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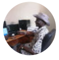
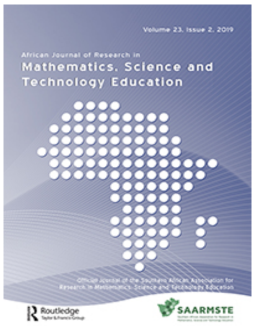


William Tap
Juba National University (Juba City)



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William D. Tap, David K. Mtetwa & Joseph C. Vere

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Using Humour for Generating and Maintaining Interest in Mathematics among Secondary School Students in South Sudan Re-settled Communities

William D. Tap*, David K. Mtetwa, and Joseph C. Vere

Faculty of Education, Department of Science and Mathematics Education, University of Zimbabwe, Harare, Zimbabwe

**Corresponding author. Email: tapx0001@umn.edu*

This paper reports on some aspects of an investigation on the impact of an instructional approach aimed at generating and maintaining students' interest in mathematics for secondary school students in displaced and re-settled communities in South Sudan. Two groups of Grade 11 students, an experimental group (E-group) and a control group (C-group), participated in the study. The E-group ($n = 31$) was taught using a Humour-supported Instructional Approach (H-SIA) and the C-group ($n = 20$) was taught using a Regular Instructional Approach. Preliminary indications from the pilot phase of the main study suggest that the method of instruction (H-SIA) generates and maintains at least similar levels of interest as the regular Regular Instructional Approach. The H-SIA also suggests some slight modifications and enhancement to the Interpersonal Competent Communication Model, the recommended existing guiding theory for humour communication in the classroom. It is concluded that H-SIA does indeed generate and maintain interest in mathematics in the classroom. Hence, it is recommended that mathematics teachers should consider infusing humour into their lessons to enhance students' interest in mathematics.

Keywords: *classroom humour; mathematical humour; teaching and learning mathematics; interest in mathematics*

Introduction and Background

This study investigates the impact of a Humour–supported Instructional Approach (H-SIA) on interest in mathematics at secondary school level in South Sudan. The use of humour in the classroom as an effective teaching tool has been shown to be promising in arousing students' interest in certain subjects that are perceived as more creative, such as English language, psychology, communications, poetry, second language learning, economics and statistics (Bell, 2009; Deiter, 2000; Garner, 2006; Goodboy, Booth-Betterfield, Bolkan, & Griffin, 2015; Torok, McMorris, & Lin, 2004; Wanzer, Frymier, Wojtaszczyk, & Smith, 2006). However, a belief that mathematics is a highly technical and difficult subject to master, let alone to teach creatively, discourages teacher creativity or interdisciplinary boundary crossing using borderline bridges (Braund, Moodley, Ekron, & Ahmed, 2015), such as the use of humour in a mathematics classroom. Yet, even when 'teaching technical courses such as analysis or computer programming, one can still use humor effectively in the classroom' (Banas, Dunbar, Rodriguez, & Liu, 2011; Hellman, 2007, p. 37; McNeely, 2015; Weimer, 2013).

Although previous studies show that students welcome and indeed appreciate the use of humour in the classroom (Banas et al., 2011; Goodboy et al., 2015; McGraw & Warner, 2014; McNeely, 2015; Torok et al., 2004; Weimer, 2013), many teachers are still reluctant and even fearful to use humour as an instructional tool. Some teachers, especially mathematics teachers, are reluctant because they feel that the use of humour in the classroom is a highly risky business as they have not been adequately trained on its effective and appropriate use. Others believe that using classroom humour is simply just inappropriate because classrooms are supposed to be strictly dedicated only to serious business of teaching (Deiter, 2000). While these concerns are understandable, mathematics teachers need to recognise that being a flexible teacher involves 'the ability to be able to cope with ever-changing demands that the subject continuously brings to the classroom' (Nyaumwe, 2008, p. 184).

