

Humour-Supported Instructional Approach: A Method for Generating and Maintaining Interest in Mathematics for Secondary School Students in South Sudan Re-settled Communities

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Received: June 19, 2020

Accepted: July 19, 2020

Online Published: July 23, 2020

doi:10.11114/jets.v8i8.4943

URL: <https://doi.org/10.11114/jets.v8i8.4943>

Abstract

This article reports the findings from the main study that investigated relative effects of an instructional approach aimed at generating and maintaining interest in mathematics for secondary school students living in South Sudan's displaced and re-settled communities. The study compared interest-generating effects of two different instructional approaches on two groups of Grade 11 students over a twelve-week period. While the Humour-supported Instructional Approach (H-SIA) was applied to the experimental group (E-group; $n = 53$), the control group (C-group; $n = 59$) was taught using Regular Instructional Approach (RIA). No significant differences were found in the two approaches' effects in generating and maintaining interest. A four (4) week pilot study conducted prior to the main study produced similar results. However, some new insights from the main study suggest that teachers' teaching traits play a heavier and more central role in both methods than had been initially realised. This led to the conclusion that the two methods (H-SIA and RIA) have similar effects on learner interest. The equivalence appears strongly dependent on the teachers' teaching traits, characteristics and teaching qualities for marshalling teachers' teaching techniques or strategies which include humour into their pedagogical toolkit. H-SIA method, however, is more recommended because the literature indicates-and this is confirmed in this study-that the use of humour in the classroom setting provides students with additional reason, motivation and inspiration to learn.

Keywords: classroom humour, mathematical humour, interest in mathematics, pedagogical toolkit, teachers' teaching techniques, teaching and learning mathematics

1. Introduction and Background

This paper reports the results of a study which explored the effects of a proposed teaching method—Humour-supported Instructional Approach (H-SIA), in generating and maintaining interest in mathematics among secondary school students living in displaced and re-settled communities in South Sudan (Tap, Mtetwa, & Vere, 2019). There has been a recent surge in research about the use of humour in the classroom and there is some consensus that it can be an effective teaching and learning tool. It has been noted, however, that many of the studies involved have limited-specific aims, or have fragmented-divergent goals that are often overshadowed by null research results riddled with inconclusive findings, null effects, contradictory or mixed findings (Durik, Matarazzo, & Delayey, 2010; Struthers, 2011; Banas, Rodriguez, & Liu, 2011; Weimer, 2013; Repass, 2017; Goodboy, Booth-Betterfield, Bolkan, & Griffin, 2015; Tews & Jackson, 2015; Bolkan, Griffin, & Goodboy, 2018; Masek, Hashim, & Ismail, 2018). Some teachers or researchers use humour with the goal of boosting learning by students (Heinze, Reiss, & Rundolph, 2005; Warwick, 2009; Wanzer, Frymier, & Irwin, 2010; Bolkan et al., 2018), while others use it to increase students' engagement in classroom collaborative activities or in the learning process in general (Chesser, 2013; Tews & Jackson, 2015; Lamminpaa & Vesterinen, 2018; Masek et al., 2018). Outside the classroom setting, other professionals may use humour as a tool in business management success or for health benefits (Kushner, 1990; Robinson, Smith, & Segal, 2017). Humour may even be used in the work place environment to get even with some mean-rude co-workers or difficult supervisors in the area of social justice at work places (Friedman & Friedman, 2019; Wardman, 2019). This study focused on exploring the use of humour in the secondary school classroom to generate and maintain interest in mathematics learning (Karlin & Machleu, 2017; Tap et al., 2019).

Humour may be used as an instructional approach in the mathematics classroom for the purpose of livening or firing-up students' learning experience and inspiring or motivating students to develop a liking for the subject matter being taught. Along the way, students' social skills (Uibu & Kikas, 2014) may also be enhanced, which is an important social development aspect that is often ignored in the mathematics classroom, where cognitive development is often exclusively promoted. For mathematics instruction, mathematical humour is typically applied. This is humour derived from the mathematical content under discussion and is often used in combination with the incongruity-resolution humour forms that are characterised by the surprise element, exaggeration, and unexpected twists and turns (Godbey, 1997; Deiter, 2000; James, 2001; Wanzer, Frymier, Wojtaszczyk, & Smith, 2006; Banas et al., 2011; Weimer, 2013; McGraw & Warner, 2014; Morreall, 2014; McNeely, 2015; Schukajlow, 2015; Grawe, 2016; Weber, 2016)

This orientation in teaching and learning (Tap et al., 2019), where related-instructional-humour is infused and laced into lesson plans, could even be seen as essential with students such as those in displaced and re-settled communities of South Sudan. These students have experienced severely disrupted socio-cultural-economic lives (Kuek, Velasquez, Castellalous, Velasquez, & Nogales, 2014) and are perceived to be more preoccupied with their day-to-day survival, than about mastering school mathematics.

