable devices. We strongly believe that schools must prepare kids for the world of tomorrow - the world they will spend the rest of their lives." Lessons and the curriculum must be designed with the use of technology that will not further inhibit students to learn.

When we think about our college years, we always remember going to class, listening through lecturers, performing labs, studying, and taking exams. This is how college operates

because of TTWWADI. However, what we don't think of is someone teaching us how to study when we were freshmen. It is assumed upon graduation from high school, one knows how to study and is ready for college studies. However, for many millennial students, this is not the case. There are big differences between high school level learning and college level learning and most graduating high school seniors have no comprehension of how to study. As Kiewra and Jairam point out, "Many believe that college students should be expert learners; after all, they have practiced learning for a dozen or more years. In reality, 73% of college students report difficulties preparing for exams, and this percentage of reported study problems is consistent across college years. Research also confirms that college students employ weak strategies in the classroom and while studying. Those weak strategies include poor note taking, organizing ideas linearly, learning in a piecemeal fashion, and employing redundant strategies." There is a gap between how professors expect students to learn and how students actually learn. To close the gap, students have to first realize the differences and then take control of their own learning. Second, students have to be equipped with effective learning strategies.

As part of the No Child Left Behind Law (NCLB) signed by President Bush, high schools across the United States, are seeing a growth of students enrolled in a non college preparatory mathematics plan of study. However, students receive their high school diploma and are accepted into a community college, college, or a university. However, with their high school education, they are not prepared for the challenges ahead. Currently, a typical non-college preparatory mathematics curriculum involves Algebra I, Liberal Arts Mathematics designed to get students ready for Geometry, and Geometry. In a college preparatory curriculum, students take Algebra I-II, Geometry, Pre-Calculus, and either Calculus or Statistics. Views are mixed if the No Child Left Behind Law is working. Some states are seeing improvements in mathematics, while others aren't. Below are two charts of two American states with a comparative view before and after NCLB according to Center on Education Policy (CEP),

TABLE 3. Average yearly gains by subject and grade for states with greater overall gains after NCLB than before.

Pennsylvania					
Subject / Grade Level	Pre-NCLB Percentage Point Gain	Post-NCLB Percentage Point Gain	Average Yearly Effect Size Gain Pre-NCLB	Average Yearly Effect Size Gain Post-NCLB	Comparisons of Pre vs. Post-NCLB Gains
Math 5	0.1	3.5	0.03	0.11	Post-NCLB gains exceed Pre-NCLB gains on 8 of 12 comparisons
Math 8	0.7	2.6	0.03	0.06	
Math 11	1.7	0.6	0.03	0.02	

TABLE 4. Average yearly gains by subject and grade for states with greater overall gains before NCLB than after.

Delaware					
Subject / Grade Level	Pre-NCLB Percentage Point Gain	Post-NCLB Percentage Point Gain	Average Yearly Effect Size Gain Pre-NCLB	Average Yearly Effect Size Gain Post-NCLB	Comparisons of Pre vs. Post-NCLB Gains
Math 4/5[1]	3.9	3.2	0.10	0.08	Post-NCLB gains exceed Pre-NCLB gains on 8 of 12 comparisons
Math 8	4.1	1.6	0.10	0.05	
Math 10	4.2	3.0	0.11	0.08	

Source: Center on Education Policy.

As we can see, Pennsylvania did see an improvement in grades 5 and 8. On the other hand, Delaware has not seen improvements. The next logical question is, have curriculum's changed along with NCLB? Are we teaching with the same level of rigor before NCLB? This is also a mixed answer. Some schools have created new mathematics courses that don't motivate students to study higher-level mathematics. For example, many United States high schools have different sequences of mathematics courses for students to take. According to the Center for the Study of Mathematics Curriculum, 24 States require three years of mathematics courses. However, none of those 24 States require courses past Geometry. Only Arkansas and Michigan require mathematics course through Algebra 2 (see figures below).

