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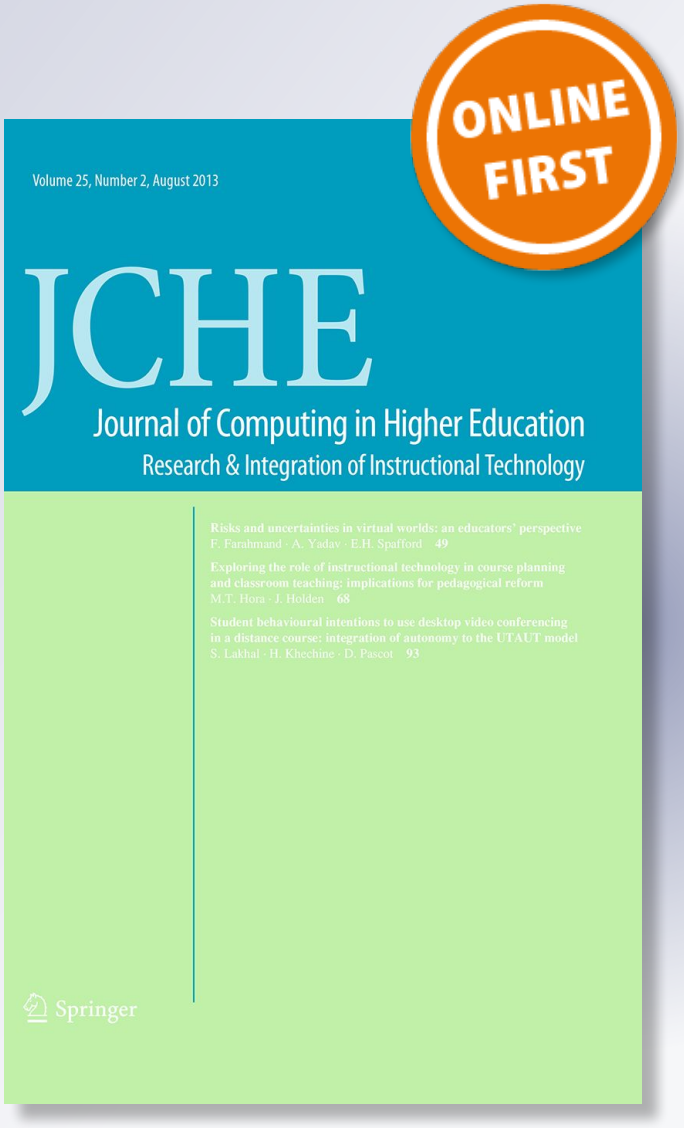

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Spaces for interactive engagement or technology for differential academic participation? Google Groups for collaborative learning at a South African University

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Abstract The rhetoric on the potential of Web 2.0 technologies to democratize online engagement of students often overlooks the discomforting, differential participation and asymmetrical engagement that accompanies student adoption of emerging technologies. This paper, therefore, constitutes a critical reality check for student adoption of technology to the extent that it explores the potential of Google Groups (i.e. self-organised online groups) to leverage collaborative engagement and balanced participation of students with minimal educator support. Community of Inquiry and a case study approach involving in-depth interviews with racially mixed students and Google Group artifacts were drawn upon as theoretical and methodological lenses for examining the equality of participation, academic rigor and complexity of engagement in Google Groups. Study findings were mixed: a semblance of authentic peer-based engagements, emergent academic networking, and inter-racial communication in Google Groups was juxtaposed with gender asymmetries in participation, dominance of group administrators' postings and shallow collaborative engagements. The study, therefore, recommends actively engaged Group leaders who steer gender and racially balanced engagements, scaffold peer on-task behavior; including a sound pedagogical strategy anchored in collaborative problem-solving; authentic construction of knowledge; effective completion of collaborative tasks by students; and constructive assessments by the educator and peers.

Keywords Google Groups · Collaborative engagement · Academic participation · Collaborative learning

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Introduction

A Google Group is a free online discussion service from Google that allows users to chat with peers and engage collaboratively in groups via Web pages or an e-mail system. Normally, the administrator of a Google Group creates a common email address, and invites participants to join this group. The emails sent to this email address will automatically be emailed to all participants linked to this group (Brown and Gachago 2013) allowing for both interpersonal communication and group communication. Despite the growing research into collaborative learning using Google Groups (Abrantes and Gouveia 2011; Harris 2006; Marín and de Benito 2011; Srba 2010), little is known about the capacity of autonomous, student-regulated Google Groups to enhance interactive engagement and promote equitable participation among learners. For Ingram (2005), interactive engagement entails three aspects: (1) deep attention to the learning tasks and activities at hand; (2) activation of effective cognitive processes that improve both performance of tasks and learning; (3) a social context for the fulfilment of collaborative learning activities. Equitable online participation, therefore, entails balanced participation through adequate student access to the technology and the absence of undue dominance by any member or groups (Masters and Oberprieler 2004).

While Marín and de Benito (2011) conceive Google Groups as productive spaces for academic communication, organisation of tasks between workgroups and discussion of topics proposed by the educator, such engagements cannot be guaranteed if such groups were formed, managed and moderated by students with little or no involvement of the educator. An absence of educator scaffolding (i.e. through allocation and organisation of discussion tasks based on learning goals, assignment of roles to students and evaluation of the academic quality of discussions) can undermine student collaborative learning using Google Groups. This failure of student collaborative learning arises from several factors and these include non-participation of some students due to perceptions of exclusion (Zembylas and Vrasidas 2007); student challenges with expressing themselves in the language of instruction (Chen et al. 2008); and lack of sufficient academic knowledge of the subject under discussion.

This paper, therefore, explores the impact of student adoption of a Google Group (i.e. student-regulated group) on their interactive engagement and academic participation. Interactive engagement is critical to deeping learning as it facilitates students' understanding of materials through sharing and critical evaluation of their personal ideas and those of peers (Ho 2002). Specifically, the study examines whether the use of a Google Group, in a case where limited support is rendered by the educator, enables equitable online participation among racially diverse students. As a result, the paper addresses the following research questions:

1. How effective are Google Groups (self-initiated and regulated by students) in the enhancement of interactive engagement?
2. To what extent is equitable participation among all Google Group participants achievable in the absence of educator regulation and support?

The paper is organized as follows: a literature review is articulated, followed by an outline of the theoretical framework and the research methodology. Thereafter, the findings are presented and discussed and a conclusion is reached.

Literature review

The literature review covers student interactive engagement, student academic participation and collaborative learning in Google Groups. These themes are elaborated in subsequent sections of the paper.

Student interactive engagement

Student engagement is a heavily contested term in academic literature (Appleton et al. 2008; Astin 1985; Krause 2005; Parsons and Taylor 2011; Willms et al. 2009). The elusive nature of the term stems from its multiple variants (that is, academic, intellectual, emotional, social and psychological engagement) and a lack of consensus on its precise measurement. Essentially, student engagement describes students' psychological investment in the academic enterprise. Student engagement describes the quality of effort students devote to educationally purposeful activities that contribute directly to desired outcomes (Astin 1993; Hu and Kuht 2002). Yet, effort is just one component of an otherwise expansive body of dimensions of engagement spanning relational, emotional, psychological, and intellectual aspects.

Krause (2005, p. 3) espouses a unitary definition of student engagement as "the time, energy and resources students devote to activities designed to enhance learning at university. These activities typically range from a simple measure of time spent on campus or studying, to in- and out-of-class learning experiences that connect students to their peers in educationally purposeful and meaningful ways" (Krause 2005, p. 3). Therefore, student interactions with learning materials, participation in class, and conversations with educators and peers on academic and social matters, qualify as "student engagement" in the same way as their participation in extra-curricular activities (e.g. student politics, critical citizenship) in wider university life. Despite the lexical murkiness of the concept, multiple variants of student engagement continue to flourish: from *effective participation* (Ho 2002; Sun et al. 2010; Weaver and Albion 2005), *cognitive engagement* (Garrison et al. 2004; Greenwood et al. 1990; Jackson 2010), *emotional or affective engagement* (Willms 2003), to *behavioural engagement* (Astin 1985; Krause 2005). It should be underscored, however that, limitations of space make an exhaustive discussion of each variant of student engagement unattainable in this paper.

