

# WhatsApp as a tool for Building a Learning Community

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**Abstract:** WhatsApp groups are considered useful for creating and supporting virtual communities. This mixed method case study explores the patterns that emerged when we used WhatsApp to create a community of learning during the multimodal presentation of a postgraduate course in research proposal writing. Three questions drive the study: (1) What kinds of messages were sent? (2) Who participated and how? (3) How did the learners experience the use of WhatsApp in support of the community of learning? Data were collected during the presentation of a five-evening proposal writing workshop that was conducted using Zoom, WhatsApp, and YouTube as communication platforms. To answer the first question, all WhatsApp messages were analysed through both manual (individual) and automated (meta) content analysis. The third question was answered by analysing students' responses to the end-of session online questionnaire that was administered via Google Forms. Results indicate that many messages were administrative in nature, while the most notable academic messages concerned a discussion of empirical research, research paradigms, and research design. The presenter and co-presenter together accounted for almost half of the messages sent, and the other messages were evenly distributed between members of the class, with five notably vocal students. Student responses indicated that they liked the high level of interactivity and the content, but that they disliked the time it took to form groups. The paper contributes to the literature by showing how this use of multiple WhatsApp groups was effective in creating a sense of community by facilitating access, relationships, vision, and function (West and Williams, 2017). More research is needed in determining the extent to which students might support one another with conversations outside of the main WhatsApp group.

**Keywords:** COVID-19 pandemic, Emergency remote teaching, blended learning, WhatAspp, Zoom, student engagement

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## 1. Introduction

At a contact university, it is easy to create a sense of community in a classroom using group-work and emphasising common tasks. In a distance-situation, students seldom get to mingle. This paper reports on a course where WhatsApp was used to create a feeling of community among a group of former contact students during the pivot to emergency remote learning brought on by the COVID-19 pandemic. We present an analysis of the WhatsApp messages sent during a five-day workshop, to show what patterns of use emerged.

In May 2020, at the height of the COVID-19 lockdown in South Africa, the authors were asked to present a one-week introductory workshop on proposal writing to a group of new Masters' and Doctoral students enrolled at a university of technology. It was early in the academic year and many students were not yet registered on, or familiar with the university virtual campus. In keeping with the institutional policy of *No student left behind*, we taught using the least available resources. Given widespread access to WhatsApp, and its low bandwidth advantage, we decided to host the workshop via the app's group chat feature. One hundred and fifteen students joined the group, and the workshop ran for one work week, from 17h00 to 20h00 every evening. The contribution of this paper lies in its presentation of a case in support of building a community of learning (Leonardi, 2017; Garrison, Anderson and Archer, 1999) using WhatsApp (Madge et al., 2019).

## 2. Research aims, objectives, and questions

The aim of this research was to uncover the elements that contributed to building a community of learning. The sudden move to emergency remote teaching in our context potentially undermined the learning experience. Our university has historically been a contact institution offering face-to-face learning. We had to establish whether and how learning occurred at a distance through a text-based instant messaging system. Although our findings cannot be generalised, we present them hoping they might resonate with the experiences of others and contribute to the unfolding stories of disruptive innovations resulting from the pandemic. We contribute to the emerging literature on facilitating communal distance learning through inexpensive, synchronous tools, in the

context of extreme disruption. Similar work was done in neighbouring countries (see Maphosa, Dube and Jita, 2020; Martins et al., 2021; Tarisayi and Munyaradzi, 2021.) There is little literature in the South African context (see Hedding et al., 2020). Collectively these cases can improve our understanding of those factors and patterns that affect student learning and community building at a distance.

Three questions drove this study:

1. What kinds of messages were sent?
2. Who participated and how?
3. How did the students experience the workshop?

The objectives with these questions were: Firstly, to see how the course unfolded, and which events in the course accounted for what types of messages. How many messages were technical or administrative in nature? How many were of an academic nature and what kind of topics did they cover? Secondly, to determine patterns of participation, to see how many students participated, whether some students overpowered others, and how some students were in the group without sending messages. We were also interested in the ratio of messages sent by the presenters versus those sent by the students. Finally, we wanted to know how the students experienced the learning event: what they liked, how we could improve, and what outcomes did they achieve?

### 3. Literature survey

This literature survey provides background regarding online learning communities, next-generation pedagogy, and WhatsApp at university.

#### 3.1 Online learning communities

The socio-constructivist use of educational technology has seen the emergence of online or virtual communities, since learning is a shared, participatory activity, where “interpersonal transactions mediate the exchange of knowledge” (Ke and Hoadley, 2009, p.488). Learning communities are “a learning atmosphere, a context providing a supportive system from which sustainable learning processes are gained through a dialogue and collaborative construction of knowledge by acquiring, generating, analyzing, and structuring information” (Carlen and Jobring, 2005, p.273). Online communities need “commitment; connection to others; reciprocity; interaction; agency and consequences” (Hammond, 2017, p.118). Problem-based learning is a vehicle for building learning communities (Childs et al., 2015). Building a community requires a “therapeutic” facilitator (Bluteau, 2020). Therapeutic presence is a combination of social, cognitive, and teaching presence (Garrison, Anderson and Archer, 1999). Our analysis considers the activities of the two facilitators and the social dynamics such as the composition of groups that influenced how users share knowledge (Kwayu, Abubakre and Lal, 2021).

We use West and Williams’s (2017) four “defining characteristics” of (online) learning communities: access, relationships, vision, and function. *Access* goes beyond physical or geographic space and refers to the *presence* of community members. Types of ‘presences’ include cognitive, social, and teaching presence, as per the Community of Inquiry model (Garrison, Anderson and Archer, 1999). *Relationships* extend beyond virtual-physical access and presence. Relational boundaries are critical and may include a sense of belonging, interdependence, and trust (West and Williams, 2017), while “[t]he effective use of an online social media network to support a virtual community of practice is dependent on the participants’ awareness of the context within which the community exists and the willingness of the participants to accept differing views and opinions” (Moodley, 2019, p.1). *Vision* or ‘sense of purpose’ refers to a collective identity and shared image of the group’s function (West and Williams, 2017). Developing a core vision involves negotiating a common language and agenda to achieve the overarching learning goal(s). The boundaries between real and virtual environments are blurred when “WhatsApp is used ... as a key component (in) their way of dwelling with others” (O’Hara et al., 2014, p.1142). *Function*, or functional cohesion, is about what community members *do* to realise the common vision, while satisfying individual ambitions. Function lets community members work collaboratively, (a)synchronously, and relationally, but without necessarily having the same individual motivations or interpersonal agreements.

#### 3.2 Blended learning and online pedagogy

Most definitions of blended learning refer to blends of contact and distance education (Friesen, 2012; Graham, 2006) but we support a definition in a previous issue of this journal, which points out that: “The concept of blended learning is derived from two words, blend and learning. The word blend means combining things and

learning denotes an assimilation of new knowledge” (Tshabalala, Ndeya-Ndereya and Van der Merwe, 2014, pp.102–103). Thus, blended learning may occur completely at a distance.

We will consider five characteristics of the IDEAS next-generation pedagogy for blended learning: Intelligent, Distributed, Engaging, Agile and Situated (Witthaus et al., 2016). *Intelligent* means the use of technology, including electronic communication, virtual and augmented reality and analytics. *Distributed* refers to a distributed ownership of the elements of learning between various stakeholders. *Engaging* means students should participate actively to co-create the learning process. *Agile* means the course is flexible and customisable to individual learners, and sensitive to changes in the internal and external environment. *Situated* refers to contextualisation and real-world relevance.