TABLE 5. Number of years of high school mathematics course/credits required for graduation in the United States.

Specified at Local Level	1 year	2 years	3 years	4 years	Varies by Diploma
CO, IA, ME, MA, NE		AK, AZ, CA, ID, MT, ND, WI	CT, DC, DoDEA, HI, IL, KS, KY, LA, MD, MN, MO, NH, NM, NJ, NV, NY, OH, OK, OR, PA, TN, UT, VT, WY	AL, AR, DE, FL, MI, MS, RI, SC, TX, WA, WV	IN (2-4 yrs) GA (3-4 yrs) NC (3-4 yrs) SD (3-4 yrs) VA (3-4yrs)
5	0	7	24	11	5

TABLE 6. Courses required for United States high school graduation/diploma.

Course	States Requiring Course	Total
Algebra I	AL, AR, CA, DoDEA, DC, FL, GA, IL, KY, MD, MI, MS, ND, NH, NM, OK, SD, TX, UT	19
Algebra I or Integrated Mathematics I	IN, LA, NC, TN	4
Geometry	AL, AR, DoDEA, IL, KY, MD, MI, TX, UT	9
Geometry or Integrated Mathematics II		0
Algebra II	AR, MI	2
Algebra II or Integrated Mathematics II	DE	1
Algebra I, Geometry, Algebra II or Integrated Mathematics I-III	LA, TN, VA	3

Source: Center for the Study of Mathematics Curriculum.

As a supplement for high school graduation, students may register in a developmental course, a senior seminar, or a capstone course. Regardless of the fact that some students maybe going for a Liberal Arts degree after high school, will still need to take some form of mathematics courses in college. However, with the lack of students the non-college preparatory track in high school, students will feel at a loss. There is simply not enough in the curriculum to motivate critical thinking skills. Many students across the United States face the reality they must first take a remedial mathematics course when starting their college career in order to be placed in a College Algebra II course needed for most programs. However, College Algebra II is very similar to Algebra II taught in high schools, which is not taught in the non-college track. We are not doing students any favors in our high schools by letting students enroll in a curriculum that doesn't prepare them for future studies. We should be encouraging students and parents to help make our students the best they can be and giving them all the knowledge possible for success in college and for the future.

VI. Kenya's curriculum

From independence, except in the recent past when electronic calculators were introduced in secondary school mathematics and now president Uhuru's 53 billion laptop project for class one pupils earmarked for January 2014, Kenyan generation after generation have been taught in the same old way devoid of ICT. Classrooms have been set up in straight military rows and the teacher did all the lecturing. Given the calculator innovation has not been very successful in enhancing performance in mathematics, alternatives A and B curriculums were introduced at secondary schools in 2010 to cushion weak students. Kenyans are yet to see the implementation

[1]Percentage proficient data are for grade 5, and effect size data are for grade 4.

of the laptop project and whether it will enhance mathematics learning or not. The Dakar World Education Forum (2000) declaration of EFA saw the introduction of free primary and day secondary education in 2003, a move that resulted to an increased enrollment of up to 10 million pupils at primary schools and a transition rate of 72% from primary to secondary by 2010. Despite this achievement, mathematics has remained a much feared and poorly performed subject in Kenya (Eshiwani, 1987, 1993; Owiti, 2008). Learning assessment by UWEZO (2010, 2011) found that pupils are leaving school without the ability to perform the most basics sums. For instance, 3 out of every 10 children at primary schools can't perform basic arithmetic, 70% of children in class 3 can't do class 2 work while 60% of standard eight pupils can't solve problems tackled in lower classes (Abagi, 2012). Furthermore, Kenyan 13 year olds are behind their counterparts in Mauritius in mathematics (SACMEQ, 2010). Effective pupil learning and achievement in mathematics is hampered by weaknesses in teachers' pedagogical classroom practice (Pontefract and Hardman, 2005). Dominant is individual seatwork teaching activity in mathematics while recitation is dominant in English (APHRC, 2010-2011). Interaction discourse comprises of teacher explanation and question and answer sequences that are ritualistic exchanges (Pontefract and Hardman, 2005). The lessons are reiterative rather than developmental in nature to ensure progression in learning. Focus is on revision of a topic previously taught rather than the development of a concept or introduction of new ideas. Most of the learning tasks put strong emphasis on factual, propositional knowledge (knowing that) rather than procedural knowledge (knowing how). Teachers' questions (99%) are closed and are factual narrow requiring recall and single word responses (Pontefract and Hardman, 2005). Majority of teachers of mathematics are not conversant with the syllabus they are teaching and learning is too teacher centred (Mugo et al., 2011; World Bank, 2013).