Interactive engagement, in particular, describes the extent to which learners pay attention to the tasks; use effective cognitive skills (for activating prior knowledge, elaboration and monitoring comprehension); and interact with others in collaborative and cooperative learning contexts (Ingram 2005). It captures the value of situated contexts by emphasizing learning and thought processes that unfold in group activities rather than reflective processes that happen in solitary moments. McLaughlin et al.'s (2005) study differentiates procedural engagement from

substantial engagement and reports that procedural engagement targets students' conformity to traditional rules of behaviour (e.g. attending classes, paying attention in class and focusing on the educator). On the contrary, substantial engagement is considered to involve both these built-in procedures of instruction and student investment in learning processes through their interaction with the content of the lesson in a deep and thoughtful manner (Solís 2008). As such, students who engage substantially with learning materials have a greater chance of making good grades and graduating from college than those who simply conform to university regulations.

Interactive engagement has a number of positive results on students' activities. Studies show that it has the potential to influence student retention positively and improve academic performance (Finn 1989; Summerlee 2010); improves their learning experiences and reduces dropouts of under-presented and disadvantaged groups (Appleton et al. 2008; Parson and Taylor 2011); and increases student regulation and control of their learning (Libby 2004; Summerlee 2010). Beer et al. (2010) propose the quality of student participation as one possible indicator of interactive engagement in online learning environments that is activated by student motivation to learn. Several studies (Sun et al. 2010; Weaver and Albion 2005) consider online participation as an indicator of interactive engagement. Sun et al. (2010), in a study that investigates the ability of social influence to increase user participation in online forums, employs sidebars that display forum threads to users as a strategy for heightening users' presence and participation. Their study highlights that buzzes in users' sidebars maximize participation by improving online users' access to peers who reshare, like or comment on particular posts.

Academic participation

The Social Research Centre (2011) defines academic participation as a series of methods and processes specifically designed to actively involve students in influencing decisions that shape policies, practices, products or services (cited in Beamish et al. 2012). For Mulvenna (2012), academic participation provides students with the opportunity to articulate their minds, engage with peers' ideas, perceive the opinions of others, and to consider how their perspectives are conceived by peers. Participation in academic activities, therefore, promotes student engagement with peers' views and activates reflexive engagement with their thoughts as they relate to those of peers. Sfard (1998) conceives participation as involving a dialogic interaction and co-construction of meaning that allows the co-construction of knowledge. This implies that participation in learning processes, especially dialogue with peers, enables student access to knowledge and enhances the development of new perspectives. Thus, building in authentic assessments into student participation enhances their involvement in class discussions and improves their active engagement as well as their own learning (Dallimore et al. 2006).

However, voluntary academic participation does not guarantee the involvement of all learners. Literature suggests that not all students are likely to participate in learning activities like discussions, which compromises the academic value of discussions (Brookfield and Preskill 1999; Dallimore et al. 2010). Students' active

participation in collaborative learning activities, such as group discussions, can be constrained by a number of factors, which include their level of preparation, confidence or fear and the size of the class (Weaver and Qi 2005). Prior exposure and familiarity with the topic under discussion or learning activity, as well as student communicative competences have a bearing on both the level and quality of the participation. Student comfort in participating in collaborative discussions is dependent on prior experience, typical preparation, participation frequency, typical satisfaction with own participation, and familiarity with and liking of collaborative discussions (Dallimore et al. 2006).

Participation in collaborative learning in Google Groups

Google Groups have been instrumental in facilitating student-based collaborative effort. Maslo et al.'s (2014) study focuses on a Google Group in which students work collaboratively with the same document and edit it as a team. This self-initiated Group enables them to participate in the self-organisation of interactive learning; solve the problems that arise collectively; and use the academic staff as one of their resources freely. Online technologies, such as Google Groups, trigger collaboration and document sharing among learners, heighten their intensive interaction with faculty and content, enhance their active participation, promote peer-to-peer reflection on learning content and resources and foster deep critical thinking (Yukselturk and Top 2013). Harris (2006) assesses the potential of Google Groups to support collaborative online learning among 60 students enrolled for a distance learning course at Caribbean Island University in Jamaica. His study affirms the capacity of Google Groups to foster multiple interactions between students (student–student; student–facilitator; student–course) through questions and answers posted on-line; facilitate e-learning of course materials; and broad communication among class members. The opportunities for reflective engagement in Google Groups stem from their asynchronous nature, which enables students to post messages at their own convenience and does not require them to log on to the software or platform simultaneously in order to interact with one another (Hew and Cheung 2012).

Other studies on Google Group are instructive. The study conducted by Ng et al. (2008) draws on the experiences of a Google Group for Strategic Management students in the School of Business at Curtin University of Technology to determine how it heightens student engagement in learning. Their findings suggest that student participation in Google Groups enables the honing of critical thinking skills through their active development and provision of solid arguments and analysis when answering questions during online discussions. The Google Group also heightens student self-learning and peer-based learning through the provision of documents and Websites relevant to the course. Taye (2014) examines the value of Google Groups in supporting student engagement and interaction with their peers and teachers in a block teaching curricula for postgraduate health professionals. The study establishes that, although both full-time and part-time students post educational messages that enrich their learning experiences, part-time students posted slightly more social messages. Overall, however, the study reports a high level of student satisfaction with their online experience. Therefore, the fact that

student satisfaction and motivation influence meaningful learning positively, suggests that Google Groups heighten student engagement.

Finally, Srba (2010) documents how an Aalborg University educator appropriates Google Groups, Google Docs, Google Calendar and wikis to support in-group collaboration and student–educator interaction among three Computer Science students undertaking their Master's theses on the verification of embedded systems. Although students give positive evaluations on the capability of Google tools to foster collaborative engagement in their projects, they allude to the redundancy caused by the difficulty of reusing the text directly from wiki pages during the write up of their reports. Therefore, these mixed results on the potential of educator-moderated Google Groups to foster collaborative learning, show that there is scope to investigate the impact of student-initiated Google Groups on student interactive engagement.

Theoretical framework

A Community of Inquiry approach was conceived as an ideal 'lens' for unraveling and interpreting student levels of engagement and participation. This approach arises out of the realization that effective interactive engagement and equitable participation call into question student active engagement with the learning resources (i.e. strategies, learning materials, peer networks, educational technology), learning communities and a collaborative learning context.

Community of Inquiry (CoI)

The Community of Inquiry (CoI) theory explains how deep, reflective and interactive learning is fostered practically within a formal educational context (Garrison et al. 1999). The theory provides a framework for describing the learning that takes place in online asynchronous communication by considering three core elements: *social presence, cognitive presence* and *teaching presence* (McDonald and Loch 2008). In this case Google Groups constitute Web-based asynchronous communication mediated by group discussion threads and networked exchange of knowledge. Therefore, CoI provides a credible framework for exploring student engagement and participation in these online learning environments.

Social presence

In an online group context, social presence describes the ability to project one's self and establish personal and purposeful relationships (Garrison 2007). It must transcend the establishment of socio-emotional presence and personal relationships (Garrison 2007) by ensuring that group members feel secure to communicate openly and coalesce around common goals or purpose for a community to sustain itself (Thompson and MacDonald 2005). As such, social presence should foster unity of purpose among Google Group participants through the realization of collective learning objectives, fostering meaningful relations and effective communication among participants. More so, social presence constitutes a cohesive social glue that

allows students to identify themselves as collective members of a discursive community whose common goal is to generate authentic knowledge and shared practices. A sense of collective identity is essentially critical to racially mixed Google Groups—especially in South Africa, where the apartheid legacy of discrimination bequeathed some contours of racial identification, binaries of privilege/prejudice and advantage/disadvantage in academic participation in post-independent higher education.

Cognitive presence

Cognitive presence is the exploration, construction, resolution and confirmation of understanding through collaboration and reflection in a CoI (Garrison 2007). It fosters higher order thinking skills by emphasising practical inquiry and reflection. Critical thinking is the acquisition of deep and meaningful understanding as well as content-specific critical inquiry abilities, skills, and dispositions (Garrison et al. 2004). Google Groups bridge critical inquiry with experiential and lifelong learning by embracing personal knowledge and practice-based problem-solving in real-world contexts. Cognitive presence in Google Groups compels students to draw on peer-generated knowledge and self-concepts as they develop their own interpretations of issues, problems and situations as well as position themselves inter-textually and discursively.

