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## **Mobile instant messaging: New knowledge tools in global health?**

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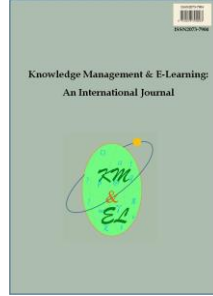
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## **Mobile instant messaging: New knowledge tools in global health?**

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**Abstract:** Despite the proliferation of Mobile Instant Messaging (MIM) platforms, such as WhatsApp, studies that examine their role for learning and knowledge sharing are still rare. Using the context of global health, this study seeks to examine the ways in which MIM platforms are being used for learning and knowledge sharing and identify associated potentials and constraints. A survey with open- and closed-ended questions was administered and the experience of 40 respondents from 44 different project settings was gathered and analyzed. The findings indicate that MIM, and particularly WhatsApp, are used in a boundary-crossing manner, i.e., involving various groups of health professionals, students, and patients from across a range of low-income countries, particularly from Sub-Saharan Africa. MIM platforms are used in informal learning settings for knowledge creation and sharing, supervision, enacting social presence and collaborative problem solving, and for the support of formal education. In addition to enhancing communication efficiency and responsiveness, MIM was also used to bridge geographical (e.g., central-local and urban-rural) and social divides (e.g., professional rankings). Despite technical and socio-behavioral constraints, the use of MIM was reported to significantly benefit distributed global health work and to enhance learning and knowledge sharing in “distributed” networks of practice.

**Keywords:** Instant messaging; Informal learning; Mobile instant messaging; Boundary crossing; Connectivism; Mobile learning; Community of practice; Global health

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## 1. Introduction

Mobile Instant Messaging (MIM) applications, such as WhatsApp and WeChat, have seen a massive, global proliferation in recent years. For example, more than one billion active users access WhatsApp daily in over 60 languages. On average, 55 billion messages, 4.5 billion photos, and 1 billion videos are shared each day (WhatsApp Blog, 2017). These numbers reveal the popularity of use and reach of WhatsApp in comparison to Facebook, the most popular social media platform (Statista, 2018a), which has 1.47 billion active daily users (Statista, 2018b). Although the role of Facebook and other social network sites in formal and informal learning has been well researched (e.g., Aydin, 2012; Cain & Policastri, 2011; Manca & Ranieri, 2013, 2016; Pander, Pinilla, Dimitriadis, & Fischer, 2014), MIM applications have received far less analytical attention to date.

A recent systematic review of MIM applications identified a limited number of MIM studies, many of which did not meet stringent methodological criteria (Tang & Hew, 2017). The review concludes that MIM supports a number of instructional purposes, such as journaling, dialogue, knowledge transmission, constructionist learning, peer feedback, assistance, and assessment (Tang & Hew, 2017). The authors also concluded that MIM offers many positive qualities, including accessibility, user-friendliness, minimal costs, and multimodality including the sharing of emoticons, pictures, videos, and other files. However, the review reveals very little regarding the use of MIM in more informal, lifelong and work-related learning settings (Tang & Hew, 2017). Another systematic review of MIM argues that educational benefits would not be realized in a straightforward way, but users need to navigate the interdependent dialectical tensions of immediacy versus delays, intimacy versus detachment, and task versus ludic orientation (Pimmer & Rambe, 2018).

As MIM combines some of the key characteristics of mobile and social media, it epitomizes increasing levels of media convergence. This means that MIM integrates typical social media features, such as multimodal profiles, status messages, and a list of social contacts, with common mobile communication functionalities. Typical mobile communication features include immediate oral and text-based communication, which are fostered by a range of notification and alert mechanisms (Pimmer et al., 2018). The integration of these communicative features into one digital application is arguably important in informal and formal learning and knowledge-sharing contexts in (global) health education, particularly in practice-based and work-related learning settings, as some studies indicate. For example, as part of a qualitative, small-scale study, Raiman, Antbring, and Mahmood (2017) investigated the use of WhatsApp groups to support British medical students' problem-based learning (PBL) activities during clinical placements. The content analysis revealed that organizational, social, and educational MIM-based discussions fostered understanding and learning. In addition, by allowing for peer and tutor contact, MIM also provided additional learning opportunities outside the pre-defined PBL activities. A study looking at South African nursing students, who used WhatsApp groups in a Primary Health Care Module, emphasized the learners' positive experiences with the digital space and the platform's capability to support them in the integration of theory and clinical practice (Willemse, 2015). Another research project examined the acceptability and feasibility of using WhatsApp groups as a platform for continuing professional development courses. Groups of Kenyan health workers and students accessed a family planning continuing professional development (CPD) training on WhatsApp, which included the provision and discussion of blog posts, videos, infographics, and journal articles (Jayarajan, Lee, & Mwaikambo, 2017). The majority of respondents found the training -- particularly the provision of videos, journal articles, and discussion questions -- useful and indicated that it improved their knowledge of the subject matter. However, the actual knowledge gained between the pre- and post-test was minimal and there was no statistically significant difference between pre- and post-test.