In an attempt to maximise positive or minimise negative effects reported earlier during the pilot phase (Tap et al., 2019), the following research question was asked over the course of the main study: Will the main study on H-SIA yield different or similar effects on students' interest in mathematics for a similar, but larger sample size of South Sudanese secondary school students living in displaced and re-settled communities? This question was posed during the main study while maintaining the original question asked during the pilot phase, which was 'what is the impact (if any) of an H-SIA on student interest in mathematics?'

2. Theoretical Background

Guiding this study is a theory relating to teacher's communication competence in the classroom, referred to as the interpersonal communication competence model (ICCM) (Anderson, 1979; Spitzberg, 1983; Rubin & Martins, 1994; Richmond, 1990; Hartley, 1999; Anderson & Tucker, 2000; Kromka & Goodboy, 2019), which falls under constructivism (Jones & Brader-Araje, 2002). This theory argues that the most creative, imaginative, and effective teachers always possess certain communication traits, qualities or characteristics such as classroom immediacy, instructional quality, clarity in organization skills, and socio-communication style in the classroom (Wanzer & Frymier, 1999; Wanzer et al., 2010; Anderson, 1979). Among these effective teaching qualities, traits or characteristics, is a teacher's humour orientation or the use of humour as a teaching and learning tool (Banas et al., 2011; Weimer, 2013). When students view their teacher as someone who uses humour frequently, effectively and appropriately, they also view him/her as more immediate, approachable and friendly in the classroom. Hence, a teacher's perceived acceptance of the use of humour as a teaching tool in the classroom is an indication of a teacher's overall communication competence and best teaching practices (Kane, 1999; Ornstein, Behar-Horenstein, & Pajak, 2003; Driscoll, 2005; Nyaumwe, 2008).

3. Methodology

As this study involves comparing two similar but separate independent groups, a quasi-experimental research design was appropriately adapted and utilised (Dimitriou-Hadjichristou & Ogbonnaya, 2015; Repass, 2017). Form III (Grade 11) South Sudanese students living in temporary shelters for displaced and re-settled communities were used in the study. These students, who had the same mathematics background, were randomly assigned to two groups—an experimental group (E-group) and a control group (C-group). The sizes of the two groups were initially equal and higher at the beginning of the teaching experiment. By the end of the (12-week) study, however, the numbers had become unequal and lower, with the E-group having 53 students while the C-group ending up containing 59 students.

The two groups were taught the same mathematics content by the same teacher who was assisted by a co-teacher with an observer role. However, the teaching approaches used were different: while the E-group was taught using a method referred to as the Humour-supported Instructional Approach (H-SIA), the C-group was taught using a more conventional approach referred to as the Regular Instructional Approach (RIA). The two approaches were both based on student centred learning techniques and problem-solving strategies. Relatedly, a constructivist approach consistent with teaching mathematics for conceptual and relational understanding, with an emphasis on forming and recognising relationships, patterns and connections between seemingly different topics, and which adopted a horizontal view of mathematics teaching as opposed to a hierarchic perspective (Moru, Qhobela, & Magutu, 2014), was used. However, the approaches differed in that humour was an essential element of H-SIA, while it was deliberately avoided in a RIA lesson. Thus, all forms of humour were deliberately avoided in teaching the C-group, except for unplanned and unexpected spontaneous humour (James, 2001; Kuipers, 2009; McGraw & Warner, 2014; Robinson, Smith, & Segal, 2017; Tap et al., 2019). A total of twenty-four double period lessons, each lasting 90 minutes were delivered during the study—twelve (12) H-SIA based, and twelve (12) RIA based. (The H-SIA lesson plans, available upon request from the

authors, can either be found in a detailed-related upcoming article that reports the types of specific humour used during the study, or in a related doctoral dissertation (Tap, 2020).

The study used three (3) data collection instruments: the Students' Opinions Scale (Survey) Questionnaires (SOSQ) which was adapted and customised from the Interpersonal Communication Competence Scales (Freedman, 2014; Karlin & Machleu, 2017; Kromka & Goodboy, 2019; Palacios, Arias, & Arias, 2014; Schukajlow, 2015; Tapia & Marsh, 2004), Mathematics Tasks Set (MTS) constructed by the teacher-researcher; and the follow up Whole-Group Interviews and/or Written Oral-Interviews Guide (WO-IG).

The SOSQ instrument has a five-point Likert-scale-type format and is in two parts (A & B). Part A has 30 close-ended items based on an adapted literature-based interest scale (survey) questionnaires (ALBISQ). The questionnaire was coded and assigned numerical values to reflect levels of interest as follows: *Strongly Disagree/Disinterested* (1), *Disagree/Disinterested* (2), *Neutral* (3), *Agree/Interested* (4) and *Strongly Agree/Interested* (5). Students' interest scores (self-reported) were organised and arranged in a rectangular array-spread sheet format (not shown) in which the rows showed students' individual scores while the columns showed overall groups' average percentage scores. The ALBISQ results were then collapsed into five (5) dimensions or dynamic components of interest, namely: short-term *situational interest* (SI), long-term individual or *personal interest* (PI), teacher's classroom *immediacy*, *quality* of the teaching method used by the teacher and the teacher's overall communication *competence* in the classroom. Students' average percentage scores on each of the five (5) dynamic-components of interest contained in ALBISQ were then calculated. The results are summarised in Table 1.