Teaching presence

Teaching presence involves the design, facilitation and direction of cognitive and social processes for the realisation of personally meaningful and educationally worthwhile learning outcomes (Anderson et al. 2001). Teaching presence in Google Groups points at the pedagogical strategies necessary for inducting students into academic discourses, scaffolding their knowledge development processes and fostering academically mature learners. It questions the appropriateness of tools-in-use and the effectiveness of pedagogical techniques deployed in student–peer and student–educator engagement. However, a restriction of educator participation in Google Groups to online social presence without any substantive involvement in the provision and organisation of content (such as learning materials, questions, queries) and group activities (such as exchanging knowledge, information seeking and information provision) may result in the emergence of a teaching presence that is of limited analytical relevance. On the contrary, the vertical roles that students can assume (such as group administration) could constitute vital accoutrements of teaching presence.

Methodology

A case study approach was employed to examine the participation on Google Groups of Masters in ICTs in Education at a South African university. A case study is considered ideal when the researcher's intention is to unravel the meanings

subjects give to their life experiences and immerse herself in the activities of a small group of people in order to obtain an intimate familiarity with their social worlds (Fouch‘e and Schurink 2011). This study is concerned with understanding the influence of using Google Groups on student engagement and their capacity to support equitable participation, drawing on students' social worlds and personal experiences of their appropriation of Google Groups, hence a case study is considered ideal.

The objectives of the Master's in ICTs program this study draws on were to: (1) Conceptualise contemporary educational challenges and formulate assumptions about educational technology; (2) Examine practical applications of learning theories; and (3) Theorize the practical applications of educational technology and their relevance to developing countries (Centre for Educational Technology 2008). This Masters is a 2-year program that is divided in two parts, coursework (Year 1) and dissertation (Year 2). The courses covered in the first year included: the use of emerging ICTs in African developing countries, online learning theories and learning design, learning and teaching with emerging ICTs and research and evaluation of emerging ICTs. On satisfactory completion of first-year coursework, students would proceed to Year 2 where they will write a mini dissertation (Master's in Education (ICTs) Programme).

Eighteen students originally enrolled for the programme, although only fifteen students completed course work. The Module is run on a block release basis to cater for the majority of students who are in-service professionals in primary and tertiary education, government or the corporate sector. The first semester of the Module is convened for approximately 2 months. The sessions involve mixed instructional approaches encapsulating guest lectures, student seminars, group work, and an individual project that run on Tuesdays from 16:00 to 19:00. Five educators presented 8, 3-hour long sessions at the Centre for Educational Technology (CET), the venue where students and academics intellectually engaged with each other and with content. At the formative (i.e. pilot) phases of the programme, the teaching team comprised the convener of the programme (an associate professor), three educators from CET (two associate professors, one lecturer) and one lecturer from the School of Education.

The ICTs in African developing countries course involves lectures and seminars on various suite of emerging technologies used in the African educational systems. These include blogs, wikis, podcasts, Google applications, social media (Facebook, Twitter), discussion forums, chat rooms and instant messaging applications. The majority of these services were already seamlessly integrated into the Sakai-based, institutional learning management system locally branded "Vula." These theoretical lectures and seminars were usually followed by practical seminars in computer labs where students were inducted and trained in good practices of using these technologies. Thereafter, students were expected to experiment with these technologies continually by maintaining the practices of social commentary on Facebook, blogging, wiki-based discussions and instant messaging.

Procedure

Two students (black female and white male) with a sophisticated knowledge of computers created a Google Group and invited their peers to join, discuss their thesis topics, share their learning experiences and find academic resources. The black female participant, was an international doctoral candidate who had been requested by her study promoter to attend the Master's programme to familiarise herself with the uptake of educational technology in South African contexts. She was a highly experienced educational technologist with over 5 years of experience in online facilitation of learning at university level. The white male was a high school educator, learning designer and a technology champion who had spearheaded technology-assisted teaching at his high school. He had over 7 years of experience in teaching with technology, including online facilitation of student discussions on the Moodle learning platform. The researcher considered the diverse experience of these two students (or in-service educators) as well placed to facilitate student engagement on Google Groups. They, therefore, became Group site administrators who approved the signing of new group members, regulated their academic behavior and blocked access to non-class members.

The Google Group was a restricted/closed site with only students who registered on it being able to access and read the discussion threads. Four students (two black males and two white males) and the researcher joined the site. The default function on the Google Group enabled all group members to receive e-mail notifications on every posting made by any group member. Since the educator wanted students to retain ownership of the group and assume responsibility for discussions, he maintained an online presence but did not participate, unless when prompted to address some of the students' challenging questions. It was hoped that the group administrators, who were also highly experienced in online administration, would assume the vertical roles of managing the group. Students were, however, not obliged to make postings to the site since the postings were based on creating a learning community and not necessarily on course requirements. The postings were made for approximately 4 months. The illustrations below summarise the issues discussed (Fig. 1).

Figure 1 summarises the main topics that were discussed in the Google Groups that were the focus of this study.

Data collection

The data collection process involved the mining of Google postings in 2009 and in-depth semi-structured interviews with Group participants in 2010 and 2012. It should be highlighted that the data that was used was extracted several years ago. Nevertheless, although the context of using Google Groups might have shifted significantly with the massive adoption of smartphones among university students, it is critical to bear in mind that the Google Group interfaces have not changed considerably in the intervening years. More so, the issue of the potential of new technology developments (e.g. smartphones) to shape the nature and complexity of interactions is potentially inconsequential since the majority of Google Group

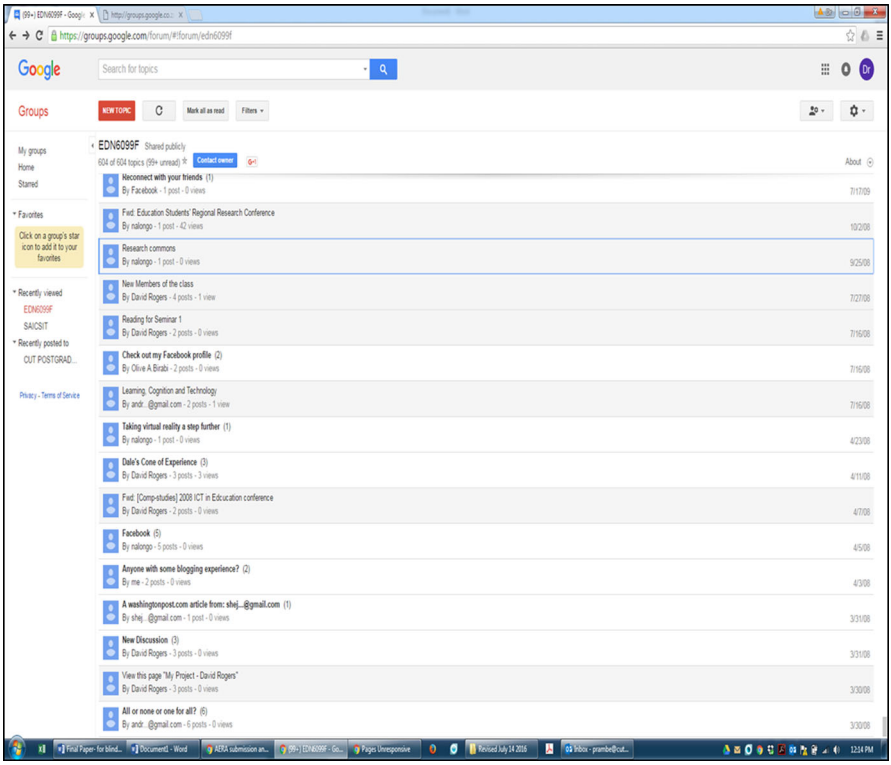

Fig. 1 Summary of some of the issues discussed in the Google Group

participants were in-service professionals who already possessed smartphones at the time this investigation was conducted. For these reasons, it can be assumed that the insights from this study are relevant to our contemporary academic context. The data collection methods adopted are elaborated in sections below.

Data mining

Since the researcher was a participant–observer on the Google Group, he had access to all the discussions on the site. After securing permission from the group administrators and their peers, he downloaded all the publicly available student postings, printed them and analysed them quantitatively.

