Lecturers’ perceptions of students’ social media exposure and its influence on mathematics performance

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**ABSTRACT**

This study was premised on the Community of Inquiry model and a qualitative method approach was used with an online individual semi-structured interview protocol as the data collection instrument to collect and analyse data gathered from the respondents’ individual interviews. A case study design was used with six participants (3 lecturers and 3 students) being sampled. The participants comprising three (3) Mathematics education lecturers, and three (3) Mathematics education students (preservice teachers) either in the first, second or third year of study in Mathematics education. Interviews were conducted online with the participants through Skype and Zoom. A thematic analysis was used to identify themes and patterns. The findings of the study revealed that the participants, understanding the use of social media, have transformed their teaching and learning in higher education institutions. Apart from making the shift from face-to-face teaching to teaching online using a technology-based independent mode to continue teaching in the Covid-era, lecturers have experienced academic wellbeing through a change in their pedagogy and teaching approaches as Mathematics lecturers. This change has ensured that students are exposed to a more student-centred approach through the use of social media platforms, which has enhanced students’ learning of Mathematics. Recommendations are made.

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**Introduction**

Teaching and learning continue to flourish on digital devices largely with the emergence of the Covid-19 pandemic which surfaced at the end of December 2019 in Wuhan city of China and has since spread globally. As a result, everything was shut down including institutional establishments like schools and universities. Several governments ordered institutions to switch, almost overnight, from conventional face-to-face to online teaching and virtual education for learners (Daniel, 2020). People, especially students, increasing began to use social media more than any previous time because they were confined to their homes, and hostels, had more free time, and most importantly, needed to stay connected. The situation thus called for education to be held on various virtual platforms either fully online or in a blended learning mode. For instance, practical usage of education supportive platforms such as WebEx, Webinar, Zoom, Google Meet, as well as Learning Management Systems (LMS) like Moodle, and Blackboard were used to support students’ learning during the lockdown (Bordoloi et al., 2020). This move has compelled the education fraternity to apply different innovative technological resources, tools and devices to acquire knowledge and skills and embark on research to provide solutions to societal challenges.

The extensive use of social media resources such as Facebook, YouTube, Twitter, LinkedIn, and WhatsApp, to name a few during the Covid-19 pandemic, appeals for a study to investigate teachers’ opinions of its influence on students’ performance in Mathematics. Furthermore, the use of social media, the internet, and other education supporting media is expected to transform the teaching and learning of Mathematics from a traditional face-to-face (F2F) mode to a technology-based independent mode where the basic focus is on developing the potential and creativity of the students in the best possible way.
Social media exposure and its impact on students has been major in recent times, raising concern for lecturers in Mathematics to ascertain its relevance on students’ academic performance, especially during the Covid-19 pandemic era. In a study on the influence of social media on EFL Yemeni learners in Indian Universities during the Covid-19 pandemic, Altam (2020) reports that some learners (10.8%) use social media for one to two hours daily whilst the majority (89.1%) use social media excessively with YouTube (81.7%) as the most frequently used app, Facebook (12.5%), WhatsApp (4.2%) and Twitter (1.7%). The researcher, therefore, concludes that learners spent more time on social media due to free and unlimited time during the pandemic, hence acquiring new information, knowledge, and skills that improved their performance. Other researchers examined the use of social media and its impact on students’ academic performance but found no significant relationship between using social networking and students’ academic performance (Hargittai & Hsieh, 2010; Ishfaq & Qazi, 2011) or that it was really a factor in students’ academic performance (Pasek et al., 2009). However, Karpinski (2009) pointed out that Facebook users devoted less time to their studies in comparison to non-users, and subsequently had lower GPAs (Grade Point Average). Karpinski (2009) also mentioned that among various unique distractions of every single generation, Facebook remains a major disturbance for the current generation. As to whether social media impacts students’ academic performance, this study envisages investigating and revealing lecturers’ perceptions of social media exposure and its influence on students’ Mathematics performance.

Social media and its network sites are increasingly attracting the attention of academic and industrial researchers intrigued by their affordances and spread. Regardless of the popularity of social media, few lecturers make use of these technologies for educational purposes (Murire & Cilliers, 2019) even though the use of social media in the classroom could ultimately be influenced and determined by the choices lecturers make. A number of studies have found that the majority of social media users are university students (Apeanti & Danso, 2014; Lenhart et al., 2010; Sponcil & Gitimu, 2013). However, the concerns lecturers share about students’ exposure, the use of social media and its influence on their academic performance, especially in the learning of Mathematics, is yet not known. Thus, how students access social media, how often students access social media, what students use social media for, concerns students have about the use of social media and the views of lecturers about the academic use of social media during the Covid-19 pandemic has not been documented. It is therefore necessary to investigate lecturers’ views of social media exposure and how it influenced students’ performance in Mathematics during the Covid-19 pandemic period.

To improve students’ learning, constructivist-oriented, ICT-enriched lessons (including social media tools and resources) have been introduced into classrooms worldwide (Orlando 2013). Previous studies by Orlando (2013), and Voogt et al. (2013) have explored the relationships between ICT and teaching practices. Among them, Voogt et al. (2013) have emphasized the need for ICT in twenty-first-century learning. However, Orlando (2013) argued that current teaching was not effectively adopting practices consistent with constructivist ICT-enriched learning environments and resources. Since social media creates a web-based or computer-mediated environment to facilitate students’ learning, there is a need to investigate lecturers’ perception of students’ social media exposure and its impact on their performance in Mathematics.

It is expected that the outcome of this study will document the level of awareness, exposure, and use of social media by lecturers and students in their academic activities which might inform policy reforms in the teaching and learning of Mathematics in higher education.