The average interest level scores of the E-group where the treatment (H-SIA) was used were compared with those of the C-group where the treatment was not applied. After computing the means (averages) and standard deviations (S.D.) for the two groups, the strength of difference in the overall interest levels of the two related but separate independent groups was assessed using a student T-test, which was deemed appropriate for the quasi-experimental research design used. The T-test results for part A of SOSQ (ALBISQ) are displayed in Table 2.

Part B of the SOSQ (WO-IG) had the following open-ended questions (Q1-Q5): (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?* In order to get average scores comparable to the average percentages obtained in the close-ended part A of SOSQ (ALBISQ), the open ended part B of SOSQ (WO-IG) was coded and quantified by assigning numerical values—ranging from one to five (1-5)—to students' open-oral comments or responses to the open-ended questions (Tap et al., 2019), which reflected SOSQ levels of interest as follows: *Strongly Disinterested/Negative* (1), *Disinterested/Negative* (2), *Neutral* (3), *Interested/Positive* (4) and *Strongly Interested/Positive* (5). The results from open-ended section of SOSQ (WO-IG or part B) are summarised in Table 3 and Table 4.

The information obtained from the Mathematics Tasks Set (MTS) instrument was organised and analysed using an adapted and customised rubric (Tekin-Dede & Bukova-Guzel, 2018), which compared each student's answers against pre-established acceptable correct answers to the questions asked. Each student was awarded points based on a four-point scale for each item, according to the depth of their solutions (Tap et al., 2019). The scores for each of the two independent groups (E-group and C-group) were averaged and compared using a T-test. The MTS results are displayed in Table 5.

As a follow-up to the close-ended section of SOSQ (ALBISQ or part A), whole-group interviews were conducted with the E-group and C-group respectively, using a whole-class interview guide (WO-IG or part B of SOSQ). Scoring on the WO-IG was done using the open-ended SOSQ (part B) scheme where students' open-oral comments or responses were quantified according to SOSQ interest level codes (Tap et al., 2019) to get comparable average-percentages. The results from these whole-group interviews are summarised in Table 6.

4. Findings

Table 1. Results from part A of SOSQ (ALBISQ), Students' Opinions on Close-ended Items

Groups	Number	SI	PI	Immediacy	Quality	Competence	Mean
E-group	n = 53	81%	86%	82%	82%	84%	83%
C-group	n = 59	82%	83%	80%	80%	77%	80%

Table 1 shows the explored five (5) dynamic-components of interest and the corresponding average percentages from the close-ended items of the SOSQ (part A or ALBISQ) for the two independent groups. The dynamic-components

assessed are as follows: the short-term *situational interest* (SI) created by the teacher (e.g., enjoyment, excitement and engagement); student's long-term individual *personal interest* (PI) generated in the subject matter (e.g., motivation, inspiration and overall satisfaction); teacher's classroom *immediacy*; *quality* of teacher's instructions; and teacher's overall communication *competence* in the classroom setting.

Scores across the ALBISQ dynamic-components of interest are quite similar for the two groups of interest (E-group and C-group) and this is reflected in the overall means, which are 83% and 80% respectively. To test the extent to which the two means were different, a T-test was conducted and the results are shown in Table 2.

Table 2. T-test for the Interest Levels of the two Separate Independent Groups (part **A** of SOSQ or ALBISQ), Students' Opinions on Close-ended Items

Groups	Number	Mean	S.D.	Calculated t-value (Cal t)	Critical t-value (Crit t)
E-group	n = 53	124	15	1.33	1.96
C-group	n = 59	120	17		

As Cal t (1.33) was found to be less than Crit t (1.96), it was concluded that the levels of interest between the two groups were not significantly different at the 0.05 level. A two-tailed test was used since the research question explored through ALBISQ was designed to address opinions and was concerned with the impact (if any) of an H-SIA, with no expectations either way, of a positive or negative impact.

The use of the simple student T-test parametric statistic in the present study to compare the two independent groups is based on the assumption of normality that all natural phenomena based data sets (such as students' opinions, students' test scores, heights or sizes) become increasingly normally distributed as sample size increases (Lumley, Diehr, Emerson, & Chen, 2002). Also as the number of samples increases (despite short term variability that may occur), such data sets tend towards a normal distribution—the famed bell-shaped curve. Hence, the student parametric T-test statistic appears in the context of this study to be the most appropriate among alternative tests as it does not only apply to normally distributed data, but also to data sets that may first appear wildly scattered or skewed out of norm and later on become normally distributed as the number of samples increases (Lumley et al., 2002; Reimann & Filzmoser, 1999; Delacre, Lakens, & Leys, 2017).