This paper draws from a study that investigates whether instructional humour (humour related to the content material) (Goodboy et al., 2015; Wanzer, Frymier, & Irwin, 2010), in particular humour that relates to mathematics concepts combined with general humour ideas, could contribute to a teacher's pedagogical toolkit in generating, stimulating, maintaining or even raising students' interest in mathematics—something which has not been seriously considered. The overall purpose in using mathematical humour in the classroom is to make mathematics enjoyment accessible to students as humour can help make mathematics become part of everyday life experience (Schukajlow, 2015). Students should be helped to enjoy mathematics rather than just encouraged to endure it, as is often the case as Grawe (2016) points out, 'mathematics is a difficult enough subject that it pays to lighten up the subject in ways students can appreciate' (p. 224).

Mathematics teachers are often left to their own devices in deciding *what* to teach while at the same time developing the other equally important pedagogical factor of the teaching business—the *how* to teach effectively, efficiently, reflectively, imaginatively and appropriately (Deiter, 2000; Nyaumwe, 2008). Given the difficulties involved in learning the subject, it is not surprising that interest in learning the subject is typically low among students (Gadanidis, Gadanidis, & Huang, 2005; Goodman-Scott, 2019; Grawe, 2016; Karlin & Machlev, 2017; Masek, Hashim, & Ismail, 2019). Hence, the number of students who pick up the subject for further study is typically low, especially in war-devastated areas such as South Sudan.

Kane (1999) and Nyaumwe (2008) argue that the one-size-fits-all approach to teaching is no longer an effective, efficient or appropriate strategy. Therefore teachers need professional growth in terms of 'wisdom to carefully choose instructional tools such as learning materials, design the learning environment, determine appropriate faces of instructions, challenge–extend learner thinking and choose pedagogical strategies that suit students' learning styles' (Nyaumwe, 2008, p. 24). As classroom practitioners, teachers understand that classroom teaching techniques and strategies are never a complete product or a set of 'prescribed-predetermined fixed ideas which apply to every classroom situation' (Ornstein, Behar-Horenstein, & Pajak, 2003, p. 77). Effective, adaptable and flexible teaching is a learner-centred profession with a continuously changing knowledge base (Davies, Harber, & Schweisfurth, 2005; Kane, 1999; Nyaumwe, 2008). Hence, a continuous search for creative yet effective classroom techniques and strategies, such as the use of mathematical humour, is essential (Brandt, Lunt, & Meilstrup, 2016; Durik, Matarazzo, & Delaney, 2010; Friedman & Friedman, 2019; Kromka & Goodboy, 2019; Poirier & Wilhelm, 2014; Tews et al., 2015; Warwick, 2009; Weber, 2016).

To explore the relative effects of H-SIA on students' interest in mathematics, the following research question was posed: 'What is the impact (if any) of the H-SIA on students' interest in mathematics among secondary school students in displaced and re-settled communities in South Sudan?' These students are some of the internally displaced people living (for the last six years) in temporary re-settlement camps or shelters called Protection of Civilian Sites under the protection of the United Nation Mission in South Sudan. The students were displaced by South Sudan's civil war and are taught in five secondary schools, namely Hope, Mat (Union) 1 & 2, Future and Equity Senior Secondary Schools. These students are taught by a group of volunteer teachers who double as primary school teachers in adjacent UNICEF-sponsored feeder primary schools. These students were chosen because of their exposure to traumatic situations such as displacement, atrocities, poverty and living in an insecure environment characterised by threats and intimidations. These students are perceived to be more concerned with issues of survival than the learning of mathematics in the classroom.

Theoretical Background

Humour has both bright and darker sides, and there is a possibility that appropriate and inappropriate types of humour may be used in the classroom. In response to this, the Interpersonal Communication

Competence Model (ICCM) has recommended a guiding theoretical framework for research on humour (Struthers, 2011; Wanzer et al., 2006, 2010). Sometimes what is amusing for some people may be taken as offensive by others and therefore the key for the successful use of humour in the classroom is for the teacher to always laugh along with students rather than laughing at them (Sidelinger & Tatum, 2019; Struthers, 2011; Wanzer et al., 2006, 2010).