This study aims to establish the lecturer’s opinion on students’ social media exposure and its influence on their performance in Mathematics during the Covid-19 pandemic era. The main research question of the study is:

What are the perceptions of lecturers on students’ social media exposure and their (students’) performance in Mathematics?

**Literature Review**

**Theoretical and Conceptual Background**

There have been several studies reported in the literature about students’ use of social media in higher education (Apeanti & Danso, 2014; Peake & Reynolds, 2020; Selwyn, 2009; Sponcil & Gitimu, 2013). Social media platforms are amongst the most widely used sources of information in the world, with the relatively easy and inexpensive access to the internet and a large number of registered users on these platforms making them one of the easiest and most effective ways to disseminate information.

The collaborative and communal qualities of social media reflect much of what we know to be good models of learning in that it can be used to promote active participation of learners (Apeanti & Danso, 2014; Maloney, 2007). Whilst growing numbers of lecturers celebrate the potential of social media sites to re-engage learners with their studies, others fear that such applications compromise and disrupt students’ engagement with ‘traditional’ education provision (Apeanti & Danso, 2014; Selwyn, 2009). Hence, a study of this calibre helps to unravel the benefits as well as detriments associated with its usage alongside what lecturers and students perceive.

**The Use of social media in Education**

Social media is a group of Internet-based applications that allow individuals to create, collaborate, and share content with one another. For instance, Facebook, Twitter, and Wikis, along with open social practices, such as blogging, are beneficial in the teaching and learning environments in diverse ways (Murire & Cilliers, 2016; 2019). Murire and Cilliers (2019) deduce that regardless of the high popularity of social media for personal use, a low percentage of students and lecturers use them for educational purposes. Yet,
adopting social media in teaching and learning results in an improved output rate, student-lecturer interaction, student-centered learning and collaboration, and student engagement.

Lecturers can access social media’s untapped potential by incorporating it as part of the larger social collaborating strategy, beyond promotion. Social media, if used correctly, may help educational institutions, for example, Mathematics lecturers, to improve students’ academic performance through group activities, by sharing resources and information, by getting to know others, and by learning from them. Social media offers the capacity to radically change the educational system to better engage students rather than learners who are primarily passive observers of the educational process. However, some opponents suggest that social media may distract learners from their studies and could contribute to students becoming incapable of independent critical thinking (Churchill, 2009; Selwyn, 2009).

Social media also has the great advantage of rapid dissemination of educational content on its platforms such as YouTube and LinkedIn, which are increasingly being consulted as an information source in the Covid-19 era (González-Padilla & Tortolero-Blanco, 2020; Murire & Cilliers, 2019). González-Padilla and Tortolero-Blanco (2020) reported that when it comes to publications, studies have shown that the dissemination of scientific literature on social media platforms or network communities such as Facebook, Twitter, Hi5, LinkedIn, YouTube, WhatsApp, Snapchat, Instagram, and WeChat, to name a few, increases the number of downloads, queries, and citations of these articles (from 8-10) which are characteristics that have undoubtedly allowed rapid dissemination of knowledge worldwide, in addition to markedly reduced editorial times, which have gone from months of processing to days or weeks since its reception.

Students in recent times have been hugely exposed to social media and enjoy using it more often, which means that it could therefore be seen as one of the online learning platforms to derive benefits of learning outcomes for the teaching and learning of Mathematics. For instance, Mathematics projects could be given out to students who are put together in groups to share ideas, participate actively and work collaboratively which then could be considered as the most important activity when interacting online.

Social media educational platforms have the potential of helping students who are working in groups to perform task-oriented and socially-oriented projects. It is reasonable to assume that adult learners who have social networks of their own are less enthusiastic about building virtual social media networks. However, students who choose to work in groups, generally and online, may be people who already are 'visibility conscious', externally oriented, and strong in terms of Gardner’s interpersonal intelligence frames (Gardener 1985).

Conversely, Murire and Cilliers (2019) identified challenges that hinder the adoption of social media in higher education as inadequate ICT resources and data cost. Thus, referencing a situation in South Africa, authors reiterate that exorbitant data costs are always a concern for students who use their mobile phones to access information via social media. South Africa is one of the most expensive countries on the African continent when the cost of data is compared (Almeshal, 2015; Murire & Cilliers, 2019). Additionally, the use of social media and other recreational sites are often 'blocked' in computer laboratories at universities as a precaution to improve network speed and the productivity of students (Chetty, 2014; Murire & Cilliers, 2016). Gualtieri et al. (2015), and Stephanie and Vladlena (2014) found that the most important barrier to social media adoption and continued use is the lecturer’s computer and technology literacy skills. Another challenge identified is students’ unfamiliarity with specific social media applications that could be used for academic courses. Consequently, Mathematics lecturers must provide training, support, and encouragement to the students to make use of the technology. One of the institutional barriers is a lack of managerial support for social media integration in the academic setting. According to Murire and Cilliers’ 2019 study, managerial support seems the most critical factor as it provides the much-needed financial resources, develops a vision and plan for social media integration, and provides incentives and encouragement (Gualtieri et al., 2015).

Hence, Murire and Cilliers (2019) have identified the following critical success factors (CSFs) to enhance social media in the academic environment and take into account the various aspects that could hinder the successful incorporation of emerging technologies in the academic environment: Provide adequate resources, management support, introduce a champion, and provide sufficient training for lecturers.

**Lecturers’ Perceptions and Experiences of social media**

Lecturers’ perceptions and beliefs are crucial in facilitating students’ learning on social media platforms in this era where different digital tools, media and resources are used in support of all aspects of education. Since lecturers are key agents for any education development, it seems necessary to assess whether lecturers are supportive of their students’ exposure to social media utilization and how it impacts students’ performances in Mathematics.