In more informal learning contexts, emergency surgery specialists of a British hospital used WhatsApp for team communication. The platform provided junior trainees easy access to more experienced clinicians, which, in turn, aided support and supervision (Johnston et al., 2015). The use of this platform could be viewed as an online community of practice that connected spatially distributed health care professionals in a clinical site. Informal, work-based MIM use was also researched in low-resource areas. A study found that the increasing availability of internet-enabled (3G) phones increased informal use of MIM and other networking applications among health workers in Ghana (Hampshire et al., 2016). Henry et al. (2015) examined a group of Kenyan community health workers and their supervisors who started using a WhatsApp group for supervision and professional development. The analysis revealed that the vast majority of the conversations related to at least one of three supervision objectives: quality assurance, communication and information, and a supportive environment (Henry et al., 2015). WhatsApp groups were also used in the communication of community health workers and facilitators in rural areas in Malawi. In addition to instrumental and work-centered activities, such as problem solving and information sharing, MIM spaces were used to share personal information and messages of encouragement, ultimately strengthening emphatic ties. This type of digital engagement contributed to heightened connectedness in a professionally isolated health workforce (Pimmer, Mhango, Mzumara, & Mbvundula, 2017).

To conclude, despite the potential of MIM for learning and knowledge sharing, the literature is limited and fragmented, especially in more informal and work-related

learning and professional development contexts, such as in the field of global health. This is the gap the present study seeks to address, using the following research questions:

- Is MIM being used as a knowledge and information tool in work-related learning and professional development contexts, and if so, how?
- Secondly, what are associated potentials and constraints of MIM use in the contexts under investigation?

In seeking to develop a comprehensive picture of the use of MIM applications as knowledge tools, arguably a broad conception of learning and professional development needs to be applied. This perspective should not be restricted to instructionist and transmissive standpoints which are predominant in formal technology-enhanced and mobile education settings (Frohberg, Göth, & Schwabe, 2009; Pimmer, Mateescu, & Gröhbiel, 2016). Moreover, informal, situated, and participatory learning viewpoints need to be taken into consideration to understand the potential breadth of MIM use in more informal and work-based education and collaboration settings. As knowledge in mobile instant messaging spaces is typically created and shared in and across communities and networks, community of practice and connectivism can be viewed as particularly relevant theoretical approaches for consideration. A community of practice is, broadly speaking, conceived as a bottom-up, self-organized group of people who are informally bound together by shared expertise. The group would share experience (for example, via a WhatsApp group) in groups across classic organizational hierarchies (Wenger & Snyder, 2000). Connectivist viewpoints conceptualize learning as the ability and the processes of connecting, nurturing, and maintaining specialized nodes or information sources in networks (Siemens, 2005). They could be thus seen to be reflective of the ways in which knowledge and information are being shared via MIM platforms across individual groups and community spaces.

## **2. Approach and methods**

In addressing these questions, the study focused on the field of global health, and, specifically, on “mhealth” which is also known as “mobile health”. The reasons for this scope were grounded in the proliferation of mobile communication tools and apps in the field of global health (Labrique, Vasudevan, Kochi, Fabricant, & Mehl, 2013; Sama, Eapen, Weinfurt, Shah, & Schulman, 2014).

