Review Article

The Beauty of Mathematics:

Learning Mathematics by Questioning

Abstract

Mathematics problems may seem to have no real use in life, but this could be further from the truth. The use of mathematics is everywhere in our daily lives and, without discovering it, we apply mathematical ideas, as well as the expertise we learn from executing mathematical challenges each day. Woefully, mathematics feedback at national exterminations is deficient. A mean of between 23 to 29 percent for 5 in a row years between 2014 to 2018 is comprehensible that the training of students Today for Tomorrow's provocation with concept nurturing in the situation, problem solving by dependent adventures and grasping by applications is overlooked. Above this period of time the evaluation of the outcome has also shown a standard deviation almost equal to mean or even greater than the mean for instance 2016 for paper 2 (refer to Kenya National Examinations Counsel) a transparent symptom that there is a considerable disparity from the mean and a likelihood of a number of students scoring zeros or below 5 percent. This decimal performance in national examinations particulary in mathematics demonstrates that contextual curricula and manual that inspires numerous structures of learning like relating, transferring, applying, encountering and collaborating is not achieved. Consequently this article looks into different surroundings in which students learn and how they broaden their abilities to make relationship, enjoy uncovering, and application of the knowledge. These are crucial faculty they will require all round their daily lives and careers. A mastery in arithmetic skills is of little importance to an individual except if he or she can appeal that content. All arithmetic operation are explored in details for its usage in the real world challenges. Day to day challenges provoke ideas and provide supplementary setting for application.

Keywords: Under Performance; actual world challenges; Making link; Appreciating mathematics through utilization; idea nurturing ; Problem Solving.

1 INTRODUCTION

1.1 Why Mathematics?

All calculations used to build the Pyramids, suspended bridges, landing on the moon all are possible due to usage of mathematics. Mathematicians have been resolving humanitys biggest puzzle for many years by coupling the faculty of mathematics. With mathematics intolerable problems such as building the tallest tower, beautiful roads without forgetting beautiful pyramids is possible. Mathematics is a vital gear that assists in simplification of day to day challenges. Despite mathematics being all around us, it is also important for success in furthering different careers and life thereafter. Mathematics rules and laws are transparent throughout our life. The expertise obtained from mathematics training and learning can aid gearing problems in other areas of our life. Mathematics skills are very useful in daily activities and without a good understanding of these skills, one can encounter significant difficulties in their daily activities. Mathematics maybe tedious,complicated or even tiring, but the fact of the matter is that mathematics expertise makes life and to extend the world much interesting and fun living.

1.2 Why is Mathematics So Important?

Mathematics is a basic element of human understanding and judgement. It provides a constructive way of building mental order and motivates straight-thinking and mental thoroughness. Furthermore, mathematical command plays a pivotal role in comprehending the contents of other disciplines such as science and Engineering. Mathematics significance can be seen a number of areas such as, in Engineering, body scanners, software, coding, and much more. Literacy in mathematics such as basic computational skills, quantitative reasoning, spatial ability is an important trait to productive lives as profitable, concerned and reflective people.

Mathematics always come first and it is at the central of any flourishing career and fertile lives. Careers in Science, technology and engineering are so crucial and the future victory of any country can thrive with educators having a concrete mathematics basis. A firm mathematics education goes much beyond the present day gossip of upgraded competence on examination scores. Expertise in mathematics gives us the evaluative potential to learn and think objectively in any career field.

A well grounded basis in mathematics grows and sharpen the expertise of creating hypotheses, scheming experiments and checks, data analysis, patterns recognition, evidence verification and coming up with clear conclusions but still open to new set of knowledge. Mathematical competency will not only lead to prominent mathematicians, engineers and scientists, but also it will nurture

more people who can grasp and think creatively, regardless of the field they are in.