Interviews

The six Google Group participants were purposively selected to participate in scheduled, in-depth, semi-structured interviews. The interviews examined different contexts associated with using the Google Group, academic content exchanged by students, the nature of learning resources accessed via this platform and their impact on student learning. A copy of the interview guide comprising the actual questions

posed is provided as an appendix. The interviews were conducted in a laboratory foyer, a neutral, familiar and cozy space for most students. Interviews were audio recorded using a digital audio recorder and transcribed verbatim and analysed using thematic content analysis (see Table 1). Each interview lasted for approximately 1 hour.

Data analysis

Quantitative analysis

The purpose of quantitative analysis was to establish the equity of participation among the six group members. Therefore, it examined the number of postings per student; postings made by each racial group; postings by the group administrators; direction of postings; amount of peer feedback; and types of postings. A Social Network Matrix and Social Network Analysis were developed to create a visual representation of the information flows between participants and the extent of mutuality of transactions. The matrix comprises numerical values that represent different interactions between participants who share information and resources in a given context. Matrix data was used subsequently to develop a Social Network Analysis (SNA). SNA plots formal and informal relationships among individuals and organisations to reveal central communicants who are critical to effective communications (Horton 2008). The nature of postings that emerged from an examination of the quantitative analysis of postings are summarised in Table 2.

Qualitative analysis

In-depth, semi-structured interviews were analysed using Burnard's (1991) thematic content analysis, which involves: (1) identifying main themes from transcripts through immersion in the data, (2) re-reading transcripts to identify loadings and categories and shedding irrelevant material, (3) resorting categories and grouping with similar headings to form a relevant list, (4) validation of the research findings (by the researcher's two colleagues) and a discussion on and adjustment of lists of categories, (5) re-examining transcripts and categories to identify data relating to each category and linking the data to category headings, (6) coding transcripts according to the developed categories and sub headings, (7) asking respondents to validate and check categories as well as make adjustments where necessary and (8) writing up section by section with reference being made to transcripts.

The analysis was also informed by the Community of Inquiry (CoI) concepts (i.e. social presence, cognitive presence and teaching presence) and two main research questions focusing on interactive engagement and equitable participation themes. As a result, seven categories on interactive engagement were developed and four categories were also developed on equitable participation. The main categories on the interactive engagement theme, were: online social presence, embryonic knowledge sharing, critical questioning, creating learning communities, peer-based academic networking, instant communication and reflection. The

Table 1 Using CoI concepts and research questions to analyse Google postings and interviews

Theme	Category	Evidence from Google posting/ interview data	Researcher comments
Social presence	Online presence	I have invited new people joining us this semester to join this group so that we can build our "community of practice" and I noticed some have already done so. They may not be reading their university mail yet, but next week we should see more joining us here online (Daniel, Google posting)	Invitations and accepting invitations are critical components of recruiting online social presence and creating a vibrant online community
		I like Google chats because I know that my peer on the other side is waiting. As she types, I see a little icon written "Lorna is typing" so I know she is responding to me. Google chats provide different colors for users who are offline, busy, idle, or online so I know how to handle my peers (Interview with Andy)	Anticipation of online peers and social presence affordances on Google are antecedents to creating online networkers
Cognitive presence	Embryonic knowledge sharing	Google Groups could be used for managing work load through students voicing the amount of work load given by academics, the concerns for project deadlines, quest for additional reading literature during vacation when webmail is not accessible […] (Interview with Prudence)	Engagement in on-task behaviours, sharing of pedagogical content knowledge and mutual concerns sustain an academic learning community
	Critical questioning	According to a review of twenty-first century skills in Information Literacy…"the amount of electronic information doubles every hour" …need more than "twitch speed" to deal with this…however, my question is. Is there a twenty-first century learning style? or is it more a smorgasbord of abilities that we need to be developing (Andy, Google posting)	Probing is a critical component of intelligent sharing of knowledge
Teaching presence	Instant communication	Google chat is an online facility that is portable like a notebook so it means that I have no boundaries as to where and when my learning happens. When I have a question, I don't want to wait, I check Dr Murphy on Google for an instance response. I won't wait long for answers as I would forget my	Information seeking and instant feedback from the educator enhances the scaffolding of students

Table 2 Nature of posts and their frequencies

Nature of Google Group postings	Frequency
ICT news	2
Compliments	5
Provision of academic information, videos and URLs	8
Logistics	2
Academic project information	2
Research	2
Exhortations	1
Observations and interpretations	2
General announcements	4
Critique	1
Notification	1
Total posts	30

equitable participation theme had the following categories: communication asymmetry, homophilous tendencies, peer-based clusters and breaching racial boundaries.

Presentation of findings and discussion

The presentation first attends to quantitative findings and then turns to qualitative findings drawing on CoI concepts as interpretive lenses. The quantitative findings examine the nature of postings, gender and racial representation of postings, communication asymmetry and homophilous tendencies of engagements and differentiated clusters of engagement. These findings address the question on equitable participation. The qualitative findings on the capacity of Google Groups to promote interactive engagement include its potential to heighten online social presence, promote embryonic knowledge sharing, enhance critical questioning, create learning communities, engender peer-based academic networking, foster instant communication and enabling reflection. These quantitative and qualitative findings are discussed in the sections below.

Quantitative results on equitable participation

Nature of postings

The nature of postings and level of participation of the six students were first examined in an effort to unravel the equity of participation. There were eight postings that related to the sharing of course-related information, academic URLs and videos related to course activities. Students also exchanged project-related information and academic research interests. The students, however, exchanged IT news and personal experiences of the course on rare occasions. Overall, student discussions on theoretical concepts were austerely limited (see Table 2). The

students' level of participation was low, despite the fairly long duration (4 months) of their existence on Google Groups and some semblance of collaborative learning (see Table 2). Collectively, few academic postings and limited participation can be interpreted as shallow learning. Such shallow learning could be attributed to the difficulty of accomplishing complex learning tasks in the absence of educators who directed the academic orientation of postings, or would give structure and sequence to participation processes, monitor students' on-task behavior and reduce their cognitive load. As Brack and Van Damme (2010) aptly suggest, students need support in the effective adoption of technology to engage in constructive participation, refine collaborative engagement processes, and check ideas rather than just messaging. Similarly, Alexander's (2013) study on using Google Groups to promote student engagement emphasizes regular facilitator participation, and facilitator support and scaffolding of tasks through the provision of interim feedback. Educator support is conceived to be critical when students study in isolated online environments, which are considered detrimental to study motivation (Alexander 2013).

Gender and racial representation and direction of postings

An examination of the equity of participation necessitated a disaggregation of postings by gender. Although different genders posted some messages on the Google Group, a black[1] female and white male administrators dominated the Group. The female administrator was one of the dominant members of the group in terms of postings in spite of the unequal gender representation (5 males:1 female) and skewed gender distribution of postings. While her status as a group administrator and a PhD candidate in Educational Technology partly explained her technological confidence and profound knowledge of the topics discussed, her dominance seemed to counter the popular view that intra-group dynamics often undermine female participants' assertiveness in male-dominated groups. Perhaps, the dominance in online postings of two individuals of different gender (black female and one white male)and the non-participation of peers can be attributed to silencing [by the academically dominant members] and a feeling of exclusion [by some academically weaker students] (Zembylas and Vrasidas 2007). It can then be argued that online interactions are not insulated from the exercise of academic authority. The high levels of student non-participation and attrition in online learning environments is partly attributable to the sense of isolation and disengagement students experience due to lack of familiar types of social interaction (Roberts and McInnerney 2007). Familiarity with online interactions, knowledge of the subject under discussion, prior preparation and linguistic competence may be implicated in students' ability to participate actively in online learning environments. Therefore, the female

[1] The constitutionally enshrined and widely recognized racial categories in South Africa are those racial identity markers established during the apartheid era namely Black African, Colored (for the mixed race), Indian/Asian and White. While I draw on them as the commonly known identity markers in the post independent South Africa albeit their heavily contested nature, such use does not necessarily mean my legitimization of these terms. The use of the term "people of colour", which is prevalent in the United States racial discourse is uncommon in the South Africa context, and hence was dropped in this study.

administrator's dominance, in this study, seem to have arisen from her academic level of study and prior knowledge of online learning environments.