A survey, which contained general questions about the use of MIM (e.g., audience, setting, benefits, and challenges), was administered from March to July 2016. The invitation to participate was circulated electronically in a number of digitally organized groups in the global and digital health realm (i.e., HIFA, Global Digital Health Network, Social Media for Global Health, ICT4D, and Social Media for Development). As the topic was located at the intersections of several fields of research and practice including health, social media, and technology for development, the study sought to collect responses from groups and networks that had a key role in these areas. These included the Healthcare Information For All (HIFA) network with more than 17,000 members, including health workers, librarians, publishers, researchers, policymakers from 177 countries ([www.hifa.org](http://www.hifa.org)); the Global Digital Health Network, a 3,000 person-strong networking forum with members from 108 countries who are dedicated to sharing perspectives, resources, and practical guidance on the use of digital technologies in global public health (<https://www.mhealthworkinggroup.org/>); and the Social Media for Global Health (SM4GH) group, which has the goal to connect global health and development

professionals with social media responsibilities and allow them to share experience. Moreover, the invitation to participate in the survey was also circulated to two Facebook groups dedicated to the use of technology and development, i.e., ICT4D and Social Media for Development with about 8,000 members in total. Although the data collection was based on a convenience sample, the invitation reached a considerable number of potential participants.

In view of the exploratory nature of the field of research, the survey was directed to a broad range of practitioners from across the field of global health. To capture the possibly very broad experience, no restriction was made regarding the role (e.g., moderator, participant, project manager) that the participants had in the use of MIM. The survey yielded 40 responses, which included the experience from 44 project settings. (Two respondents each described the use of WhatsApp in three and two project settings, respectively, while two respondents only provided basic data but very limited project information).

The qualitative data from the open-ended survey questions was analyzed following principles of thematic analysis (Bearman & Dawson, 2013). In a first round, two researchers independently analyzed all data and identified central themes and subthemes. In a discussion round, the themes and the coded material were reviewed and critically discussed by all authors until consensus was reached. One author recoded the material using NVivo v11 (Silver & Lewins, 2009), and the final coding and interpretation were cross-checked by the other two authors.

### 3. Findings

#### 3.1. Settings and user groups

The analysis reveals a remarkable range of settings and a variety of health professions that use MIM. The three most predominant professions that were involved in the use of MIM (indicated by 40% or more of the respondents) were: community health workers (CHWS), nurses and midwives, and doctors.

**Table 1**  
MIM target audience\*

Audience Profession Category	Percentage of respondents / responses	Responses
<b>CHW</b>	<b>45% / 19%</b>	<b>18</b>
<b>Nurses/midwives</b>	<b>45% / 19%</b>	<b>18</b>
<b>Students</b>	<b>42% / 18%</b>	<b>17</b>
<b>Doctors</b>	<b>40% / 17%</b>	<b>16</b>
Lab workers	15% / 6%	6
Program/technical staff	15% / 6%	6
Patients, beneficiaries	12.5% / 5%	5
Researchers	5% / 2%	2
Policymakers	2.5% / 1%	1
Other	12.5% / 5%	5

*Note.* Professions involved in MIM use (40 respondents, 94 responses \*multiple answers possible)

These three top categories reflected the breadth of the health profession spectrum, from highly qualified doctors, to groups with much shorter pre-service training, such as community health workers. The involvement of other user groups, such as lab workers, program/technical staff, researchers, and policymakers, further underlines the broad professional spectrum of MIM use (see Table 1).

Remarkably, the platforms' use is crossing diverse professional boundaries, as more than half of the respondents (60%) indicated that two or more user groups were the target audience. In addition to qualified health professionals, the boundary-crossing nature also manifested in that 42% of the respondents said that students were involved. Some respondents (12.5%) reported that MIM was also used by patients, thus even cutting across the provider-patient divide.

**Table 2**  
Indicated number of target audience groups

# of groups	Percentage
1	40%
2	25%
3	15%
4 or more	20%

The results are reflective of the global health and development programming focus in Asia and, particularly, in sub-Saharan Africa (Table 3). Given that MIM is used widely by a range of health professionals in both high- and low-resource settings, MIM can be viewed to be an accessible tool for reaching and bridging geographical (e.g., central-local and urban-rural) and social divides, connecting professionals across all settings, including isolated health workforce, as also the qualitative analysis will further emphasize (see 3.2.).

