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Chapter

Teaching and Learning Mathematics for Understanding, Enjoyment and Everyday Life Experiences

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Abstract

This chapter expresses the views of a teacher-researcher who advocates and argues for the use of humor in the classroom setting, especially in the mathematics classroom. While existing research based literature has shown the use of humor to be promising and encouraging effecting teaching and learning tool, very little instructional humor or classroom humor–an appropriate type of humor often related to the content materials being discussed–has been used in the classroom setting–especially in the mathematics classrooms. The chapter explores, surveys and highlights ways in which the existing-related literature about the effective and appropriate use of humor in the classroom setting can be implemented in practice, especially in the teaching and learning of mathematics, in this challenging era of the increasingly rapid technological advancements referred to as 21th century technological revolution or the re-engineering of industrial education 5.0 relative to STEM subjects study areas. The use of humor as teaching and learning tool in the classroom setting has been shown to have so many associated benefits ranging from but not limited to a conducive-relaxed learning environment, enhanced students' learning experience, motivating and inspiring the students to learn more and even the improvement of student-teacher classroom rapport, just to mention a few. Hence, the literature recommends that classroom teachers should make more use of humor as an effective teaching and learning tool, especially the contextualized-appropriate humor types that are related to the content materials being discussed.

Keywords: Classroom humor, mathematical humor, interest in mathematics, teaching and learning

1. Introduction and background

With the increasingly rapid technological advancements such as the birth of the industrial technology based education 5.0, sometimes popularly described as the looming 5G or 6G and its successive next generation technologies or the 21th century technological revolution, there are suggestions, demands and even requirements that the traditional-classroom education needs to be re-engineered, that is, the traditional roles of classroom teachers should as well be re-examined and change along the way to adjust accordingly. Therefore, the birth of continuously

re-engineering education leaves not only unanswered questions to be asked, but also a lot of acceptable old answers or assumptions to be questioned and re-examined such as whether or not classroom teachers, researchers as well as other practitioners should embrace the re-engineering of education, or whether teachers' primary-traditional roles would survive such an emerging-continuous revolution. Certainly and indeed, the current wave of technological trends and changes that are accompanied by huge explosion of knowledge through the popular World Wide Web, brought about by the 21th century technological revolution (which demands the re-engineering of education), through Internet based independent learning aids or tools such as YouTube channels, TED Talks and Google searches, one wonders whether the basic traditional-primary role of teachers long held perceptions as being the only knowledge sources, knowledge containers and even walking libraries (e.g., being regarded as the only single source of knowledge–the unnecessary burden of having to carry heavy load of knowledge in the head, a skill now made obsolete by the era of Internet and Google) would survive at all, if not already phased out and perhaps made obsolete in the face of increasingly competent high quality YouTube-based lectures as well as attractive, interesting and inspiring TED Talks, popular Internet sites and even TV based talk shows.

Surely, in the era of the 21th century technological advances in the forms of continuously improving World Wide Web, Internet connection or Google search engine, one does not need to be a knowledge container or walking library with a head fully loaded with facts, unnecessary details and teachers' lectures, since such facts and details can be Google searched in blink of an eye in nanoseconds and openly accessed with just a click of mouse away.

Nowadays, traditional classroom teachers no longer have the monopoly and sole privileges of being the only walking libraries in the face of Google or the only single sources of knowledge as used to be, given various Internet based independent learning facilities freely available in the World Wide Web along with the competing as well as competent high quality 21th century technologically revolutionized independent learning aids or tools openly and freely accessible such as Khan Academy, MIT's open course ware, to mention a few. With the inevitable knowledge rapid expanding, approaching but diverging toward infinity through YouTube lectures, the primary-traditional role of classroom teachers have to transform along the way to new advisory, supervisory and managerial roles [1] such as knowledge managers, classroom moderators and even knowledge consultants.

In fact, and addition to transforming, adjusting and adapting to the continuous emerging demands and requirements of 21th century technological advancements, classroom teachers and practitioners are already embracing and utilizing interdisciplinary collegial cooperation and collaboration with each other [2], while at the time encouraging individual creative-innovative explorations in their own unique ways, which they deem to be suitable for the teachers' various individual styles of teaching and learning in different classroom settings.

Therefore, not everything or all is lost for classroom practitioners as the consequence of the 21th century technology advancements as classroom teachers as well as researchers are now exploring in the form of action research new ways of teaching and learning, such as the classroom teachers' creative-innovative teaching techniques and strategies that emphasize, for example, understanding, enjoyment and connection to everyday real world life experiences. Exploring new ways of teaching and learning [3–5] is essential if the classroom teachers are to survive the 21th century technological revolutionary changes, combined along with the open attitude of welcoming and embracing such emerging technological trends instead of resisting them. Indeed, teachers cannot only survive but can even thrive and flourish in the face of the fierce competitions with those machine based-driven

technological advancements, by not only welcoming or embracing the technological advancements, but also by being versatile, transformative, cooperative, innovative and relying more on alternative-innovative effective teaching technique and strategies, areas where machines are not known to do well on their own. Teachers can stay relevant and can continue to do so effective by recognizing, appealing and utilizing traits that are uniquely humane (e.g., utilizing human emotions such as the tendency to enjoy having fun, humor use, playing music and even singing songs in the classroom), techniques and strategies that make human beings different from those powerful–seemingly unlimited and apparently endless-high energy robotic machines based tools such as Google, YouTube or Facebook.