### **3.3 WhatsApp in higher education**

Social media provides unique affordances that let individuals contribute to knowledge sharing (Leonardi, 2017). WhatsApp is one of the most widely used communication tools on the planet (whatsapp.com, 2021). In higher education, WhatsApp is an effective communication tool for academics and students (Klein et al., 2018). In pre-pandemic South Africa WhatsApp was ‘the’ key social media tool for African international distance students to transfer knowledge, sustain relationships, and to support self-directed, autonomous learning (Madge et al., 2019). WhatsApp affords and improves interactivity, knowledge sharing, collaboration, ubiquity, and achievement (Klein et al., 2018; Nitza and Roman, 2016). During the pandemic, it has been surprisingly agile in the education and mentoring of students (see Tarisayi and Munyaradzi, 2021). On the down-side, WhatsApp can disrupt learning communities in various ways, for example by creating an urgency to reply immediately, or by spreading disinformation (Ahad & Lim, 2014). Overlapping of message threads can be confusing (Smith and Tang, 2015).

## **4. Method**

This case study involved the ex post facto analysis of data generated during the presentation of a multimodal distance course in research methodology for Masters’ and Doctoral students at the beginning of their research journey.

### **4.1 The case: Course description**

The first author had first taught a Web-based class in 1996, and has always been interested in universal design, and low-cost, low-bandwidth online teaching and learning. We incorporated much of the experience of those early bandwidth-hungry days into this course design. The main communication channel was WhatsApp, augmented by Zoom meetings, YouTube videos, Google forms (for attendance and feedback) and other websites. The course design was socio-constructivist. Students formed separate WhatsApp teams of six to promote interaction and mutual support. They received short learning tasks (individually or in groups) so that a few could be completed within one class period. Finishing the task meant achieving the learning outcome. Individual tasks were presented to the group of six, then posted to the larger group. Flexible design allowed that, should a task take longer, we could omit another or speed it up. There was overnight homework but no long-term assignments. Assignments were personalised – students were given frameworks but had to apply those to their own research proposals. There were no live video-based lectures.

### **4.2 Data collection and analysis**

Data were collected and analysed in three activities: To answer question one, we read the whole communication stream like a script, to extract the narrative of the course. Then we pasted all interactions into Excel and coded manually using open coding. “Interactions” mean messages as well as indications of people joining or leaving the group. For qualitative intercoder reliability (see O’Connor and Joffe, 2020), the two authors cross-checked each other’s coding to ensure they understood the same with each code.

To determine who participated and how (Question two), the WhatsApp messages were emailed to WhatsAnalyzer, a web-based tool from the University of Würzburg, Germany. WhatsAnalyzer collects and analyses chat histories of WhatsApp conversations (or chats): the data is completely anonymised, leaving core information like timestamps, message types and message lengths in place (Schwind & Seufert, 2018). The tool does not analyse *content* thematically, but provides metadata about complex group interactions. WhatsAnalyzer returned a thorough analysis of twelve dimensions, including who sent the most messages, who sent most

replies, how many messages were sent per day, who wanted to have the last say, and the like. We present some of the salient findings in the next section.

At the end of each session, students were encouraged to complete a Google asking: What did you like about the workshop? How should we improve the workshop? What did you achieve during the workshop? This data was pasted into a word-cloud generator and inspected through close reading to answer the third question.

## 5. Discussion of findings

The discussion follows three primary strands, aligned with the research questions: 1) message types, 2) nature of participation, and 3) qualitative evaluation. We interpret these results in terms of our conceptual-theoretical lens, grounding the phenomenon of blended distance learning in relation to community building through WhatsApp.

### 5.1 What kinds of messages were sent?

This section describes the first two days of the course, derived from reading all the messages. (The other three days followed a similar pattern and, for the sake of brevity, are not described here). After the story follows an analysis of the message types that were sent in developing the community of learners.

The course started on a Monday at 17h00. Students completed the attendance register on Google Forms. As they registered, they were placed into teams of six who had to form their own collaborative WhatsApp groups. After 30 minutes, all teams were formed, and the work could start. For the first activity, each student presented their research to their teams of six, in the form of a fairy tale: *Once upon a time, researchers believed that... But I think that maybe... So, I will <interview some people, or do a survey etc...>; And I hope to find ... Which will change the way in which we...* Then, the teams put forward the best two or three for a plenary discussion via Zoom. Students presented their fairy tale proposals and instructors gave feedback. Alongside the Zoom meeting, students still commented and asked questions on the WhatsApp group. However, less than half of the students in the WhatsApp group joined the Zoom meeting. The rest relied on WhatsApp, and accessed the cloud recording afterwards. After the Zoom meeting, homework was announced on WhatsApp: (1) Watch a 90-minute YouTube video about how to find an academic research problem; (2) Write a précis of a given passage reducing the word count from 94 to 30.

Since not all participants of Day One attended Day Two, and a few new ones joined, we formed new WhatsApp teams. Because we knew it took so long, we started fifteen minutes earlier. For the first exercise teams circulated their individual précis and arranged them from best to worst. The criteria were: *How close to 30 words? How close to the original?* Questions posed to the large group showed some people had not done the homework. We posted the 94-word original again and pointed out that 'If someone did not do the homework, then obviously they move down to position 6 on your team's ranking with 1 being best and 6 being worst'.

While a few latecomers were still joining teams, and the teams were doing their rankings, we gave feedback about students' reactions to the previous night's class and answered questions about the video. After about half an hour, we started with feedback on the best précis from each team. At 17h57, we posted a link to a YouTube video with a model answer. A brief discussion followed. At 18h08, we posted the next task. The teams had to arrange 20 random sentences about smoking into a branching-tree diagram and then post a picture of their diagram to the main group. The first team response came in nine minutes later and we discussed it. The next one was so close to the model answer that we posted it in return and followed up with a voice note discussing why it looked the way it did. We then discussed and compared all other responses as they were received. At 18h30, we posted a voice note of the next task. Students had to design their own individual branching tree maps of their own research proposals. After 30 minutes, the first student posted a solution. We discussed the diagrams as they were posted. We wanted students to look at the diagrams during the discussion, so we presented our comments as voice notes. The students stuck to text. Never in the entire course did a student send a voice note. Class ended at 19h30 with homework, and a call for students to complete the post-session evaluation.

To see how individual messages contributed to creating the learning experience, all the interactions (messages and indications of joining, leaving, etc.) were imported into a spreadsheet and coded manually. Seven meta-codes were identified: Instructor, Admin&Log, Theme, Pedagogy, Mode, Channel, and Timeframe. These formed the headings of columns, with one interaction per row. Interactions were then scrutinised to identify themes in

one or more of the columns. The Instructor column was used to identify all messages sent by the presenter or co-presenter. Admin&Log identified interactions where people joined or left the WhatsApp group, formed sub-groups, joined Zoom, performed technical operations such as logging in, turning WhatsApp comments on or off, etc. Themes referred to the course content that was taught. Pedagogy included codes for acts of teaching and learning such as presentation, discussion, etc. Mode and Channel were used to identify images, documents, audio clips and Zoom sessions. Timeframe referred to opening time, closing time, as well as communication that was conducted outside scheduled class time. This paper will only consider Administration and Logistics, Themes and Pedagogy, as the other codes were used to give the authors an indication of the circumstances under which certain messages were sent.

#### 5.1.1 Admin and Logistics

WhatsApp indicates if someone joins or leaves a group, as well as whenever the administrator turns group participation on and off. This indicates class size, late arrivals and early departures from class. Some students left the group after class and joined again the next day. Most stayed throughout the course. There were 156 joins and 26 leaves. Most messages (351) in this category involved the formation of teams, where the instructor posted the names of students in groups of six, and the students then had to form their own groups. This process was time consuming and in later versions of the course, the instructor formed the groups before class commenced. Technical messages (56) involved asking for Zoom passwords, learning how to use the desktop version of WhatsApp, or where to find certain features on Zoom. Administrative messages (43) dealt with moving the timeslot of a class meeting, or notifications of who would present on a particular evening.