Mathematics assists in creative thinking and streets ahead reasoning potentials. The aspect of being critical about the the world and the surrounding is known as faultfinding thing. Deducing on the other hand is the aptitude to think coherently about a circumstance. Faultfinding and deducing competency are crucial since they assist clear up challenges and seek for remedies. Solving a linear motion problem can aid one in clearing up a problem in life, remember the expertise used in conceiving the challenge, recognizing the familiars and unfamiliars, and following guidelines to unravel the challenge can be a salient blueprint that is usable activities in real life.

In undertaking a mathematical challenge: data is fetched, simplified plan sought, relationship observed or systematically solved in a rational technique. A good mastery of mathematics and and being able meander through mathematical problem and arrive at sensible responses, can put together mind in real life challenges, that is, one can seek best reasoning, see the available options and relate to available data to draw a perfect conclusion.

Living in a mathematically-driven society and be devoid of mathematics skills is like a having a tour guide with language barrier. Appreciating mathematics can help you appreciate things round you and around the world since mathematics is everywhere and in everything we come across and do.

Lastly, the sweetness of mathematics is also found in its universal language. A mathematics equation does not need to be translated to another language to be comprehended. The universality of mathematics is one of the many things that makes it such a powerful tool and, indeed, essential life skill. Further, choosing mathematics as a degree path can lead to surprising, and fulfilling, career paths.

2 Is Mathematics anxiety the Cause of this Dismal Performance in Mathematics?

Mathematics anxiety may be a feeling of tension that interferes with mathematics learning and performance. Having mathematics anxiety do not necessarily indicate inability in mathematics; rather, one can not perform to maximum potential due to interfering symptoms of anxiety Nathan and Owade[17]. Majority of students feel helpless immediately they come across any Mathematical challenge. Score in mathematics is very less evident of mathematics dislike. Mathematics anxiety leads to less exposure to mathematics practice, leaving students more anxious and mathematically unprepared to realize learning goals.

Mathematics anxiety is gained not from personal experience but from the surroundings such parents, peers and even teachers. A surrounding with ma-

jority being mathematics avoiders can unintentionally or even knowingly convey the idea that mathematics is difficult and thereby provoking mathematics anxiety feelings. Mathematics anxiety is mostly conceived in schools from teachers and peers who are themselves suffering from the same mathematics anxiety.

Teaching exclusively from the textbook, relying on memorizing facts, and employing only drill and practice to reinforce the lesson create mathematics anxiety amongst students. Examinations stress and probability of public embarrassment as result of poor performance have lead to unproductive fears amongst learners. Teaching mathematics in a right or wrong approach has accelerated the this fear toward learning mathematics [17]. The expectation a fixed answer from the learners and some times this rigidity is so high that it blocks any alternative thought or approach. Indeed, mathematics anxiety is among the major causes of this decimal performance in mathematics(three other causes are discussed in section(3) of this article.

Motivating learners to empress mathematics by staying positive and enthusiastic should be the mandate of all mathematics educators. mathematics educators should motivate the alternative(wrong) answer, since they literally help learners brains expand. Mathematics core objective is to groom learners to confront daily challenges using skills from mathematics. Mathematics is a creative field as opposed to the labeled true or wrong subject. Approaching mathematics with open ended challenges not only motivates learners but also boost their critical thinking and reasoning skills.

Students are more motivated once they realize where all the concepts in mathematics are applied. Teaching of mathematics must be accompanied by everyday life experiences so as to unlease curiosity. learning mathematics by experimenting help to learners to master the mathematical concepts and making the learning of mathematics enjoyable. To learn mathematics in-depth, students should be engaged in exploring, conjecturing, thinking and experimenting. Studies have shown students learn best when they are active rather than passive learners.

To overcome mathematics nightmare, the signs of mathematics dislike should be known and addressed at an early stage. The signs such as panic, docile behaviour and insufficiency of confidence towards learning mathematics is sign of mathematics anxiety building up. Mathematics anxiety is not the cause of poor performance, but failure to address does. Learning mathematics by motivating students to question the whatever they are learning not only makes mathematics interesting but also enhances mastery of the content being taught. Working in group of peers can sometimes help mastery of mathematics concepts better than struggling alone. Peer group discussion is more useful especially to the learners who suffer from mathematics anxiety.

