

Analysis of Factors That Can Positively Influence the Learning of First-Year University Mathematics through an Online Social Media Whatsapp Group

Daniel Ofori-Kusi

University of the Free State, South Africa.

Abstract

Most universities in South Africa, with the exception of one, relied in the past on face-to-face sessions to deliver lectures to their students, but the novel corona virus brought into sharp focus and attention the fact that there may be a time when face-to-face sessions may not be possible. This implies university lecturers only delivering remotely through online technologies. The hard lockdown brought about by the rapid spread of the corona virus meant gathering was no longer possible, hence most university lecturers started to explore different distant methods of communicating and delivering their lectures to their students. Consequently, one of the useful methods explored by most university lecturers was online social media WhatsApp groups. The current study takes a critical look at how the potential use of an online social media WhatsApp group can contribute positively to mathematics score performance of first-year, under-prepared university students. This study followed a qualitative research approach to divide WhatsApp group discussions into themes so as to explain the way online WhatsApp group discussions can contribute positively to under-prepared first-year mathematics students. The study is underpinned by the theory of social constructivism and connectivism with the population of the study being first-year, under-prepared, first-year university mathematics students studying mathematics and using WhatsApp group discussion as one of their learning tools in the midst of a situation when face-to-face sessions are not possible in South Africa. The sample comprised 192 first-year students who were purposively sampled from a university in South Africa. The main data-collection instrument was the Online WhatsApp group discussion platform. The study relied on the advanced technology of the Online WhatsApp platform to validate the data collected on the platform, and triangulation to check for reliability to corroborate the data the instruments provided. The main source of data for this study was mainly messages in the form of text, audio, videos and pictures posted by both the students and the lecturer. The data gathered were analyzed and grouped into themes that highlighted and explained how a social media WhatsApp can group contribute positively to the learning of mathematics at first-year university level. The study found that an online WhatsApp learning platform can be a valuable resource tool that offers 24-hour, 7-day-a-week support for first-year, under-prepared university students in mathematics giving students the confidence to take ownership of their own learning through active engagements with fellow students and their lecturer and has the potential to translates to mathematical knowledge construction and the transfer of mathematics knowledge between student and student and between student and the lecturer. In conclusion, the study identifies and recommends factors lecturers should look out for when delivering mathematics lessons through an online social media WhatsApp group that can positively impact the mathematics of performance under-prepared, first-year university students.

Keywords: Online WhatsApp teaching group, under-prepared university students, first-year university students

INTRODUCTION

The novel Covid 19 corona virus has brought into focus the important role online learning plays in higher education. Covid-19 insidiously made its way into South Africa in 2020, most universities in South Africa moved their lectures from the traditional, face-to-face lecturing approach to online portal approaches. Most universities use known online communication packages such as blackboard collaborate, Zoom Microsoft Teams etc. Most of these online communication tools however, only allow synchronous modes of communication and are limited when it comes to asynchronous communication which is not readily accessible to students outside the synchronous mode.

Li, Finley, Pitts, and Guo (2011) define communication as a two-way process where the sender and the receiver take turns to send and receive a message with synchronous communication taking place in real time, while asynchronous communication happens over a period of time where there is no requirement for the sender or the receiver to participate immediately. The current study explores how asynchronous platforms can influence teaching and learning in the mathematics classroom.

Lim (2017) lists various forms of asynchronous communication as discussion forums, web logs, email messaging and social media messaging.

This study investigates and provides insight into how social media messaging, as a type of asynchronous communication tool, can contribute to knowledge transfer and knowledge acquisition for first-year, under-prepared university students enrolled in an extended mathematics program. Social Media has become a powerful and important communication tool used by most individuals and groups (Seedat, Roodt&Mwapwele, 2019). Sturkenboom, Baha and Tempesta (2013) however, concluded in their studies, that there was still a lack of clear guidelines on how students can be encouraged to participate using social media platforms in order to share knowledge and to motivate people to encourage in discussions about this knowledge.

WhatsApp Social Media Messaging forms the basis of this study as it is popularly used, especially among the Z generation. WhatsApp messaging dominates today's mobile communication; which the feature of group chats, in particular, contributing to its success in changing the way people communicate (Seufert, Hoßfeld, Schwind, Burger & Tran-Gia, 2016). Z generation students refer to students born after 1996 and who have not experienced life without digitization (Turner, 2015). This crop of students is very familiar with the use of social media networks such as WhatsApp and Facebook for social activities.