#### 5.1.2 Themes and pedagogy

The course curriculum comprised 12 themes, described chronologically in Table 1 and discussed below.

**Table 1:** Themes (n = number of interactions per theme)

Code	n	Description
Story	25	Describe your research as a fairy tale using the format "Once upon a time, researchers believed that... but I thought that maybe... So, I... and I found that... which will change the way we..."
Paragraphs	91	In your groups consider three paragraphs and identify the topic sentence as well as the organising principle (Chronological, general to specific, etc.)
Video1	75	Watch a one-hour video on how to extract a research aim out of a literature survey
Précis	46	Students were asked to reduce the length of a paragraph from 94 words to 30 without losing meaning
Smoking	39	Use a branching tree diagram to organise 20 sentences about smoking
Ownmap	40	Organise your own research in the form of a branching tree diagram
Wordcloud	61	Paste the abstracts of all the articles you have read into a word cloud generator
Empirical	133	Discussion of empirical research
Topquest	44	Discussion on empirical research topics and associated questions
Resdesign	117	Research design for topics and questions
Analysis	22	Quantitative and qualitative analyses of the previous day's messages
Paradigms	126	Discussion of a video on research paradigms and questions

#### 1. Story (25 messages)

For the first exercise, presented as an icebreaker, students had to describe their research as a fairy tale. They were still quite shy and uncertain so they first shared their stories in WhatsApp teams of six. Forming teams and discussing stories took about an hour, after which the plenary Zoom discussion lasted another hour. WhatsApp messages were entirely administrative and technical by nature, with students asking to be put in a team, or for the Zoom link and password. Using smaller teams in the initial phase contributed to student confidence and their willingness to participate in the large group.

#### 2. Paragraphs (91 messages)

In their teams, students considered three paragraphs to identify the topic sentence as well as the organising principle (chronological, general to specific, etc.). This was the first exercise via WhatsApp only. The worksheet document was shared on WhatsApp and students answered the questions in their small team first before a plenary session in the main WhatsApp group. Teams had 10 minutes for discussion. During the plenary session, the presenter asked volunteers to suggest topic sentences and structuring principles of the paragraphs. In this



question and answer session, students would answer and the presenter would respond telling them why they were correct or incorrect. The exercise took 22 minutes. Once again the smaller teams built confidence in the students.

3. Video1 (75 messages)

The Presenter had recorded and uploaded onto YouTube a video lecture on extracting research aims from the literature. It was always homework after the first (contact) lecture and formed homework for this class also. This 11-minute discussion session covered what the students learnt from the video and how it would influence their study. The discussion flowed over into the first 8 minutes of the next session and was revisited two days later. Here we see how WhatsApp sessions can become confusing, as some students would still discuss one theme, while the group may have moved on to the next discussion.

4. Precis (46 messages)

For homework, students reduced a paragraph from 94 words to 30 by précis. In class, they first ranked their versions in the smaller WhatsApp teams. Then they sent the best examples to the plenary group for the presenter to comment. Finally, they were directed to a brief model answer on YouTube to watch later. This exercise again shows how external resources such as YouTube videos can be incorporated into a WhatsApp class.

5. Smoking (39 messages)

In their teams, students drew a branching tree diagram to organise 20 sentences about smoking. Then they posted pictures of their branching tree to the main group for discussion, after which they were given a link to the model answer on YouTube. Here we see how WhatsApp allows sharing of images, leading to richer multimodal information.

6. Ownmap (40 messages)

Having participated in a team exercise on making branching tree diagrams, students had to organise their own research in the form of a branching tree diagram. Again they presented it to the main group as a photograph or screenshot. The instructor presented a critique of each contribution in such a way that it was relevant to the whole group. He used a voice note so that students could look at the diagram and listen to the voice note.

7. Wordcloud (61 messages)

Students pasted the abstracts of all the articles they had read into a word cloud generator. They presented their word clouds via the group and the presenter commented by voice note. The activity took 45 minutes, and shows how a third-party application such as a word-cloud generator can be incorporated into a WhatsApp class.

8. Empirical (133 messages)

The co-presenter facilitated a discussion of empirical research. He followed a Socratic process by posing problem questions via voice notes, with the students responding via text. Two things were learnt here. As a result of all the previous exercises, students had developed confidence and a sense of community and were no longer shy to participate. The “I-thou” power relationship between the facilitator and the students became evident in that the facilitator used voice notes, but the students still used text only.

9. Topquest (44 messages)

The discussion on empirical research flowed naturally into a discussion of empirical research topics and questions, which the students first discussed in groups and then in the main group. The discussion then evolved into adding research questions to the specific topics.

10. Resdesign (117 messages)

The same groups that had proposed topics and questions now had to propose a research design to answer them. These were discussed in the next session. By now, the discussion format had been well-established and students participated freely, indicating a high level of trust in the facilitators and one another.

11. Analysis (22 messages)

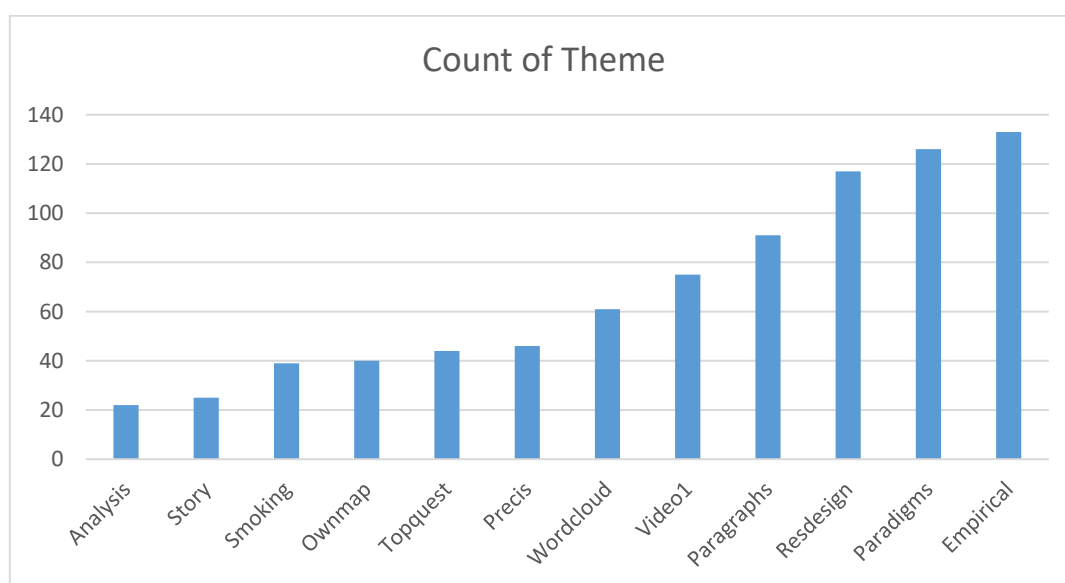
This exercise involved a quantitative and qualitative analyses of the previous day's messages. In their teams students used all the messages of the previous day as a data set, then developed two research questions: one qualitative/narrative and one quantitative/numeric. They then used the data to answer those questions and presented it to the big group during the Zoom session. Most WhatsApp messages were administrative, although some students shared their results on WhatsApp as well as Zoom. Here we learn that when WhatsApp is used

in support of a Zoom meeting, the messages tend to be administrative rather than related to teaching and learning.