The ICCM argues that, during the communication interaction, a person may be effective but not appropriate, such as in winning an argument through insults; or when appropriate, a person may not be effective, such as in doing the right thing but not getting desired results (Wanzer et al., 2006; Weimer, 2013). Hence, being both effective and appropriate during humour communication is one of the main keys to successful communication. ICCM has five key interconnected operational communication components, namely the *motivation* to use humour, the *knowledge* base to rely on, the *skills* set necessary to deliver humour successfully, the *context* for applying humour appropriately and the *outcomes* of the interaction through humour communication (Struthers, 2011). Because humour communication in the classroom is an interactive dynamic constructive process, the ICCM, which is underpinned by the constructivism theory of education (Jones & Brader-araje, 2002), is used as a guide for this study. The ICCM provides the study with concepts and ideas for the creation of appropriate classroom humour and assessment of its effectiveness (Sidelinger & Tatum, 2019; Wanzer et al., 2006; Weber, 2016; Weimer, 2013).

Methodology

Because this study involved administering a treatment (H-SIA) while keeping the remaining variables controlled, a quasi-experimental research design was suitably adapted for this study (Dimitriou-Hadjichristou & Ogbonnaya, 2015; Repass, 2017). South Sudanese Secondary school students with the same level of mathematics background and taking the same level of mathematics in Form III (Grade 11), equivalent to first year 'A' level, were randomly assigned to two groups, namely the experimental group (E-group) and the control group (C-group). While both groups were taught by the same teacher and a co-teacher, who also acted as an observer, the E-group was taught using the proposed method (H-SIA) while the C-group was taught using the regular instructional approach (RIA). All groups lived in temporary shelters in re-settled communities for the displaced population. The numbers of students in each group were approximately the same and higher at the beginning of the teaching experiment, dropping to 31 and 20 for E- and C-groups by the end of the 4-week pilot study.

Humour-supported Instructional Approach

The H-SIA was applied to the E-group using typical H-SIA lesson plans opportunistically laced with instructional humour. Instructional humour is humour related to the content material such as mathematics. Mathematical humour, for example, is humour derived from the mathematics concepts being discussed combined with general humour ideas, particularly the incongruity theory of humour characterised by elements of surprise and unexpected twists or turns (Banas et al., 2011; Deiter, 2000; James, 2001; McGraw & Warner, 2014; McNeely, 2015; Morreall, 2014; Schukajlow, 2015; Wanzer et al., 2006; Weber, 2016; Weimer, 2013). Infused into H-SIA lessons are pseudo-mathematical proofs riddled with hidden commonly made mistakes (e.g. division by a disguised zero), which fall into these categories of elements of surprise and unexpected twists or turns. However, and according to Weber (2016), 'false proofs are funny only if there is some interpretation scheme by which they could plausibly make sense' (p. 58). A total of six H-SIA double-period lessons lasting 90 minutes were delivered as a treatment to the E-group over 4 weeks. Although the quantity of humour used during a lesson may not be as important as the quality, the literature recommends that the treatment (humour) be spaced out throughout the lesson, that is, one at the beginning, one in the middle and one at the end of the lesson (Banas et al., 2011; Repass, 2017). An H-SIA lesson plan (available upon request from the authors) follows a constructivist approach and is in line with the concept of teaching mathematics as conceptual and relational understanding in mathematics learning where mathematics is taught by forming and recognising relationships, patterns and connections between seemingly different topics, a horizontal view of the subject as opposed to a hierarchic view (Moru, Qhobela, & Maqutu, 2014).

A well laid out H-SIA lesson plan shows the contexts where the humour applies and includes the following headings: (1) current discussion topic and/or concept development; (2) lesson objectives; (3) classroom or homework tasks (activities); (4) an extension (connection) which stresses existing relationships (relational and conceptual understanding) between concepts from the present lesson and the next; and (5) a lesson recap, summary, forecast, conclusion or wrap-up at the end of the day's classroom activities. Each lesson is then followed by a 15–30 minutes post-lesson reflective dialogue or discussion by a teacher-researcher and a collaborative teacher to see how the next lesson could be improved. The reflective dialogue is guided by three questions which attempt to explore what went really well or wrong about a particular lesson, what could have been done differently and in what way the next lesson could be improved.