Human beings may not have unlimited, automatic and endless-high energy as robots do, but they do have an equivalent powerful-seamless energy source called emotions, which allow humans to acquire feelings, purposes, goals and meanings (not to mention that human beings are naturally endowed with moral ethics which they use to make big decisions, judgments, plans and preparations; and even the fact that humans are the original inventors of those impressive self-regulated automatic machines). Emotions provide humans with a powerful-significant source of emotional energy which humans can apply and utilize effectively by exploring the associated and often ignored affective learning domains of a subject matter such as enjoyment of mathematics, rather than the usual one-dimensional focus on the pursuit of only the cognitive domains of the subject such as competition based performance, computation or rote memorization, things which are better performed by machines such as high speed calculators or computers. Affective learning domains of the subject such as the enjoyment, gratification and satisfaction with mathematics concepts allow learners to acquire high order thinking skills such as understanding or comprehension, analysis, synthesis, critical thinking, logic and reasoning. Therefore, cognitive domains are not the only path to such important high order thinking skills, and if anything at all, a well-balanced combination of the applications of both the cognitive and affective domains of the subject matter is best suited for achieving the desired goal of overall learning outcomes.

One of the teachers' creative-innovative teaching techniques and strategies, which are uniquely human traits rather than the machine based, is a technique such as the deployment of an instructional humor (classroom humor), the use of contextualized-appropriate types of humor in the classroom setting [6]. To enhance students' interest in the subject matter, teachers can deploy, infuse and lace appropriate humor in into their lesson plans. Typical example of human traits based classroom strategies or technique is a humor-laced instruction delivered in the form of a lesson plan in a mathematic classroom. Mathematics classrooms are often regarded as stressful learning environments by many learners, and humor use as teaching and learning tool has a potential to make such dreadful environments conducive for learning [7].

2. The call and need for the use of humor in the mathematics classroom

It is generally accepted that mathematics is a difficult subject to teach and learn effectively, and therefore anything that claims to facilitate the learning of mathematics or learning in general is worth a look [8–10]. Hence, the 'teaching of mathematics with humour' as a proposed pedagogical toolkit, referred to as humor-supported instructional approach (H-SIA) as compared to its regular counterpart known as regular instructional approach (RIA), is an attempt to make mathematics an everyday real-world-life experience and its probable impact on students' learning experience. The idea of teaching mathematics with humor is an attempt

to make mathematics part of everyday life experiences, something that has not been seriously considered in mathematics classrooms. Teaching with humor, as a proposed pedagogical toolkit, is an intervention (teaching experiment) through an action research [11], which originated from a classroom teacher's desire to minimize students' boredom in mathematics by finding ways of triggering or capturing the opposite of boredom known as interest—the whole idea is to generate and maintain interest in mathematics through humor as a teaching tool for that purpose–turning the learning of mathematics into an enjoyment experience [12]. This intervention tries to address students' widely perceived lack of interest in mathematics classes in general [13, 14] and in South Sudanese mathematics classroom in particular. The usual main purpose of the intervention is for classroom teachers to investigate and explore for the purpose of improving their own practices in the classroom [11, 15]. In action research, for example, classroom teachers or practitioners in general deal with classroom issues they are concerned with such as, in this case, lack of student's interest in learning mathematics as a subject. Besides diminishing student's interest in the learning of mathematics, boredom in the classroom or subject matter, if left unaddressed, could lead to more serious classroom related negative emotional issues or negative feelings such as anger, frustration, anxiety, hopelessness, shame, guilt and even unnecessary outrageous violence in the classroom [16].

Meanwhile the opposite of boredom such as interest in a subject matter always leads to positively welcome and desirable classroom positive emotional states, variables, or experiences such as enjoyment, excitement, engagement, inspiration, motivation and satisfaction with the subject matter [16]. Being generally viewed as a difficult subject to teach and learn, mathematics often makes students report and even complain that they frequently get bored in class as they are bombarded daily with too many dry, dismal and boring lectures–making students ending up viewing many of their classes as triple-threat, which to students means not only difficult, stressful and intimidating but also boring and frustrating to learn [16–18]. The triple-threat or the so called dreaded courses are the ones that students sometimes avoid due to lack of self-confidence, perceived difficulty of the material or perceived negative experience in a content area in courses such as mathematics [17, 19]. Overcoming these kinds of students' negative perceptions and lack of interest in mathematics remains a big challenge in teaching, especially if teachers want to motivate and inspire students to learn further in the dreaded courses such as mathematics.