#### 12. Paradigms (126 messages)

This exercise was a discussion of a video on research paradigms and questions. For homework, students had to watch a second one-hour YouTube video in which the presenter explained how to develop research questions based on Burrell and Morgan's four paradigms of social science research, and then to develop their own questions for their own research. These were discussed on Zoom, with the discussion duplicated to WhatsApp via voice notes. The presenter made these voice notes while he was speaking over Zoom, as some students could not access Zoom. This final exercise was a veritable cacophony of interaction, and showed the interaction of two parallel platforms, WhatsApp and Zoom, working simultaneously in facilitating teaching and learning. Student comments at the end indicated that they were happy with the process and quite able to cope with this style of blended or multimodal delivery.

A quantitative analysis of the messages (Figure 1) shows that activities with individual or group tasks generated fewer WhatsApp messages to the group, while discussions generated more.



**Figure 1:** WhatsApp messages per theme

#### 5.1.3 Pedagogy

Codes related to pedagogical acts were identified as praise, thanks, humour, Q&A, present, clarification, instruction, feedback, and discussion. These codes are clarified in Table 2 (n = number of interactions in the category).

**Table 2:** Pedagogical acts (n = number of interactions in the category)

Pedagogy	n	Description
Praise	23	Presenters praising students with quality of work, students praising presenters with the course quality, congratulations to the co-presenter
Thanks	34	General expressions of thanks, including emojis
Humour	36	Light-hearted comments and "lol" and smiling emojis
Q&A	69	Presenter asks a short-answer question and waits comments on student responses
Present	73	Longer one-way communications, or the presentation of a document, picture, or audio clip
Clarification	80	Follow-up messages to clarify instructions or questions
Instruction	91	Administrative or learning tasks set for students, both in-class and homework
Feedback	145	Feedback from students and lecturers about the quality of work or the course, as well as requests for students to complete the feedback form
Discussion	516	Longer sections of Socratic questioning rather than quick question-and-answer sessions

In the coding, Q&A was distinguished from discussion as short answer questions that were easily answered:

*Message 344: Any suggestion of the topic sentence?*

*Message 346: First sentence*

*Message 347: Yup. Indeed. First.*

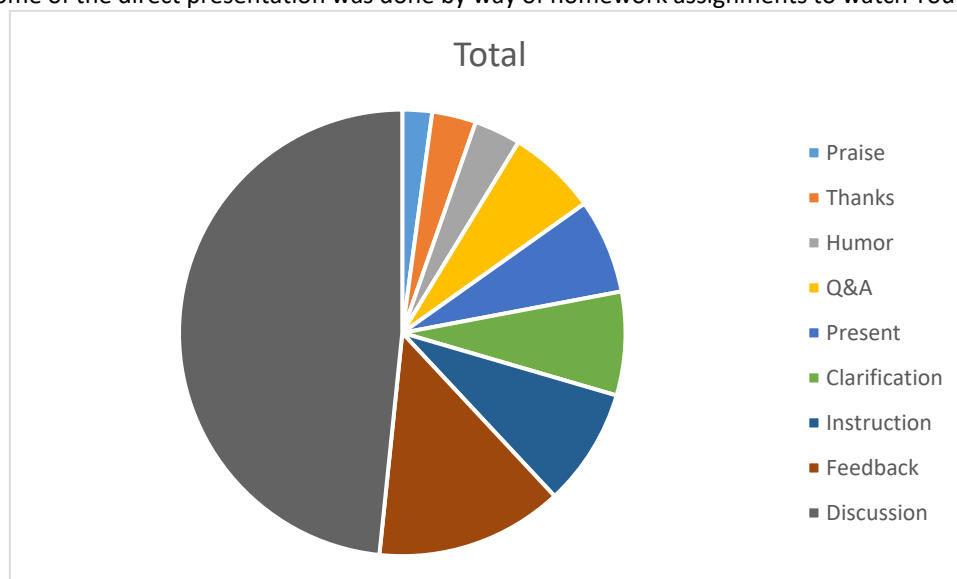
Discussions were longer exchanges [sic]:

*Message 1330: Just difficult to find literature for the Lit Review on the subject because it is so new 😞 Or at least a variety only a few are available and that can cause an ethical issue?*

*Message 1331: And like you can't just use websites...*

*Message 1332: Yes please can the Profs expand on [Name withheld]'s comment of little Literature, I am finding that in my topic, Spent weeks looking and found almost nothing on specifically consent period to adoptions studies. People just accept the law as is...*

The quantitative analysis (Table 2) showed that most messages were in discussion format. Feedback had the second highest volume. The presenters encouraged students to complete a feedback form after every class since, as there was no visual feedback, it was impossible to see body language or, in fact, if a student was attending at all. Clarification messages were almost equal to instruction messages, as nearly every instruction had to be clarified. In distance mode, it is difficult to see if a student understands. Given the presenters' socio-constructivist approach and the high level of groupwork, there was little outright presentation. This is also because some of the direct presentation was done by way of homework assignments to watch YouTube videos.

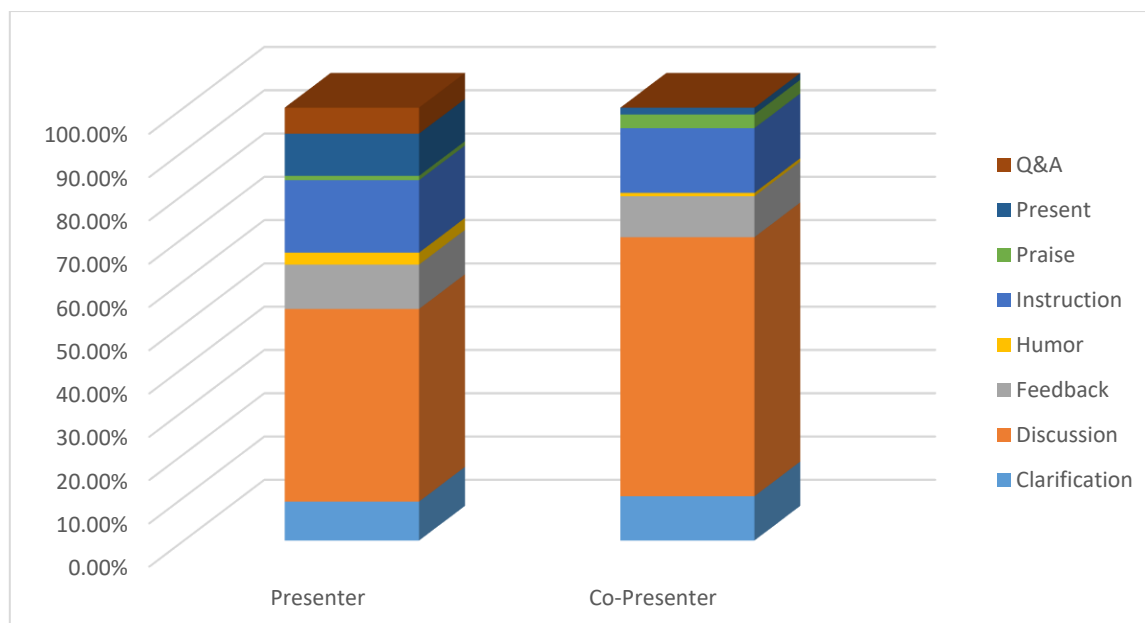


**Figure 2:** Messages related to pedagogy

#### 5.1.4 Presentation style

Over the five days, the presenter posted 402 messages and the co-presenter 127. From these messages, the therapeutic nature of the facilitation becomes evident in terms of social, cognitive, and teaching presence (Bluteau, 2020; Garrison, Anderson and Archer, 1999). *Teaching presence* is seen in presenting, giving instructions, clarification, and feedback. *Cognitive presence* comes from Q&A and discussion while humour and praise relate to *Social presence*. Separating out the percentages in the categories of pedagogy for the two, showed interesting differences in style. As shown in Figure 3, the presenter followed a project-based approach in which he gave the students learning tasks and discussed what they had learnt in the process, so the presenter had more instances of instruction (17%) than the co-presenter (15%). The co-presenter never ran a question-and-answer session, preferring Socratic discussion (60%) over the 44% of the presenter, which accounts for the biggest difference in presentation style between the two.