Table 3. Results from part B of SOSQ (WO-IG), Students' Opinions on Open-ended Items

Groups	Number	Q.1	Q.2	Q.3	Q.4	Q.5	Mean
E-group	n = 53	82%	84%	81%	82%	75%	81%
C-group	n = 59	82%	81%	77%	81%	72%	79%

Table 3 presents the results from WO-IG instrument, which is part **B** of SOSQ. The displayed results were based on E-group and C-group responses to five open-ended questions (Q1-Q5) designed to capture student's opinions on the teacher's quality or method of instruction. Students' responses or comments (C1-C5) were quantified and analysed based on the patterns of themes (that is, negativity or positivity of students' comments). Although the differences between the E-group and the C-group averages in Table 3 do not appear huge, the student T-test parametric statistic was used to determine if there was a significant difference between E-group and C-group (Table 4).

Table 4. T-test for the Interest Levels for the two Independent Groups (part **B** of SOSQ), Students' Opinions on Open-ended Items

Groups	Number	Mean	S.D.	Calculated t-value (Cal-t)	Critical t-value (Crit-t)
E-group	n = 53	20	4	0	1.96
C-group	n = 59	20	5		

Table 4 shows that there was no significant difference in the opinions of the two groups as assessed by the open-ended items of SOSQ. On the basis of the same argument given earlier, a two-tailed test was performed.

Table 5. T-test on the Mathematics Tasks Set (MTS) for the two Separate Independent Groups on Students' Performance

Groups	Number	Mean	S.D.	Calculated (Cal-t)	t-value	Critical (Crit-t)	t-value
E-group	n = 53	2.5	0.91				
C-group	n = 41	2.7	0.73	1.18		1.96	

From Table 5, since Cal-t (1.18) < Crit-t (1.96) at $\alpha = 0.05$ (2-tailed), it was concluded that there was no significant difference in performance on the MTS between the E-group and the C-group.

The information displayed in Table 6 summarises the results of the follow up whole-group interviews conducted for the two related but separate independent groups (E and C-groups). Students' open-verbal comments to part **B** of SOSQ (WO-IG open-ended items, namely Q1-5) were coded and quantified according to SOSQ student's interest level codes with each scoring level ranging from one to five (1-5). In those interviews where the two major groups (E and C-groups) were each further split up into two smaller sub-groups (E-group into E1 & E2 and C-group into C1 & C2), the open-ended WO-IG items (Q1-5) from part **B** of SOSQ were used as oral interview guide. The subgroups were created to get manageable groups' sizes that were suitable for interactive discussion, engagement and active participation from students.

Table 6. The Results of E-group (1 & 2) and C-group (1 & 2) Interviews for the Groups' Opinions (Views) about the two Methods (H-SIA and RIA) used during the Teaching Experiment

E-group (E1 & E2)			
Sub-groups	Items (Q1-5)	Students' Responses	Researcher's Comments
E-group 1		84%	No significant difference of opinions observed within and across the two independent groups
E-group 2		80%	
Average Interest Level		82%	
C-group (C1 & C2)			
Sub-groups	Items (Q1-5)	Students' Responses	Researcher's Comments
C-group 1		80%	No significant difference of opinions observed within and across the two independent groups
C-group 2		80%	
Average Interest Level		80%	

5. Discussion

Overall, the results appear to suggest that there is no significant difference observed in terms of the opinions of the two separate but related independent groups (E and C-groups) toward the methods of instruction (H-SIA and RIA) used during the teaching experiment.

The fact that the two methods (H-SIA and RIA) yielded similar results or effects on students' learning experience, both in the main study as well as in the pilot phase (Tap et al., 2019), is not too surprising, since results of studies on humour in education have rarely been conclusive, with mixed results and null effects being quite common (Struthers, 2011; Banas et al., 2011; Weimer, 2013; Repass, 2017; Bolkan et al., 2018). Although the present study can be seen as a replicate of its earlier pilot study since the results appear to be similar and no significant differences observed—an indication of the robustness of results—the inconclusiveness of the apparent null effects can be interpreted in many different ways. One possibility is that the similar results could be due to some underlying—unknown—hidden variables such as the perceived and suspected positive effects of humour, for example, where laughter is known to be contagious like other emotional feelings (e.g., anger, sadness or happiness), and the fact that students tend to welcome, appreciate and perceive the use of humour in a positive way even when it has not been applied (Torok, McMorris, & Lin, 2004). In this case, the same instruments of measurement (e.g., SOSQ) which focussed on the use of humour in the classroom, were administered for both E and C-groups; and the groups' average self-reported scores on this instrument were almost identical (Tables 1 and 3). Because of the quasi-experimental nature of this study, the same instruments of measurement had to be administered across the two related but separate independent groups under controlled conditions.