And this is exactly where the teaching of mathematics with humor comes in as a proposed teaching method, technique or strategy for attracting students' interest in mathematics. The proposed approach, the method of humor–supported instructional approach (H-SIA), as a technique for overcoming students' negative perceptions and lack of interest, can be seen as an appetizer, if not a pain reliever, which means making mathematics enjoyable and satisfying, by making learning sound fun, amusing, engaging, thrilling, exciting, inspiring, motivating and satisfactory to learn as mathematics is generally considered one of the most difficult subjects to learn by students. While the intention of this newly proposed H-SIA method of instruction is to capture interest, it also tries to relax the learning environment as a necessary preparation so that the classroom becomes encouraging and conducive for the learning of mathematics.

If the learning of mathematics is a formidable task by itself, then it can be claimed and argued that it is even a more difficult subject to teach effectively, appropriately and more often than not, many teachers end up (not surprisingly) focusing and relying heavily only on what to teach rather than exploring how to teach effectively as well as appropriately [17, 20]. Teaching effectively and appropriately implies that teachers of mathematics need to "learn not only

the mathematics they teach but also interesting methods of delivery and useful applications of mathematical concepts" ([21], p. 8). The so called what to teach and how to teach factors are respectively what are referred to as the technical competency in the subject matter as well as the necessary continuous professional development for mathematics teachers. It is the how to teach factor rather than what to teach that can lead to approaches which may either reduce the perceived triple-threat-ness of the subject matter or at least alleviate students' anxiety, fear and frustration [22, 23], and thereby encouraging them to further pursue the subject matter.

Interesting methods of delivery include introducing humor into the classroom setting, especially humor related to the content materials, as the use of humor in teaching benefits students by reducing anxiety or anticipated fear of the subject and therefore facilitating learning [21, 23]. This can be done through the use of "mathematical cartoons, jokes, puns, riddles, stories, and even certain spontaneous behavior that contain unexpected or out of context elements" ([21], p. 9). This is because elements of interesting methods of delivery such as humorous examples are known to promote and enhance comprehension (understanding), information recall or long-term retention [21]; and therefore such elements or methods of delivery may be helpful to students in the learning of mathematics. When used properly, humor can be helpful in creating group identity and to regulate negative emotions such as anxiety, frustration, uncertainty, boredom and classroom disappointment [24].

The incorporation of how into what to teach, the technical competency aspect versus the professional growth in a subject matter [20], however, only further complicates the teaching of mathematics—making it a difficult subject to teach and thereby making the learning of mathematics not only a teaching problem but also a continuous-researchable problem as well. Therefore, if the learning of mathematics is a problem on its own, then teaching mathematics effectively is another issue altogether whereas searching for more alternative solutions—techniques and strategies—only compounds and complicates the tasks at hand. Hence, there may be no single word, description or clear cut neat distinction between these classroom's related problems in the teaching of mathematics, as they may after all be better addressed simultaneously and not in isolation.

The difficulties involved in effectively teaching mathematics to the students in the classroom can be compared to the difficulties in teaching a child or a baby to walk. When learning to walk for the first time, a child may not be interested in the act of walking in itself, but may be interested in a toy placed at a distance or ahead of him/her by a guardian. As the child reaches for a toy, the child unknowingly ends up learning the task of walking: Here the child may not be interested in walking neither is the parent interested in the toy per se, but the learning still takes place in that way. Similarly, a student may not be interested in mathematics at first glance, focusing instead on the related mathematical humor, which would play the role of a toy and the learning may take place in this fashion, similar to a child learning to walk. This analogy of viewing mathematical humor as a toy for attracting student's interest in mathematics is in line with literature recommendation that teachers should always have courage to teach creatively, effectively, imaginatively as well as appropriately as Dieter [17] observes:

> *Dullness in the classroom can kill student intellectual interest in any subject and destroy all student desire to pursue additional study in the subject matter area. Teaching effectively requires imagination and creativity to turn students on by turning off negative perceptions. Using humor can be a successful teaching tool for that purpose. ([17], p. 20).*

Teaching creatively, effectively, imaginatively and appropriately, the how to teach factor that facilitates the learning of what to teach, means teaching that raises student's interest in the learning process and this is critical in the subject area such as mathematics that many students experience as difficult and even terrifying. Therefore, this piece of writing advocates for the use of humor in the classroom to facilitate students' learning of mathematics, with a focus on mathematical–couched humor—humor related to mathematics content area in order to help students develop interest in mathematics in the war affected re-settled communities or areas such as in South Sudan. The aim of using humor as a tool for teaching and learning or as an instructional approach is to liven or fire-up students' learning experience, inspire or motivate them to develop liking–interest for the subject matter and perhaps increase, along the way, their achievement or attainment in mathematics [8, 25, 26].