An H-SIA lesson plan is similar to any learner-centred constructivist lesson plan, a method more likely to be used by teachers who teach mathematics as conceptual and relational understanding (Moru et al., 2014). To apply an H-SIA to instruction, a teacher would plan as s/he would for any other student-centred problem-solving-based lesson plan, and then place instructional humour according to the opportunities presented by the concepts being taught.

Regular Instructional Approach

The RIA was applied to the C-group. RIA is defined in the context of this study as any constructive instructional method which is based on an enriched–authentic curriculum (derived from real-world daily life experiences) using a lesson plan, such as for the H-SIA described above for the E-group, but avoiding the use of the treatment (humour). When the use of humour is deliberately avoided during the teaching experiment, an H-SIA lesson can be considered as an RIA lesson plan. Thus, a total of six RIA lessons were taught to the C-group during the same pilot study. All types of humour were deliberately avoided for the C-group, except for unplanned, unexpected spontaneous humour. An example of unplanned spontaneous humour would be a dog suddenly walking into the classroom during the lesson while sticking out its tongue and wagging its tail, an action which may trigger a chorus of laughter from the students but was unplanned (James, 2001; Kuipers, 2009; McGraw & Warner, 2014; Robinson, Smith, & Segal, 2017).

Data Capturing Instruments

The data were captured and collected using two instruments, namely Student's Opinions Scale Questionnaires (SOSQ), adapted and customised from the Interpersonal Communication Competence Scales (Freedman, 2014; Karlin & Machlev, 2017; Kromka & Goodboy, 2019; Palacious, Arias, & Arias, 2014; Schukajlow, 2015; Tapia, 2004), and the Mathematics Task Set (MTS) constructed by the teacher-researcher. The SOSQ is a customised version of the Interpersonal Communication Competence Scales, and was chosen because of its suitability for assessing affective learning domains such as attitudes, values, beliefs, interest and anxiety (Freedman, 2014; Tapia, 2004). Meanwhile, the MTS was designed to assess cognitive factors such as performance and students' understanding of mathematics concepts being taught (Banas et al., 2011; Heinze, Reiss, & Rudolph, 2005; Schukajlow, 2015). The instruments were administered towards the end of the intervention, during the last 2 weeks of the 4-week-long pilot study.

Instrument 1 (SOSQ)

The SOSQ, instrument 1, had two parts, namely the Adapted Literature Based Interest Scale Questionnaires (ALBISQ, part **A**) and the open-ended Written–Oral questions (comments) or Interview Guide (WO-IG, part **B**). Part **A** of SOSQ (ALBISQ) contained 30 closed-ended items designed to measured five components of student's overall *interest*, namely long-term *personal interest* (PI), short-term *situational interest* (SI), teacher's classroom *immediacy*, teacher's *instructional quality* and teacher's *communication competence*. Part **B** of SOSQ (WO-IG) contained five open-ended questions or comments which assessed and evaluated the method of teaching used by the teacher during the intervention.

Instrument 2 (MTS)

The MTS, instrument 2, was designed to assess student's understanding of the mathematics concepts that were taught during the study (Banas et al., 2011; Heinze et al., 2005; Schukajlow, 2015). Students' performances on the mathematics tasks set were compared for the two separate independent groups.

Validity and Reliability of Instruments

An overall α-value of 0.87 for degree of accuracy and precision was computed for closed-ended items of SOSQ (ALBISQ, part **A**). This indicated that the closed-ended items were internally consistent with each other. The value of α for the MTS instrument could not be calculated directly because of its open-ended nature. The MTS tasks focused on students' understanding of the relevant mathematics concepts (Banas et al., 2011; Heinze et al., 2005; Schukajlow, 2015). To ensure the validity of the MTS instrument, the scoring of the items was double-checked by the teacher, co-teacher and supervisors. Both instruments (SOSQ and MTS) were adapted from relevant and reliable literature-based instruments (Freedman, 2014; Palacious et al., 2014; Tapia, 2004; Tekin Dede & Bukova-Guzel, 2018), which were customised to meet the needs of South Sudan secondary school students in displaced and re-settled communities. Hence, the instruments can be considered as fairly valid in terms of content validity.