Parents taking part in educational processes of their children is quite relevant. Participation of parents can greatly change perception of mathematics

[18]. Parents have to monitor their childrens behaviour and identify any sign of mathematics anxiety earlier and countering it with positive reinforcement to help them overcome mathematics anxiety. Parents should always discuss the challenges their children face in learning mathematics and emphasize the significance of the subject in daily activities. Students should be reminded that learning mathematics skills is a process and and that everyone learns at a different pase. In addition, learners need to appreciate that mathematics is not a competition and statements around learners that may give them the impression that parents are comparing them to their own classmates or siblings should be avoided. A positive and supportive attitude towards students can result in overcoming mathematics anxiety from both parents and teachers.

3 How Can We Improve Mathematics Achievement?

The puzzle mathematics educators keep unraveling are, first how to develop the best way of thinking and the understanding in which application depends upon and secondly is finding out what mathematics educators are currently doing wrong. Seemingly their is consensus over three main causes of this dismal achievement. These include but not limited;

- Too many topics that are taught to a shallow degree.
- Most mathematics teachers have less mastery of mathematics as a subject.
- Mathematics is taught in a rigid, rule-based approach that blocks any other alternative views.

Mathematics lessons are characterized with neatly organized rows, facing the the board with the instructor as a sole source of information. Examples are demonstrated on the board thereafter students are required to follow the same procedures in doing class work as demonstrated by the instructor in silence. Students are required to work out most of the work individually, and when stuck, they are required to call upon the instructor for help, not the peer. This cycle is repeated over again across the course. This teaching approach ends up producing graduates who are robot like in that they can think on their own. In addition, there problem solving skills and reasoning are much much lower if at all they are there.

The interactive approach to learning mathematics which appears much more chaotic is more interesting and it provokes curiosity and leaves students motivated. Imagine students siting in groups within the classroom setting chewing over how to work out a particular challenge, or even standing at the

board arguing about the best way to proceed. The instructor responsibility is scaled down to monitoring and guiding for harmonization purpose. The instructor can occasionally call upon the entire group to order and sometime to explain their responses to the rest of the class, or to give a short, a summary about a particular concept in question.

Of course, teaching mathematics in an interactive approach requires teachers with more mathematical mastery than does the traditional approach (where a mathematics instructor with a weaker background can simply meanders through the textbook and achieve whatever the objectives disregarding the students' interest). It is also much more demanding to teach mathematics this way, which makes it a job that demands higher status of qualifications and perfect mastery of the subject[17]. With this approach of teaching mathematics beefed with well trained mathematics instructors makes mathematics more interesting and easy grasp mathematics concepts.

Poor mastery of basic arithmetic skills, could disadvantage students in their daily life and making it impossible for them appreciate the subject. Teaching methods used today (as stated above) emphasis on memorization of concepts disregarding alternative views. Mathematics should be taught from the point of analysis and understanding, with the primary focus placed on application. Of course test scores are essential but not sufficient. The objective of quality education is to develop the skills associated with learning and thinking, teaching approaches must be changed if this objective is to remain a priority. Innovative learning programs such as integrating available technology to stimulate students' creativity, imagination and confidence need to be implemented in teaching as well as learning of mathematics. Students need more hands-on and effortful learning in order to spark their curiosity and enjoyment of learning mathematics. Improving mathematics skills requires a flexible and interactive approach as opposed to commonly used rigid and rule-based method. This can be achieved in the following ways:

3.1 Learning to Apply Strategies.

Leaching mathematics in the absence of application is incomplete and can lead to students avoiding mathematics. If the connection between the mathematics content and the learners' experience is missing, mathematics can be extremely difficult. Dewey[1] and many others researchers over the past years have a firmed that learning is boosted when students are guided on how new knowledge applies to their daily lives. Apart from creating curiosity to learn new concepts[2], learning to apply also increases critical thinking [3], and thereafter enable students to recall the learnt content [4]. The entire constructivist view of learning is predicated on the concept guiding as learners discovers for themselves. That is, they use the information they have obtain to construct meaning in their lives, and use previously learned information and experiences

to build a framework for effectively incorporating new information. Adoption of instructional methods that help students answer their own questions, demonstrate importance of mathematics, stimulate intellectual effort, introduce stimulating ideas and inspire students to set challenging goals should be the goal of any mathematics instructor.

Active involvement of students in the learning process and to assist them to notice relevance and importance of the information involved should be the goal of all mathematics instructors. Teaching methods used are also strongly related to several other learning objectives pertaining primarily to developing solid foundational knowledge and skills, and an interest of the topic. It appears that learning relevant foundational information and skills and seeing how these are used in class is more critical to applying the learnt concept for improved thinking and decision making. Comprehending a concept does not by itself ensure the content can be applied in an appropriate manner and hence it is important to help students to learn by helping them to practice recalling and using the information and skills as often as possible.

Helping students to learn so that they can apply is closely related to [5] principle of using active learning in the classroom. Active involvement through applying new information is crucial to real-life problem solving, and connecting learning to something directly relevant to the student as a person is a basic concept in creating an active environment.

Teaching approaches that allow students to involve themselves in their own learning processes should be implemented. Students must be given chances to construct, question, transfer and apply their new knowledge. Students understanding improves when they actively construct meaning and try to make sense of the mathematics new skills. There are many ways to assist students to learn mathematical applications of new knowledge. This article will focus on four methods; Deeper learning process, Critical thinking skills, Problem-based learning approach, and Community service -learning.

3.1.1 Critical Thinking skills

. Testament of critical thinking in mathematics is to register relevant expertise and experiences to the answers of the issues or challenges encountered in daily life. Use of questions to prompt the application of existing or new knowledge is one strategy used to improve critical thinking in mathematics. Investigative questions motivate students to cogitate more remuneratively and to judge the evidence more coherently. phototype critical thinking and application thinking amongst students by putting across challenges that motivate students to gauge substitute and settle on most productive solutions [3]. The type of questions and how the questions are asked should intrinsically motivate students to think critically and provide clever feedback. Framing questions in such away it answers the Why and How motivates students think critical and provide

creative responses.

The technology changes rapidly and daily, therefore, mathematics facilitators must not really only on mathematics textbooks, or seeking simple correct answers to validate student learning rather they should incorporate an open ended approach to foster thinking outside the the normal mathematics class. The right or wrong approach of teaching mathematics only strengthens student trust that there is a correct solution and the work of a mathematics instructor is to find it and then proceed to a different new area. Instead, we need to ask questions and speculate beyond what is known to create new ideas and information. Probing questions will automatically ignite discussions, this will be a proof to students that their questions, critique and their alternative points of view are valued and they are relevant.

Providing opportunities for students to relate the mathematical skills to their life experiences and challenges and also and to evaluate and critique what is taught in class, than accepting it as truth will encourage creativity and to a higher extend critical thinking amongst the students. A critical thinker will argue both sides of problem, balance feedback and decide the best alternative based on proof. Students who have master the the skill of critical thing will always encourage their peers to engage in educated arguments in a reasoned approach and avoid emotions. Critical thinking strategies encourage students to use new mathematical skills and apply it to knowledge acquired previously.

3.1.2 Transfer learning practices.

Competencies skills are required by the modern young people in order to be effective workers and citizens in information society. Development of better understanding of interplay competency in cognitive domain supports deeper understanding. Pellegrino and Hilton[19] defines deeper learning as the process by which students are able of taking what was learned in one situation and applying it to new situation. This approach encourages students in developing the knowledge, skills, altitudes and characteristics that will lead them to become personally successful, economically productive and actively engaged citizen.