This new orientation in teaching, referred to as the humor–supported instructional approach (H-SIA) as compared to the popular-regular instructional approach (RIA), could even be seen as essential with students such as those living and residing in displaced and resettled communities in South Sudan. These students have experienced severely disrupted socio-cultural-economic lives [27], and are therefore consumed more by their day-to-day survival concerns than learning of mathematics in the classroom setting.

If a teacher is unable to grab students' immediate attention or attract their interest, it can be difficult, if not impossible to teach in a classroom—let alone making students understand a subject such as mathematics. This is because students' interest, "attention as well as participation" precedes learning or understanding ([28], p. 137). However, it is still the teacher's responsibility to make students pay attention and get them interested so that learning proceeds in an organized and meaningful way. Perhaps the old saying expresses it better as "one can lead a horse to a water source, but one cannot force it to drink." As the use of force is inappropriate in almost any interesting, effective and appropriate learning environment, teachers with interesting teaching styles find other strategies to employ and this is where mathematical humor in a mathematics classroom may come in handy as a teaching and learning tool. Sometimes creative teachers just rely on their artistic and creative skills in order to win student's interest in the learning process: A science teacher dressing and acting like a mad scientist—in order to attract students' interest and curiosity in the learning process—is an example of classroom artistic activity which is similar to the use of mathematical humor in a mathematics classroom.

3. Myths against the use of humor in the classroom setting

There are some voices and even stiff opposition to the use of humor in the classroom as a teaching and learning tool, most of which come from teaching and research communities themselves, and not necessarily from the well-known classroom critics where such criticism is often expected such as parents, policy makers (politicians), teaching supervisors or school administrators. These voices, however, are based professional myths or conspiracies against the use of humor as a teaching and learning tool in the classroom and are reported as follows: (1) humor is nothing more than the telling of jokes–is only a comedy and nothing serious, (2) teachers should not try to use humor because they do not have anything humorous to present as they lack training on the use of humor, and (3) humor is just a waste of precious classroom time and is also demeaning to teaching as a profession ([17], p. 20). However, according to research and some experienced humor practitioners in the classroom [17, 29, 30], these allegations are just what they really are, just myths or

allegations. These allegations are just lame duck excuses for those teaching professionals who are often reluctant and even afraid to pursue excellence–exploration in the area of how to teach creatively, effectively and appropriately. The alleged conspirators responsible for generating such myths are the ones who prefer to focus only on what to teach while ignoring the other part of how to teach and teach effectively, all of which is due to fear of taking risks in the classroom. Teachers who only focus on what to teach while ignoring the how to teach factor risk increasingly becoming perceived as the so called content persons instead of being viewed positively as overall well rounded professionals. A content person, sometimes called a restricted or limited professional [31], is a common derogatory term in education literature used to describe teachers who ignore or fear the other aspect of teaching, the how to teach factor–the other effective teacher's pedagogical toolkit.

According to Davies and et al. (2005), there are three types of teachers practicing in the classroom, namely the unprofessional, limited/restricted professional and extended professional. The extended professional is a fully developed classroom teacher who regularly attends and participates in professional workshops, seminars or academic conferences. The unprofessional type is characterized by chronic absence from the work place, showing up to the class with unprepared or unrevised lessons, isolated from colleagues, hostile to students and reliance on the heavy use of corporal punishment as a teaching tool or strategy, e.g., they teach through fear and intimidation as a pedagogical strategy. The second type of teachers, described as the restricted/limited professionals, is concerned mostly with the mastery of the content materials and skills, usually in the form of drills or repeated recitations and rote memorization. These teachers are either self-centered, concerned only with basic competence and tend to blame students for the failure to learn the materials. They have little or no continuous professional development and are more often than not unimaginative. Hence, they are rigid as they rely on daily classroom routines as a teaching strategy. In contrast, the third type of teachers, known as extended professionals, is the one who go beyond the technical competency. They master not only what to teach but also how to teach effectively. They take active responsibilities not only for themselves but also their students. In short, these teachers are student-centered, adaptive and reflective, are highly flexible and independent minded as well as creative thinkers [31]: These are the ones who would be expected go the extra mile in terms of exploration of humor as a possible pedagogical teaching tool.

Even if teachers are unable or afraid to tell jokes, they can still be good at telling funny-humorous stories in their own unique ways as stressed and argued by Maguire [30] that "no one ever had difficulty producing a story, and no two stories have ever been quite the same" (p. 110). Therefore teachers have the freedom to choose, relive and tell stories as they see fit into their teaching and learning contexts in the classroom settings.