Data Analysis

Instrument 1 was in an adapted typical five-point Likert scale format and it was analysed accordingly. The first 30 items, part **A** of SOSQ (ALBISQ), were assigned numerical values as follows: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5). Students' self-reported scores were organised and arranged into rectangular array format where the rows show students' individual scores while the columns show groups' overall average scores. The ALBISQ was then collapsed further into five dimensions, namely *PI*, *SI*, teacher's *immediacy*, *quality* of the teacher and teacher's *communication competence.* Students' average score on each of the five components of ALBISQ was calculated. The total average scores (rows and columns sums) on either the entire instrument or its components were determined to see the group averages. The average scores of the E-group where the treatment was used were compared with those of the C-group where the treatment was not applied. After computing the means and standard deviations for the two groups, the difference in the overall interest levels of the two independent groups was assessed using a *t*-test parametric statistic (see Tables 3 and 4 where the calculated *t*-values are shown).

The information obtained from the open-ended section of SOSQ, part **B** (WO-IG), was analysed similarly after patterns of emerging themes (where students' comments appeared strongly negative, neutral or strongly positive) were observed in the students' open written comments. The following open-ended questions were asked: (1) 'Overall, how would you rate the topics or maths concepts taught in the way used by the teacher?'; (2) 'How satisfied are you with the maths concepts or topics taught in the way used by the teacher?'; (3) 'How could the teacher best improve the way he teaches?'; (4) 'Please add any other relevant comments'; and (5) 'With all things considered during the term, how would you rate the method of teaching used by the teacher (e.g. outstanding, very good, good, satisfactory or poor)?'

Comments indicating student's level of interest (e.g. positivity and/or negativity toward the method of teaching used by the teacher) were observed, coded and quantified by assigning numerical points or values as follows: Strongly Disinterested/Negative (1), Disinterested/Negative (2), Neutral (3), Interested/Positive (4) and Strongly Interested/Positive (5).

Table 1. Instrument 1 results, part **A** of Student's Opinions Scale Questionnaires (SOSQ—Adapted Literature Based Interest Scale Questionnaires, ALBISQ), closed items

Group	Number	Personal interest	Situational interest	Immediacy	Quality	Competent	Mean
E-group	*n* = 31	84%	80%	80%	80%	80%	81%
C-group	*n* = 20	83%	81%	84%	82%	86%	83%

The information obtained from instrument 2 was organised and analysed using a customised rubric, which compared each student's answers against pre-established acceptable correct answers to the questions asked on the MTS. Each student was awarded points based on a four-point scale for each item, according to the depth of their solutions. In this way, students' average scores on the MTS were determined and compared for the two independent groups, which were kept separate and not connected with each other to reduce interaction. As with the case with the opinions of the two groups (part **A** of SOSQ), a *t*-test parametric statistic was used to determine if there was any significant difference in performance between the two independent groups.

Findings

Tables 1–4 summarise the findings from the two instruments used to capture and collect the data. These instruments were the SOSQ and MTS. The SOSQ, instrument 1, comprised 35 survey items, with the first 30 being closed-ended items (part **A** or ALBISQ) and the last five being written–oral open-ended questions or comments (part **B** or WO-IG), which assessed and evaluated the quality of instructional approach or method used by the teacher. The method used was H-SIA for the E-group and RIA for the C-group. ALIBSQ, part **A** of SOSQ, assessed five major possible sources or components of interest, namely long-term PI, short-term *SI*, teacher's classroom *immediacy*, *quality* of the instructional method used by the teacher and teacher overall *communication competence* in the classroom.

Part **B** of SOSQ (WO-IG), which assessed the method of teaching used by the teacher, was organised as questions (Q1–Q5) and the corresponding responses, which were analysed based on the patterns of themes (e.g. negativity or positivity of student's comments) that emerged from those open-ended comments. A sample of two students' written responses or comments (C1–C5), one from the C-group (student 7) and another from the E-group (student 5), is presented below. Both students achieved an identical overall interest level score of 21 (out of a maximum of 25).