Thus, lecturers influence the choice of and determine how social media could be used in the classroom. Bexheti et al. (2014) found that a lecturer’s attitude is a major enabling or disabling factor in the adoption of social media in teaching and learning. The authors further explained that lecturers who have positive attitudes towards social media are comfortable incorporating it into their teaching and learning. Hence, lecturers’ perceptions affect their delivery behavior and levels of participation in students’ online (social media) education activities. This is because lecturers might presume that students’ exposure to social media in the social context could greatly affect the nature of learning activities and outcomes (Bexheti et al., 2014). For instance, in a case where some students are more active than others, online discussions and activities might be of interest to some, but not to others, resulting in high performance...
at the expense of inactive ones. Therefore, an increase in students’ exposure and participation in social media online activities should be prioritized to suit students’ needs, focusing more on project work, information exchange, learning computer tools and communication skills, and building social networks. Wang (2004) deduced that the significant correlation between visibility and students’ overall grades confirmed the importance of being ‘visible’ and social in online courses. But the nature and extent of their online socialization need to be further investigated.

Lecturers have the responsibility for the success of inquiry-based learning, collaborative learning, critical thinking, problem-solving, creative thinking, meaningful use of digital tools and resources, and self-directed learning of their students as they are the decision-makers for how an inquiry approach is interpreted and adapted (Sang et al., 2018) in teaching and learning Mathematics. Researchers have also reported that the successful implementation of teaching strategies, such as self-regulated learning, depends on lecturers’ acceptance and willingness to make substantial changes to their teaching practices (Lombaerts et al., 2009; Yigit, 2014), including accepting students’ use of new technology applications. In addition, it is important for lecturers to fully understand the pedagogical values of new technologies related to their teaching subjects such as Mathematics. Teaching Mathematics requires lecturers’ pedagogical knowledge and how to deal with students’ problems and learning difficulties as well as lecturers’ subject content knowledge about knowing what to teach (Nantschev et al., 2020; Yigit, 2014). Consequently, lecturers should have knowledge of the appropriate educational technologies such as social media educational resources, and their potential in improving students’ performance in Mathematics.

Bordoloi et al. (2020) affirms that lecturers in India are currently participating in Facebook Live classes, resorting to Google classroom, uploading content on YouTube, teaching through WhatsApp and meeting apps such as Zoom, Cisco WebEx or Google Meet as an emergent response to the Covid-19 crisis. The authors reiterate that discussion is needed to ascertain whether such efforts are actually transforming the Indian educational system from the pedagogical point of view. Gualtieri et al. (2015) and Stephanie and Vladlena (2014) found that the most important barrier to social media adoption and continued use is the lecturer’s computer and technology literacy skills and thus, lack thereof inhibits their interest in the use of emerging technologies. Therefore, providing lecturers with the needed support and incentives could create a conducive environment for applying such technologies in their teaching practice.

Nantschev et al. (2020) suggest that the use of technologies in Mathematics teaching and learning can be classified into two dimensions such as domain-specific Mathematics software (for example, GeoGebra, https://www.geogebra.org/) and the general use of learning technologies (for example, social media, Moodle, https://moodle.org/) (Crawford et al., 2012). Mathematics-specific software applications are tools with the ability to increase students’ conceptual understanding of mathematical modeling, visualization, and simulation (Young, 2016), which could be available on social media educational resources. Studies indicate that the integration of technology in teaching has the potential of moving teaching towards a more student-centered approach (Nantschev et al., 2020; Tondeur et al., 2017). Hence, an innovative teaching approach geared toward student-centeredness (such as problem-based learning) ought to be adopted and developed to enhance the teaching and learning of Mathematics. Additionally, Nantschev et al. (2020) who based investigated teaching approaches and educational technologies in teaching Mathematics in higher education, observed a strong need for continuous training of Mathematics lecturers in the use of technology in teaching, especially in fostering student-centered teaching. Additionally, there ought to be a promotion of Mathematics lecturers’ awareness of current technologies that can support content-related pedagogy. It is therefore argued that social media educational supportive resources have the potential of supporting Mathematics content-related pedagogy and improving students’ performance.

**Students’ Perceptions of Social Media**

Negative perceptions about the possible effects of social media on students’ academic performance have been reported (Tham & Ahmed, 2011). However, a study by Baran (2010) revealed that students found it quite appropriate for a lecturer to use Facebook, and for lecturers and students to socialize by this means. Students also believed that such tools could allow them to share knowledge in formal education contexts. A related study by Churchill (2009) also showed that the use of blogs, and social media education sites, facilitated a useful learning atmosphere. However, some students perceive that social networking sites interfere with their personal space and do not want their studies to intrude into this space. The students often cite privacy concerns as a reason for not wanting to participate in social media activities in the classroom (Murire & Cilliers, 2019).

A study conducted by Peake and Reynolds (2020) among the lecturers and students of the University of Bordeaux, France during the pandemic, reported that the virtual language center at the university was established to ensure that students benefit from social media that would direct them to useful resources and to create an online virtual community to keep communication open among all those who had been involved. A similar approach could be adopted by lecturers in Mathematics instructional delivery to enrich learning and students’ performance. In another study conducted on students’ use of social media in higher education in Ghana, Apeanti and Danso (2014) conclude that students have a positive view of the use of social media for academic purposes. Therefore, policymakers in higher education institutions in Ghana ought to consider creative ways of restructuring the methods of content delivery and learning activities in order to incorporate the use of social media to extend lecturer-student contact hours.