Maguire [30] stresses that a story is a valuable uniting-social factor, and according to Kane [28], Catherine Bateson, a long-time advocate of authentic curriculum in education, a curriculum connected to everyday life experiences, could not agree more although Bateson puts it differently by arguing as follows:

> *In a world that emphasizes the one-dimension, autonomous individual, stories tie complex, deeply feeling protagonists to particular social traditions, loyalties and histories. In a world that myopically promotes the development of rational and decision making skills, stories expand the imagination, enlarging visions of what life may be. ([28], p. 87).*

Perhaps the most misplaced myth, that is probably placed way out of context, is that humor is demeaning to the teaching as a profession, especially when it comes to

the use of self-disparaging or self-depreciating humor–humor directed toward the teacher or teaching profession–in the classroom [17, 18, 32, 33]. Some, if not most teachers, see the use of humor in the classroom as demeaning simply because they are afraid it may undermine their own authority as well as credibility in the classroom. Chesser [34], along with Hellman [35], however, point out that most or all teachers on this matter should be aware of the fact that they themselves are already walking and laughing stoke in the eyes of their students. Therefore, the earlier the teachers start making fun of themselves in front of the students in the classroom, the better for teachers, according to Chesser [34] who practices and recommends about at least "50 different ways to bring laughter into any classroom's lesson" Chesser [34].

Instead of being fearful to the use of self-disparaging or self-deprecating humor, Chesser [34] insists that teachers should be able to embrace the idea of humor use by just being themselves, enjoying the moment without worrying too much about any associated minor negative consequences when practicing humor as a teaching tool. That also means there has to be willingness to be honest, weird, gross and even messy. The following is a long winded explanation of what Chesser [34] means by the above statement of 'being your-self' when practicing or using humor as a teaching tool in the classroom:

> *Be yourself: too often, teachers are the walking jokes to students, so the sooner you make fun of yourself, the better…slip some self-depreciating/disparaging remarks in there--right away from the start and students will know that you are for real. Be honest: the best comedy stems from blatant honesty. Telling students that you once walked from the bath room through half of a school day with a toilet paper hanging from the back of your pants does not just garner laughter at a humiliating moment, but it makes them feel not so bad about their daily disappointment. Be weird: there is absolutely nothing more refreshing than a strange teacher. Wear your bell bottoms or your bow tie. The hair that flies everywhere or the bright yellow shirt makes students giggle and feel like they met a real character. Be gross: tell them about a time a bird pooped on your head when you were talking to that person whom you adored. Or, ask why students pick their noses right in front of you, even when you look at them, your eyes widening, hoping for an end to the madness. Be messy: we are all a mess sometimes. When your papers go flying or you trip, do not profess defeat too soon. May be you are used to being orderly, but that cannot always happen. So when you are messy, enjoy it. Show them you not only have grace but can laugh at yourself too. ([34], p. 10)*

Similar to 50 different ways by Chesser [34] is the Hellman's [35] recommended seven simple steps for successful use of instructional humor, classroom humor or humor related to content material, by the classroom teachers.

4. Benefits associated with the use of humor in the classroom setting

The use of humor in the classroom is often very rare, if not almost none existent. In order to see or explore what are the benefits of humor in the classroom, one has to first take a look elsewhere, e.g., outside the classroom setting, so that such benefits could be imported into the classroom as well. According to Wanzer, Frymier, Wojtaszczyk, & Smith [18], the benefits of humor are well enjoyed far away from and beyond the classroom context. This is because professionals from other fields (outside the classroom setting) use humor as means to generating positive affects in their areas of practice. Examples of these outside

professionals are primary care physicians, medical doctors or business managers who use humor with their patients or clients [36–38]. Because the use of humor helps build up positive relationships between the doctors and their patients, the doctors are less likely to have medical malpractice law suits brought up against them by their patients Wanzer et al. [18]. It is also reported that business managers, who use humor, are more liked and are perceived as more effective by their employees [3, 5, 17, 18, 39]. Therefore, outside the classroom, the use of humor has been recommended as (1) a business management tool that promotes a productive work environment [39], (2) an effective health care tool, and (3) a possible tool to improve interpersonal relationships [17, 18].

Many experts outside of education have incorporated the use of humor in their fields for various physiological and psychological benefits that are believed to be associated with laughter. Some of these physiological benefits include muscle relaxation, stimulated circulation, improved respiration and exercise of the lungs and chest muscles, increased production of the body's natural pain killers called endorphins, as well as lowered pulse rate and blood pressure [17, 18, 23]. Therefore, for those who do not like physical exercise such as running, the use of humor has even been suggested as a tempting alternative because intense physical exercise can now be replaced with a humorous session of smile and laugher for those who cannot physically exercise [23]. Positive psychological effects of laughter–one of the effects or functions of humor–include reduced anxiety and stress, greater self-esteem, and increased self-motivation [3, 5, 17, 18, 23, 29].