At Secondary School level, 10% of students like mathematics and perform well in it. The rest 90% dislike the subject, perform poorly in it (average 25%) and have to be forced to study it (KNEC, 1999; Ayodo, 2009). A baseline survey by SMASSE in 1998 in nine districts (Kajiado, Gucha, Kakamega, Lugari, Butere-Mumias, Kisii, Maragua, and Makueni) revealed problems to do with attitudes towards science and mathematics, inappropriate teaching methodology, content mastery, inadequate assignments, few or no interaction for teachers, infrequent professional guidance and missing links between primary and secondary school levels. Analysis of Kenya Certificate of Secondary Education (KCSE) mathematics results over the years by the Kenya National Examinations Council (KNEC) reveal that Kenya is producing a generation that is mathematically incompetent (Daily Nation, 1996). Over 80% of the candidates, majority of who are girls, are failing in the subject (Daily Nation, 1996). For instance, between 2001 and 2006 the mean score in mathematics was 19% (Waihenya, 2003; 2nd International handbook of mathematics education part one). The introduction of the new mathematics curriculum (alternative A and B) in 2010 for students without ambition of pursuing careers requiring advance mathematics and science is an indication that all is not well at secondary schools Kenya (Otieno, 2009). There is very little or no use of teaching aids and or technology (ICT). Use of calculator, an innovation in the curriculum, has not yet succeeded partly because teachers lack the pedagogical competent in making the correct use of the aid thanks to the mathematics education curriculum teachers go through in college. It has remained traditional and conservative and so teachers leave colleges without knowledge of incorporating ICT in their teaching. Fingers point at the school-based programs (TSC) at the universities for producing incompetent teachers who can't work with students to produce results (Ayiro, 2012).

At Colleges and Universities, shortage of qualified and experienced staff is forcing colleges and universities to resort to unqualified lecturers, many of whom are still pursuing masters courses (Mugo, 2012). Kenya's former higher education minister Prof. Kamar admitted that quality of university education is dwindling and calls for deliberate measures to end the same (Oduor, 2012). Lecturers and Professors are less innovative in their teaching and are driven by economic gain (commercial mentality) at the expense of meaningful teaching often resulting into mediocre teachers of mathematics (Mugo, 2012). Teacher education curriculum doesn't adequately address the issues pertinent to secondary school mathematics teaching (CEMASTEA, 2010-2011). Theories in the curriculum are often outdated and inapplicable in the today's classroom (CEMASTEA, 2010-2011). There are no tutorials and emphasis is on theory with haphazardly organised school-based practices lasting just a few months (Owiti, 2012). Teaching practice (TP) assessment results are never analysed to inform subsequent mathematics teacher education resulting into a continuous supply of teachers who are unable to embrace and apply technology in their teaching and are uncommitted to the profession (Aluanga, 2012). Furthermore, the best students never opt for B.Ed programmes. The majority of those who join school of education have had to "bridge" meaning they are weak in mathematics, the subject they are expected to teach after graduation. The end result is a Kenyan child who is less innovative.