**Table 3**  
MIM geographical setting

Continent	Countries	Percentage	Numbers
Africa	Malawi (4), Nigeria (4), Tanzania (4), Zambia (3), Botswana (2), Ghana (2), Kenya (2), Swaziland (2) Uganda (2), Mozambique (2), Ethiopia, Lesotho, Liberia, Sierra Leone, South Africa, Zimbabwe	67%	33
Asia	India (3), Indonesia, Myanmar, Turkey	12%	6
Europe	Cyprus, Spain, UK	6%	3
South America	Argentina (2), Peru	6%	3
North America	USA (2)	4%	2
Global/unspecified	2	4%	2

*Note.* Q2: Country/ies where the messaging application was used. (n=49 countries); \* Multiple answers possible

### 3.2. Purposes of use

This part of the results summarizes the respondents' answers to the open-ended question regarding the activities and goals for which MIM was used.

**Supervision and flexible coordination of work routines:** According to the qualitative survey data, health workers have adopted MIM for the coordination and management of a wide range of routine work tasks. The most frequently mentioned sub-themes in the survey were supervision and team management. For example, regional managers in Tanzania reported using WhatsApp to guide a group of program staff about budgets, planning, tracking progress, and other management issues. By allowing more continuous communication and feedback, MIM spaces bridged the periods between face-to-face meetings. MIM also supported logistics and procurement regarding work tools and drugs. In creating peer-to-peer networks, challenges associated with linear and bureaucratic supply chains were addressed in a more flexible manner, as the following example shows:

*They [health workers] have been sharing challenges and solutions like stock out, where health facilities have been notified which facility has enough stock to share [...]. It could take time and resources for nurses to move from a facility to district level. But it was easy to take [excess] stock from [a] nearby [facility]. (Respondent 33)*

MIM spaces were also leveraged by managers to collect data from subordinates or local team members regarding performance and progress monitoring. Further purposes included the organization of campaigns and specific events and meetings.

**Distributed knowledge and information sharing:** In addition to the organization and coordination of concrete work activities, MIM spaces were also adopted as general knowledge-sharing spaces, which involved the exchange of technical, organizational and, particularly, health-related knowledge. While one respondent reported the distribution of formal and codified information, such as health-related articles among a Zambian emergency peer-support group that consisted of community health workers, nurses, and doctors, most of the cases were centered around the sharing of knowledge and experience in informal communities across diverse health system and project levels. The latter was mostly focused on participants' concrete work and learning experiences. One case reported a more central facilitation (i.e., encouraging Liberian community volunteers in the Ebola response to use WhatsApp to share experiences); however, most of the engagement appears to happen in decentralized and bottom-up formats.

*A group of 45 Nurses [and immunization officers ...] formed a group of WhatsApp discussing about immunization issues, success and challenges, sharing ideas... Nurses have been sharing different ideas, such as how new vaccines are used, how they can improve ways of transporting vaccine from district level to facilities, etc. (Respondent 33)*

In addition, formal education spaces also transformed into informal and decentralized learning environments over time, as a case from Zimbabwe shows: A WhatsApp group, which had originally been set up to accompany a formal training for Zimbabwean nursing students continued to be used by learners' as a peer-based discussion and learning forum after the end of the training. MIM groups were also reported to be used to engage in broader professional debates, such as that about equity versus equality in health care.



**Cooperative problem-solving:** Situations where an actor experiences a more challenging and difficult situation, for example, a complex patient case, often require the interaction with another knowledgeable actor. The survey revealed different situations in which MIM was used as a platform to involve peers and supervisors in different forms of clinical decision-making and addressing patient-related questions and problems. An example is the use of MIM for joint diagnoses, which was reported to be used for cases in remote areas. Other examples involved the adoption of a WhatsApp group to activate peer support in emergency cases or other difficult situations.

*A few [participants of a Zimbabwean group made up of nurses, midwives and students which has been set up for training on Client Retention in Prevention of Mother-to-Child Transmission (PMTCT) training] have brought cases to their peers to ask advice on challenging situations which fall in the grey area of the national guidelines. (Respondent 28)*

The boundary-crossing nature of many MIM spaces allowed also for cross-cultural problem-solving in which approaches to similar problems varied across different global regions.