(1) A representative (student 7) from the C-group made the following comments (C1–C5) to open-ended questions (Q1–Q5), and the corresponding scores appear in parentheses:
C1: I like it and I want him to use humour to [help] us create positive environment (5/5);
C2: It has help me in solving my problems and I like maths in every turn of my life (5/5);
C3: By creating good relationship with students in the class and used humour as the tool (5/5);
C4: I advise him/her to use humour as the key to [tuaghe] student in the class (3/5);
C5: C. Good (3/5).

Although the control group did not experience humour-laced instruction, this student is simply expressing his/her wishes for humour.

Table 2. Instrument # 1 results, part **B** of SOSQ (W0-IG), open-ended items

Group	Number	Q1	Q2	Q3	Q4	Q5	Mean
E-group	*n* = 31	84%	82%	80%	80%	70%	80%
C-group	*n* = 20	83%	84%	75%	80%	76%	80%

Table 3. The statistical t-test for the interest levels for the two independent groups

Group	Number	Mean	SD	Calculated *t*-value
E-group	$n = 31$	119	15	1.25
C-group	$n = 20$	124	13	1.25

Table 4. Instrument 2 results: Mathematics Tasks Set (MTS)

Group	Number	Mean	SD	Calculated *t*-value
E-group	$n = 31$	1.2	0.4	0.44
C-group	$n = 20$	1.4	0.6	0.44

(2) A representative (student 5) from the E-group made the following comments (C1–C5) to the open-ended questions (Q1–Q5), and the corresponding scores appear in parentheses:
C1: I can rate the course [base] on how teacher [teach] the subject is very good to me (4/5);
C2: I am [satisfying] enough because my teacher is using humour teaching. I am very happy because I have solved some problems that I cannot solve without him (5/5);
C3: He is best because he is using humour teaching in our class (5/5);
C4: It is good to learn in order to solve some problem (5/5);
C5: D. Satisfactory (2/5).

Students' responses to open-ended items were quantified as shown in Table 2, where the responses are similar (comparing columns) and the overall means are identically 80% (the sum of row percentages) for the two independent groups. This means that the two methods used for two independent groups produced similar opinions indicating similar levels of interest by participants in the two groups.

Tables 1–4 summarise the results from SOSQ, MTS and the corresponding statistical *t*-tests. Table 1 shows the components of interest from the closed items of SOSQ (part **A** or ALBISQ) for the two independent groups, namely Comp 1 (*PI*), Comp 2 (*SI*), Comp 3 (*Immediacy*), Comp 4 (*Quality*) and Comp 5 (*Competence*). Table 2 presents the results from WO-IG items, part **B** of SOSQ, the written–oral open-ended questions (comments) or oral interview guide of SOSQ (instrument 1) for the two independent groups, namely Q1–Q5, which assessed and evaluated the method of instruction used by the teacher.

In the tables, the average percentages are identically 80% (Table 2) and very close 81 and 83%, respectively (Table 1). These percentages are much higher than the neutral level of interest (60%), which means that both groups showed similar high levels of interest for the two instructional methods used (H-SIA and RIA). Put into perspective, the lowest interest level on this opinion scale continuum would have been 20% (which was never reached or recorded) and the neutral level of interest would have been 60%. The fact that the lowest level of interest (20%) was never recorded indicates that no student in the class indicated zero interest in the subject. The highest end level of interest (100%) was, however, achieved by some individual students in both groups.

From Table 3, the calculated *t*-value of 1.25 on the closed items, part **A** of SOSQ (ALBISQ), was found to be too low to be significant, which indicates no difference in the levels of interest between the two groups. The critical *t*-values with a 0.05 level of significance for one- or two-tailed hypotheses are ≥ 1.64 and 1.96, respectively.

From Table 4, the *t*-value for the two independent groups was found to be statistically non-significant, $t = 0.44$, which means there was no difference in performance between the two independent groups, as was the case for opinions in Table 3.