Thinking about Kenya and the United States education a few years back, no one gave the now famous motivational talks or taught students how to study. Perhaps there were fewer distractions comparatively and students would spend time studying mathematics. For many millennial students, this is not the case. Students are at a loss and constantly need guidance. Many students across Kenya and the United States face the reality that they must first take a remedial mathematics course or bridge in mathematics in order to be placed in college programs requiring mathematics. To close the gap, students have to be equipped with effective mathematics learning strategies. Most teaching and learning interventions are not designed with millennial needs in mind

(Paul, 2013). It is therefore believed that there is need for designing study skills resources, which attempt to cater for them.

Now that we have laid out the key characteristics of the Kenyan and the United States millennial students and the struggles both teachers and students are faced with, let us now look at how we can help the generation Y students through the teaching of mathematics study skills.

VII. Effective Mathematics Study Skills

Mathematics is not a spectators sport and one cannot learn it by watching the instructor lecture or work problems (Paul, 2013). The reality is that many people need to work harder at mathematics and spend a couple of hours studying before each exam. One must be actively involved taking good notes, working homework and studying regularly not just the night before exams (Paul, 2013). While note taking is that critical, many millennial students don't know how to take notes because they have been spoon-feed all the notes during high school years. When students are beginning their freshman year, many simply don't know what to do or how to collect and organize information. As Kiewra points out: "How can you possibly select key ideas when you miss or show up late for class, spend class time searching for materials, lack background knowledge about the topic, daydream, sit where it's difficult to see and hear, overtax your brain trying to listen and copy at the same time, become distracted by things happening around you, and record sketchy notes?" Taking good notes starts with the student being proactive and taking on the initiative to want to take good notes. Sitting idle in the class and relaying on your listening skills to remember what was said in class will not work. The days of high school teachers passing out notes or writing them on the board are non-existent in college.

Memorization of simple formulas does not work in mathematics as one has to in addition understand how to use the formula. For instance, simply memorizing the quadratic formulae:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

without understanding that one has to first express a quadratic in standard form i.e., $x^2 - 6x = 16$ must be written as $x^2 - 6x - 16 = 0$, before applying the formula will make it difficult to handle the problem (Paul, 2013). Besides, Mathematics is cumulative. For instance one cannot do logarithms without first taking indices e.g., solve for x in the equation $2^x = 55$ giving your answer correct to 2 decimal places. Again a candidate failing to give the answer as required in this case may not score all the credit. In addition, millennial needs to be taught General tips foe studying mathematics, taking notes, getting help, homework, problem solving, studying for exams and taking a mathematics exam.

Mathematics is a cumulative subject. Students must recall past concepts in order to be successful on future exams and classes. In Algebra I, students are first introduced to simplifying complex fractions. This skill has many application to higher mathematics courses. For example, if a student is asked to prove

$$\frac{\sin^2\theta - \tan\theta}{\cos^2\theta - \cot\theta} = \tan^2\theta,$$

the natural starting point is to write

$$\frac{\sin^2\theta - \tan\theta}{\cos^2\theta - \cot\theta} = \frac{\sin^2\theta - \frac{\sin\theta}{\cos\theta}}{\cos^2\theta - \frac{\cos\theta}{\sin\theta}}.$$

However, many students make the classical mistake of cancelling out

$$\frac{\frac{\sin\theta}{\cos\theta}}{\frac{\cos\theta}{\sin\theta}}$$

to get $\frac{\sin^2\theta}{\cos^2\theta} = \tan^2\theta$. Clearly, there is a misunderstanding of the basic concepts of complex fractions in a PreCalculus class. In addition, students may not have the proper exposure to higher level thinking skills or not enough exposure for them to be successful in college.