While there are those noted physiological and psychological benefits associated with humor, e.g., students' reported less anxiety and relieved stress, encouraged creativity, students' motivation, inspiration, participation and engagement, one of the main reasons for using humor in the classroom is to improve student learning [3, 17, 18]. Therefore, the creative use of humor in the classroom deals with the idea of how to teach effectively and appropriately, and not necessarily what to teach in the classroom: The pedagogical content knowledge versus technical competency [20, 40]. The use of humor in the classroom is a considerable teaching tool that, if used creatively, effectively and appropriately, may increase the amount of what is taught–that is, what is actually learned by students [17, 18, 32, 41].

When it comes to learning, there are three different types of students' learning in the classroom, namely *affective*, *perceived* and *cognitive* learning [42]. And so far, however, only the first two types of learning (affective and perceived learning) are known to have some degree of correlation with the use of humor or teacher's non-verbal immediacy behaviors [18]. The reported correlation, however, is nothing more than student's self-reported-assessed learning through students' opinion surveys and course evaluations and therefore somehow problematic or inconclusive. Student's self-reported-assessed learning is problematic because it cannot be measured independently while at the same time, it cannot be ignored as well as it is also widely quoted by students as one of their sources of motivation and inspiration–if not their best source of motivation and inspiration for learning [18, 42].

Therefore, very little is known about correlation or association between humor–an immediacy behavior–and the desired increase in cognitive learning, e.g., learning outcomes as measured independently through grades or testing, because mathematics itself is widely considered a cognitive activity as opposed to perceived and affective domains of the subject matter. Until a strong correlation is observed between humor and cognitive learning, the link between the two constructs may still remain an exploratory hypothesis [18]. While the main focus of this study is to generate and maintain interest through the use of humor, as informed through correlates of interest such as positive attitudes, beliefs, motivation and values placed toward mathematics, it also tries to see or explore if there is any link or if indeed

humor does increase the amount of what is learned for both self-reported-assessed affective learning, perceived learning, and the cognitive learning. In this study, for example, a cognitive performance in a mathematics task of two independence samples is compared—as measured independently through performance on mathematics tasks by means of grades or testing as opposed to students' self-reported opinion surveys.

Overall, researchers have so far reported that the use of humor in the classroom can help to (a) create a more positive learning environment by breaking down barriers to communication, which are also barriers to learning, between the teachers and the students, (b) help students retain subject matter, especially if the humor reinforces the class material, (c) give students a reason to attend class, and (d) increase or enhance comprehension and cognitive retention; and this enhancement is presumably due to less stress and anxiety, reduced student negativism or hostility regarding potentially confrontational issues (e.g., grading) in the classroom, as well as improved student attitudes toward the subject and the teacher [17, 18].

Researchers also report that students have consistently evaluated humor strategies and techniques as effective at reducing their anxiety, improving their ability to learn, and helping them to do their best; and the last but not the least suggested benefit of humor, primarily from the teacher's perspective is that a teacher who effectively prepares and appropriately uses humor regularly in the classroom will find that teaching is more fun, enjoyable, thrilling and exciting [17, 18]. Trying to achieve excellent in how to teach, whether through humor or something else, requires creativity and can bring some of the challenge–one of the requirements for continued improvement–back to teaching for those who may have lost it because they think they have already mastered the what to teach part of the teaching business [17]. Humor can be, if not already, one of the important components of how to teach effectively and appropriately because watching students who seem to be enjoying listening to you and hearing them laugh at your humor is very rewarding experience [3, 5, 17, 18, 34]. Besides the rewarding experience, humor use shows students that the teacher is immediately one of them, that is, the teacher is indeed closer, approachable, and friendly both in and outside the classroom environment. This is because "humor can serve as a bridge between educators and students by demonstrating a shared understanding and a common psychological bond" ([4], p. 177).

5. The existence of various teaching styles in the classroom setting

There are various teaching and learning styles as there are different classroom environments [41]. However, what exactly is an effective and interesting teaching style in a classroom? Concerning this question, there are at least two perspectives or explanations in the education literature about effective and interesting teaching styles in the classroom:

> *(1) Teaching as a science-based theory which argues that "Psychologists have spent decade [sic] studying how human (students) think and feel, how learning occurs, what influence motivation, and how teaching affects learning. These general and abstract conceptions apply to a wide range of situations, therefore, teachers should not have to reinvent all this knowledge" ([43], p. 199); and (2) Teaching as an artistic skill-a creative process that argues "The hallmark of an excellent teacher is not the ability to apply techniques but the artistry of being reflective, thoughtful and inventive-about teaching. So teaching is so complex that it must be reinvented with every new subject and class." ([44], p. 7)*

While teachers may not agree on whether teaching is strictly a science—a set of procedures and techniques—or an art (a creative endeavor), they do, however, understand that the "real world rarely consists of neat packages or either-situations" ([45], p. 77; [20]). Therefore, not only is teaching an art, a science or a combination of both, but also a way of life which must be continuously reinvented or improved over time [20, 40], and that is because "each time a lesson is taught, it will be different and that is a hallmark and the beauty of teaching" ([30], p. 137).