Another possible explanation for the observed similar effects of H-SIA and RIA may have something to do with teacher

personal characteristics. The results indicated in Tables 1-6 seem to indicate a strong link between the teacher's teaching-personality traits, characteristics or qualities (Davies, Harber, & Schweisfurth, 2005; Moru et al., 2014; Uibu & Kikas, 2014; Jong, Mainhard, Tartwijk, Veldman, Verloop, & Wubbels, 2014; Zaidi, Wajid, Zaidi, Zaidi, & Zaidi, 2013) such as teacher's classroom *immediacy*, teacher's instructional *quality*, and teacher's communication *competence* (Puggina & Silva, 2014; Anderson & Tucker, 2000); or the teacher's teaching ability to arouse students' interest in learning mathematics as central to both methods (H-SIA and RIA). Hence, the teacher's teaching traits or characteristics such as the teacher's effective-teaching qualities or teacher's personality-teaching traits in the classroom (e.g. the teacher being regarded by students as a *competent* communicator, teacher's instructional *quality* or teacher's classroom *immediacy*) appear to be the main variables playing and weighing heavily at the centre of the now modified ICCM model (referring to Table 4 where the average means of the opinions for the two separate independent groups are identical, the standard deviations (S.D.) almost identical and the calculated t-value is zero for the two groups).

Yet another possible interpretation or perspective is dependent on the role played by the ICCM itself, the main theoretical framework guiding this study. Similar to teacher's effective teaching qualities, traits or characteristics, ICCM, on the other hand, claims and argues that a teacher who is regarded as a *competent* communicator in the classroom setting (Wanzer et al., 2006; Struthers, 2011) and using any regular-competent student centred approach would in general produce comparable results or effects similar to those produced through other perceived innovative methods of instruction such as an H-SIA. Therefore, it is possible that the C-group students in the controlled section who were taught using regular student centred-problem based RIA approach perceived the teacher-researcher as *competent* and effective communicator of mathematical concepts or topics taught during the study (see Tables 1 & 3 where the average opinions-percentages appear similar for the two independent groups).

Neither the adapted original ICCM model nor the proposed version of it mentioned earlier at the beginning of this paper places the role of teacher's effective teaching qualities, traits or characteristics (e.g., the teacher's ability to arouse students' interest in the learning process) at the centre of the dynamic interaction as does the H-SIA's modified-enhanced version of ICCM. Both the earlier original and proposed versions of ICCM for this study do not clarify whether *competent* communication was one of the interactive-dynamic components of teacher's effective teaching qualities, traits or characteristics, along with teacher's classroom *immediacy* and instructional *quality*. That situation is clarified better in what can now be considered an H-SIA enhanced-modified ICCM version with the teacher's effective teaching traits, characteristics or teaching qualities playing a heavy central role at the centre of the dynamic interaction of the teaching and learning factors in a classroom setting (Tap, 2020).

6. Conclusion

Because the two contrasted-different approaches (H-SIA and RIA) produced almost the same results or effects on students' learning experience (both during the pilot phase as well as the main study) in relation to the research question that explored the impact (if any) of an H-SIA, the main message to take away from the present study is that the effectiveness of two methods appear to depend heavily on the teacher's teaching traits, qualities or characteristics. That is to say the two methods can produce similar relative effects in learner interest and performance (reflected in both pilot and main study), depending on teacher's teaching-personality traits, qualities or characteristics. The two methods appear to produce equivalent positive results or effects, implying that the methods can be used as alternatives, considering that the methods produced similar levels of interest and therefore similar positive but relative effects on students' learning experience.

Another take away is that interest itself in a subject such as mathematics is a multidimensional phenomenon with at least five dynamic-interactive components or possible sources of interest, namely the short-term *situational interest* (SI) created by the teacher (e.g., enjoyment, excitement, engagement and satisfaction with mathematics concepts), long-term individual or *personal interest* (PI) generated in the subject matter by elements of SI (e.g., long-term motivation and inspiration in the subject matter), teacher's classroom *immediacy*, *quality* of teacher's teaching method, and teacher's overall communication *competence* in the classroom (see Tables 1 and 3). This seems to endorse the proposal that interest in the classroom or subject matter can be generated and maintained in many different ways and there appears to be no single best method or single source of interest that guarantees learner's interest or understanding in the subject matter (Nyaumwe, 2008; Driscoll, 2005; Kane, 1999; Papo, 1997; Ornstein et al., 2003).

In relation to classroom practices, knowledge gained from this study can be used as (a) a pedagogical toolkit for arousing student's interest in learning mathematics, (b) an instructional module or guide on effective use of appropriate types of humour in the classroom setting, and (c) tips on how to create mathematics humour from mathematics concepts combined with general humour ideas, especially concepts of incongruity-resolution humour theory, as typical mathematical humour often exist in the form of isolated single-one-liner jokes that are not usually contextualised into lesson plans (Cherkaev & Cherkaev, 2013; Renteln & Dundes, 2007).