PowerPoint lectures are becoming more commonplace for classes. However, students should still take notes about the PowerPoint lectures as many PowerPoint's only have pictures or key ideas of topics. If students totally put faith on printing out the PowerPoint's once an instructor has completed talking about them, they maybe faced with leaving out vital information. This is especially true in an art history class where the PowerPoint lectures may solely be pictures of art while the details about the works are pouring out of the professors' lips. While the typical millennial studies, many times, students are memorizing isolate facts. Whether it is due to over highlighting, underlining, making note cards, if one can't make connections and draw on topics, one will never be successful in class. Think about it, are the vast majority of exams in college going to ask students isolated and, quite possibly, boring facts about when certain events took place? Or when someone did something special? Highly doubtful. Why? Professors want to know what the student has learned by collecting the

notes, making connections, and applying new knowledge to a different and often times, a harder situation. By studying the same random facts without drawing on the topics is not what professors want to hear, because, quite frankly, it's tiresome. Professors know the facts and instead, what you, as the student, to show off your knowledge mussels. Splitting up ideas and memorizing facts is good to know but will serve no benefit for the student in the larger scheme of things. As Kiewra points out: "There are two types of associations you can create when learning: internal and external. Internal associations are those made within the material being learned. External associations are made between the new material being learned and past knowledge already stored in memory." If one can make connections to things already learned, one is already well on their way to making connections. This is where real learning takes place.

An excellent technique to note taking are the four BEs - BE there, BE on time, BE up front, and BE on edge - before lectures (Kiewra, 2009). This is even more the case in a mathematics course. Seeing a professor work out a problem is beneficial at first, but working out problems with the professor and fellow classmates is critical. In other words, mathematics is a not a subject one can lean back in your chair and only listen. One must be active and participate in the discussion. If a student misses class, they are missing out on the human interaction they would receive. In mathematics, a student may miss an important problem solving strategy that may not be mentioned in the text. For example, if a student is learning how to long-divide polynomials and is asked to divide x^3-1 by $x-1$. Here, the quotient turns out to be x^2+x+1. However, the student may wonder how the author of the text obtained x^2 in the solution. This is where going to class is vital. Of course, the key idea is to ask how many times does x go into x^3 or $\frac{x^3}{x}=x^2$. All professors should stress to their students to come to *each* class. . If students are not in class, they miss out on lecture and a chance to ask questions that motivate dialog between the professor and fellow classmates. The price of missing class is the opportunity for human interaction, a skill needed for school and everyday life. We as professors need to be pro-active with tracking student's progress, especially freshmen in college. Being on time to review previous class notes and reading is important for the students to have a habit of doing on a daily basis. Inform students that when they are late, they miss important information, which maybe questions from other students in the class on previous materials, overview of last class with a transition of the next class by the professor, and any announcements. If possible, don't allow students to sit in the back rows of the class as they are most likely to space out and not pay attention. Lastly, being on the edge of your seat and being physically ready for the lecture is important for successful note taking. Students will not have any benefit for sitting back in their seats, whether up front or in the back of the class, listening to you talk. Emphasize to the student to have their minds open to discussion and to activity participate. Having the concentration during the lecture requires students to be fully rested and have no distractions.

During the lecture, students should follow the four GETS - GET it all, GET it fast, GET is now, and GET it again (Kiewra, 2009). Many students only write down main ideas of the lecture thinking they will get the details later. This is never the case. In mathematics, when students are given mathematical definitions, it is not enough to simply write down the definition. The definition must be understood followed by simple examples in the notebook for quick reference (Dawkins, 2006). For example, for the definition of a logarithmic function, the student should note that $y=\log_b x$ and $x=b^y$ are equivalent and the first is in logarithmic form and the second in exponential form. Next, short examples are needed for quick memory recall as in $\log_2 8=3$ since $2^3=8$. When taking notes, encourage students to obtain all the notes needed with examples for use on exams. Another effective skill is to use abbreviations for memory recall. Encourage students to ask you, the professor, to repeat parts of the lecture missed. After the lecture, students can complete their notes with filling in any missing information. This can be done by re-writing notes, looking up terms in the textbook, going over the lecture with the professor or replaying the lecture through a tape recorder. Stress to students to check their solutions. For example, when solving $\sqrt{2x}=-10$, once the solution of $x=50$ is reached, students assume this is the final answer. But further investigation through check the solution back into the original equation leads to $\sqrt{2\cdot 50}=\sqrt{100}=10\neq -10$. In short, motivate students not to simply sit back and listen to you lecture. This is what they were taught to do in high school as all the notes were written on the board for them. Encourage them to be proactive and take charge of their education.