Just as there are two different perspectives on effective and interesting teaching styles among practicing-teaching professionals, there are also at least two different types of communication in mathematics classes among mathematics teachers. These types of communication are classified as (1) the traditional patterns of communication and (2) the alternative patterns of communication [46]. The manner in which teachers and students interact in the classroom "reflects not only the routines for harmonious functioning in the class but also the nature of the learning opportunities that may occur for children. Lessons in mathematics classrooms can be characterized by interaction patterns and ways of communicating that, to the observer, reveals the different views about teaching and learning mathematics that are held by the participants"(Wood, 1998, p. 167). Therefore, the dialog, discussion or the conversation that is found in the classrooms marks the "stance of the speaker towards the event being represented, toward the occasion of utterance, and towards the manner in which the speaker expects the listener to view the world and use his mind" ([46], p. 167). This means that there are at least two competing communication and teaching styles in mathematics classrooms and regardless of which style a teacher prefers, a teacher is expected to be an overall competent communicator of mathematical concepts in mathematics classroom.

A mathematics teacher's desire and effort to be competent communicator in the subject matter such as mathematics shows willingness and continued improvement in pursuit of excellence, continuous professional development, on not only what to teach (pedagogical content knowledge), but also on how to teach (strategies and techniques) effectively as well as appropriately [17, 20, 21, 46]. Therefore, mathematics teachers should be aware that their students always expect them to be competent communicators in the subject matter, a skill most mathematics teachers are arguably not known to possess—given the fact that mathematics teachers are always blamed and even accused, through teacher evaluations or in the eyes and the courts of public opinions, by many of their students for not always well explaining and even sometimes failing to explain mathematical concepts in ways that are easily understandable to their students. Most of these allegations are due to mathematics teachers' widely perceived lack of communication competence in the subject matter [46], which is compounded by the perceived difficulties of the subject matter itself.

As a consequence of the lack of communication competence in the mathematics classrooms, there is reportedly prevailing and widespread complaints of students' boredom accompanied by lack of interest in mathematics classrooms; and this piece of writing tackles this widely reported factor, the students' boredom in mathematics classrooms, which interferes negatively with the learning of mathematics and results into the total loss of interest all together in the subject matter.

6. The factors that interfere with the teaching and learning of mathematics

As can be seen in the above discussion, there are many factors that can interfere with the teaching and learning of mathematics in the classroom setting. These include factors such as the difficulties associated with the learning of the

subject, the difficulties involved in teaching the subject due to various competing teachers' teaching styles in the classroom [31, 47–49], and the various competing corresponding methods of delivery, the communication competence aspect and the critical issue of going beyond technical competency in the form of continuous professional development or growth. All of these factors interfere with the learning of mathematics in the guise of boredom, due to the belief that boredom is closely associated with lack of interest in the subject matter and therefore if students are interested in the subject, they will always find ways to overcome any obstacles that are associated negatively with the learning of mathematics. Hence, a question arises: How or in what ways can interest be generated, captured and even maintained in mathematics classrooms so that students' boredom is at least minimized? Humor has been shown to have a potential for that purpose of capturing students' interest in the learning process because humor itself is part of everyday real world life experience, and it therefore has the possibility to make mathematics a part of everyday life experience. Making mathematics an everyday life experience through the use of mathematical humor or other mathematics content related humor would make mathematics accessible to a wide range of students and not just the most curious or serious ones.

As repeatedly mentioned in the discussion, mathematics is generally a painful subject to learn for anyone–including even mathematicians, mathematics teachers or educators in general [50–52]. However, for those who manage to learn it successfully and eventually became good at it, especially mathematics teachers, mathematicians as well as physicists and to some extent, statisticians or accountants, the resulting rewards for apparently understanding such a difficult language are huge. These rewards include popular social recognition by the general public for doing something regarded as difficult, accompanied by a great deal of personal satisfaction in the form of both the instant and delayed gratifications, e.g., feelings such as joy, thrill or excitement, especially after successfully performing a mathematics task or even for trying such a task.

7. Humor provides for much needed instant gratification in the classroom setting

Humor in the classroom provides the needed and often lacking momentary feelings of joy (instant gratification), thrill, excitement or satisfaction. Such short term feelings of joy, also known as situational interest in the subject matter, can be experienced by students-learners either as the results of the teacher's use of humor in the classroom setting; or from a successful completion and performing of a mathematical task, joyful feelings which are comparable (for lack of better analogy or metaphors) to the same feelings or effects people who drink usually get as a result of getting high with a substance such as an alcohol, a cigarette, a physical exercise and even sexual experience. Perhaps a silly example, but these afterward consequential feelings or effects after experiencing such events or actions of drinking or smoking are probably the same reasons people keep craving for more and keep getting drunk or smoking despite knowing the risks and negative consequences associated with heavy drinking or smoking: Even an excessive use of something regarded positively such as physical exercise or sexual experience can be harmful, whenever the proper ratio of the limit of pleasure to pain is exceeded.