Social media has the tendency to increase students’ motivation to build their mathematical skills and raise students’ performance levels in Mathematics. Consequently, higher education institutions should focus on improving teaching quality, enhance the support provided to students through social media education programmes to overcome their difficulties and misapprehensions of how to learn
Mathematics, and enrich practice with engaging teaching techniques. For instance, lecturers’ delivery of Mathematics instruction could introduce students to problem-based learning - an active pedagogical student-centered learning method that empowers students to conduct research, integrate theory and practice and apply knowledge and skills to develop a viable solution to a defined problem (Nantschev et al., 2020; Savery, 2006). This approach prompts students to search for new sources of information to solve mathematical problems that cannot be resolved with their current knowledge. Hence, students, in an attempt to address challenges faced in learning Mathematics, will undoubtedly resort to social media and use it more wisely without abolishing the time spent on that platform. Another aspect is that students learn from each other therefore, working in groups is another fundamental aspect of problem-based learning which is an advantage that social media offers its users.

Students perceive YouTube as the most commonly-used social media for learning the English language especially for improving their fluency and their listening skills; thus, their attitude towards social media platforms as a pedagogical tool is positive. Students feel that their interaction with lecturers and classmates is improved and this improvement leads to overall improvements in their academic performance. Altum (2020) concludes in his studies on the influence of social media on EFL Yemeni learners in Indian Universities during the Covid-19 pandemic. However, some students confessed that frequent use of social media wastes much of their time because they do not register the passage of time when using social media, especially when chatting with friends. Hence, time management skills and self-discipline must be applied to use social media in a meaningful manner to achieve the learning objectives.

Conceptual Framework

The adoption and application of Garrison et al.’s (2000), Community of Inquiry (CoI) model for this study, aimed at understanding learners’ social media exposure and its influence on their performance in Mathematics vis-a-vis lecturers’ perceptions. The CoI framework was adapted to guide the research and practice of online learning, applicable in social media learning in the larger sector of education. The framework is grounded in a critical, collaborative learning community consistent with the ideas of higher education. Garrison and Vaughan (2008) explain that the CoI is a comprehensive yet sparingly understandable and widely-used framework, giving meaning to community and inquiry. Thus, the community recognizes the social nature of education and the role that interaction, collaboration, and discourse play in constructing knowledge. For instance, social media creates a community of its own among learners to interact, collaborate, construct and acquire new mathematical concepts. The inquiry also reflects the process by which learners construct meaning through personal responsibility and choice in their use of diverse resources found on social media platforms. The CoI model states that learning occurs in a community of lecturers and students through the interaction of cognitive, social, and teaching presence; thus, the three key elements necessary for a viable community of inquiry are a social presence, a teaching presence, and a cognitive presence. In the teaching and learning of Mathematics, it is crucial to engage students in improving their performance during this era where digital devices are used most often by students on diverse technological platforms including social media. Hence, in order to engage students in online courses, the critical factors in each domain need to be well attended to encourage students’ cognitive, emotive, and social presence in an online learning environment (Wang & Kang, 2004) and in this case, students’ exposure to social media.

Cognitive Presence

Learners’ understanding in any subject taught is a highly complex cognitive activity that requires knowledge application in multiple domains (Resnick, 1987; Shulman, 1987). Lecturers need to adopt and apply cognitive knowledge of emerging technology-mediated resource use in teaching and learning. This should result in learners’ application of complex cognitive activity that helps in executing the problems at hand. Lecturers could support students’ critical thinking by motivating students to think about other possible ways of understanding what they are learning. Self-directed learning support is given to students by the lecturer to check their progress when they study. For instance, various social media educative platforms such as Wiki and YouTube create an opportunity for students’ own self-directed learning and generate and construct new ideas out of the concepts learned. Lecturers’ support of students’ creative thinking in the mathematics class is done by letting students create different mathematical solutions for a problem.

Social Presence

Social presence, as explained by Garrison et al. (2000), creates an atmosphere for social interaction and collaboration which shapes and tests meaning, thus enriching understanding and knowledge sharing (Garrison & Vaughan, 2008). Its application to students’ performance in the learning of Mathematics requires student engagement where there will be interaction, social networking, and a learning community. Social media technologies provide convenient communication, collaboration, and sharing of information with peers in the classroom, subject experts, and peers outside the class (Bexheti et al., 2014; Staephanie & Vladlena, 2014). Thus, social media has the potential to engage students from diverse angles to share new ideas and mathematical concepts through interaction, discussion forums, and drop box, among others (Gualtieri et al. 2015). In particular, the provision of socialization is considered essential for a fun and successful learning experience in technology-mediated learning situations such as online learning, blended learning (Bersin, 2004) and social media learning.

Social media learning technology helps students to create a learning community, to easily construct knowledge and to share it with other members of a group through instant messaging. The presence of the online instructor in the social media platform has added value in the learning process where the online instructor facilitates learning. Lecturers ought to give support of students’ use of social
media resources, such as searching for useful information on the Internet to facilitate their learning (Sang et al., 2018) and to actively construct meaningful understanding in the mathematics class.

Teaching Presence

Learning is becoming more personal and is increasingly based on online social interactions that enable collaborative, networked and portable processes. During delivery of instruction, lecturers’ support of students’ authentic problem-solving development in the mathematics class via social media platforms is crucial as it allows students to investigate the reasons that give rise to real-world problems mathematically. Lecturers have the opportunity to facilitate students’ collaborative learning in Mathematics class by giving constructive feedback as well as incorporating helpful comments from other classmates in a formative manner. Conversely, Almeshal (2015) reveals that some lecturers find it challenging to utilize social media in teaching activities because there is a shortage of ICT infrastructure at universities.