A determination of equity of online participation also necessitated a consideration of the participation of students by race. Although the Google Group had balanced racial representation (3 blacks, 3 whites) in online postings, whites posted slightly (4 posts) more posts than blacks. Overall, the majority of posts were directed at all group members irrespective of their race thus suggesting some evidence of non-racial collaborative sharing of information and balanced interaction (see Table 3). Google applications such as groups, chats, hangouts and documents are highly valued for their collaborative and developmental potential—such as allowing "spontaneous sharing of relevant personal experiences" (Knapp 2014, p. 192). Google Docs [just like Google Groups] are credited with increasing student responsibility for collaborative learning, heightening student feeling of psychological ownership (Blau and Caspi 2009a). As a result, the assumption of group administrator roles and moderation of group discussions by individuals of different race are all expressions of psychological ownership of the interactive process.

It should be noted that all Google Group members had access to postings made by anyone of them. The open access to postings and the ease with which members could comment on individual postings could have increased engagement and sharing of norms. Rimor et al. (2010) observe that group participants can succeed in online group work if they invest in developing shared norms and work procedures.

However, the pressure to match the group's level of discussion might have adversely affected personal engagement (Rimor et al. 2010) judging from the low levels of engagement of group peers.

Inter-racial communication

One possible expression of participation was the dialogic engagements that unfolded among students of different racial backgrounds on Google Groups. Although Google Groups provided a user-friendly platform for peer-based communication irrespective of race, it was unclear whether such Groups were actually responsible for breaching any racial stereotypes and anxieties of engaging with peers from unfamiliar cultural backgrounds. In an interview a black student claimed that Google Group:

> …enabled me to chat with white guys about our profession and school work more freely. It allows us to get rid of the 'holes' between different races. Anxieties and fears of talking to unfamiliar racial groups are removed because on Google Group they just have to respond (Interview with Shemiah).

Students also claimed that the inter-racial communication in Google Groups also enabled them to overcome social barriers. A colored student affirmed in an interview that: "Google Groups break social boundaries. I remember, after conversing with Joy (Black female classmate) on Google, we met in class and I asked her to hug me, so I got to know her more personally" (Interview with Kirsty). Joining and participating in the focus (i.e. social or physical entity around which joint activities are organized) (Shipilov et al. 2014), such as a Google Group, and

Table 3 Analysis of participation by race, gender, nature and direction of posts

Student name	Number of posts by white students	Number of posts by black students	Direction of posts	Nature of posts
Daniel (group administrator) (white male)	10		Group	1. Logistical-reminding peers of the venue
			Amanda	2. Interpretation of peer's post
			Group	3. Exhortation and announcement
			Group	4. Sharing personal project information
			Group	5. Provision of URL and critique
			Group	6. Provision of a book and an article
			Group	7. Provision of information and URL on a concept
			Group	8. Observations and reflections on group management issues
			Group	9. Sharing projects
			Group	10. Video sharing
Prudence (black male)		4	Daniel	1. Research-access to peer postings for research
			Amanda	2. Compliment
			Daniel	3. Suggestions in response to peer's query
			Group	4. Sharing research interests
Amanda (group administrator) (black female)		8	Group	1. Provision of URL
			Andy	2. Response to question on twenty-first century skills
			Group	3. Compliment
			Andy	4. Sharing a book
			Group	5. Announcement
			Group	6. Announcement of research facility
			Group	7. ICT news sharing
			Prudence	8. Response to blogging query
Andy (white male)	6		Group	1. Complaint about use of pseudonyms by a group participant
			Group	2. Theoretical question on twenty-first century literacy skills
			Geoffrey	3. Notification
			Amanda	
			Daniel	
			Geoffrey	

Table 3 continued

Student name	Number of posts by white students	Number of posts by black students	Direction of posts	Nature of posts
				4. Compliment, and logistical query 5. Logistical announcement and compliment 6. Response to query on the existence of two Groups
Geoffrey (white male)	1		Andy	1. Provision of URL
Shemiah (black male)		1	Group	1. ICT news
Total number of posts by race	17	13		

NB: All names adopted in this study are pseudonyms

attending an organized function (such as Google interactions), enables individuals to demonstrate their common interests and willingness to socialize (Feld 1982; Shipilov et al. 2014).

We are hesitant to claim that inter-racial communication on Google Groups gave students the confidence to share knowledge and articulate their views. If it did, then such participation is conceived as a "structured foci networking" (SFN); that is, networking that unfolds in "ongoing formal entities that actively and regularly bring individuals together to engage in organized, joint activities created specifically to encourage members to form personal bonds (Shipilov et al. 2014). If Google Group participation constitutes a SFN, the extension of the network to outwards groups (i.e. other racial groups) contradicts the claim that as an individual engages in SFN, the opportunity costs and maintenance costs for range-diversifying ties increase (McPherson and Smith-Lovin 1987; Shipilov et al. 2014). These scholars maintain that such costs increase due to pressures toward homophily among group members, which tend to be stronger than among people who meet outside of foci. In our SFN, there is evidence of engagement with the outer-group as much as student engaged with their racial peers.

Although, inter-racial communication was common in Google Groups, we are unsure whether such communication was sufficient to challenge entrenched racial stereotypes and barriers bequeathed by apartheid legacy in South Africa. In view of this, we are ambivalent about the claim that the most serious problem facing post-apartheid South Africa is the persistent failure to forge cross-cutting relationships between races given that there is evidence to suggest that many South Africans exist in racially isolated enclaves (Hoeane 2004). We can only assume that if these interactions were exploited sustainably for academic engagement, they would have fostered potentially rich academic ties vital for authentic knowledge production and

sincere social interaction. However, there was no evidence to suggest that this actually happened.

Social network matrix (SNM)

Online postings data was also analysed from a quantitative perspective to determine the extent of representivity of the postings and equity in participation rates. The mined data were used to develop a SNM that displays the direction and intensity of inter-personal communication (see Table 4).

The volume and direction of online interactions were examined to determine the equity of participation. The width of arrows demonstrates the volume of online interaction while arrows themselves show the direction of communication. As the matrix shows (cf. also Table 3), Amanda and Daniel (pseudonyms), the group administrators, dominated the interactions judging from the posts they made to the group (see the density of their networks basing on the thickness and direction of arrows originating from them). The group administrators were the nerve centers of information-judging from their central location, number and width of arrows (see Fig. 2) emanating from them. This lack of representivity and inequity of participation was reinforced by the general apathy of the other four participants. Perhaps, this scenario could be indicative of the complexity of maintaining equitable participation in the absence of academic regulation and incentives.

Communication asymmetry due to moderator domination

The significant outward communication from group administrators to peers and the limited feedback from peers to administrators during online interactions, are all indicative of limited engagement. Limited peer engagement online can also develop from the absence of an engagement strategy—as would be the case when an educator is actively involved. Although the group administrators were qualified e-learning designers, with the female administrator being a PhD candidate in Educational Technology, they had no clear engagement strategy to encourage all Group members to participate online. As a result, their academic dominance can also be explained by their familiarity with Google Groups, relatively sophisticated computer proficiency and their hyper-communicative qualities, which worked to

Table 4 Social Network Analysis matrix

	Daniel	Prudence	Amanda	Andy	Geoffrey	Shemiah
Daniel	0	9	10	9	9	9
Prudence	3	0	2	1	1	1
Amanda	5	6	0	7	5	5
Andy	4	3	4	0	5	3
Geoffrey	0	0	0	1	0	0
Shemiah	1	1	1	1	1	1

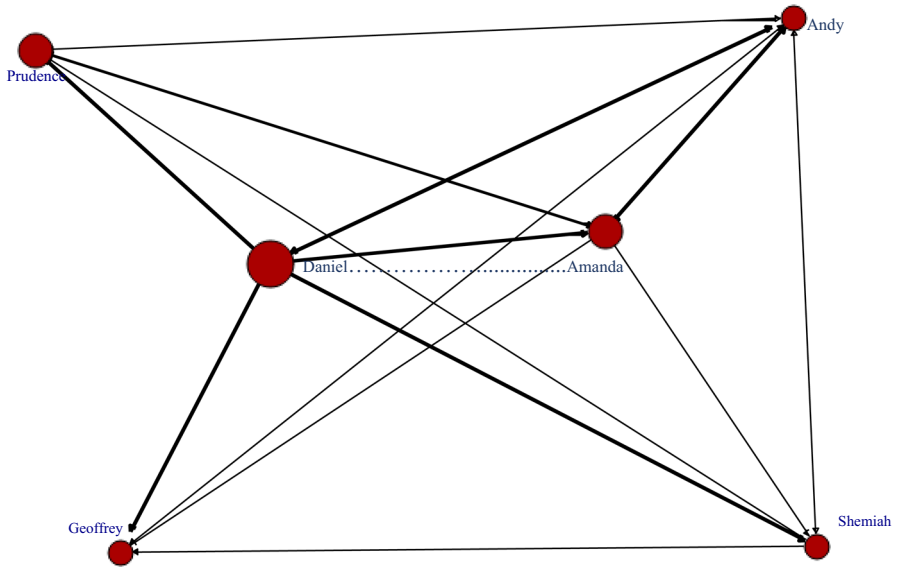

Fig. 2 Social network diagram showing direction and volume of interactions among participants

sustain their increased discursive participation in the group. When interviewed about how her life shaped her use Google Groups, one group administrator claimed:

> As a qualified learning designer, I was already familiar with a suite of Google applications (e.g. Google Search, Google Docs, Google Maps, Google Translate), so it was a natural transition to using a collection of applications of the same platform. My computing background also shaped my willingness and open-mindedness to try new apps, allowing me to easily adopt new technologies that our educators introduced to us (Interview with Amanda).