**Figure 3:** Differences in instructor style

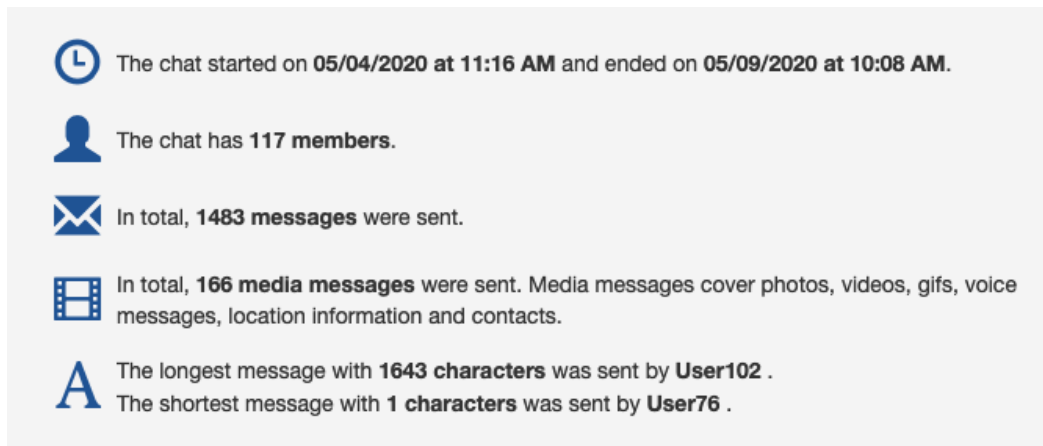
## 5.2 Who participated and how?

This metadata extracted through WhatsAnalyzer reveals information about the nature of participation according to twelve dimensions as described in Table 3. Importantly, each dimension gives only a fractional insight into overall engagement; and while there may be overlap, not all dimensions are of equal conversational (or pedagogical) value.

**Table 3:** WhatsAnalyzer depiction of twelve dimensions of group engagement

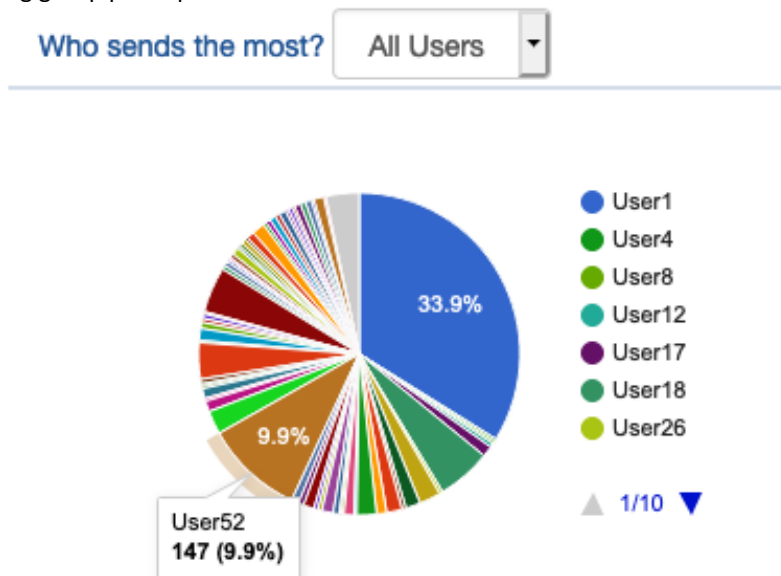
Dimension	Description
1	Who sends the most messages
2	Who replies to whom most often
3	Who sends how many messages of a particular type (media and text)
4	Who sends how many text messages
5	Who starts a new session (chat) after a period of inactivity
6	How many messages were sent on each day
7	Which day of the week is most popular for texting
8	What time of day is most popular for texting
9	Who uses the most emojis
10	Who uses the most emojis in single messages
11	Who sends the longest messages
12	Who wants to have the 'final say'

By structuring the data in this way, we are able to present a meta-classification of the group chat over the week. This classification is summarised in **Figure 4**:



**Figure 4:** Meta-classification of the group chat (week 1) as extracted from WhatsAnalyzer

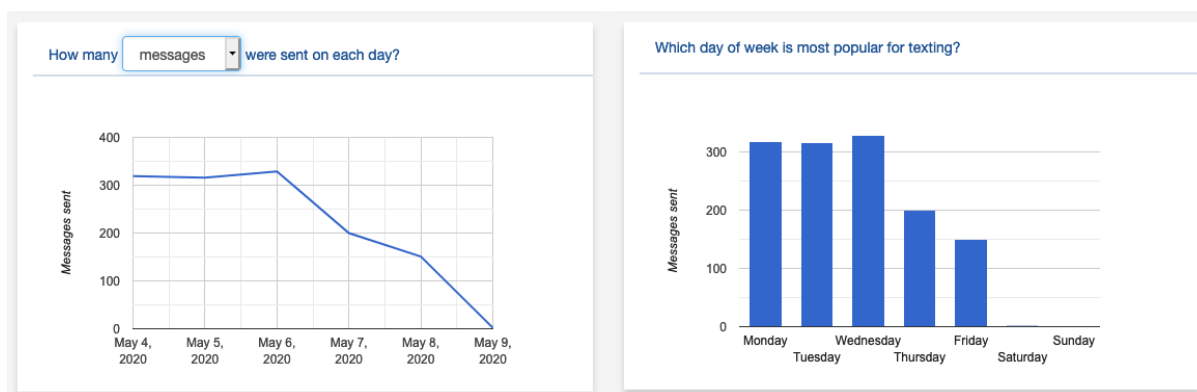
The group chat effectively ran for five days and had 117 members, including two instructors (Users 1 and 52). Expectedly, according the first five dimensions of WhatsAnalyzer, the instructors drove the engagement. As shown in Figure 5, they sent the most messages – 504 (34%) and 147 (10%) respectively. Instructors also replied to themselves and one another the most. Nonetheless, the majority (56%) of total interactions were from non-instructors, indicating group participation.



**Figure 5:** Proportion of messages sent per user

The overall data shows that engagement was distributed, in that many students (of course, some more than others) took part in the overall discussion. Out of 1483 exchanged *text* messages, the instructors accounted for 526 (35%) of them. While there is no universal 'ratio' of acceptable participation, the data suggests that instructors drove the engagement on an equitable basis. Additionally, we could find no straightforward evidence that some students overpowered others by dominating the discussion. The three most active contributors (non-instructors) only accounted for 13% of the total exchanged text messages. Interestingly, as per dimension 11, neither instructor was in the top five of the longest messages sent, which suggests longer queries or discussion points on part of students.

Other dimensions not mentioned above might be of less immediate value, apart from the engagement trajectory throughout the week:



**Figure 6:** Messages sent throughout the week

Figure 6 shows participation was high upfront, but tapered off nearer to the end of the week. This is not an unexpected finding, given the phenomenon of increasing digital fatigue, and is in line with that of a large cross-sectional study conducted by Malik and colleagues (2020). The researchers found that the intensity of social media use is a strong predictor of social media fatigue, which in turn contributes to a decrease in academic performance. However, another reason for the tapering off on Thursday was that much of the discussion took place on Zoom.