Statement of the Problem

Despite the popularity of social media Networks such as WhatsApp Messaging, it has not been fully explored for use in the mathematics education sector and how it can be used to share mathematical knowledge that can translate into mathematical knowledge transfer and acquisition. The current study investigates how the three learning styles, namely, auditory, visual and kinesthetic can be explored on online WhatsApp social media networks on mathematics knowledge transfer and acquisition in the midst of the Covid-19 pandemic when traditional face-to-face interaction is not always possible. Social Media tools like Whatsapp are seen by many authors as powerful drivers of change for teaching and learning practices, in terms of openness, interactivity and sociability (Manca&Ranieri, 2016).

Objective

1. To provide further insight into how WhatsApp Social Media messaging can contribute to the transfer of mathematics knowledge and skills in the absence of face-to-face traditional modes of instruction.

Research Question

1. In what ways does social media WhatsApp messaging contribute to knowledge transfer and acquisition in mathematics?

Conceptual Framework

This study will be underpinned by and developed under the integration of the theory of Social Constructivism and Connectivism. Vygotsky describes social constructivism as a phenomenon where the teacher provides a social environment in which the learner can assemble or construct, with others, the knowledge necessary to solve the problem. The WhatsApp social media network that forms the basis of this research provides a form of social interaction through its group chats. Social Constructivism is used in this research to explain how mathematics knowledge can be constructed and shared among participants using the social platform. Social Constructivism was developed from an interest in determining which cognitive processes are involved to enable humans to reason and make decisions, solve problems, form perceptions and mental images, and construct and understand language. Social Constructivism 'maintains that what we consider "reality" is largely our own mental creation; the product of a shared way of thinking among members of social groups (Passer & Smith, 2008).

Connectivism was developed recently by Siemens and Downes which explains and make clear on how technology created from the internet can be used to make teaching and learning more effective (Siemens, 2004). Connectivism in the current study will be used to explain the role of technology in the construction and absorption of mathematical knowledge for first year underprepared university students. Connectivism can be used to account for how technologies can be used to create opportunities for students to learn and share knowledge across the World Wide Web (Albalaw, 2017). The main idea behind connectivism suggests that the process of learning take place within a specialized social online network and the lecturer becomes more of a moderator who guides students to construct, learn and share new knowledge in the subject matter under consideration,

Social constructivism and connectivism guided the study to analyse and explain how WhatsApp social media learning groups can facilitate the teaching and learning process of first year underprepared university students in mathematics.

Social Media and how it works

Social Media comes in the form of an application software that works on various media such as cell phones and computers and which are more convenient and inexpensive to use compared with normal ways of communicating electronically such as making phone calls and posting letters. These applications serve as means for users to communicate multi-dimensionally and mainly through text, audio, video and pictures. Users are able to share personal

diaries, post images and videos, meet new people and establish communities, based on common interests (Rahman, Othman & Al-Rahmi, 2016). Users have the option to share contents publicly, or privately with selected individuals (Sponcil&Gitimu, 2013). Users also have the option to use their real biographic details and personal information or use phony biographic details and personal information. Social media can be categorised into three main groups based on certain features, namely, social networking, microblogging and media sharing (Seedat, Roodt&Mwapwele, 2019).

A social networking site contains the user's details such as biological information and allows users to set up their personal profiles before establishing communication (Seedat et al, 2019).

In addition, social media users use microblogging to update their followers about their daily activities and share and seek information in real-time (Java, Song, Finin, & Tseng, 2007) whereas media sharing sites allow social media users to upload videos and pictures as well as giving followers the opportunity to comment on the videos and pictures (Alwagait, Shahzad&Alim, 2015). Examples of social networking sites include Whatsapp, Facebook and LinkedIn and examples of Microblogging sites includes twitter, whereas examples of media-sharing sites include YouTube and Instagram. Most tertiary students are drawn to social media as it serves as a source of entertainment and leisure during their free time. Tertiary students also use social media to download and post audio, pictures and podcasts and communicate among themselves (Seedat et al, 2019). The current study explores how WhatsApp can be used as a viable online teaching tool in the midst of the Covid 19 pandemic.