Relating recently learned mathematics skills to new situations is an intricate and critical cognitive goal. Transfer learning is the cognitive process of involving last training and knowledge to learning or problem solving in a different or new situation [6]. This is an fundamental skills we must teach our learners. Cognitive transfers can be illustrated using three sets of views: near(er) transfer is what is required for activities that are routine and consistent or far(ther) transfer which is learning used in a real life situations that are different from from the learning contexts [7]; high-road or low-road; and forward or backward[8]. An example of near transfer is a student who learns how to solve a quadratic equation and applies that same knowledge to solve

equation of a circle. An example far(ther) transfer is where a student applies knowledge of percentages to determine the discount on sales.

Mindful transfer(High road transfer) and reflex transfer(Low road transfer) refers to the cognitive energy required to make the connection. A reflex transfer(Low road transfer) occurs when previous learning automatically, often unconsciously transfers to another situation(for example being able solving all simultaneous equations after knowing how to solve one). The key to a reflective(low road transfer) is practicing a skill often and in a variety of situations until your performance become automatic. Mindful transfer(High road transfer) involves conscious application of abstract knowledge to a new situation(for example learning mathematics prepares students to study physics).

Forward-reaching is a situation where one learns something and abstracts it in preparation for application elsewhere and backward-reaching transfer is where one finds oneself in a problem situation,abstracts key characterizes from the situation and reaches backward into one's experience for matches. Both forward and backward transfers are concerned with the timing of the application. When teaching for transfer, it is important to ground the concept you are teaching in some applied context. Introduce your topic, briefly discuss, and then ask students to generate examples of the concept. As you do this, notice the type of transfers they are using. Challenge them to apply the concept to their personal and professional lives as well as to other contexts. As you teach concepts for application, you will also want to remember that teaching for depth of meaning and understanding increases a students ability to transfer information. Students will need time to construct meaning and consider the implications of the new knowledge. They will also need assistance to first see how information can be transferred to a variety of settings. By encouraging students to make a variety of transfers, you will be increasing the likelihood of deeper learning.

3.1.3 Problem-Based Learning.

Too much of traditional teaching involves giving students isolated bits of information to be memorized and then demanding that it be retrieved for examinations. Problem-based learning is an alternative approach whereby students are given a real-world scenario that is often structured to be complex and ill-defined. Students are required to use specific course material and concepts to solve the problem at hand, thereby setting up a situation in which students are directly applying course material to a real-world problem. Working in groups, students strive to solve the problems while the instructor serves as a facilitator and guide. Instructors who use problem-based learning report that this approach helps students to develop critical thinking sills, improves retention of material, demonstrates the values of working with others, and provides a framework for solving problems that persists after the course has ended [9].

This approach also facilitates transfer of learning as described above.

3.1.4 Service-Learning.

Service-learning is a pedagogy that integrates community service with academic study, reflection and analysis to enrich the learning experience, teach civic responsibility and strengthen communities. The theory of service-learning begins with the assumption that experience is the foundation for learning; and various forms of service activities are employed as the experiential basis for learning[15]. It gives students opportunities to directly apply course material to meet a community need, and is based heavily on the suggestions for good instruction and learning by Dewey[1], Piaget, and Kolb[14]. It reflects the belief that education must be linked to social responsibility and that learning must be meaningful and active [14],[16]. Service-learning has many of the same benefits of an apprenticeship, with students learning directly applicable skills from course content, and the community receiving assistance at very little cost. With respect to academic development in the area of the course content, reflection on the project is vital to learning. Evidence of student learning and future civic engagement by those participating in well-organized service-learning activities is overwhelming [11].

4 Contextual Learning Strategies

Contextual Learning Strategies is a proven way to improve learning for students with multiple intelligences and different learning styles. Putting contextual learning together with cooperative learning can greatly facilitate students' efforts in linking new concepts to existing knowledge and to the world away from classroom.