In a study exploring the correlational analysis of student visibility and performance in online learning, Wang (2004) concluded that visibility seems to affect students’ performance on certain tasks that require more social or teaching presence, such as communication and collaboration with others (group cohesion). This finding is consistent with the existing knowledge base on visibility and learning outcomes (Picciano, 2002). Wang (2004) attests to the fact that students attempt for more visibility to feel more part of a learning community becoming comfortable with its discourse styles. It is therefore argued that the sense of community and discourse styles should not have discouraged students from being interactive and visible online.

Research and Methodology

In this study, the researchers adopted a qualitative approach to collect and analyze data gathered from the participants through interviews. A qualitative study focused on social processes and the meanings which respondents attribute to social situations. McMillan and Schumacher (2010) state that a qualitative study is imperative for theory generation, policy development, and improvement of good teaching practices. This qualitative research was an inquiry into the perceptions of lecturers’ perceptions of students’ social media exposure and their performance in Mathematics conducted through face-to-face situations by interacting with selected respondents in their natural settings.

Population and Sampling

The current study involved social interaction in the field with the subjects of the study. In this regard, the study’s population was drawn from lecturers and students of the Faculty of Education in one particular university in the country because of the interest of the phenomenon being studied. For this study, the population was narrowed down to ten (10) lecturers and ten (10) students, totaling 20 participants. Purposive sampling techniques were used in selecting the university and the respondents that have some understanding of the phenomenon being studied. The selection was guided by the pre-selected criteria relevant to the research question (for instance: a lecturer teaching Mathematics education, and students studying Mathematics education). The sampled participants comprised of three (3) Mathematics education lecturers, and three (3) Mathematics education students (preservice teachers) either in their first, second, or third year of study in Mathematics education.

Instruments and Data Collection Procedure

In this study, semi-structured individual interviews were conducted to collect the data from the sampled participants from one selected university in the country. Interviews were conducted online with the participants through Skype and Zoom to collect first-hand data. An open-ended interview schedule was developed to guide the interviews which were conducted in a semi-structured manner to allow for more flexibility between the researchers (the interviewers) and the participants (the interviewees). Interviews were also used to check how lecturers embarked on their teaching and learning or recorded/documentated/captured official information on their systems during the pandemic. The students were also interviewed to check any problems they faced if any, during the Covid-19 era about how they were able to attend classes/lectures, the lecturer’s attendance in class, how they managed to do their assignments/tests on time, and how their lecturers responded/managed their queries/problems during this period. Interview questions were given to an expert in the field of online learning for comments and critique before finally conducting the interviews with the participants.

Data Analysis

A thematic approach was adopted to analyze the data as it is simple to use and “a qualitative analytical method which identifies analyses and reports patterns (themes) within data” (Braun & Clarke, 2006). The interviews were recorded and then transcribed verbatim for flexible analysis. In analyzing the data, segments of data were coded, then categories were identified and further developed into themes. In order to conform to the agreement of research during the signing of the consent forms before the commencement of the study, the interviewees were assigned acronyms; for instance, MEL 1, MES 2, etc., were used to represent Mathematics Education Lecturer 1 and Mathematics Education Student 2 and so on.

Validity and Reliability

To enhance validity, the researcher ensured accurate capturing by mechanically recording the data and taking notes as discussions went on. Data were later transcribed verbatim and to ensure the quality of data, participant checking was used to confirm with the
participants that the data was what the research participants meant. Reliability was addressed by a combination of the following strategies: verbatim accounts of conversations, transcripts, and direct quotes from interview documents.

Data Presentation, Analysis, and Discussion of Findings

Data collected from interviews were analyzed through content analysis and presented using tables and words. Formulated themes and sub-themes are linked with the objectives of the study. Direct transcriptions are found in Table 1-10 in the Appendices indicating both lecturers’ and students’ responses (MED1-3 and MED 1-3). Table 1 to 2 illustrate the raw data captured from the participants’ transcripts respectively, while Table 1 records both lecturers and students’ responses (MEL 1-3 and MES 1-3).

Table 1: Response and Theme for Question 1 - What do you understand by the term students’ social media exposure?

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEL 1</td>
<td>Student’s social media exposure is whereby students have access to social media items/resources such as cell phones, television, computers etc used for watching social media items like movies, soaps, teaching and learning etc that influence their way of living. It gives them the opportunity to learn so many things to improve/influence their lives either positively or negatively.</td>
<td>Meaning of social media exposure</td>
</tr>
<tr>
<td>MEL 2</td>
<td>Err when you are talking of students’ social media exposure, it means that students use Facebook, WhatsApp, etc either for teaching and learning or for playing with their peers.</td>
<td></td>
</tr>
<tr>
<td>MEL3</td>
<td>Social media exposure is the extensive use of social media resources such as Facebook, YouTube, Twitter, LinkedIn, WhatsApp etc communication and other purposes.</td>
<td></td>
</tr>
<tr>
<td>MES1</td>
<td>Is an environment or a space whereby students use Skype, twitter, Facebook, WhatsApp, etc either for learning and teaching, and get information from peers.</td>
<td></td>
</tr>
<tr>
<td>MES 2</td>
<td>This is whereby students use internet, Facebook, YouTube, Twitter, LinkedIn, WhatsApp etc to support their learning especially maths by finding out useful information on the Internet especially when they are given assignments during the Covid-19 period.</td>
<td></td>
</tr>
<tr>
<td>MES 3</td>
<td>Is the extensive use of social media resources like (Facebook, YouTube, Twitter, LinkedIn, WhatsApp etc for communication and other purposes to support their teaching and learning.</td>
<td></td>
</tr>
</tbody>
</table>

The subsequent tables record the lecturers’ responses (MEL 1-3).

Table 2: Question 2 - What is the impact of students’ exposure to social media on your experiences of teaching Mathematics?