An Overview of Social Media WhatsApp Messaging

Colom (2021) explains Whatsapp messaging software as a software that works on both Android, IOS and KIOS devices and can also be used on Desktop and Laptop computers using the Desktop version by pairing mobile phones with Desktop and Laptop Computers by scanning a QR code. It is used by over 6 billion people in 180 countries worldwide and allows instant, one-to-one or group sharing of text and voice messages, links, images, videos and other files. The Network allows users to see the behaviour of other users such as when they are online, or the last time they were online, and whether they are online typing or not. It also gives users the option to broadcast text, pictures, audios, and videos on their statuses. The user performing these behaviours have the option to select who they would like to share this behaviour with or to block anyone from accessing his or her personal behaviours or communicating with him or her on a one-on-one

basis on the network. Users don't have the option of blocking out messages from setting individuals on a WhatsApp group platform but are at liberty to leave and delete any group chat.

Research Design

This research followed a qualitative research design where a WhatsApp group chat was created by the lecturer and the enrolled first-year, under-prepared university students studying first-year university preparatory mathematics on the group chat. The design enables the researcher to gather and explain themes on how WhatsApp group chats could aid student engagement with the learning process, their development, acquisition and transfer of mathematical knowledge particularly among first-year under-prepared university students. A qualitative research design provides the means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The process involves emerging questions and procedures, data typically collected in the participant's setting, data analysis which inductively builds from particulars to general themes, and the researcher interpreting the meaning of the data (Creswell, 2014).

Population, Sample and Sampling

The population of the study were all first-year, under-prepared students in South Africa who were compelled to engage in some form of learning mathematics through WhatsApp groups when face-to-face sessions were not possible. The sample comprised 192 first-year students taking Introduction to University Mathematics as a module; they were purposively sampled. Purposive sampling studies a few cases in depth (McMillan & Schumacher, 2001). Meriam (1998) emphasizes the fact that purposive sampling is based on the assumption that the researcher wants to discover, understand, and gain insight into the phenomenon under study. The current study therefore chose a sample from which much could be gained and learned.

Instruments, Validity and Reliability of Data Instruments

The main instrument for gathering data in this research was online the WhatsApp group platform. The study depended on the advanced technology used by WhatsApp and the worldwide acceptance of WhatsApp social media to validate the data application collected. Data downloaded were compared with answers selected from the written tests of a few students and transcripts from contributions from a few students in face-to-face sessions to check for consistency in the data. It is important for a study to select measuring instruments that are appropriate indicators of the constructs to be investigated, shows satisfactory reliability and are valid for measuring the constructs to be investigated.

Data Gathering and Procedures

Data were gathered from communal texts, audio, pictures and videos resulting from communication between student-lecture and student-student communication on the WhatsApp group platform created by the lecture. The group was created at the beginning of the first semester in 2020 with the main purpose of mobilizing first-year, under-prepared students to discuss content challenges in our first-year, extended mathematics program.

Data Analyses

All posts on the group chat were be loaded. Thematic analysis was be used to analyze the data with the following themes being examined. Numbers were used for students' real names because of ethical reasons as the students were not to be identified

1. Students' community of engagement with other students and the learning process.
2. Viability of the medium of instruction and its role it plays in mathematical knowledge transfer.

This analysis only shares a few snap shots of students' discussions on the platform.

FINDINGS

Students' Community of Engagement with other Students and the Learning Process.

The first theme explains how a WhatsApp social media learning platform is able to orient students and give them information about the module and how things are generally going to work in their new environment.

The lecturer starts by introducing students to the group chat

Lecturer: *Good Morning, this platform will be used for all communication regarding MATD issues, Any question including contents you are having challenges*

The WhatsApp group was widely welcomed by the students. Judging by their responses, they were relieved to have a reference point that they could use for information about aspects that confused them in their new content environment.

Student 1: Good morning everyone. And many thanks to @27837156207 for creating the online communication platform

Student 2: Morning

Student 3: Good Morning to you too

Student 4: Good morning everyone. And many thanks to @lecturer for creating the online communication platform

Most of the students saw an opportunity to clarify some nagging questions that they would have otherwise kept unasked.