4.0.5 Diversity in Learning Style

A number of teachers apparently understand how to instruct and teach concepts so that all learners can clutch them through example, illustration, and hands-on application. These kind of teachers seem to acknowledge that human capacity for learning is much wider than traditional measurements of intelligence(verbal and and analytical) would specify.

In reference to [13], learners have as many as seven forms of intelligence: linguistic, logical/mathematical, musical, spacial, kinesthetic, interpersonal, and interpersonal. Gardner [13] further observed that every learner has some measure of each of the seven intelligences, and that specific strengths and combinations of intelligences vary for each learner. This theory of multiple intelligences by Gardner [13] specifies a need to address diverse learning styles in classroom. His views is reinforced by learning theorist David Kolb[14].

According to Kolb [14] learners tend perceive information either abstractly (by conceptualizing and thinking) or concretely (by experiencing and feeling) then they process that information either actively (by experimenting and doing) or reflectively (by observing and watching).

Kolb's approach, like Gardner's plainly demonstrates that majority of learners do not fit neatly into one category or the other. Majority of students can learn by and benefit from all four experiences and all contributes to the process effective of effective learning. Nevertheless, most students will show the preference for one or two particular kinds of learning, and this preference will indicate the individual's primary learning style. Furthermore, Kolb's analysis points to only a small percentage of students have a strong ability to learn by perceiving abstractly and processing reflectively -precisely the learning style rewarded in the traditionally used lecture method of teaching. Nevertheless, majority of learners tend to perceive and process information concretely and actively. This is an indication that most learners are extroverted learners, that is, they learn best through interpersonal communication, group learning, sharing, mutual support, team processes, and positive reinforcement.

4.0.6 Making Connections

Amidst of individual differences in learning styles and intelligences, nearly if not all learning requires strives for connectedness. Broken or isolated bits of information normally are not processed and retained by the mind for usefulness unless connections are made and points of reference or relationships are established between what is known and the unknown. In most cases students are expected to make all these connections on their own. Furthermore, few teachers are now discovering that most students' interest and and achievements in mathematics improves dramatically when when they are directly assisted in making connections. Teachers now than ever must facilitate their students' efforts in connecting new information, or knowledge, to experiences they have had or other knowledge they have already grasped or mastered. Students' involvement in their schoolwork increases greatly when they are learning the concepts and how those concepts can be used outside the classroom, more so in in the work place. Furthermore, students learn much more efficiently when they are allowed to work cooperatively with other students in groups or teams and to learn from one another. Cooperative learning greatly facilitates making connections. A curriculum using contextual learning strategies and demonstrating the connections and usefulness of the curriculum should require the average student to develop a stronger academic foundation, higher caliber of work skill, and a better understanding of how academic concepts relate to his or her environment outside the classroom and to the workplace. This is the higher level of learning that is not usually taught the above average, much less to the average student who need it the most.

4.0.7 Contextual Learning

The premise of contextual leaning theory is that learning occurs only when students process new information or knowledge in such a way it makes sense to them in their frame of reference-their own inner world of memory, experience and response. This approach to learning and teaching assumes the mind naturally seeks meaning in the context; that is, in the learner's own environment. In a contextual learning environment, students discover meaningful connections between abstract ideas and practical applications in the context of the real world. The students internalize concepts through the process of discovering, reinforcing, and interrelating the ideas and applications. Using formulae for instance, introduce the concept of volume of a sphere by describing spheres as a familiar objects, footballs, basketballs, globes, ball bearing and balloons. Then the formulae is stated in highlighted area within the text. The formula is immediately tied to the real application with an example of a technician who must calculate the number of cubic metre of helium required to inflate a weather balloon. The students apply the concept in a hands-on activity in which they measure the diameters and volume of sphere and compare their measurement to calculations using the formula. The students further reinforce the concept by applying the formula in assessment, discussion, and practice problem and then interrelate the formula with other formulas for volume and area.