**Enacting social presence:** Another dominant theme was the enactment and maintenance of social presence. MIM spaces were reported to be used for the provision of socio-emotional and motivational support, including for example groups of nurses, midwives, clinical officers, and medical assistants in Malawi who supported each other and acknowledged each other's progress.

The breadth of social presence identified ranged from personal and humorous exchanges to broader cultural, religious, sports-related, and political topics and news. Enacting MIM-supported social exchanges and camaraderie was deemed particularly valuable as it connected isolated health workforce in the field and contributed to team morale.

*The network provides an innovative forum for otherwise isolated rural health workers to meet for professional and social support. (Respondent 5)*

**Supporting formal education and professional development:** Beyond informal practices associated with knowledge sharing and problem solving, MIM platforms were also used to enable and support learning and teaching in formal education settings. This was reported in the form of direct instruction of health care workers and professionals who used WhatsApp to teach and guide their students, as well as in the form of peer-to-peer interaction (e.g., discussions on assignments). MIM was also used to enhance individual content-based learning with interactive and collaborative forms of education. An example being a WhatsApp group in the above-mentioned setting on client retention in prevention of mother-to-child transmission (PMTCT) training, which was implemented to complement a self-study case-based training in Zimbabwe. MIM was also used by lecturers and among peers to organize and arrange learning and training sessions, for example, communicate timetables, reminders, assignments, and events. In one case, MIM was used to advertise professional development courses among doctors in Sierra Leone, as it was perceived to be the best way of reaching this target group.

**Client interaction and unintended uses:** Other forms of usage involved health workers' interactions with clients. For example, patients were counselled in one-to-one sessions or in group-based arrangements, sometimes before a face-to-face visit. This was also done with clients on the move.

*People send a message and we reply them. We have created groups of 20 people with a doctor as the moderator. Patients found it a private place to share their health issues plus they could also share photos. (Respondent 27)*

In one case, however, an unintended outcome was observed, as community volunteers in the Ebola response used WhatsApp as a dating service.

### 3.3. Potentials and constraints of MIM communication

Most of the respondents viewed MIM positively. Many tied its use to improved communication and knowledge sharing, which positively impacted cooperative work, especially in rural settings and in contexts where health staff had limited means of communication.

*This is a great tool that enhances all aspects of work in rural settings. It is amazing what improved communication can achieve. (Respondent 36)*

Many benefits reported in the survey related to the efficiency or the quality of information and knowledge sharing.

#### 3.3.1. Efficiency: Ease, responsiveness, and costs

MIM was associated with ease of access and use. Respondents particularly stressed the ease and convenience of communication enabled through MIM. The overwhelming popularity of MIM use in people's personal lives appeared to leverage the use of these tools for professional and educational purposes. The technology allowed easy communication in team and group spaces and was reported to reach "many members at once". The second key characteristic of MIM efficiency was the enhanced speed of communication, which was seen to result in higher levels of responsiveness among MIM users. The instantaneous nature of MIM communication was also attributed to the fact that many people were constantly on these platforms and, thus, could be reached much faster than via conventional digital technologies. In one case, WhatsApp was even used as a way to direct people to their mailboxes and to support classic forms of digital information dissemination.

*Also, if one of us sends something via email, we can alert the others via WhatsApp, and people check their inboxes ASAP. It has really improved timeliness and responsiveness. (Respondent 13)*

In addition, some survey respondents also underscored the low cost and the cost-effectiveness of the use of MIM.

#### 3.3.2. Quality: Boundary crossing and connectivist

A second sub-theme emerged around the quality of MIM-based communication. The nature of MIM communication was viewed to help bridge organizational, geographical, urban-rural, and interprofessional frontiers and to allow for new levels of awareness and connectedness among health workers. Examples from the survey describe communication across organizational hierarchies (e.g., between health workers and their supervisors), rural and urban settings (e.g., a camp and a city hospital), different professional cadres (e.g., health workers and doctors), central and local units (e.g., headquarters and field), as well as high- and low-income settings:

*Much improved communication [from] field to HQ on issues [...]. It also allows UK-based counter-parts (partners) to follow what is happening in the field [in Zambia]. (Respondent 36)*

In addition, by involving clients and project beneficiaries, MIM offered new opportunities to expand and enhance communication down the value chain. In one case, WhatsApp was used to communicate with project beneficiaries (i.e., vulnerable populations) about the project's performance, with the goal to better engage these beneficiaries and the regional staff. The "new" communicative qualities were often described to allow for a new level of connectedness and closeness, team cohesion, and team morale, all of which were deemed relevant, particularly for health workers who were isolated in the field.