There are, however, some obvious limitations to the present study as it focused only on student's population who have been through hardship from war conflicts, displacements, and re-settlement. It would be interesting to see if similar studies or the method of H-SIA would yield similar results or effects for wider student populations that have not been exposed to such debilitating life experiences. The results of the present-main study appear to be promising, encouraging, and robust with support from the pilot study, hence, the authors recommend using the method of H-SIA with other diverse-student populations to see how they react to a teaching approach that infuses humour into lessons.

Acknowledgements

The authors appreciate and are grateful to the school personnel and the secondary school students in South Sudan's re-settled communities who voluntarily participated in this study.

References

- Anderson, J. F. (1979). Teacher immediacy as a predictor of teaching effectiveness. *Communication Yearbook*, 3(1), 534-559. <https://doi.org/10.1080/23808985.1979.11923782>
- Anderson, S. L., & Tucker, J. S. (2000). Adult attachment, interpersonal communication competence, and social support. *Personal Relationships*, 7(1), 379-389. <https://doi.org/10.1111/j.1475-6811.2000.tb00023.x>
- Banas, J., Rodriguez, D., & Liu, S. (2011). A review of humor in educational settings: Four decades of research. *Communication Education*, 60(1), 115-144. <https://doi.org/10.1080/03634523.2010.496867>
- Bolkan, S., Griffin, D. J., & Goodboy, A. K. (2018). Humor in the classroom: The effects of integrated humor on student learning. *Communication Education*, 67(2), 144-164. <https://doi.org/10.1080/03634523.2017.1413199>
- Cherkaev, A., & Cherkaev, E. (2013). *Mathematical humors collected by Andrej and Elena Cherkaev*. Retrieved 10 22, 2015, from Researchgate.net: <http://www.researchgate.net/publication/25928021>
- Chesser, L. (2013). *Comedy in the classroom: 50 ways to bring laughter into any lesson*. Retrieved 10 5, 2015, from Opencolleges.edu.au: <https://www.opencolleges.edu.au/informed/features>
- Davies, L., Harber, C., & Schweisfurth, M. (2005). *Democratic professional development*. Birmingham: CIER/CFBT.
- Deiter, R. (2000). The use of humor as a teaching tool in the college classroom. *North American Colleges and Teachers of Agricultures (NACTA)*, 4(2), 20-28. Retrieved from <https://www.merlot.org/merlot/viewMaterial.html?id=329565>
- Delacre, M., Lakens, D., & Leys, C. (2017). Why psychologists should by default use Welch's t-test instead of student's t-test. *International Review of Social psychology*, 30(1), 92-101. <https://doi.org/10.5334/irsp.82>
- Dimitriou-Hadjichristou, C., & Ogbonnaya, U. (2015). The effects of using the Lakatosian heuristic method to teach the surface area of a cone on students' achievement according to Bloom's Taxonomy levels. *African Journal of Research in Mathematics, Science and Technology Education*, 19(2), 185-198. <https://doi.org/10.1080/10288457.2015.1049013>
- Driscoll, M. P. (2005). *Psychology of learning* (3rd ed.). Boston: Pearson.
- Durik, A. M., Matarazzo, K. L., & Delayey, M. L. (2010). The effects of humorous instructional materials on interest in mathematics task. *Motivation and Emotion*, 34(3), 293-305. <https://doi.org/10.1007/s11031-010-9178-5>
- Freedman, E. (2014). *Mathematics anxiety test*. Retrieved 05 23, 2016, from Mathpower.com: <http://www.mathpower.com>
- Friedman, H. H., & Friedman, L. W. (2019). The pen versus the sword: Humor in the services of social justices. *Review of Contemporary Philosophy*, 26-42. <https://doi.org/10.2139/ssrn.3396640>
- Godbey, C. (1997). *Mathematics anxiety and the underprepared student*. ERIC Document Reproduction Services NO. ED426734.
- Goodboy, A. K., Booth-Betterfield, M., Bolkan, S., & Griffin, D. J. (2015). The role of instructor humor and students' educational orientations in student learning, extra effort, participation, and out-of-class communication. *Communication Quarterly*, 63(1), 44-61. <https://doi.org/10.1080/01463373.2014.965840>
- Grawe, P. H. (2016). A meeting of minds: An alternate humor for teaching mathematics to non-STEM majors. *Journal of Humanistic Mathematics*, 6(1), 220-234. <https://doi.org/10.5642/jhummath.201601.14>
- Hartley, P. (1999). *Interpersonal communication* (2nd ed.). London and New York: Routledge.