Therefore, instead of getting high with undesirable-harmful substances such as alcohol or cigarettes, it should be related and pointed out to students that there are alternatives out there such as doing or performing mathematical tasks. This implies a person can actually get drunk from successfully doing a mathematics task and,

as a bonus in getting high with mathematics concepts and the satisfactory feelings that follow, a person also gets popular social recognition in the form of praises and positive publicity. It is amazing how mathematicians tend to get high on daily basis with their apparent heavy doses of mathematics concepts, only to get praised and be recognized positively rather than shunned as is the case in getting high with alcohol or other harmful substances: This irony is something which does not happen anywhere else, except in the world of mathematics or physics.

This is the part where mathematicians or teachers of mathematics felt short to convey, perhaps in humorous fashion, to their students or the general public at large—the real hidden secret behind the continuous love for continuously doing and pursuing seemingly hard subjects such as mathematics, physics or chemistry. Perhaps for the lack of better metaphors, all is claimed and argued, in an attempt to sell mathematics to students or general public, is that mathematics is a beautiful subject—needed as a strategic gateway for other related careers—without frankly going into details as to exactly why it is such a beautiful subject in the first place. For the students and general public, however, mathematics equations are not as so beautiful as otherwise claimed or argued because, if anything at all to students or general public, the equations actually look and appear very intimidating if not too ugly in appearance. If anything at all, it is the ideas hidden behind those apparent ugly equations that are so beautiful—but if and only when one understands the ideas expressed behind those seemingly ugly symbols. Therefore, the mathematics community with mathematics teachers in particular needs to do a better job at selling mathematics to the general public, particularly students in the mathematics classroom and related fields.

One way to sell mathematics among others (such as the use of an advanced-attractive technology based instruction, interactive games, small groups work and even playing music or singing songs in the classroom) is to make use of an appropriate classroom humor as a pedagogical toolkit—teaching tool—especially mathematics humor and other content related humor as this would help make mathematics appear to be part of everyday real world life experiences. The introduction of humor into the classroom may be the needed remedy to this age-old multidimensional classroom problem summarized as follows: (a) mathematics is more often than not a terribly difficult subject to teach and learn, (b) students often perceive the learning of subject as dreaded or triple-threat, which means stressful, frustrating and intimating; and students often complain under the guise of boredom in the mathematics classroom, leading to the total loss of interest in the subject altogether, and (c) the current-popular regular instructional approach (RIA) as the teachers' preferred current method of teaching (although it is also a student-centred approach in its design) tends to focus only on cognitive aspects while ignoring the affective domains of the subject: For example, regular RIA's method of instruction focus is more often than not on competition-based performance, aimless computations, rote memorization or repetitive drills, which although effective to some degree as an integral part of the overall learning outcomes, can be claimed and argued as sort of achievement of a success through exhaustion rather than pure enjoyment of the subject, with the aim of making the learning of the subject fun, amusing, engaging, thrilling, exciting, inspiring, motivating and even satisfying learning experience. In the classroom where humor is used as teaching and learning tool, students often express these feelings of enjoyment (instant gratification) in the form of smiling, noise making, laughing out loud, arguing and debating with classmates as the students actively participate in their learning process.

Stressing the idea that competence as a skill is not equals or the same as competition, that is, fierce competition in the classroom is unnecessary in any effective learning environment, it is a well-known fact and also self-evident that some of the

most admired-respected people are highly competent professionals, who tend to value cooperation and collaboration without being competitive, and are still highly regarded as effective- successful individuals in whatever they do: The same idea applies to students-learners as well in a classroom setting where humor is used as a teaching and learning tool, not only to relax the learning environment, but also to inspire and motivate students in their learning process.

8. Wrap-up summary of the chapter

As a round up-summary to this chapter, it is extra-ordinarily claimed and argued with literature-based evidence earlier in the above discussion that classroom teachers can not only survive the 21th century technological revolution–the re-engineering of industrial education 5.0–but also they can thrive as well in the presence of those challenges. However, these desired-important educational goals or objectives of not only the survival of teaching as a profession, but also the demanded-required continuing professional improvement or growth, are possible if and only if teachers are willing to welcome and embrace the continually emerging technological advancements that are happening on almost daily basis. This is in addition to teachers being open and willing to take the risks necessary to achieve the desired-overall educational goals or outcomes, risks such as willingness to not only explore, discover and experiment with new ways of teaching and learning, but also the classroom teachers expected responsibility to take part (through action research) in such innovative-creative activities that help in the creation of those novice ways of teaching and learning in the classroom setting. Not only being open, welcoming, embracing and willingness to take risks, but also teachers must be willing to take up emerging roles that are brought about as the inevitable consequences of the 21th century technological advancements, new roles such as knowledge advisors, knowledge supervisors and even knowledge managers.

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