### 3.3.3. Technical and socio-behavioral constraints

Although some respondents indicated no challenges regarding MIM use, two key constraints surfaced from the analysis. These related to technical and socio-behavioral barriers. Technical issues affected access to MIM, whereas socio-behavioral challenges tended to be linked to the quality of MIM conversations. The predominant technical challenge was a lack of MIM-enabled smartphones and limited network connectivity. Some viewed irregular connectivity as less problematic because messages were delivered as soon as users went online again. In some cases, however, health workers were required to travel considerable distances to reach places with stable internet connectivity. The second main technical challenge was that some workers did not own phones capable of MIM and were thus excluded from these ways of communicating. In addition, some workers were reported to have restricted participation opportunities due to high costs of data bundles, and in one case, the lack of power supply.

Socio-behavioral challenges included tensions regarding the scope of MIM use, low media literacy, and low levels of active participation. Study participants indicated that typical MIM use was of private and personal nature, which stood in direct contrast to more formal and professional use. This phenomenon was observed on MIM in general but also within group spaces.

*In a typical WhatsApp chat, serious clinical information about patients resides amidst loads of other routine chat messages from friends, family, colleagues. (Respondent 41)*

Divergent expectations about the scope of MIM use, which could not be reconciled, were reported to provoke tensions and even caused some members to abandon the joint digital space:

*Most of the time they post and discuss social issues and breaking news as well as jokes and share funny stuff, hence some members left the group. (Respondent 34)*

A socio-demographic barrier was linked to age. Older people were said to have lower levels of media literacy, which restricted their opportunities for participation in MIM spaces. In one case, it was also reported that fewer women were enrolled and actively contributing to MIM discussions. Further constraints were (micro-)political in nature: Access to groups was reported to be protected through gatekeeping and some users were deemed reluctant to interact freely in spaces with more senior-level colleagues. Another constraint was varying levels of active contributions, which resulted in a lack of momentum: "Not all members participate; not all groups are active". Along similar lines,

the lack of feedback and interrupted communication with long breaks of silence were found to be challenging.

#### 4. Discussion

The findings can be interpreted through different conceptual and theoretical lenses, most notably community of practice and connectivism. We also argue that the findings are also relevant for other professional domains, such as teacher training and professional development. This is followed by a discussion of the practical implications of the study. This part draws on the survey responses to the question about practical recommendations regarding setting up and running MIM spaces.

##### 4.1. Educational reflections – Connectivist learning in communities of practice

Most of the forms of MIM usage relate directly or indirectly to learning and professional development. Supervision, one of the identified key purposes of MIM, is, however, in global health, a more managerial than educational approach in which supervisors monitor, guide, and facilitate health workers on a regular basis (Robertson et al., 2015; WHO, 2008). In the extant literature, it was, nevertheless, found to be an important lever for professional development, which also improves health workers' job satisfaction and motivation, and even has large to moderate effects on their performance (Rowe, de Savigny, Lanata, & Victora, 2005). In the present study, MIM communication was reported to aid supervision processes and to bridge the often lengthy periods between onsite supervision, which are typically constrained by a lack of transport (Rowe et al., 2005).

The sharing and discussion of knowledge and situated experiences in informal communities and networks across organizational structures, another central theme, form an essential tenet of a *community of practice*, i.e., of groups of people who are informally bound together by a shared expertise. This is especially the case if these (digital) communities are generated bottom-up and self-organized (Wenger & Snyder, 2000), as reported in several instances in this study.