- Heinze, A., Reiss, K., & Rundolph, F. (2005). Mathematics achievement and interest in mathematics from differential perspective. *Zentralblatt fur Didaktik der Mathematik (ZDM)*, 37(3), 212-216. <https://doi.org/10.1007/s11858-005-0011-7>
- James, D. L. (2001). *Split a gut and learn: Theory and Research*. Information Analysis (070). (ERIC Document Reproduction Service No. ED458671).
- Jones, M. G., & Brader-Araje, L. (2002). The impact of constructivism on education: Language, discourse and meaning. *American Communication Journal (ACJ)*, 5(3), 1-10.
- Jong, R., Mainhard, T., Tartwijk, J., Veldman, L., Verloop, N., & Wubbels, T. (2014). How pre-service teachers' personality traits, self-efficacy and discipline strategies contribute the teacher-student relationship. *British Journal of Educational Psychology*, 84(1), 294-310. <https://doi.org/10.1111/bjep.12025>
- Kane, J. (1999). *Education, information, and transformation (6th ed.)*. Upper Saddle River, NJ: Prentice-Hill.
- Karlin, N. J., & Machleu, M. (2017). The relationship between instructor use of different types of humor and student interest in the course material. *College Teaching*, 65(4), 192-200. <https://doi.org/10.1080/87567555.2017.1333080>
- Kromka, S. M., & Goodboy, A. K. (2019). Classroom storytelling: Using instructor narratives to increase student recall, affect, and attention. *Communication Education*, 68(1), 20-43. <https://doi.org/10.1080/03634523.2018.1529330>
- Kuek, J. C., Velasquez, R. J., Castellaous, J., Velasquez, D. R., & Nogales, E. (2014). Hunger for education: A research essay on the case of South Sudan and the voices of its people. *Forum for International Research in Education (FIRE)*, 1(2), 1-12. <https://doi.org/10.18275/fire201401021004>
- Kuipers, G. (2009). Humor styles and symbolic boundaries. *Journal of Literary Theories*, 3(2), 219-240. <https://doi.org/10.1515/JLT.2009.013>
- Kushner, M. (1990). *The light touch: How to use humor for business success*. New York: Simon and Schuster.
- Lamminpaa, J., & Vesterinen, V. (2018). The use of humour during a collaborative inquiry. *International Journal of Science Education*, 40(14), 1718-1735. <https://doi.org/10.1080/09500693.2018.1508926>
- Lumley, T., Diehr, P., Emerson, S., & Chen, L. (2002). The importance of the normality assumption in large public health data set. *Annual Review Public Health*, 23(1), 151-169. <https://doi.org/10.1146/annurev.publhealth.23.100901.140546>
- Masek, A., Hashim, S., & Ismail, A. (2018). Integration of the humor approach with student's engagement in teaching and learning sessions. *Journal of Education for Teaching*, 45(2), 288-233. <https://doi.org/10.1080/02607476.2018.1548169>
- McGraw, P., & Warner, J. (2014). *What, exactly, makes something funny? A bold new attempt at a unified theory of comedy*. Retrieved September 9, 2019, from [www.slate.com: http://www.slate.com/articles/arts/culturesbox/features/2014](http://www.slate.com/articles/arts/culturesbox/features/2014)
- McNeely, R. (2015). *Using humor in the classroom: Laughter has the power to fuel engagement and help students learn*. Retrieved October 15, 2019, from National Education Association (NEA): <http://www.nea.org/tools/52165.htm>
- Morreall, J. (2014). Humor, philosophy and education. *Educational Philosophy and Theory*, 46(2), 120-131. <https://doi.org/10.1080/00131857.2012.721735>
- Moru, E. K., Qhobela, M., & Magutu, T. Z. (2014). The impact of instruction in enhancing teachers' knowledge of teaching mathematics in Lesotho primary schools. *Teacher Development*, 18(2), 246-263. <https://doi.org/10.1080/13664530.2014.900107>
- Nyaumwe, L. (2008). *Professional development of secondary school mathematics teachers through collaborative reflection in pre-service and in-service learning context (Unpublished Doctoral Dissertation)*. Harare: University of Zimbabwe.
- Ornstein, A. C., Behar-Horenstein, L. S., & Pajak, E. (2003). *Contemporary issues in curriculum (3rd ed.)*. Boston: Allyn and Bacon.
- Palacios, A., Arias, V., & Arias, B. (2014). Attitudes toward mathematics: Construction and validation of a measurement instrument. *Revista de Psicodidactica*, 19(1), 76-91. <https://doi.org/10.1387/RevPsicodidact.8961>
- Papo, W. D. (1997). *Effective teaching and learning in large classes at tertiary institutions (Unpublished Ph.D Thesis)*. Rand Afrikaans University, Faculty of Education and Nursing.

