

# Facilitating Professional Mobile Learning Communities with Instant Messaging

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Although Mobile Instant Messaging (MIM) is a massive communication phenomenon and its educational use can be seen as a genuine form of mobile learning, it has been studied to a limited extent to date. The present study examined the use of MIM to engage young professionals in mobile learning communities during their school-to-work transition. This transition is one of the most central but also challenging developmental phases marked by the experience of knowledge gaps and a lack of belonging.

To assess knowledge and socio-professional learning effects associated with the use of MIM, this study adopted a quasi-experimental, survey-based approach with an intervention and control condition (n=114) in the setting of an international research project. In the intervention condition, newly graduated nurses from Nigeria participated in WhatsApp groups in which moderators shared knowledge and stimulated professional discussions over a period of 6 months. Data were collected via online surveys and knowledge tests.

The findings show that participants in the moderated WhatsApp groups had significantly higher knowledge and exhibited fewer feelings of professional isolation compared with the control group, which was not subject of any treatment. The effects were even more pronounced when controlling for *active* contributions (writing vs reading messages), which also amounted to significantly higher levels of professional identification. In addition, across intervention and control groups, the self-reported *general active* use of WhatsApp (outside of the intervention) was positively associated with the measures of professional social capital maintained with school connections, professional identity, (lower) professional isolation, job satisfaction, and the perceived transfer of school knowledge to work practice.

Whereas knowledge and socio-professional effects can be triggered through moderated WhatsApp interventions yet the general (and thus informal) use of WhatsApp is associated with socio-professional connectedness. The findings are of particular relevance in the developing context under investigation, which is marked by a lack of alternative support structures.

**Keywords:** mobile learning; instant messaging; school-to-work transition; nursing education; professional networks;

# 1 Introduction

## 1.1 School-to-work transitions: Participatory and knowledge challenges

The school-to-work transition is, viewed from educational and professional development perspectives, a pivotal phase (Rudd, 1997). The experience that learners make during this period impacts their work skills and future career success (Koen, Klehe & Van Vianen, 2012). This transition is not an isolated and narrow phase between the completion of schooling and the beginning of the first job. Instead, the phase is boundary crossing in nature, as it starts already during school and includes the processes of adjustment and habituation in the initial phase of work. This paper focuses on the second aspect, i.e., on the immersion into the professional world upon graduation.

In health professional education, the domain of the present study, considerable attention has been paid to the period of professional immersion in which graduates start a new job. The experience made during this phase is a determinant of professional success and retention in the job (Christmas, 2008; Clark & Springer, 2012; Rush, Adamack, Gordon, Lilly & Janke, 2013). Although the phase of professional immersion can offer a broad range of learning opportunities (Clark & Springer, 2012; Meleis, 2010), graduates are often struggling with high levels of stress and low job satisfaction, particularly in the first six to nine months in the new job (Rush et al., 2013). They also experience professional isolation, i.e., feeling distant from their teams (Evans, Boxer & Sanber, 2008). In addition, the initial work experience after graduation is marked by the experience of gaps in knowledge, especially challenges in the transfer and application of prior knowledge, which Clark and Springer (2012) coined as “not knowing.”

## 1.2 WhatsApp to support learning and professional development

The underlying rationale of the present study was to examine the support that can be provided to learners and young professionals by means of Mobile Instant Messaging (MIM) groups during this critical phase of transitioning from studentship into the world of work. Despite the fact that MIM is a massive phenomenon that has transformed global communication practice, relatively little is known about its role in education and learning. The burgeoning use of MIM manifests, for example, in WhatsApp user statistics. The platform is the third most popular social media platform after Facebook and YouTube (Statista, 2017). More than one billion active daily users share 55 billion messages on a daily basis (WhatsApp Blog, 2017).

However, whereas the educational role of social network sites, such as Facebook, has been examined widely, MIM has only started recently to be the subject of more systematic research efforts. Emerging findings have been summarised in a recent systematic review, which conceives its central affordances as “temporal [anytime and anywhere], user-friendly, minimal cost, and multi-modality features” (Tang & Hew, 2017, p. 85). The authors also observed six specific purposes for the use of MIM in education, which included “journaling, dialogic, transmissive, constructionist with peer feedback, helpline, and assessment.” (Tang & Hew, 2017, p. 85). The analysis of the literature points to the potential of MIM to enable a social and emotional presence across a range of different

education and learning contexts. For example, a study found that students use it as a tool to provide practical, social and emotional support to peers (Timmis, 2012). MIM allows for a form of intimacy which is not achieved through social network sites, such as Facebook, which are more focused on self-presentation and self-disclosure (Karapanos, Teixeira & Gouveia, 2016). Intimacy, trust and closeness are enacted through a particular form of social presence labelled as “dwelling”, which is marked by “profoundly small, continuous traces of narrative, of tellings and tidbits, noticings and thoughts, shared images and lingering pauses (O'Hara, Massimi, Harper, Rubens & Morris, 2014). Interactants are dropping in and out, maintaining their digital presence across lengthy periods of time (Timmis, 2012).