Student 5: Hi guys .Can I please see your timetables .There's a bit of a clash on mine .You can send it to me privately

Student 6: Same with mine

Student 7: Morning. How do u register for a group. Cos like i don't know what's going on

Student 8: You don't have to register for a group. You just choose a group that fits in your timetable

Student 9: Honestly I have so many issues as well, I have classes today online but am not sure how to attend since I haven't received any links

Lecturer: Good Morning, issues with the timetable will be finalized soon. You will be updated as at when
In another scenario student 16 wanted to know whether there was going to be a class. This generated a discussion and gave students in the group an idea of who to consult if there was to be a class or not.

Student 16: do we have a lesson installed today or should we still wait for your call about it?

Student 12: I haven't seen this one

Student 21: Check Ur black board if u doing Bio 1504

Student 12: Yeah

Student 21: Okay

Student 10: Ohk check Ur BB

Student 14: Same here

Student 8: Is there anyone here who has managed to select their group classes (time table)?

Student 6: Am failing to do

Student 11: Anyone who can help us please

Student 1: I also need help

Student 15: Me too I need help

Lecturer: Groups for MATD will be finalized when the time table is ready, because of social distancing there will be 30 per group, you will be afforded the opportunity to choose a group taking into consideration your other schedules

Student 11: Thank you for the information

Student 1: Thank you sir.

First-year university students were unfamiliar with the university rules and how things were done. Most of the students were floundering and did not know exactly what to do, but with the gradual engagements between fellow students and their lecturer on the WhatsApp social media platform, the students gradually kept abreast with what was expected of them at the required level.

The platform gave students the opportunity to share their frustrations about not having enough information about what to do. These queries were mostly addressed by their peers and the lecturer. The WhatsApp group platform, through these social interactions gave students the confidence to address challenges as they navigated the module. The WhatsApp group platform became a very important asset that first-social year students could use to adjust to their new environment and also gave students the opportunity to share and learn new information

Within every social network of students are students who are always abreast with information, who will facilitate and ensure knowledge flow. Student's

interdependence of 'effective knowledge flow' ensures their personal understanding of the state of activities in the organization (Kleiner, 2002).

WhatsApp social media did not only offer them information but the chat groups made them realize they needed to fish out information for themselves. Through these social interactions they were able to source information from their fellow students and were thus able to understand how things are run at the university and started adjusting to the situation. The ability of students to recognize the fact that new information can always alter decisions previously made is very vital (Siemens, 2004).

WhatsApp chat groups becomes an alternative source to share information between students and students and between students and the lecturer and in the process share the information with all users of the group and can be turned into an information bank where students can access information on a module in real time or delayed. Users can also assess past information if they wish to do so. Technology from the internet can leverage small efforts of many in a social group with the large efforts of a few (Brown, 2000).

Viability of WhatsApp as a Medium of Instruction and its Role in Mathematical Knowledge Transfer

The second theme explores the question of how viable WhatsApp chat groups are, for the transfer of mathematics knowledge in a social environment. The platform served as a consultation resource for students having challenges with specific mathematics problems.

Student 16 posts a picture of a question with which he finds challenge:

Student 16: <Media picture omitted>

Student 9 suddenly had an idea about the solution:

Student 9: Once absolute value negative no solution

Student 16 appreciates it and shares his solution with the group:

Student 16: Okay cool thank you.

Student 16: <Media picture omitted>

His solution arouses the interest of his peers in the group who disagree with his solution and offer various ideas of how the question should be solved. Student 14 refers his/her peers back to what was said in the lecture room:

Student 9: They are not same if i look

Student 12: How cause there is an xso we don't know whether that x will make that right hand side to be negative or positiveso how will it be undefined

Student 14: I don't know my guy i am the 1 who actually asked that we solve it in class and the answer was no solution..

Student 14: He said whenever the absolute value is - that thing is undefined

Student 14: I guess is the rule

Student 12: But we only have undefined or no solution when we have negative number which doesn't include x

So if we have x included we solve it right?

Student 14: That's not what he said... He said when u c negative on the other side of equal sign u just know s undefined he didn't mansion the condition "with/without X"

Student 12: Ohh is that sooMyb I thought wrong

Student 14 posts a picture of a varying solution

Student 14: <Media picture omitted>

The lecturer quickly steps in to inform the group student 14's solution is wrong:

Lecturer: The answer is wrong

Student 16: Thank you sir

Student 13: Thank you sir

The lecturer remains in the background to moderate the discussion. The students interactions' afforded the lecturer to pick up some misconceptions students may have had.