The academic dominance of Google Group administrators, which could have been instantiated by their advanced familiarity with collaborative technologies supports Srba's (2010) claim that there is a positive association between student familiarity and experience with Google Groups and their level of participation. The limited engagement of online peers resonates with Rimor et al.'s (2010) findings that peer dominance is inimical to collaboration and the promotion of original independent thought. The limited peer engagement also contradicts Knapp's (2014) findings on an engagement strategy, in which the educator's provision of relevant content (i.e. articles, videos, and screencast mini-lectures), regulation of small discussions (of students sharing experiences, answering educator generated questions or discuss case studies) and facilitation of student discussions (on work in progress and digital artifacts) via Google hangouts improve the academic engagement of the entire group. Our finding also consummates with previous research, which suggest that students with high digital competence and a positive attitude towards digital tools have more positive perceptions about learning (Brodahl et al. 2011) leading to higher participation.

The discursive constraints of text-based interactions

Given that all postings were visible to group members through Google Group notifications, the limited online participation could be attributed to the predominantly text-based nature of Google Groups interactions. For instance, during an interview one participant complained that: "Unlike Facebook users who combine text messages with pictures, videos and graphics, most Google Group postings tended to be textually oriented. As a visual person I often remember visual images better than texts…" (Interview with Andy).

The few deep conversations on Google Groups, therefore, could be indicative of the reality that effective use of technology demands more appealing features combining various textual formats to improve social and emotional presence of interactants, increasing student motivation to engage in on-task behavior, and improve Google Group members' perceptions of the academic efficacy of this technology. The limited student online participation can be contrasted with Knapp's (2014) study on the educators' engagement with students via Google hangouts, where rich student–peer engagements and increased participation in all activities are attributed to the user-friendliness of the technology interfaces. The visual appeal of hangouts is considered as allowing the overlapping of brisk discussions, personal talk, laughter, civil disagreements and spontaneous sharing of relevant personal experiences, and experiences similar to face-to-face classroom discussions. In addition, the different levels of experience and mastery of Google Groups between the group administrator and members could have contributed to the asymmetrical academic participation in the group.

Homophilous tendencies

Although not necessarily a dominant feature of Google interactions, students' homophilous tendencies of directing their online queries to friends (of the same colour) were conceivably inconsistent with group administrators' behavior of posting queries to the entire group. Such homophilous tendencies potentially skewed the online interactions among group members. For example, a group member (black female) who was acquainted with her peer's (black male) research project on the academic appropriation of social media sent an informative article to him via the Google group: "I know you are working on Facebook research. Follow this BBC link below and see if the article makes sense http://news.bbc.co.uk/2/hi/technology/7149588.stm" (Amanda).

Similar homophilous tendencies were also observed when students were interviewed about the impact of their use of Google Groups on their social interactions in class and outside classroom:

> Interactions inside and outside of lectures/seminars were positively influenced by the constant communication and sharing of ideas, which Google Groups necessitated. Even though we tended to communicate in similar ways by directing most queries to peers we engaged with more offline (Interview with Geofrey).

The skewed outcomes demonstrate the importance of understanding how student demographic characteristics impact on equality of participation outcomes. This finding resonates with Bécares and Priest's (2015) study on the importance of understanding the influence of ethnicity, gender, and class on inequalities in academic and non-academic outcomes. Although their study does not focus on technology utilization per se, it reports on the value of contrasting racial/ethnic and gender in ascertaining academic and socio-emotional outcomes (as compared to reliance on standardized assessments).

The nature of collaborative interactions on this platform were also examined as the study also addresses the effectiveness of Google Groups (self-initiated and regulated by students) in enhancing interactive engagement. While productive collaborative engagement on Google Groups necessitated the co-existence of interpersonal communication with group engagements, the conversational dyads on this platform potentially activated skewed communication by ignoring the collective engagement needs of the entire group. In view of these asymmetrical collaborative interactions online, the researcher wondered about the impact of using Google Groups on social relationships offline, to which one student professed in an interview that: "Social interactions with my black folks were influenced positively. Through Google Group, I maintained constant touch with buddies I met during the course." The occasional racially based interactions (offline and online) could be a consequence of the close ties students of the same race background built in class and in their offline interactions, judging from the racially-based seating patterns that often obtained in this Master's class. This finding contrasts with Alexander's (2013) findings, in which educator's integration of paired tasks (e.g. assignments) into Google Group activities (e.g. discussions, group tutorials) allows culturally diverse students to draw on their varying academic and social experience and locations (especially working professionals) to provide authentic problem-solving tasks within diverse contexts.

Our preoccupation with the influence of using Google Groups on collaborative engagements also exposed the value of social affinities. One of the participants, Shemiah, states in an interview that: "Using this platform enabled our peer group to work collaboratively and meet assignment deadlines without having to physically be on campus or having to locate peers. There was no break in communication afterhours". In addition, although personal cliques were not a profound feature of online group collaboration, when sustained over time, they had potential to create fissures in participation and asymmetrical communication among learners by denying peers opportunities to engage with the entire group. This is inconsistent with Alexander's (2013) claim that the technological features of closed Google Groups, such as their self-containment and archival clarity, enable participants to engage intensively and foster strong student-to-student relationships for academic peer support. These claims should be conceived in view of strong educator modelling of activities and scaffolding of students when they encounter difficulties in task execution. Student participation in authentic learning demands not only their involvement in social practices and communicative processes in which knowledge building can happen through collaborative activities (Hane 2010), but rather continual educator support. Therefore, while engagement with acquaintances and

friends constituted nascent collaboration, academic networking with all peers and the generation of new ideas were essential for equitable participation and transformative learning.

Differentiated engagement clusters

Student proclivity to engage with close friends (i.e. peer-based interactions) online threatened to split the cohesive group into two engagement clusters. Peer-based conversations were common in the Google group. In the online postings, one student foregrounded his research interests in his compliments to a peer for her academic support by stating: "Thanks. what an informative article! I would be happy if you sent me anything that relates to innovative uses of Facebook like this" (Prudence). While the sharing of articles among peers seemed to suggest that students had developed some mutual academic interests, it unintentionally undermined the contribution of other group members to the conversations that were going on. One student commented on these discursive fissures emerging the Google group:

> We seem to have two separate Google Groups for the course. Is this a concern? Having several groups gives more of us a chance to experience owning and managing groups. We get to see the [engagement] problems firsthand and [this] gives us the confidence to use Web 2.0 sites in our own teaching once. We see that it is not a frightening experience. Are there people who are not members of either groups? Are there other groups for this course? Should we try to unify the groups? (Daniel's posting).

The formation of online dyads based on affinity buttresses Rawlings and McFarland's (2011) claim on interpersonal selection effects in professional ties that it is reasonable to assume that faculty members select (or are selected into) affiliations in part on the basis of shared productivity norms (professional homophily). However, in the case of the aforementioned student, the divisions in the group afforded more students the opportunity to assume responsibility and ownership of knowledge production. The opportunity to use technology to experiment with new roles potentially enabled students to familiarise themselves with the affordances of technology. This student's perspective contradicts Shipilov et al.'s (2014) observation that the tendency to meet people through membership in formal groups and other structured foci has a negative effect on individuals' engagement network range at work, with those engaging in an above average amount of networking in structured contexts suffering a dramatically lower range. The study, however, could not establish whether divisions were exploited to broaden participants' use and confidence in educational use of technology; such use would have equalised the participation of all Group members.