Highlighting has proved to be a non-effective study skill for millennial students. There are three problems with highlighting; 1. Students tend to overly highlight, 2. Highlighting alone is not effective as they do not remember key ideas better than students who read the same text and don't highlight, and 3. Students who highlighted don't recall non-highlighted areas of the text (Kiewra, 2009). Students need to be taught they must paraphrase their notes and not simply copy the lecture or readings word for word. In addition, right after a lecture, students should be spending time rewriting their notes and making connections across topics. The sooner the rewriting of notes and making connections takes place, the better the chances of student retaining the information in the long run occurs. For students who are visual learners, the idea of concept maps or Cmaps, proves to be an effective study skill. Here, the student creates a map of various terms and how they are related. Connections can be drawn and written up for the notebook. Details can be organized, which in turn, will make notes have a constant flow of ideas.

A major concern with millennial students is cramming for exams and other assessments. Cramming is when students wait until the last possible day or evening, to study for an exam or write a research paper. While some students can get away with cramming the night before an exam, there are no lasting benefits as the information a student crammed the night before will be forgotten for the next exam. A research paper takes weeks and even months to write properly. In most cases, some college courses have students write term papers, which are meant to be written over the course of the semester. They are designed to encourage students to draw option topics covered during the whole semester and make conclusions. If a student crams the paper in the last possible evening, they are tossing out any meaningful knowledge they may have been learned during the semester.

Taking a step back after re-writing notes, students should ask themselves, what could the professor ask as an assessment question? Motivate students to create their own test questions and have them answer them. This can be done in study groups, individually, or with the professor. Students should not be afraid to talk with their professors about how to go about studying or having a review session before an exam. Students need encouragement to take charge of their education and not to let education pass them by. This is their time to be in the spotlight and to prove to their professors, and, more importantly, to themselves, they can master any subject. Ask students to make a weekly schedule of their activities. By making a weekly schedule, students should be able to see how much time they spend on studying, being in the classroom, and time for pleasure. By seeing times spent, it should be a greater motivation to cut out certain activities, which take away for their studies. If handy, show students an example of several students' schedules for past years of different grade levels. The example of the A student schedule should involve more hours of study than a D level student.

In recent years, multitasking has been a topic of conversation. Due to our fast-paced society, we are all receiving information at a rapid rate from various sources. Millennials have grown up with this speed of information. Today's student may look at one screen, which maybe the computer for email (which may not be fast enough for them these days), then turn to their cell phone for texts, then facebook, then their Ipod, then Ipad, the list goes on. In short, they are wired to this rapid and quick paced environment. They believe they can perform multitasking however most aren't good at it. Our brains aren't designed to handle multiple tasks at once. Often times, when we attempt to multitask, we make mistakes. When we believe we are multitasking, the smallest of disruptions can cause us to lose our attention. Even when we believe we are note multitasking, we most likely are. For example, if you are sitting down studying for an exam and listening to music, you are multitasking. The reason being your brain is taking in information about your exam and taking in the musical notes and lyrics of the song being played. You are multitasking and don't even know you are multitasking. During the schooling years and while in college, millennial students are faced with many more distractions than previous generations had been faced with. They relay on the Internet to get information fast, don't write letters but emails instead, don't use the phone but text instead, and play video games instead of being outdoors in the fresh air. Sitting in front of monitors and screen for long periods of time is the way of life for many of us these days. However, for the millennials, born in the late 1990s onward, they have been exposed to this from childhood.