- Puggina, A. C., & Silva, M. J. (2014). Interpersonal communication competence scale: Brazilian translation, validation and cultural adaptation. *ACTA Paul Enferm*, 27(2), 108-114. <https://doi.org/10.1590/1982-0194201400020>
- Reimann, C., & Filzmoser, P. (1999). Normal and lognormal data distribution in geochemistry: Death of a myth. Consequences for the statistical treatment of geochemical and environmental data. *Environmental Geology*, 39(9), 1001-1014. <https://doi.org/10.1007/s002549900081>
- Renteln, P., & Dundes, A. (2007). Foolproof: A sampling of mathematical folk humor. *American Mathematical Society*, 52(1), 24-34.
- Repass, J. T. (2017). *Making test anxiety a laughing matter: A quantitative study (Unpublished Doctoral Dissertation)*. ProQuest 10261256: University of Keiser.
- Richmond, V. P. (1990). Communication in the classroom: Power and motivation. *Communication Education*, 39(1), 181-195. <https://doi.org/10.1080/03634529009378801>
- Robinson, L., Smith, M., & Segal, J. (2017). *Laughter is the best medicine: The health benefits of humor and laughter*. Retrieved from Help Guide: <https://www.helpguide.org/articles/emotional-health/laughter-is-the-best-medicine>
- Rubin, R. B., & Martins, M. M. (1994). Development of a measure of interpersonal communication competence. *Communication Research Reports*, 11(1), 33-44. <https://doi.org/10.1080/08824099409359938>
- Schukajlow, S. (2015). Effects on enjoyment and boredom on students' interest in mathematics and vice versa. *Proceedings of 39th Psychology of Mathematics Education Conference*, 4, pp. 137-144. Hobart: PME.
- Spitzberg, B. H. (1983). Communication competence as knowledge, skill and impression. *Communication Education*, 32(3), 323-329. <https://doi.org/10.1080/03634528309378550>
- Struthers, J. (2011). The case for mixed methodologies in researching the teacher's use of humour in adult education. *Journal of Further and Higher Education*, 35(4), 439-459. <https://doi.org/10.1080/0309877X.2011.584966>
- Tap, W. D. (2020). *Relative effects of a humour-supported instructional approach on interest in mathematics among secondary school students in South Sudan re-settled communities (Unpublished Doctoral Dissertation)*. Harare: University of Zimbabwe.
- Tap, W. D., Mtetwa, D. K., & Vere, J. C. (2019). Using humour for generating and maintaining interest in mathematics among secondary school students in South Sudan re-settled communities. *African Journal of Research in Mathematics, Science and Technology Education*, 23(2), 244-253. <https://doi.org/10.1080/18117295.2019.1656871>
- Tapia, M., & Marsh, G. E. (2004). An instrument to measure mathematics attitudes. *Academic Exchange Quarterly*, 8(2), 16-21.
- Tekin-Dede, A., & Bukova-Guzel, E. (2018). A rubric development study for the assessment of modeling skills. *The Mathematics Educator*, 27(2), 33-72.
- Tews, M. J., & Jackson, K. (2015). Fun in the college classroom: Examining its nature and relationship with student engagement. *College Teaching*, 63(1), 16-25. <https://doi.org/10.1080/87567555.2014.972318>
- Torok, S. E., McMorris, R. F., & Lin, W. C. (2004). Is humor an appreciated teaching tool? Perceptions of professors' teaching styles and use of humor. *College Teaching*, 63(1), 16-25. <https://doi.org/10.3200/CTCH.52.1.14-20>
- Uibu, K., & Kikas, E. (2014). Authoritative and authoritarian-inconsistent teachers' preferences for teaching methods and instructional goals. *Education 3-13*, 42(1), 5-22. <https://doi.org/10.1080/03004279.2011.618808>
- Wanzer, M. B., & Frymier, A. B. (1999). The relationship between student perceptions of instructor humor and students' report of learning. *Communication Education*, 48(1), 48-62. <https://doi.org/10.1080/03634529909379152>
- Wanzer, M. B., Frymier, A. B., & Irwin, J. (2010). An explanation of the relationship between instructor humor and student learning: Instructor humor processing theory. *Communication Education*, 59(1), 1-18. <https://doi.org/10.1080/03634520903367238>
- Wanzer, M. B., Frymier, A. B., Wojtaszczyk, A. M., & Smith, T. (2006). Appropriate and inappropriate uses of humor by teachers. *Communication Education*, 52(2), 178-196. <https://doi.org/10.1080/03634520600566132>
- Wardman, N. P. (2019). *Humour or humiliation? When classroom banter becomes irresponsible sledging in upper-primary school contexts*. Discourse: Studies in the Cultural Politics of Education. <https://doi.org/10.1080/01596306.2019.1707777>

- Warwick, J. (2009). An experiment relating humor to student attainment in mathematics. *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies*, 19(4), 329-345. <https://doi.org/10.1080/10511970701590510>
- Weber, K. (2016). Mathematical humor: Jokes that reveal how we think about mathematics and why we enjoy it. *Mathematical Intelligencer*, 38(4), 56-61. <https://doi.org/10.1007/s00283-016-9676-8>
- Weimer, M. (2013, October 3). *Humor in the classroom: 40 years of research*. Retrieved from Faculty Focus: <http://www.facultyfocus.com/articles/effective-teaching-strategies/humor-in-the-classroom>
- Zaidi, M. R., Wajid, R. A., Zaidi, F. B., Zaidi, G. B., & Zaidi, M. T. (2013). The big five personality traits and their relationship with work engagement among public sector university teachers of Lahore. *African Journal of Business Management*, 7(15), 1344-1353.

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