The cooperative solving of problems, another key category yielded by this research, is also a crucial characteristic of a community of practice, in which members are learning together by jointly solving problems that are directly related to their work (Wenger & Snyder, 2000). From work-based learning perspectives, the solving of problems, i.e., addressing situations in which an actor's smooth flow of work activity is interrupted (Smith, Morris, Francovich, Hill, & Gieselman, 2004), is seen as a main route for learning and competence development (Slotnick, 1996). The high levels of responsiveness afforded by diverse MIM features are particularly significant in addressing urgent problems, a very common phenomenon in patient care and clinical work.

Social presence, another of the study's key themes, is typically associated with MIM (Tang & Hew, 2017). The "*ability of learners to project themselves socially and affectively into a community*" is, alongside cognitive and teaching presence, at the core of technology-enhanced learning (Garrison, 2007; Rourke, Anderson, Garrison, & Archer, 2001). In the field under investigation, the opportunity to connect socially with peers and work colleagues alone can be seen as very positive, since many rural health workers suffer from professional isolation and have limited opportunities to participate in professional communities (WHO, 2010). However, from a learning perspective, social

presence should reach beyond socio-emotional communication and the development of personal relationships and should aim at intellectual focus, i.e., at open and purposeful communication (Garrison, 2007). This observation is particularly relevant in the context of this study, as a tension between *open* and *purposeful MIM communication* was identified in some cases. In other words, the introduction of personal and social technologies in more formal education and work settings was deemed to cause and aggravate contradictions and conflicts. The tensions of balancing instrumental and work-centered communication on the one hand side and personal and social discussions on the other hand side, are also addressed in the extant literature. For example, Pimmer et al. (2017) described the reconciliation of different expectations among participants as an ongoing negotiation process in the introduction and use of WhatsApp among community health workers.

Viewed from a community of practice perspective, the data provided no qualitative evidence that MIM-based social presence allowed learners to advance from a peripheral to more central members of one (virtual) community in the sense of a continuous trajectory, as one of its central tenets would imply (Lave & Wenger, 1991). Instead, the patterns resembled connectivist viewpoints, in which learning is conceptualized as the ability and the processes of connecting, nurturing, and maintaining specialized nodes or information sources in and across communities and networks (Siemens, 2005) on demand. In this way, MIM allowed users to activate (multiple) networks, which went across diverse organizations and informal, interest-centered collectives in a situated, ad-hoc, and more ephemeral (rather than continuous developmental) manner.

The connectivist affordances are also of relevance in other professional fields, such as teacher training and professional development. Although MIM has been studied only to a very limited extent in this domain, the insights of the present study resonate with observations on the use of digital and social media in general. For example, the findings bear resemblance with the work of Mackey and Evans (2011), who analyzed how, in the context of a teachers' online professional learning diploma program in New Zealand, teachers created their own networks of practice by integrating online and offline interactions and, in the same way, formal and informal learning experiences with fellow learners and workplace colleagues. They used online connections in pragmatic and purposeful ways instead of a continuous trajectory (Mackey & Evans, 2011). The convenience, ease of use, and low costs associated with MIM, which is also highlighted in previous literature on the educational use of MIM (Tang & Hew, 2017; Willemse, 2015; Willemse & Bozalek, 2015), could make the platforms especially conducive to reaching, connecting and supporting teachers from low-resource settings, allowing them to leverage connectivist learning opportunities.

Finally, it needs to be noted that, despite its boundary crossing nature, the use of MIM cannot be equated to a more democratic access of knowledge resources itself. Like other technologies, MIM is a structural amplifier, which can even lead to a further discrimination of already disadvantaged groups, as examples in this study have illustrated. They include users who live in settings with limited or no network connectivity, have lower levels of media literacy, and limited access to advanced mobile phones.

#### 4.2. Recommendations and practical considerations

The following sections describe practical recommendations and considerations regarding the design and use of MIM groups. Despite the inherently personal and peer-to-peer

nature of MIM communication, a key theme brought up by several participants, was the need to establish moderation and facilitation mechanisms to provide direction for, and to motivate and engage users in the discussions. However, top-down moderation can negatively affect local or peer ownership dynamics, which was also emphasized by some survey respondents. As a compromise – but contingent on the specifics of the context – engaged and skilled peers might be encouraged to take over facilitation and moderation (gradually), as was nicely demonstrated in the use of Facebook as a social network site for learning and professional development among Nigerian laboratory scientists (Cassaniti, Mwaikambo, & Shore, 2014). Deliberate facilitation by peer or central moderators could also address the challenge of inactive contributions or loss of momentum in MIM spaces, which is a common phenomenon (Henry et al., 2015; Jayarajan et al., 2017). To address this issue, study respondents also pointed to a “tipping point” – a threshold exceeded by the engagement of a minimum number of active core contributors, who then sparked further engagement and conversations.