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEL 1</td>
<td>Social media exposure has transformed my academic wellbeing and teaching approaches as a Mathematics lecturer.</td>
<td>Transformation of teaching and learning approaches (Impact of social media exposure)</td>
</tr>
<tr>
<td>MEL 2</td>
<td>It has helped me to change my style of teaching by presenting my lessons through Skype and Zoom which are new learning for me.</td>
<td></td>
</tr>
<tr>
<td>MEL3</td>
<td>It has helped me to improve my teaching methods since I have to present my lessons through electronic Blackboard, Zoom and Skype</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Question 3 - What are your perceptions as a lecturer, of the use of social media in the teaching of Mathematics?

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEL 1</td>
<td>Students’ social media is really good for teaching and learning of Mathematics. It gives opportunity for students to be deeply involved in the teaching and learning process since they have to look for information for their online assignments and tests.</td>
<td>Lecturers’ perceptions of social media on maths teaching</td>
</tr>
<tr>
<td>MEL 2</td>
<td>It’s good because it equips you technologically to teach your students online but time consuming in the sense that it requires both internal and external interventions from people like CLTD to provide possible assistance/solutions to integrating technologies in the classroom teaching and learning. This is good because it has given us first-hand experience and helped the students to perform better in Maths as they get more information from social media which is not all that common to lecturers.</td>
<td></td>
</tr>
<tr>
<td>MEL3</td>
<td>It’s good because it supports teaching and learning especially during this Covid-19 era, because it has helped us to teach online which help students to perform well in Maths. Thus, the lecturer only becomes a facilitator and students collaborate and construct their own learning with support or guidance from the lecturer and peers.</td>
<td></td>
</tr>
</tbody>
</table>
Table 4: Question 4 - What is the impact of social media exposure on your students’ learning of Mathematics and performance in the subject?

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEL 1</td>
<td>To me, students’ social media exposure has positively influenced their learning of Maths and performance because their performance in Maths has improved during this Covid-19 era.</td>
<td>Social media exposure on Mathematics learning</td>
</tr>
<tr>
<td>MEL 2</td>
<td>It has negatively influenced their learning of Maths since they copy from their peers when you give them any assignment. However, their performance has improved.</td>
<td></td>
</tr>
<tr>
<td>MEL 3</td>
<td>Social media exposure has helped students academically and has helped to improved their performance this time as they retrieve information from Facebook, YouTube, Twitter, LinkedIn, WhatsApp etc.</td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Question 5 - Would you recommend students’ social media exposure to any colleague in either Mathematics department or any other department? Explain your response.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEL 1</td>
<td>Yes, I will do that because it supports teaching and learning</td>
<td>Recommendation of social media exposure to colleagues/peers</td>
</tr>
<tr>
<td>MEL 2</td>
<td>No, because you become disadvantaged in Maths class if you don’t have the resources during Covid-19.</td>
<td></td>
</tr>
<tr>
<td>MEL 3</td>
<td>Yes, because it helps students to share information through Facebook, YouTube, Twitter, LinkedIn, WhatsApp etc communication and other purposes.</td>
<td></td>
</tr>
</tbody>
</table>

Table 6: Question 6 - How would you describe your interaction with your students during Covid-19 and how did it influence your teaching and learning of Mathematics and student’s performance?

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEL 1</td>
<td>Interaction with students is not good as compared to face-to-face type of teaching since you sometimes struggle to get students on board for online teaching during Covid-19 era since some of them do not have resources unlike face-to-face kind of teaching where you meet them daily. However, it has improved my teaching of Maths and students’ performance has improved since they have been doing only online tests and assignments.</td>
<td>Lecturers’ interaction with students during Covid-19</td>
</tr>
<tr>
<td>MEL 2</td>
<td>Interaction with students is good for me since they always receive notification ahead through their cell phones and internet during this Covid-19 era. This has helped me in the teaching of Maths as they always look for information themselves on internet, WhatsApp etc and therefore their performance has improved.</td>
<td></td>
</tr>
<tr>
<td>MEL 3</td>
<td>Students’ exposure to social media has supported my interaction with students since they always communicate information with their peers on their chart platforms. Hence, it has positively influenced my teaching of Maths and therefore improve students’ performance in Maths.</td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Question 7 - What is your experience of the impact of social media exposure on teaching Mathematics?

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 2</td>
<td>To me, students’ social media exposure has positively influenced our learning of mathematics and performance as we could share information on social media for our assignments at all times and has helped us especially myself to perform well in maths which was not the same before Covid-19 era.</td>
<td>Experience of the impact of social media exposure on teaching Mathematics</td>
</tr>
<tr>
<td>MES 1</td>
<td>As for me, I have nothing to complain at this moment because my performance in maths have improved drastically as compared to pre-covid-19 era because we share ideas on social media at all times with my peers.</td>
<td></td>
</tr>
<tr>
<td>MEL 3</td>
<td>Social media exposure has helped me and my study mates academically since everything is done online and you have ample time to submit your assignments which gives you an opportunity to such for relevant information online on like the face-to-face type of teaching which constraints student’s freedom and pressure to such for information on WhatsApp, Facebook, YouTube, Twitter etc.</td>
<td></td>
</tr>
</tbody>
</table>
Table 8: Question 8 - Would you recommend social media exposure to any of your peers in either the Mathematics department or any other department? Explain your response.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES 1</td>
<td>Yes, because it helps students to share information on Facebook, YouTube,</td>
<td>Recommendation of social</td>
</tr>
<tr>
<td></td>
<td>Twitter, LinkedIn, WhatsApp etc communication and other purposes.</td>
<td>media exposure to peers</td>
</tr>
<tr>
<td>MES 2</td>
<td>Yes, I will do that because it supports teaching and learning</td>
<td></td>
</tr>
<tr>
<td>MES 3</td>
<td>No because you become disadvantage in maths class if you don’t have the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>resources during Covid-19.</td>
<td></td>
</tr>
</tbody>
</table>

The subsequent tables record the students’ responses (MES 1-3).