Discussion

The data provided in Tables 1–4, showing the results from the E- and C-groups, are almost identical for the two independent groups, showing that there was little difference between the proposed method of instructional approach (H-SIA) and the regular method of instructional approach used (RIA), in terms of effectiveness and generation of interest. This implies that the proposed method of instruction (H-SIA) is at least as good as an instructional method of delivery as the regular method of instruction that teaches mathematics as relational understanding (Moru et al., 2014). This means that the two methods tested during the pilot study produced equivalent effects, that is, one can be used as an alternative to the other (see Table 2 where the average means are identically 80%). Also the average opinions and interest means for the closed-ended items summarised in Table 1 are similar and a nearly identical 81 and 83% for the E- and C-groups, respectively.

The results suggest that a competent teacher is likely to generate the same level of interest in mathematics regardless of whether he/she uses H-SIA. This result is, however, not too surprising since the research on humour has always been riddled with mixed and inconclusive results (Banas et al., 2011; Repass, 2017; Struthers, 2011; Wanzer et al., 2006, 2010; Weimer, 2013).

As was the case with the students' positive reactions between the two groups (Table 3), a parametric *t*-test statistic on the MTS results (Table 4) showed that there was no difference in the performance of the two groups, which implies that the two groups had acquired comparable levels of understanding of the mathematics concepts taught (Banas et al., 2011; Heinze et al., 2005; Schukajlow, 2015). This means that students taught using H-SIA would attain similar levels of understanding to those taught using any other RIA.

This pilot study also appears to suggest a slight modification or an enhancement to the ICCM, a guiding theory for competent, effective and appropriate use of instructional humour in the classroom. Additional components such as *preparation* of humour at the beginning of a lesson and *reflection* during and at the end of lesson should be considered essential for the effective and appropriate outcome of communication through instructional humour (Goodboy et al., 2015; McNeely, 2015; Pickhardt, 2016; Robinson et al., 2017). These should augment components of *motivation*, *knowledge*, *skills*, *context* and *outcome* of humour communication that are already in the ICCM model. *Preparation* (e.g. contextualising, infusing and placement of an appropriate type of humour into a lesson) and *reflection* (e.g. reflective dialogue or discussion with the observing collaborative teacher at the end of a lesson) are necessary components of ICCM because the teacher does not have to be the only source of humour as ICCM assumes: a classroom teacher can make use of a variety of sources and then contextualise the humour into the lessons and therefore *preparation* and *reflection* are needed as components of ICCM.

In a well-laid-out H-SIA lesson plan, a classroom teacher often makes use of comic materials available on social media resources such as comedy shows, Facebook, YouTube and Twitter, or at gatherings such as nightclubs or even bars. All a teacher needs is an open mind and *motivation* to locate appropriate and relevant humorous examples from available humour sources on the World Wide Web and then contextualise them by infusing them into already familiar concepts being taught. All of the classroom humour used must be targeted either below or at the level of mathematics concepts being taught so that it is understood by the students (Grawe, 2016; Weber, 2016). It is also helpful to use ICCM as a guide for humour communication. Humour communication in the classroom involves not only how to communicate humour competently (*skills* & *knowledge*), effectively (communicational *outcomes*) and appropriately (*motivation* & *context*), but also a *preparation* for which type of humour is appropriate to use and a *reflection* during and after the lesson on whether humour was successful and the timing of when to use humour appropriately as well as the *context* where the humour applies.

Conclusion

This pilot study investigated the impact of the H-SIA on students' interest in mathematics. H-SIA and RIA produced almost identical results for their effects on student interest and learning. This is to say the humour-supported instruction does not subtract anything from student learning gains; if anything it adds enjoyment to the experience. The study was, however, limited to South Sudanese student's population who were classified as Internally Displace Peoples residing in displaced and re-settled communities in South Sudan. It would be interesting to see if the main study or similar studies would yield similar results for the same students or students in the wider population.

Since the results of this study appear promising, it is recommended that mathematics teachers be open to embracing change and experimenting with different methods of teaching such as H-SIA. While the H-SIA was used with students who had been through hardships by being displaced and re-settled and who were more preoccupied with survival than learning mathematics, it is suggested that the method be tried on other student population to see if other students can benefit from a teaching approach that infuses humour. However, further research is required on how the proposed approach (H-SIA) can be improved and on students' perceptions of the various components of the approach.

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