Study respondents also underscored the positive impact of having users with prior offline relationships and structures involved in digital MIM spaces. Capitalizing on offline relationships and pre-existing structures in setting up MIM and social media spaces is also addressed in the literature, with examples ranging from leveraging prior educational ties (e.g., from alumni or face-to-face training settings) to professional and work-based connections (e.g., professional bodies or councils). In cases in which no offline relationships are in existence, onsite meetings might be organized prior to the initiation of MIM activities, as one respondent suggested, to foster the establishment of relationships and trust. In addition, some ground rules could be agreed upon at the beginning, which was suggested by survey respondents and in the literature (Tang & Hew, 2017). These would not only include timing aspects to avoid intrusions in users’ private lives (Tang & Hew, 2017), but should also involve the joint development of an understanding of the scope and nature of MIM discussions, to counter tensions that typically emerge from divergent expectations regarding the more formal versus informal use of the spaces (Pimmer & Rambe, 2016).

The boundary-crossing nature of MIM communication, which has been observed only to a limited extent to date, is arguably of relevance in the field of global health and beyond. For example, the use of WhatsApp groups among emergency team members to discuss and share clinical and administrative information was found to flatten team hierarchies in the clinic (Johnston et al., 2015). The findings of the present study show, however, that MIM enabled boundary-crossing practices that go far beyond connecting people within a location, but also help to bridge rural-urban, local-central, interprofessional, and even high- and low-income setting divides. The latter is of particular relevance for the field of global health, which is, though transnational in nature, marked by a disconnect between the majority of global health centers located in high-income areas and the most pressing health issues, which arise in low- and middle-income countries (Beaglehole & Bonita, 2010).

In addition, MIM-enabled boundary-crossing is likely to be of value in other professional fields in low-resource settings, such as teacher training and professional development, as a project from one of the most marginalized areas, Kenya’s Kakuma refugee camp, showcases. In the project, refugee teachers use WhatsApp groups not only for peer support but also for engaging with global mentors. These mentors are experienced educators from around the world, who provide refugee teachers with general knowledge and teaching guidance (based on a specified curriculum), and they also support them in challenging situations, which arise in their day-to-day teaching practice

(Teachers for Teachers Initiative, n.d.), similar to some of the constellations observed in this study.

#### 4.3. Strengthens, weaknesses, and future research

The study sample was representative of global health practitioners and their MIM use in terms of profession and geographic location. Most respondents were from low- and middle-income countries, close to 80% from sub-Saharan Africa and Asia. However, the study is limited due to its reliance on self-reported data and a convenience sample. Moreover, the questionnaire design did not allow for researchers to ask follow-up or clarifying questions. Despite these limitations, there are many opportunities to expand on this foundational work for future research. Given the plethora of people across the global health professional spectrum that uses MIM, it is vital to continue more research on its usage and impact, especially in terms of learning, knowledge sharing, and professional development.

### 5. Conclusion

Perhaps the main contribution of this study is the conceptualization of the role of MIM as a rich reservoir for informal, work-related learning. The advantages regarding convenience, ease of use, networked communication, and low costs make MIM a low-threshold technology; that is, a technology "that is reliable, accessible, easy to learn, non-intimidating and (incrementally) inexpensive..." (The Teaching, Learning and Technology (TLT) Group). The use of MIM platforms also appears to facilitate learning and knowledge processes in low-resource settings in which many users were excluded from these opportunities before. The responsiveness and boundary-crossing nature of MIM are particularly relevant to the demands in the field of global health, in which urgent and instant communication across multi-faceted boundaries is not only a central characteristic but also a key challenge. Despite technical and socio-behavioral constraints, MIM use was reported to benefit distributed global health work and to enhance the fabric of connectivist learning and knowledge sharing in distributed networks and communities of practice in significant ways.

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