Table 9: Question 9 - How would you describe your interaction with your Mathematics lecturer(s) during Covid-19 and how has it influenced your learning of Mathematics and performance?

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES 1</td>
<td>I have had a very fruitful interaction with my lecturers since Covid-19</td>
<td>Students’ interaction</td>
</tr>
<tr>
<td></td>
<td>pandemic. Is not good as compare to face-to-face type of teaching since you</td>
<td>with Mathematics</td>
</tr>
<tr>
<td></td>
<td>sometimes struggle to get students on board for online teaching during Covid-</td>
<td>lecturer during Covid-19</td>
</tr>
<tr>
<td></td>
<td>19 era since some of them do not have resources unlike face-to-face kind of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>teaching where you meet them daily. However, it has improved my teaching</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of maths and students’ performance has improved since they have been doing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>only online tests and assignments.</td>
<td></td>
</tr>
<tr>
<td>MES 2</td>
<td>Interaction with my maths lecturer has not been too bad since we get access</td>
<td></td>
</tr>
<tr>
<td></td>
<td>to him in most of our contact sections and he also responds to our emails.</td>
<td></td>
</tr>
<tr>
<td>MES3</td>
<td>Interaction with my maths lecturer been very good because we do get feedback</td>
<td></td>
</tr>
<tr>
<td></td>
<td>from him and update of what is happening and what is to happen in class at all</td>
<td></td>
</tr>
<tr>
<td></td>
<td>times and has supported our performance in maths. This is what we need as</td>
<td></td>
</tr>
<tr>
<td></td>
<td>students.</td>
<td></td>
</tr>
</tbody>
</table>

Table 10: Question 10 - How has social media exposure influenced your learning of Mathematics in your class?

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Response</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>MES 1</td>
<td>It has positively influenced my learning of Maths because I can easily get more</td>
<td>Influence of social</td>
</tr>
<tr>
<td></td>
<td>information on the internet to assist in my assignments.</td>
<td>media exposure on learning</td>
</tr>
<tr>
<td>MES 2</td>
<td>It has changed my academic learning style and improved my academic</td>
<td>of maths</td>
</tr>
<tr>
<td></td>
<td>wellbeing and ways of learning Mathematics in a simple manner.</td>
<td></td>
</tr>
<tr>
<td>MES3</td>
<td>It has negatively influenced my learning of Mathematics as I have no social</td>
<td></td>
</tr>
<tr>
<td></td>
<td>media resources like Facebook, YouTube, Twitter, LinkedIn, WhatsApp etc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>for communication purposes at home since there is no network to support its</td>
<td></td>
</tr>
<tr>
<td></td>
<td>use even though it is good</td>
<td></td>
</tr>
</tbody>
</table>

Discussion of Findings
The data from the participants’ interviews were analyzed and are presented below as themes that emerged from the analysis.

Theme 1: Explanation of exposure to social media

The findings of the study revealed that the participants (both lecturers and students) had a good understanding of students’ exposure to social media in the teaching and learning process during the Covid-19 pandemic. The interviewees explained exposure to social media as a situation whereby students use apps such as Skype, Twitter, Facebook, and WhatsApp either for learning or for communicating information to peers at any time. Interviewee MEL1 qualifies that explanation by indicating that students’ exposure to social media is when students have access to social media devices such as cell phones, television, computers, iPads or Smartphones used for watching social media items like movies and soaps, but also for accessing teaching and learning resources that influence their way of learning. MES 3 states that it is a virtual environment or a space in which students use Skype, Twitter, Facebook, and WhatsApp, either for teaching and learning or to source information from peers. It gives the students the opportunity to learn so many things from their peers to improve/influence their lives either positively or negatively.

The explanation given by the interviewees (both lecturers and students) shows that they do understand what students’ exposure to social media means, and it is about using the internet, and apps such as Facebook, YouTube, Twitter, LinkedIn, and WhatsApp to support their learning of Mathematics. During the Covid-19 pandemic, lecturers were forced to shift from face-to-face to online teaching and learning to ensure that learning continued during this time as social distancing was necessary to curb the spread of the virus. This is in line with a statement by Daniel (2021) that several governments ordered institutions to switch, almost overnight, from conventional face-to-face to online teaching and virtual education for learners to avoid the spread of Covid-19. In the same
way, a study conducted by Altam (2020) during the Covid-19 pandemic in India, reports that learners spent more time on social media due to free and unlimited time during the pandemic hence acquiring new information, knowledge, and skills to improve their performance. This means that teaching and learning Mathematics would not have been effective if participants of this study had no idea of students’ exposure to social media.

**Theme 2: The impact of social media exposure on the transformation of teaching and learning approaches**

With regards to theme two, all three lecturer interviewees indicated that students’ exposure to social media has helped them to transform their teaching approaches in the teaching of Mathematics. Since they can no longer embark on face-to-face teaching and learning, there has been a shift in their teaching approach so that it works in a virtual environment.

**MES1: Social media exposure has transformed my academic well-being and teaching approaches as a Mathematics lecturer.**

It is evident that students’ exposure to social media has influenced the academic well-being and teaching and learning methodologies of lecturers and consequently, the way in which they teach Mathematics. Lombaerts et al. (2009) indicated that successful implementation of teaching strategies, such as self-regulated learning, depends on lecturers’ acceptance and willingness to make substantial changes to their teaching practices including accepting students’ use of new technology applications such as social media. In addition, the move to online teaching has also had a positive effect on students:

**MES2: It has changed my academic learning style and improved my academic well-being and ways of learning Mathematics in a simple manner.**

A further two students indicated that their exposure to social media has helped them to improve their learning of Mathematics because they have access to information on the internet for their assignments and can interact with their peers on the various online platforms and collaborate on group projects. This is affirmed by the adoption and application of the Community of Inquiry model created by Garrison et al. (2000) which supports learners’ exposure to social media and its influence on their performance in Mathematics and guides the practice of online learning.