In summary, from this dimensional analysis of group-based engagement and participation, we determine the following: a) instructors have a key role of facilitating the discussion through self-replies; b) participation was distributed and equitable, with minimal overshadowing; and c) participation dwindled nearer to the end of the week.

### 5.3 How did the students experience the workshop with WhatsApp in support of the community of learning?

At the end of every session, students were asked to fill in a simple Google form with three questions: *What did you like?* *What can we do better?* And *What did you achieve?* The resultant Google sheet was analysed by generating a word clouds and a word count through Voyant Tools, (see Figure 7) and then performing a close reading of the student feedback to identify themes from their experience.

What did you like?	What can we do better?	What did you achieve?
informative (11); prof (10); research (10); feedback (8); understand (8)	time (23); group (11); groups (9); workshop (7);	research (31); topic (14); writing (9); questions (8); information (7)

**Figure 7:** Word clouds and word count

#### 5.3.1 What they liked

The most frequently used words in the feedback on what students liked, were: informative (11); prof (10); research (10); feedback (8); understand (8). The fact that *prof* – the title of both facilitators, appears so frequently supports the concept of teaching presence in therapeutic facilitation (Bluteau, 2020). Cognitive presence is indicated by *informative*, *research* and *understand*, while *feedback* may indicate cognitive, teaching and social presence (Garrison, Anderson and Archer, 1999).

Student comments focused on the information they received, feedback on their work, the exercises as well as the interactivity and sense of community it created. There were also a few comments relating directly to the platforms (WhatsApp, Zoom, and YouTube).

They liked the format that each student would present and then the presenter would give feedback to the whole group. Two participants commented:

*Feedback given to everyone so that each student can see if that applies to their work.*

*It made me engage deeply with my plans for my research - especially when reflecting about what I have learnt after the session. It was fun and interactive. Nice to hear everyone's proposals.*

The student population was highly diverse, coming from all six faculties of the racially diverse university. They were also Masters' and Doctoral candidates. Students perceived the diversity as a benefit. Working in groups increased interactivity and promoted a sense of community:

*very informative and the groups helped to understand concept better from different people without the distraction of many people posting in the main groups*

*I love the collaboration of different disciplines, it's super interesting to hear what people have brought to the table and how we encourage each other in the group*

The integrated nature of the platform and the permanency of WhatsApp was also noted [sic]:

*i joined the class very late but very informative feedback given to others. i loved the zoom call and whatsapp interaction simultaneously*

*My network was poor so I will go through that voice note notes afterwards*

There was even some praise for the technological fluency of the presenter:

*Prof got it all right! whatsapp, zoom, muting mics. Well done!*

### 5.3.2 Recommended improvements

The most frequently used words in the students' recommendations for improvement were time (23); group (11); groups (9); workshop (7). Although they really liked the groups, they found the logistics cumbersome.

Despite most comments in this section being favourable, there were several valuable recommendations that pertained to time, discipline, and pedagogy, as well as administrative and technical issues.

Two aspects of time were mentioned: The actual duration of the class, and the time it took to form the smaller WhatsApp teams. Concerning the duration of the class, the responses were conflicting, some wanting it to be longer, others shorter:

*The time. Due to being a full time employee working at home and my Masters being coursework based, I still have assignment submissions for this week and I feel that the workshop time can be reduced.*

*I feel it's too long but then again...there's plenty of students perhaps 2 hours is required*

*We are a large number of individuals who can't get enough time to speak to Prof one by one, I feel like we can increase Time so that we can also get to ask questions*

Joining time was identified as both a logistical and a disciplinary issue:

*For future reference, if we will be put into groups I think we should get the list before time to avoid time wastage*

*Workshop logistics should improve if students focus on being on time, however, starting 15 minutes early helped a great deal.*

Other disciplinary issues regarded Zoom etiquette:

*Please ask delegates more clearly to mute their mikes. Unfortunately I had no sound on my computer so had to switch to phone.*

Pedagogically, some groups were unresponsive, or students requested more direct presentation, such as slideshows and YouTube presentations. Students also asked for a clearer agenda, and a slower pace. One student asked that the Masters' and Doctoral students should be dealt with separately:

*My group members were very unresponsive / inactive. We did not work together as a group at all.*

*Coordination of the groups and a more of slide show presentation of the topics to be covered by the presenter hence a better understanding of the subject matter being discussed hence the exercises would be easier to do*

*Go a bit slower because some people get their whatsapps delayed because of connection.*

Zoom was seen as a valuable additional technology:

*The WhatsApp messages (in the main group) was overwhelming and easy to get lost in and was very convoluted. Having Zoom meeting and having students respond on there would be better and easier to follow.*

### 5.2.3 What they achieved

The most frequently occurring words were research (31); topic (14); writing (9); questions (8); information (7) indicating that the students certainly achieved the outcomes of the course, which was to provide them with information about finding a research topic, developing research questions, and writing a proposal.

While most students simply wrote a sentence or two about the thematic content of the evening, two of them mentioned affective and higher cognitive aspects such as motivation, companionship, and critical thinking skills:

*The motivation to continue with research and support from other colleagues. At least I know now I'm not alone in this journey.*

*More focused thinking, seeing thought processes and analysing feedback helped me to look at my ideas and processes critically and amend where needed. The grind work starts after class.*

## 6. Conclusions

We present our conclusions in reverse order, looking first at the students' experience of the course, then the pedagogy, and finally the use of WhatsApp in creating a sense of community. The contribution of this paper lies in its support of other theoretical and practical contributions regarding the use of WhatsApp in building a community of learning, and in our conclusions, we tie back to these.

### 6.1 Affective aspects

Student feedback showed that they appreciated the content, and the sense of community that was evoked by the WhatsApp groups (Kwayu, Abubakre and Lal, 2021). They had reservations about the time to form groups. Some felt the evening was too long, while some had problems attending because of family or work commitments. Thus, although WhatsApp does put learning in their pockets, they might just not have the time to attend to it. Finally, they regarded the course as motivational, as well as a growth opportunity.

### 6.2 Pedagogy

Considering the IDEAS framework (Witthaus et al., 2016), we cannot claim a high level of *Intelligent* systems. The course ran on WhatsApp, Zoom and YouTube, so although the level of technology use was high, it was relatively low technology, and the analytics were done after the course. We can, however, argue that the course

was highly *Distributed*. Sources of information came from the two presenters, Internet-based resources as well as students' own contributions, which contributed to making the course *Engaging*. Students pointed this out in their feedback, as reported above, in that they liked the group work and felt part of the community. Evidence that the course was *Agile* comes from the fact that it was run on an easily accessible platform as a response to both the external pandemic conditions, as well as the internal conditions of students not having much access to cheap bandwidth. All Zoom lectures were recorded and students were given links to YouTube videos to watch later in places that offered free Wi-Fi. The WhatsApp platform was selected because of its ubiquity and low bandwidth usage. The course was *Situated* in that students were given the opportunity to relate every aspect of the curriculum to their own studies and, given the currency of the COVID-19 epidemic at that stage, many students chose to study aspects related to the pandemic in their own proposals.

### 6.3 Community

This section will re-visit the elements of community discussed in the literature and consider how they resonate with our findings in terms of access, relationships, vision, and function.

#### 6.3.1 Access

Our WhatsApp groups were developed to provide access at a time of social distancing, for discussing and sharing study information (Ahad & Lim, 2014), but moved beyond that towards presence, where we identified instances of cognitive, social and teaching presence.