Qualitative findings on interactive engagement

These findings are discussed under the broader ambit of CoI concepts; social presence, cognitive presence and teaching presence. Various categories are

identified and discussed under these main conceptual themes as extrapolated in the sections below.

Social presence

Online presence

Social presence involves individual social awareness of other interactants who are online, in both spatial and temporal dimensions, at any given time. Google Groups enable users to spot the online status and presence of peers and provide users with clues on possible future permutations on interactive engagement with peer group members. The critical precursors for online presence are invitations through Google notifications via personal emails, joining of the group and confirmation of membership:

> I have invited new people joining us this semester to join this group so that we can build our "community of practice" and I noticed some have already done so. They may not be reading their university mail yet, but next week we should see more joining us here online (Daniel posting).

The above is reminiscent of the mediating role of technology in locating and recruiting online participants for academic engagement and a component of social presence. Google Group interactions, therefore, potentially heightened student interactive engagement by alerting them to the status (i.e. ready to chat, busy, idle and offline) of their online peers and thus informing them of appropriate moments to initiate, terminate and re-engage in conversations. The high social presence displayed by this group administrator reflect group dynamics that support the development of a sense of personal belonging and community among group members (Hovey 2014; Picciano 2002).

Social presence awareness was also epitomized by one student in her choice of Google chats:

> I like Google chats because I know that my peer on the other side is waiting. As she types, I see a little icon written "Lorna is typing" so I know she is responding to me. Google chats provide different colours for users who are offline, busy, idle, or online. So I know how to handle my peers (Interview with Amanda).

Recruiting the attention and anticipation of peers are an essential component of social presence awareness, and critical to interactive engagement on Google Groups. Amanda's narrative supports the claim that social presence is impacted by the availability of personae, their intentions and meaning making, which affect the existence and nature of interaction between two or more peers (Cui et al. 2012; Hovey 2014). Therefore, social presence awareness connected interlocutors psychologically and afforded emotional presence.

Email distribution list

The student's use of Google Groups as an email distribution list for sharing academic information and announcements also expresses social presence. The

female group administrator, who was also on the Education Conference Organizing Committee, used the Group platform to send information on the updated Conference program to all members:

> Dear colleagues: Herewith the updated programme of the 8th Education Students Regional Research Conference. I have added some links some of you requested. For directions to the Upper Campus click on (http://books.google.co.za/books?hl=en&lr=&id=KUD5rnh7QnwC&oi=fnd&pg=PA16&dq=fowler+Mayes+learning+relationships&ots=cFIf3MuGuc&sig=Vjx_auoy0K0KFgaJ_MiZq40znk4#PPP1,M1). For the route map click on (http://books.google.co.za/books?hl=en&lr=&id=KUD5rnh7QnwC&oi=fnd&pg=PA16&dq=fowler+Mayes+learning+relationships&ots=cFIf3MuGuc&sig=Vjx_auoy0K0KFgaJ_MiZq40znk4#PPP1,M1) and for parking arrangements you will report to the Information Centre as you enter the campus (Female group administrator posting).

Therefore, the use of the email distribution list demonstrates that students also used Google Groups as an information broadcasting platform over and above social networking.

Ellipses, emoticons and text language

Another awkward way of expressing social presence online involved the use of emoticons and ellipses. Emoticons were mainly used to express students' mood (e.g. excitement, sadness) and temperament. Ellipses, which are intentional omissions characterised by several dots after a statement, expressed the writer's unwillingness to convey the narrative in detail and their expectations of their audience to fill in the missing information: "See you all in Monday….maybe it's a good time to really kick start this group….unless someone come up with a better option :-)." The other student responded: "C u ll guz (See you all guys). Bn kinda missing da co (I have been kind of missing the company)…the jokes….the chats."

Cognitive presence

Embryonic knowledge sharing

Cognitive presence manifested in students engagement activities such as seeking information and sharing of academic materials (i.e. work in progress, project assignments, URLs, books and readings). When one student posted an interesting article on Facebook, a protracted discussion with peers on Google Groups ensued:

> The article is showing how Facebook can generate public awareness about a particular topic in a short space of time. A wine farm near us uses it as a marketing tool. They started a "I love xxx wines" group and get students to join. They make it cool to belong and they get invitations to events where XXX wines is the sponsor. Could we do the same with a Maths class? (Daniel posting).

Therefore, online conversations revealed that cognitive presence manifested in the students' sharing of knowledge, interpretation of the practical application of technologies in real-world contexts and the extrapolation of such use to other contexts such as Mathematics Education. The transfer of knowledge on technology use to other contexts and reference to social belonging suggest that students transcended social presence awareness by applying knowledge on the Connectivism theory they had acquired class.

In a similar vein, the use of Google Groups also shaped some students' professional careers through peer exchange of information on professional opportunities available on campus. The researcher investigated how these student teachers' use of Google Groups shaped their professional identities during their studies in an effort to grasp how the use of Google Groups contributed to the sharing of information on professional opportunities. One student acknowledged in an interview that:

> Being a member of the Google Group enabled me to post questions and receive feedback instantly. The use of Google Groups also enabled me to access several student job adverts posted on these sites via URLs. I was lucky to take up a few of them, which allowed me to join more Groups during my studies. Since then, I have been able to keep track of the progress in the field of molecular biology, my discipline, without having to travel or visit research labs around the world (Interview with Prudence).

Therefore, interview results show that cognitive presence manifested in student use of technology to access and develop one's professional career opportunities. It also played out in the utilization of technology to access and apply disciplinary knowledge across contexts. These findings support Koehler and Mishra (2005), and Archambault et al.'s (2010) claim that deepening and transforming student professional and academic experiences in online learning environments demands an understanding of the connections and interactions among pedagogy, content, and technology. This application of knowledge across contexts also buttress Abdelraheem and Asan's (2006) observation that students who would be learning complex tasks need to develop learning strategies that go beyond the surface level by applying their meaningful learning strategies, monitoring their learning activity and maintaining coordination between multiple strategies.

Cognitive presence also manifested in students' interpretations of how Google Groups could support the administration of courses. As one student reported in an interview:

> Google Groups and chats could be used for managing work load through students voicing the amount of work load given by academics, the concerns for project deadlines, quest for additional reading literature during vacation when webmail is not accessible. For any subject, anyone of these could be useful (Interview with Geoffrey).

Critical questioning

Another instance of cognitive presence is evident in the way the adoption of Google Groups seemed to have enhanced students' critical questioning skills. Students harnessed the platform to pose critical questions relating to information literacy skills, skills which are considered to be important in the knowledge economy. For example, after reading an online article, one student posed some critical questions about twenty-first century learning styles:

> According to a review of 21st century skills, Information Literacy…"the amount of electronic information doubles every hour" …need more than "twitch speed" to deal with this…however, my question is. Is there a 21st century learning style ? or is it more a smorgasbord of abilities that we need to be developing? My take on this is one size does not fit all…smart living? See http://www.21stcenturyskills.org (Andy's posting).

The important questions about twenty-first century learning skills and technology-enhanced-learning-abilities point to the potential of Google Groups to foster critical questioning over and above the exchange of ICT in Education knowledge. This finding mirrors Boulous and Wheeler's (2007) claim about the potential of Web 2.0 conversational technologies (such as Google Groups) to foster meaningful question-based engagements between users, bolster active learning, and build communities of learning. The promotion of deep learning and interpersonal collaboration is critical to meaningful academic participation as the focus of Web 2.0 technology is not necessarily the technology, but rather its appropriation to foster higher order thinking by using it on tasks that require problem solving, reflection, and cooperation (Fogarty and McTighe 1993).

The aforementioned question-based engagement triggered peer-based feedback that assisted the students to connect prior knowledge to new knowledge, thus sustaining interactive engagement. In response to the question, a peer furnished the aforementioned student with a web address that hosted useful resources: "Interesting question! I was looking through some references and found something that you might be relevant to your question. See web address below (http://books.google.co.za/books?hl=en&lr=&id=KUD5rnh7QnwC&oi=fnd&pg=PA16&dq=fowler+Mayes+learning+relationships&ots=cFIf3MuGuc&sig=Vjx_auoy0K0KFgaJ_MiZq40znk4#PPP1,M1). It is a site of a book review. Look at chapter 2 (p. 16 onwards)" (Geoffrey's posting).