This example demonstrate that contextual curricula and instruction encourage many forms of learning.

1. Relating: Learning in the context of life experiences

2. Transferring:Leaning in the context of existing knowledge using and building upon what a student already knows

3. Applying: Learning in the the context of how the knowledge or information can be used

4. Experiencing: Learning in the context of exploration, discovery, and invention.

5. Cooperating: Learning in the context of sharing, responding, and communicating with others.

Exercising the difference contexts in which students learn will broaden their abilities to make connections, enjoy discovery, and use knowledge. These are abilities they will need throughout their lives and careers.

5 Assessment Issues

In order to apply course material, it is important that students have a strong foundation of basic information. As an instructor or a teacher, you should first assess for critical aspects of foundational knowledge in the course. This can be done through examinations, written or oral quizzes, and class discussions. The important issue here is that students have appropriate and accurate material as the basis for reasoned applications to new problems. It is relevant that students master the importance of application in the course being taught. Make the students to appreciate that they will be expected to apply course material to real world problems and that they will be tested on their ability to solve problems in the course being taught.

Students should realize that there are critical steps to logical problem solving and application of course material. Let students know that responses will not be given full credit just because they have opinions and attempted to answer. To assess the extent to which students have learned to apply course material to improve thinking, problem solving, and decision making, ask students periodically to express their perception of the value of applying course material to new problems. Students who are in class with the expectation that there is one correct answer and simply desire for you as the instructor to give them the answer will be frustrated by a course in which they are asked to do extra work, such as applying information to seemingly extraneous situations. It is important for the instructor/teacher to be aware of such students and this possible resistance. As an instructor do not be discouraged if at first, students object to your evaluation as this process takes some time for learners to master.

In reference to transfer, start with applications that are very close to the learned material (what is known to students) and then increase the distance from the learned material to that which they are applying their new knowledge(the unknown applications). This shift from near to far transfer will assist the students in understanding not only how to apply the current information, but the process of learning to apply information in an increasingly wide range of situations. For instance, students in a calculus mathematics course may first be asked to differentiate a particular function. Later, they may be asked asked come up with a general formulae for differentiating different functions.

Problem-based learning focuses on applying learning. Having students solve problems (alone or as a group) either in class or through at-home assignments, better prepares them for not only their final examinations but also for their future endeavours. For critical thinking assessment, the teacher should be certain to ask questions at a higher cognitive level analysis, synthesis, and evaluation [12]. These questions are good for testing students on both forward and backward transfer.

There are also a number of classroom assessment techniques that can be

used to document the extent to which students are learning to apply course material [19]. As an example, Application Cards may be used whereby students write down one unique real-world application of the material covered. This is a quick and easy method to determine whether the student understands the material and how it can be applied. This technique may be broadened to include aspects of problem solving and critical thinking.

6 Conclusion

Mathematics is the forbearer of the very tag- "difficult". In fact, mathematics has become acceptable for certain students to perform poorly in this subject. if examined carefully, one cannot deny that it is a very negative trend that should be discouraged. Why should any student be poor in any subject? Especially when the subject deals with logic and reasoning! Students fail to grasp mathematics concepts due to a number of reasons which includes but not limited to poor altitude, wrong approach to teaching(method of teaching), lack of connectivity between students and subject, self doubt, low IQ, attention span, failure to understand signs and symbols, teacher student ratio, many mathematics teachers are not well versed in the subject and poor or inaccessible textbooks.

7 Recommendation

Giving learners opportunities to construct, question, transfer, critique and apply their new learning is a sure way of overcoming this poor performance and negative altitude towards mathematics. Secondly, as recommended by Nathan et.al[17], the qualification and training process of mathematics teachers is paramount in overcoming this problem and for that, higher qualification levels for mathematics tutors make it easier for them relate a particular learnt skill to its relevant area of application from an early stage.