The Internet moves quickly. It gives us answers at the blink of an eye. Millennial students expect, like the Internet, to get answers fast and do as little work as possible to achieve their goals. However, learning takes time and patience. Writing papers takes several drafts to perfect. Education and learning should be a pleasurable process, which should never be rushed because there are deadlines to meet or because one wants to finish something early to go out and party. This is how details are overlooked and one might miss on something important. Students' ability to focus and fight through academic challenges is suffering an exponential decline. With all these new technologies, are we as teachers, supposed to alter our lessons? Are we to design lessons using phones, iPads, and video games just to keep student's attention? Some teachers are incorporating these technologies in their classes. However, is this beneficial in the long run? Does this further isolate the student? Are the critical thinking skills harmed by this technology incorporated in the classroom? Most importantly, are we setting our expectations as high as we did before all the new modern technology came to the forefront? We believe students are as smart as they were before the millennial era. However, with the rapid advancement of technology, as good and beneficial as it has been, also has contributed and hurt students' attention spans.

To engage the impatient generation Y, something more is needed. More inclusive assessment and evaluation criteria that could reduce the urge to cheat in examinations are needed. Children need to be encouraged to use the skills they had developed to do more independent learning. They need to learn better. They have to move from dependent learning to independent learning so that they are prepared for a society and an economy in which they will be expected to be self-directed learners, able and motivated to keep learning over a lifetime. It would be necessary to have an education system in which students are taught effective study skills that can help them deep study, get good grades, be creative, and innovative if the current trend of events in Kenya, Sub-Saharan Africa and the United States of America is to change. The Mathematics and Science curricula should be drafted around producing skilled individuals in the ICT, technical and vocational field to produce people who are more confident and employable.

VIII. What is needed of mathematics educators?

Mathematics educators need to understand the millennials and work in collaboration with them using a variety of instructional delivery methods to engage them. As a result of being used to being hand held in education, millennials need assistance in developing independent thinking and decision making skills. Effective mathematics study skills therefore become paramount. Teachers should use styles of communication that effectively reaches the students. Teaching skills that work well involve methods that develop millennial characteristics. Problem solving and cooperative learning are among some of the methods that could work well. General tips for studying mathematics, taking notes, getting help, homework, problem solving, studying for exams and taking a mathematics exam need to be taught to the students. Like all students, millennials learn more effectively when taught in accordance with their learning style preferences and when their worldviews are acknowledged. Prominent among their preferences are visual and kinaesthetic learning styles. Our Mathematics and Science teaching methods should thus incorporate the characteristics of this group of students if 21^{st} century learning and globalisation is to take place.

IX. The way forward

The millennial student is no longer the type of learner our education system was designed to teach. As Monroe puts it: "It now costs more to amuse a child than it once did to educate his father" (*JohnD.Cook@JohnDCook*). The student constructs their knowledge and an educator should thus guide them with evidence-based practices in how to search for more knowledge. Uses of collaborative learning styles are encouraged. Thus, the educator is no longer using text recitation and lectures as modes of delivery but must provide an arena for engagement and discovery as well as being content expert and mentor. The job of the teacher is immensely harder than it was ten years ago. Designing relevant lessons that will inspire this generation of student is critical for attention to be on studies rather than on little screens. Unlike the common practice in Kenya and the United States, where most mathematics lessons consist of a review of the previous lesson, which can involve a warm-up problem, directed teaching on new material and then giving group work for students to try is simply not enough to spark enough attention of generation Y students (Owiti, 2012). Lessons must be with the times of the 21st century and must use technology and other means to motivate student learning. For example, applications involving financial mathematics should use Microsoft Excel where needed to give students a solid understanding of both the mathematics and the technology used in the field of finance. We should also encourage students to learn as much as they can on their own through self-discovery. Some American Universities are already adopting innovative practices through Mathematics Emporiums (Virginia Tech) and Mathematics MALLS (University of Central Florida). In conclusion, both Kenya and the United States, while being two totally different countries with different economic, social, financial, and demographic problems, are faced with the same crisis of the millennial student. Both countries must do something in line with their cultures to help this generation. Changes in curriculum and our ways of teaching need to be addressed to help our students be ready for life, all its challenges it brings, and helps them be the best they can be. Above all, effective study skills must be taught to the millennials.

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