Our inference of the aforementioned online conversations is that critical questioning (which is a form of knowledge seeking) and knowledge exchange (which is knowledge provision) were complementary in that they augmented students' collective knowledge and enhanced their critical thinking about pedagogical knowledge. This student exchange of educational materials is indicative of a radical shift from educator-dominant transmission pedagogy towards socio-constructivist-based collaborative learning approaches founded on sustained learning communities enabled by emerging instructional technologies (Garrison and Akyol 2009).

Muted presence

Cognitive presence was also expressed through muted presence. Peers often responded with silence when others presented complex theories and concepts that peers were not acquainted with or had not engaged with. For instance, when a Google Group member posted three detailed posts about Dale's Cone of experience (a detailed description of the theory and a URL to a full article, the relationship between the cone and concrete learning, and the misappropriation of the cone), no peer responded to these postings. Perhaps, muted presence could mean lack of interest and familiarity with the concept or limited capacity to sustain an informed conversations on the concept.

Teaching presence

Instant communication

A typical instantiation of teaching presence lay in the instantaneous communication between students and academics. Although the educator maintained a muted social presence on the Google Group, students claimed that Google Groups potentially enabled just-in-time learning by allowing them to connect with academics as per and when they needed their assistance:

> It's [Google chat] an online facility that is portable like a notebook so it means that I have no boundaries as to where and when my learning happens. When I have a question, I don't want to wait, I check Dr Murphy on Google for an instance response. I won't wait long for answers as I would forget my line of thinking (Interview with Shemiah).

There was no evidence of this elaborate educator-student interaction on Google Group, thus suggesting that this student communicated with educators via private Google chats and not the Group forum (public for participants). These instant engagements highlighted in an interview contradicted, albeit limitedly, the claims that many students and instructors are still not ready to accept the concept of knowledge sharing fully (Rick and Guzdial 2006). The value of instant communication in online activities is corroborated by Blau and Caspi's (2009b) study into the effect of instant student communication and collaboration, using Google Docs, on their sense of psychological ownership, perceived learning and quality of documents. Their findings provide support for the positive impact of communication and collaboration on the readability of documents.

Deep reflection

Interview results show that teaching presence was also expressed through a deep reflection on materials exchanged between the educators and students. Deep reflection was conceivably interlaced with opportunities to pose investigative questions to educators and students, thus negotiating pedagogical knowledge with them: "Google talk gives me the opportunity to probe my educators and peers to get

responses from them and to reflect deeply over issues because I can go back to the Google chats archives, because these responses are persistently archived online" (Interview with Andy).

These claims by students clearly contradict Ioannou and Artino's (2008) claim that students are less passionate about collaborative learning using Web 2.0 technology, but rather prefer individual ownership and accountability. It seems as if the trails of past interactions in Google Groups bestowed students with digital footprints of the transactional exchanges which enhanced their capacity to probe deeper. Thus, Google chats, unlike lectures which are often punctuated by once-off, monolithic, uni-directional delivery, rendered students with talk-back processes during their interactive engagements.

Research limitations

Since our case study focused on a small group of students engaging on Google Groups, the extent of generalisation to the entire student population in the education field could be limited. Although the study is based on data collected a number of years ago with implications for the relevance of data, it is important to highlight that although there has been the broadening of Google Group interfaces to include mobile device interfaces, the technological features of Google Groups have not shifted considerably. Therefore, it can be assumed that the results of this study are still relevant to the contemporary context.

Study implications

Study findings highlighted that the absence of a deliberate effort by a Group leader or educator to create more balance in the discussions resulted in online administrators' domination and gender asymmetry of postings during student interactive engagement. It is clear that, whether an educator or Group leader moderates the discussions or not, a proactive and deliberate effort to promote gender and racially balanced conversations results in equitable participation in online learning environments.

Future studies could examine whether the depth of interactions and engagement can be affected by adopting a multi-pronged pedagogical strategy involving the rotation of student leadership (of group administration) among different gender and races. Other studies can also interrogate if the differentiation of individual student roles (information seekers, information givers, information synthesizers, critics, providers of question prompts) for any given learning task and disintegration of group into smaller clusters would enhance individual student participation.

This study found out some semblance of inter-racial communication among students as they interacted in Google Groups. Further studies could determine whether the technology was the main ingredient for inter-racial relations or there were some hidden dynamics such as students' experiences of online interaction and student leadership in steering more balanced participation. This is critical to promoting a culturally inclusive online learning environment for all students given their racial diversity.

There is a need for Group leaders to be more intentional about gender and racial equity in online communities in order to ensure more balanced participation and

prevent general non-participation by some students. Future studies need to examine whether such a deliberate gender and racially inclusive approach would increase student engagement in on-task activities. It is not clear whether some form of distributed leadership involving the shared responsibility among group administrators and peers, with regard to the assignment of tasks and aligning participation to peer assessment, would entice non-users to participate in Google Groups.

A holistic pedagogical strategy that integrates intentional learning, collaborative problem-solving, deep personal reflection, and inter-racial communication is necessary to address the challenges of surface approaches to learning, limited inter-personal engagements with peers and the educator. The pedagogical design and execution of learning tasks should foreground cross-cultural collaboration through accomplishment of tasks by racial mixed groups, giving learning tasks that require the articulation of epistemological and propositional knowledge, tasks that require individual reflection, cluster cooperation and whole group interaction.

Conclusion

The study investigated the impact of the academic appropriation of Google Groups on effective interactive engagement. The academic use of Google Groups presented multiple academic engagement opportunities and some perceived shortcomings. The academic benefits of using Google Groups manifested in emergent academic networking, student access to knowledgeable peers and academics, and improved the online visibility of interactants that set the stage for fruitful conversations. However, collaborative interactions often exhibited limited academic rigor on content, insufficient student reflexivity and criticality, as well as scant evidence of cognitively demanding academic activities.

The research also explored whether equitable participation was plausible in Google Groups when academics took a backseat role in online interactions. The evidence was mixed, for although there were some semblance of inter-racial communication in Google groups that enabled all group members to make contributions, share resources and mutual research interests, it was unclear whether the use of Google Groups contributed to this democratization effect. Nevertheless, the downsides of Google Groups were site administrators' dominance of group members, salient gender disparities in the postings and "girl power" that unfolded through the hegemony of the only female student in the group. The results provide an exampler of how student-administered media in an instructional setting can actually produce evidence of undesirable interaction and in turn, potentially harm the inclusiveness of an instructional setting. An important caveat is that the phenomenon of undemocratic participation may not be peculiar to Google Groups exclusively but could be common to any independently-run and uncritically managed or unmanaged media system, as was the case in the context of this case-study. The most notable phenomena were examples and descriptions of the emergence of 'micro-aggression' in a setting where dominance was a component of the recent social history of these students. This behaviour is not outwardly

aggressive but is filtered through homophilous actions that mirror the social context of the communities around them.

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Appendix: Google Group interview guide

Demographics

Age
Gender
Race
Nationality
Profession
Year on the job
Years of prior experience in using Google Groups

Motivation for use of technology

1. What motivated your use of Google Groups?
2. What did you use it for?

Social and academic background issues

3. How did your social background influence your use of Google Groups?
4. How did your life experience shape your use of this platform? If not, how so?
5. What role did your cultural backgrounds (social norms, social expectations and cultural traditions) play in shaping your use of this technology? If not how so?
6. How did your (lack of) technological familiarity shape your use of this technology?
7. How did your previous academic background influence your use of Google Groups? If not how so?

Academic impact of Google Groups

8. How were your **academic interactions on the platform** affected by your use of this platform?
9. How were your **academic interactions in class** affected by your use of this platform?

10. How were your **collaborative engagements** shaped by your use of Google Groups?
11. How were your **social interactions in class and outside classroom** influenced by your use of this platform?
12. How were the **social relationships** of your peers affected by your use of technology?
13. In what was **your participation in class** and **in Google Groups** impacted by your use of this platform?

Impact of Google Groups on professional identity

1. How was your **professional identity** (during **that time** and **thereafter**) shaped by your use of Google Groups?
2. How was your **professional work** affected by your use of this technology?

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