Effective instruction approach may salvage most learners from this negative altitude, poor performance and disconnect between students and learning materials. Any effective approach should be student centered, teaching for understanding, assessment for learning, rigor and relevance and teaching for learner differences.

If the goal in a course is to teach students to apply course material for improved thinking, problem solving, and decision making, it is imperative to give the students multiple opportunities to practice that behavior. Additionally, if these forms of thinking and problem solving are important aspects of the course, they should be demanded of the students as part of the course. Students quickly determine that issues of importance to the instructors are

related to the grading process, and that attention to these issues is important for better learning and better grades.

References

[1] Dewey, J. (1913). Interest and effort in education. Boston: Riverside Press.

[2] Svinicki, M. D. (2004). Learning and motivation in the postsecondary classroom. Bolton, MA: Anker Publishing Company, Inc.

[3] Paul, R., and Elder, L. (2001). Critical thinking: Tools for taking charge of your learning and your life. New Jersey: Prentice-Hall.

[4] Craik, F. I. M., and Lockhart, R. S. (1972). Levels of processing: A framework for memory research. Journal of Verbal Learning and Verbal Behavior, 11, 671-684.

[5] Chickering, A. W., and Gamson, Z. F. (1991). Applying the seven principles for good practice in undergraduate education. New Directions for Teaching and Learning 47. San Francisco: Jossey-Bass.

[6] Gentile, J. M. (2000). Then and now: A brief view of Hope College today. In M.P. Doyle (Eds.) Academic Excellence. Chapter 6. Tuscon, AZ: Research Corporation.

[7] Shunk, D. H. (2000). Learning theories: An educational perspective (3rd ed). Upper Saddle River, NJ: Prentice-Hall.

[8] Salomon, G., and Perkins, D. (1989). Rocky roads to transfer: Rethinking mechanisms of a neglected phenomenon. Educational Psychologist, 24(2), 113-142.

[9] Major, C(2002). Problem based learning in general education at Stamford University: A case study of changing facality culture through targeted improvement efforts. The Journal of General Education 5(14), 235-256.

[10] 12)Angelo, T.A and Cross, K.P. (1993). Classroom assessment techniques: A handbook for collage teachers. San Franscisco: Jossey Bass.

[11] Eyler, J., and Giles, D. E. Jr. (1999). Wheres the learning in service-learning San Francisco: Jossey-Bass.

[12] Huitt, W. (2004). Bloom et al.s taxonomy of the cognitive domain. Educational Psychology Interactive. Valdosta, GA: Valdosta State University. Retrieved September 20,2006, from http://chiron.valdosta.edu/whuitt/col/cogsys/bloom.html

[13] Gardner, Howard. Frames of mind: The Theory of Multiple Intelligences. Basic Book, 1983.

[14] Kolb, David. Experiential learning. Prentice-Hall, 1984.

[15] Morton, K. and Troppe, M. (1996). From the margin of the mainstream: Campus compacts project on integrating service with academic study, in Troppe, M. (Ed.) Two Cases of Institutionalizing Service-Learning, 3-16. Providence: Campus Compact.

[16] Zentner, S. (2011). Lernendurch Engagement: Service-learning in German schools. A promising way to get youth involved in active learning and in civic engagement. Weinheim: Freudenberg Foundation.

[17] nathan,o.m., and Jackob, K.O.(2020). Mathematical modeling and analysis of mthematics anxiety behaviour on mathematics perforfornce in Kenya. Journal of advances in mathematics and computer science, 35(4), 46-62. https://doi.org/10.9734/jamcs/2020/v35i430269

[18] Doris K. Yee and Jacquelynne S. Eccles (1988). Parent Perceptions and Attributes for Children's Mathematics Achievements. deepblue.lib.umich.edu. University of Michigan.

[19] Pellegrino, J.W. and Hilton, M.L.(2012). Education for life and Work: Developing Transferable Knowledge and Skills in the 21st Century. The national Academies press.