In the count of who sent the messages, the two presenters emerged as the main senders. For the rest, apart from three talkative students, the rest of the senders were evenly distributed, indicating that nobody dominated the conversation, and that the reciprocal nature was respected. The high number of messages labelled as presentation or discussion also indicated that the main reason for the group was to give and receive information (Kurniasih and Riyadhshyah, 2017). The strong sense of teaching presence led to feedback that “[t]he WhatsApp messages (in the main group) was overwhelming and easy to get lost in”. The blurring of the boundaries between real and virtual environments was evident in students' mentioning that they were working from home and that class time should be reduced.

#### 6.3.2 Relationships

The dialogical nature of our language became evident from the high number of feedback messages that were counted, as well as messages of praise and thanks. The I – thou power relationships between the presenter, co-presenter, and students were scrupulously adhered to and, although the presenters often communicated via voice notes, the students never did.

Students reported their own increased confidence during the running of the course, indicating an increase in their agency (Aizenkot and Kashy-Rosenbaum, 2019). We found no instances of cyberbullying.

Several elements helped to develop trust in the community. The instructors and students remained respectful throughout. A clear set of behaviours developed throughout the workshop, although, as was pointed out by some students, the lack of discipline decreased trust because of all users not adopting specific behaviours (Ruas, Cardoso and Nobre, 2017). Critique of student work was done in such a way that everybody could learn from it, thus contributing to altruism.

#### 6.3.3 Vision

The students' appreciation for learning from the experiences of their peers shows an awareness of the context of the community (Moodley, 2019, p.1). Students also mentioned the value of diversity and different opinions and of knowing that they were not alone. In the student feedback, interactivity was one of the most mentioned aspects. Students also mentioned how much they learnt from others.

#### 6.3.4 Function

One of the downsides of our workshop was that in some of the smaller teams, the interaction was too low, as was pointed out by a respondent. We were fortunate in not having examples of conflict and coercion, although there certainly was competition between some members – particularly those who posted most frequently. The WhatsApp groups formed valuable “collaboration-oriented functionalities” (Cabitza et al., 2016, p.216).



## 7. Summary and recommendations

The aim of this research was to explore the emergent patterns of use of WhatsApp in support of a community of learners to contribute to the unfolding stories of the disruptive influence of the COVID-19 pandemic. Our research underscores the cognitive, teaching and social role of the therapeutic facilitator (Bluteau, 2020; Garrison, Anderson and Archer, 1999), and shows they can use WhatsApp effectively in all three modes. At a post-graduate level, the cognitive aspect elicited most messages. We also found WhatsApp useful in supporting problem-based learning in a big-group, small-group co-operative pedagogy, which was supported the IDEAS framework. Although it was not very 'Intelligent', the data shows that it was distributed, engaging, agile and situated. Finally, WhatsApp was able to provide access, strengthen relationships, focus a common vision, and assist in the functioning of the group.

We present the following recommendations in the hope that they provide some guidance to others using WhatsApp in teaching and learning.

### 7.1 Recommendations for improved efficiency and effectiveness

From the analysis in section five, we see that using smaller groups initially creates student confidence and willingness to participate in the large group. WhatsApp sessions can become confusing, as threads overlap. External resources such as YouTube videos and third-party websites can be incorporated into a WhatsApp class. WhatsApp allows sharing of images, leading to richer multimodal information so that students could look at a diagram and hear a voice description. The "I-thou" power relationships related to teaching and learning are upheld by WhatsApp. When WhatsApp is used in support of a Zoom meeting, the messages are administrative rather than pedagogical. Students are comfortable with multimodal delivery.

Other recommendations include: Smaller groups should be formed before the start of the programme. Groups should be larger than four, since some students leave, and others are shy to participate. As indicated by Koomson (2019), some students had to be intentionally taught certain aspects of WhatsApp, such as how to form groups and how to work from WhatsApp for desktop computers. Students intuitively recognised certain design decisions in the course, such as the use of YouTube videos in the place of Zoom lectures, the decision to discuss every student's contribution in such a way that it would be useful to all, and the decision to make smaller groups.

A clearer agenda with learning outcomes, as well as examples of what is wanted from students during the exercises, would reduce the number of instructions and clarifications required.

### 7.2 Recommendations for further research

Further research could determine optimal small group size. One could also consider the extent to which smaller groups survived and thrived after the closing of the large group, indicating sustainable peer support. It would be useful to determine the extent to which students supported one another via WhatsApp outside the groups altogether, forming an actual community of learners. Finally, one could determine the relationship between participation in the WhatsApp group and successful course completion.

## References

- Ahad, A.D. and Lim, S.M.A., 2014. Convenience or nuisance?: The 'WhatsApp' dilemma. *Procedia - Social and Behavioral Sciences*, [online] 155(October), pp.189–196. <<https://doi.org/10.1016/j.sbspro.2014.10.278>>.
- Aizenkot, D. and Kashy-Rosenbaum, G., 2019. Cyberbullying victimization in WhatsApp classmate groups among Israeli elementary, middle, and high school students. *Journal of Interpersonal Violence*. [online] <<https://doi.org/10.1177/0886260519842860>>.
- Bluteau, P., 2020. The good enough facilitator: exploring online interprofessional therapeutic facilitation in times of COVID-19. *Journal of Interprofessional Care*, [online] 34(5), pp.647–654. <<https://doi.org/10.1080/13561820.2020.1807919>>.
- Cabitza, F., Scramaglia, R., Cornetta, D. and Simone, C., 2016. When the web supports communities of place: The 'Social Street' case in Italy. *International Journal of Web Based Communities*, [online] 12(3), pp.216–237. <<https://doi.org/10.1504/IJWBC.2016.077758>>.
- Carlen, U. and Jobring, O., 2005. The rationale of online learning communities. *International Journal of Web Based Communities*, [online] 1(3), pp.272–295. <<https://doi.org/10.1504/IJWBC.2005.006927>>.
- Childs, E., Van Oostveen, R., Flinn, K. and Clarkson, J., 2015. Community building in online pbl courses : Instigating criticality. In: *Higher Education in Transformation Symposium* Dublin, Ireland, 30 March Available at: <<https://www.researchgate.net/profile/Roland-Van->