Student 1 posts another incorrect version of the solution process:

Student 1: <Media picture omitted>

Student 1: <Media picture omitted>

Student 8 now shares his frustration/confusion about the answer

Student 8: Ayy this system, answer is correct on one device and it is wrong on another one

□□♂□□□♂□.

Student 1 realises the mistake he made with his solution:

Student 1: Eish □

Student 14 produces a solution that is almost close to the answer:

Student 14: <Media omitted>

The lecturer steps in to correct a misconception

Lecturer: 100 by 60 was the bigger triangle

Student 14 quickly realizes her mistake, corrects and posts a new correct solution:

Student 14: Oh□□

Student 14: <Media picture omitted>

Student 14 is amazed at how simple the solution could be:

Student 11: aibo!!!

The episode above shows how multimedia, including text, video and audio is able to elevate a student's understanding of mathematical concepts. WhatsApp chat platform did not only offer students a remote resource for learning and but also a platform to clear out any misconceptions; peer teaching kicks in, and fellow students are able to teach each other guided by the instructor through pictures of worked-through problems, audio and text explanations.

WhatsApp chat groups have the potential to become becoming a powerful platform for learning mathematics through peer social interaction if

- communication?. *Journal of Technology Research*, 2, 1.
- Lim, F. P. (2017). An analysis of synchronous and asynchronous communication tools in e-learning. *Advanced Science and Technology Letters*, 143(46), 230-234.
- McMillan, J. H., & Schumacher, S. (2010). *Research in Education: Evidence-Based Inquiry*, MyEducationLab Series. Pearson.
- Manca, S., & Ranieri, M. (2016). Facebook and the others. Potentials and obstacles of social media for teaching in higher education. *Computers & Education*, 95, 216-230.
- Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education. Revised and Expanded from "Case Study Research in Education."* Jossey-Bass Publishers, 350 Sansome St, San Francisco, CA 94104.
- Naidoo, J., & Kopung, K. J. (2016). Exploring the use of WhatsApp in mathematics learning: A case study. *Journal of Communication*, 7(2), 266-273.
- Nguyen, T. (2015). The effectiveness of online learning: Beyond no significant difference and future horizons. *MERLOT Journal of Online Learning and Teaching*, 11(2), 309-319.
- Ofori-Kusi, D. (2017). An investigation into the use of problem-solving heuristics to improve the teaching and learning of mathematics. *Unpublished doctoral thesis. Pretoria: University of South Africa.*
- Passer, M. W., & Smith, R. E. (2008). Learning: the role of experiences. In *Psychology—The Science of Mind and Behavior*. McGraw-Hill Companies, New York.
- Rahman, N. S. A., Othman, M. S., & Al-Rahmi, W. (2016). EXPLORING THE USE OF SOCIAL MEDIA TOOLS AMONG STUDENTS FOR TEACHING AND LEARNING PURPOSE. *Journal of Theoretical & Applied Information Technology*, 91(1).
- Seedat, Y., Roodt, S., & Mwapwele, S. D. (2019). How South African University Information Systems Students Are Using Social Media. In *International Conference on Social Implications of Computers in Developing Countries* (pp. 378-389). Springer, Cham.
- Seufert, M., Hoßfeld, T., Schwind, A., Burger, V., & Tran-Gia, P. (2016, May). Group-based communication in WhatsApp. In *2016 IFIP networking conference (IFIP networking) and workshops* (pp. 536-541). IEEE.
- Siemens, G. (2004). Connectivism: A learning theory for the digital age. *Ekim*, 6, 2011.
- Sponcil, M., & Gitimu, P. (2013). Use of social media by college students: Relationship to communication and self-concept. *Journal of Technology Research*, 4(1), 37-49.
- Sturkenboom, N. I. C. K., Baha, S. E., Lu, Y. U. A. N., & Tempesta, G. A. B. R. I. E. L. E. (2013, June). Using social media for asynchronous collaboration within collaborative networks. In *Proceedings of the 3rd Participatory Innovation Conference (PIN-C 2013)* (pp. 18-20).
- Turner, A. (2015). Generation Z: Technology and social interest. *The journal of individual Psychology*, 71(2), 103-113.
- Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: MIT Press.