Gualtieri et al. (2015) state that the use of social media platforms has the potential to engage students from diverse contexts to share new ideas and Mathematical concepts through interaction, discussion forums, and Dropbox, amongst others.

Because the pandemic shutdown was quick and the decision to move onto a virtual platform was swiftly achieved, some lecturers and students might not have been prepared, which in a country such as South Africa, with vast numbers of students living in rural areas, might have presented problems and challenges. For example, MES3 stated that it negatively influenced his/her learning of Mathematics since there was no connectivity and thus access to a network to support its use was compromised with apps such as Facebook, YouTube, Twitter, LinkedIn, and WhatsApp.

When other researchers such as Hargittai and Hsieh (2010), and Ishfaq and Qazi (2011) examined the use of social media and its impact on student’s academic performance, they found no significant relationship between using social networking and students’ academic performance or a factor in students’ academic performance (Pasek et al., 2009). It could be that the potential of social media use in the academic setting has not been fully developed and enculturated so that collaborative learning becomes the norm to assist in improving students’ academic performance.

**Theme 3: Lecturers’ perceptions of the use of social media in Mathematics teaching**

The study revealed that lecturers have positive perceptions of the use of social media and its contribution to the teaching of Mathematics during the Covid-19 era. The participants indicated that the move to online teaching has forced them to become more technologically equipped for teaching their students through social media. Thus, the lecturer only becomes a facilitator and students collaborate and construct their own learning with support or guidance from the lecturer and peers. However, the shift in pedagogy in the teaching of Mathematics to a virtual environment has proven to be time-consuming especially if lecturers had not previously been using technology in their face-to-face lectures.

**MEL3: It’s good because it supports teaching and learning especially during this Covid-19 era because it has helped us to teach online which helps students to perform well in Maths.**

Thus, the lecturer only becomes a facilitator and students collaborate and construct their own learning with support or guidance from the lecturer and peers. However, some lecturers were challenged technologically but developed their skills with support:

**MEL2: It’s good because it equips you technologically but time-consuming in the sense that it requires both internal and external interventions from people like CLTD to provide possible assistance/solutions to integrating technologies in the classroom teaching and learning.**

This aligns with Almeshal (2015) who reveals that some lecturers find it challenging to utilize social media in teaching activities because of a shortage of ICT infrastructure at universities.
It seems that even though there have been some challenges in making the shift from face-to-face classrooms to a virtual online environment, the use of social media apps in online teaching during the Covid-19 era has yielded positive results in both lecturers and students.

**Theme 4: Recommendation of social media exposure to colleagues/peers**

The study revealed that all the participants unanimously agreed that having made the shift to online teaching through social media apps, they would recommend this move to their colleagues and peers due to the benefits they have acquired.

MES3: *Yes, I will do that because it supports teaching and learning.*

MEL2: *Yes, because it helps students to share information on through Facebook, YouTube, Twitter, LinkedIn, WhatsApp, etc., communication and other purposes.*

Studies have shown that social media technologies provide convenient communication, collaboration, and sharing of information with peers in the classroom, subject experts, and peers outside the class (Bexheti et al., 2014; Stephanie & Vladlena, 2014).

**Theme 5: Lecturers’ interaction with students during Covid-19**

The lecturers indicated that their interaction with students during the Covid-19 pandemic was fruitful and encouraging. Lecturers indicated that interaction with their students is very important for effective teaching and learning of Mathematics. However, in an online platform, it is not only the lecturer’s voice that is heard but through a COI, peers interact, share information, and collaborate. Thus, students use of social media resources assists in actively constructing meaningful understanding in the Mathematics class.

MES3: *Students’ social media exposure has supported my interaction with students since they always communicate information with their peers on their chart platforms. Hence, it has positively influenced my teaching of Maths and therefore improved students’ performance in Maths.*

Connectivity and access to the internet offer students the opportunity to search for information that would facilitate their learning (Sang et al., 2018).

In addition, through the online platform, lecturers are able to interact with their students more frequently and give immediate feedback:

MES2: *Interaction with my Maths lecturer has been very good because we do get feedback from him and update of what is happening and what is to happen in class at all times and has supported our performance in Maths. This is what we need as students.*

Interaction is one of the most important elements of online learning and feedback given by the lecturer and peers helps improve students’ performance.

**Conclusion**

In conclusion, the findings of the study revealed that the participants understand that the use of social media has transformed their teaching and learning in higher education institutions. Apart from making the shift from face-to-face teaching to teaching online using a technology-based independent mode to continue teaching in the Covid-era, lecturers have experienced academic well-being through a change in their pedagogy and teaching approaches as Mathematics lecturers. This change has ensured that students are exposed to a more student-centered approach through the use of social media platforms which have enhanced students’ learning of Mathematics. However, as with change, some negative aspects have arisen particularly connectivity and thus access to a network to support social media apps such as Facebook, YouTube, Twitter, LinkedIn, and WhatsApp resulting in students not having the same input to support their learning of Mathematics. The study, therefore, recommends that as the use of social media in online teaching and learning of Mathematics has benefits for both lecturers and students, materials and resources should be made available for its effective use, particularly in developing countries.

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**Data Availability Statement:** The data presented in this study are available on request from the corresponding author. The data are not publicly available due to restrictions.

**Conflicts of Interest:** The authors declare no conflict of interest.
References


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