- Oostveen/publication/277018966\_COMMUNITY\_BUILDING\_IN\_ONLINE\_PBL\_COURSES\_INSTIGATING\_CRITICALITY/links/555f426208ae6f4dcc921a62/COMMUNITY-BUILDING-IN-ONLINE-PBL-COURSES-INSTIGATING-CRITICALITY.pdf > [Accessed 06 December 2021]
- Friesen, N., 2012. Defining blended learning. *Learning Spaces*, [online] (August), p.10. Available at: <https://www.normfriesen.info/papers/Defining\_Blended\_Learning\_NF.pdf>. [Accessed 06 December 2021]
- Garrison, D.R., Anderson, T. and Archer, W., 1999. Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, [online] 2(2–3), pp.87–105. Available at: <https://doi.org/10.1016/S1096-7516(00)00016-6>.
- Graham, C.R., 2006. Blended learning systems. In: *The Handbook of Blended Learning*. [online] Pfeiffer San Francisco, CA. pp.3–21. Available at: <https://books.google.co.za/books?id=tKdyCwAAQBAJ&lpg=RA1-PA3&ots=BiilKzCCfk&dq=Blended learning systems. In%3A The handbook of blended learning.&lr&pg=RA1-PA3#v=onepage&q=Blended learning systems. In: The handbook of blended learning.&f=false>. [Accessed 5 December 2021]
- Hammond, M., 2017. Hammond (2017). What is an online community. *International Journal of Web Based Communities*, [online] 13(1), pp.118–136. <https://doi.org/10.1504/IJWBC.2017.082717>.
- Hedding, D.W., Greve, M., Breetzke, G.D., Nel, W. and Jansen Van Vuuren, B., 2020. COVID-19 and the academe in South Africa: Not business as usual. *South African Journal of Science*, [online] 116(7–8), pp.1–3. <http://dx.doi.org/10.17159/sajs.2020/8298>.
- Ke, F. and Hoadley, C., 2009. Evaluating online learning communities. *Educational Technology Research and Development*, [online] 57(4), p.487. <https://doi.org/10.1007/s11423-009-9120-2>.
- Klein, A.Z., Junior, J.C.D.S.F., Barbosa, J.L. V and Baldasso, L., 2018. The educational affordances of mobile instant messaging (MIM): Results of WhatsApp® used in higher education. *International Journal of Distance Education Technologies*, [online] 16(2), pp.51–64. <doi: 10.4018/IJDET.2018040104>.
- Koomson, W.K., 2019. Ontology of ubiquitous learning: WhatsApp Messenger competes successfully with learning management systems (LMS) in Ghana. *International Association for Development of the Information Society*, [online] pp.75–82. <https://eric.ed.gov/?id=ED601178>.
- Kurniasih, N. and Riyadhshyah, T., 2017. Virtual ethnography study of inter-lecturer communication in national young lecturers forum WhatsApp group. In: *8th International Conference of Asian Association of Indigenous and Cultural Psychology (ICAAIP 2017)*. [online] Atlantis Press. <https://d1wqtxts1xzle7.cloudfront.net/55706909/010-IC-AAICP-2017-with-cover-page-v2.pdf?Expires=1638812906&Signature=XYGrzS9MI36BgHThhAXLxkk9~bAVB98ZtwAz2meq1ARIF6QuTnontlwwXCyfs5E3X1oewaRijjOOHfwN3woAoueRkZL0wW~u~n0g9osOi7WNGYUN4AagcBcnOs-bf75af14xhDmwZaf35~DAywcN8FQ48dZDW7fDeUXzHCJ4qt-9M6EQcWkGoJXYDoJqkLoMt7WWzsTypJVc1AdRI4rZ7sNSrm8WSNlbgXFd90YmYPvKfYhNdljKsg36RoLlvhPD7IwzixrodgICeFNpqEdf0GIQKjj1kOxvuuc~x7TUBAbAGmF6haDW25BmYDJVbfalBdPQzqqEumUPadGvDnQ\_\_&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA>. [Accessed 06 December 2021]
- Kwayu, S., Abubakre, M. and Lal, B., 2021. The influence of informal social media practices on knowledge sharing and work processes within organizations. *International Journal of Information Management*, [online] 58, p.102280. <https://doi.org/10.1016/j.ijinfomgt.2020.102280>.
- Leonardi, P.M., 2017. The social media revolution: Sharing and learning in the age of leaky knowledge. *Information and Organization*, [online] 27(1), pp.47–59. <https://doi.org/10.1016/j.infoandorg.2017.01.004>.
- Madge, C., Breines, M.R., Dalu, M.T.B., Gunter, A., Mittelmeier, J., Prinsloo, P. and Raghuram, P., 2019. WhatsApp use among African international distance education (IDE) students: transferring, translating and transforming educational experiences. *Learning, Media and Technology*, [online] 44(3), pp.267–282. <https://doi.org/10.1080/17439884.2019.1628048>.
- Malik, A., Dhir, A., Kaur, P. and Johri, A., 2020. Correlates of social media fatigue and academic performance decrement. *Information Technology & People*, [online] 34(2), pp.557–580. <https://doi.org/10.1108/ITP-06-2019-0289>.
- Maphosa, V., Dube, B. and Jita, T., 2020. A UTAUT evaluation of WhatsApp as a tool for lecture delivery during the COVID-19 lockdown at a Zimbabwean university. *International Journal of Higher Education*, [online] 9(5), pp.84–93. Available at: <https://eric.ed.gov/?id=EJ1270462> [Accessed 5 December 2021]
- Martins, H.R., Manjate, J.L., Tinga, I.C., Matusse, A.P.X. and Siteo, L.C.A., 2021. Online learning and COVID-19 outbreak in Mozambique-academics' experience during suspension of face-to-face classes. *Interactive Learning Environments*, [online] pp.1–10. <https://doi.org/10.1080/10494820.2021.1969954>.
- Moodley, M., 2019. WhatsApp: Creating a virtual teacher community for supporting and monitoring after a professional development programme. *South African Journal of Education*, [online] 39(2). <https://doi.org/10.15700/saje.v39n2a1323>.
- Nitza, D. and Roman, Y., 2016. WhatsApp messaging: Achievements and success in academia. *International Journal of Higher Education*, [online] 5(4), pp.255–261. Available at: <https://eric.ed.gov/?id=EJ1119484> [Accessed 5 December 2021]
- O'Connor, C. and Joffe, H., 2020. Intercoder reliability in qualitative research: Debates and practical guidelines. *International Journal of Qualitative Methods*, [online] 19, pp.1–13. <https://doi.org/10.1177/1609406919899220>.
- O'Hara, K., Massimi, M., Harper, R., Rubens, S. and Morris, J., 2014. Everyday dwelling with WhatsApp. *Proceedings of the ACM Conference on Computer Supported Cooperative Work, CSCW*, [online] pp.1131–1143. <https://doi.org/10.1145/2531602.2531679>.

- Ruas, P.H.B., Cardoso, A.M.P. and Nobre, C.N., 2017. Persuasive technology in online social networks: a systematic literature review. *International Journal of Web Based Communities*, [online] 13(4), pp.404–424. <<https://doi.org/10.1504/IJWBC.2017.089351>>.
- Schwind, A. and Seufert, M., 2018. WhatsAnalyzer: A tool for collecting and analyzing whatsapp mobile messaging communication data. *Proceedings of the 30th International Teletraffic Congress, ITC 2018*, [online] pp.85–88. <<https://doi.org/10.1109/ITC30.2018.00020>>.
- Smith, M.E. and Tang, J.C., 2015. “They’re blowing up my phone”: Group messaging practices among adolescents. *Microsoft Research*. [online] Available at: <[https://www.madsesmith.com/docs/2015\\_TheyreBlowingUpMyPhone.pdf](https://www.madsesmith.com/docs/2015_TheyreBlowingUpMyPhone.pdf)> [Accessed 5 December 2021]
- Tarisayi, K.S. and Munyaradzi, E., 2021. A simple solution adopted during the Covid-19 pandemic: Using WhatsApp at a university in Zimbabwe. *Issues in Educational Research*, [online] 31(2), pp.644–659. Available at: <<https://www.iier.org.au/iier31/tarisayi-abs.html>> [Accessed 5 December 2021]
- Tshabalala, M., Ndeya-Ndereya, C. and Van der Merwe, T., 2014. Implementing blended learning at a developing university: Obstacles in the way. *Electronic Journal of e-Learning*, [online] 12(1), pp.101–110. Available at: <<https://academic-publishing.org/index.php/ejel/article/view/1682>> [Accessed 5 December 2021]
- West, R.E. and Williams, G.S., 2017. I don’t think that word means what you think it means”: A proposed framework for defining learning communities. *Educational Technology Research and Development*, [online] 65(6), pp.1569–1582. <<https://doi.org/10.1007/s11423-017-9535-0>>.
- Witthaus, G., Rodriguez, B.C.P., Guardia, L. and Campillo, C.G., 2016. Next generation pedagogy: IDEAS for online and blended higher education. Final report of the FUTURA (Future of University Teaching: update and roadmap for advancement) project. [online] Available at: <<http://hdl.handle.net/10609/51441>> [Accessed 5 December 2021]