Although it can be assumed that the development of closeness, togetherness and the provision of practical and educational support is central in phases of school-to-work transitions in which graduates are challenged by entering new professional and developmental terrain, no studies on the use of MIM in this particular context could be identified. However, studies on placements are indicative of the potential of MIM in the school-to-work transition because also placement learning is marked by feelings of isolation and the experience of knowledge gaps (Eick, Williamson & Heath, 2012; Levett-Jones, Lathlean, Higgins & McMillan, 2009). The potential of MIM in these settings has been explored, for example, through a small-scale study in the UK which reported the use of WhatsApp as a platform to support problem-based learning. The authors concluded that the tool enhanced the coordination of the groups and enabled the development of an extended social presence among the participants (Raiman, Antbring & Mahmood, 2017).

Even the informal and non-facilitated use of social media (including MIM) by students during placements was found to correlate with their personal and group resilience. This association was explained with the technology's capability to allow for the maintenance of social relationships which serve as a resource for feedback and emotional support in stressful placement situations (Sigalit, Sivia & Michal, 2017). Similarly, another study found that students informal use during placements was associated with reduced feelings of isolation from professional communities (Pimmer et al., 2018).

In contrast to studies that point to the capability of MIM in supporting an emotional and social presence in learning settings, the literature that confirms cognitive and knowledge outcomes is even more scarce and inconclusive. In the systematic review of Tang and Hew (2017, p. 85), five studies showed positive outcomes whereas two studies found no or even adverse knowledge effects (Tang & Hew, 2017, p. 85). This ambiguity was, for example, reflected in a study in a context similar to the present investigation, in which a training course for health professionals was offered via a moderated WhatsApp group. Although the majority of respondents found the training useful, the knowledge gains measured between the pre- and post-test were not significant (Jayarajan, Lee & Mwaikambo, 2017). This raises the question regarding how MIM can be used to achieve knowledge-related outcomes. In their review, Tang and Hew (2017) suggest that the *form* of MIM-based engagement could be a key determinant. This argument is supported by the study of Lai (2016): While Lai did not find differences in knowledge gains between a WhatsApp-based learning group and a control group

he observed significant associations between the quantity of engagement and learning outcomes in the intervention group. Using qualitative content analysis, Lai explains these differences also with the mode and quality of engagement, as some participants made only a few low-quality contributions which were not taken up by their peers (Lai, 2016).

To conclude, despite the increasing proliferation and the educational potential ascribed to the use of MIM platforms, findings from existing research are rather inconclusive. Whereas a number of studies point to the potential of facilitated as well as informal use of MIM to enable a social and emotional presence in learning settings, very little knowledge is available regarding the ways and modes of engagement through which knowledge outcomes can be obtained. In addition, the majority of the evidence presented to date is qualitative in nature.

The gap identified is particularly relevant regarding the learners' school-to-work trajectories, which present a highly critical developmental phase. In addressing these gaps, this study does not only seek to contribute to the general field of mobile learning in which the use of instant messaging has been examined to a limited extent, but also to the domain of mobile learning in nursing education. Findings from a recent systematic literature review of this emerging domain underscore the need to further investigate the aspects of peer interaction, synchronous sharing and contextual mobile learning (Chang, Lai & Hwang, 2018). All these are aspects which are part of the present intervention.

## **2 Material and Methods**

### **2.1 Objectives and research questions**

To address the gaps identified, three main research questions were formulated. The first question is centred on the potential effects which can be triggered through the systematic use of MIM in the school-to-work transition: Can the facilitated use of MIM enhance (a) the retention and transfer of knowledge, and, (b) socio-professional connectedness - in comparison with a control group (RQ1)? The dimension of socio-professional connectedness was evaluated through the measures of professional social capital maintained with school connections, the development of a professional identity, feelings of isolation from a professional community, job satisfaction and the tendency to look for a new job in a more urban area. While knowledge and socio-professional connectedness are arguably of value in any professional sector, they are particularly relevant in the domain of global health which is marked by rural health workers who tend to work in professional isolation with limited access to knowledge resources. In these settings, many professionals tend to leave the country or the job, and thus also the retention of a rural health workforce is a key issue (WHO, 2010), which we have thus included in the measurement.

A second research question was aimed at determining the potential implications of different modes of engagement, i.e., the active vs passive use of the MIM platform (as expressed by the extent to which participants were writing vs reading messages) on the abovementioned measures. The

question formulated was to determine whether, and, if so, to what extent, higher levels of active engagement (i.e., writing contributions) would impact the socio-professional and knowledge measures specified below.

Moreover, drawing on some insights from recent studies (Pimmer et al., 2018; Sigalit et al., 2017) a third question addressed possible connections regarding the general use of WhatsApp (outside of the participation in the moderated WhatsApp intervention) with socio-professional and knowledge measures in the school-to-work transition. The question was formulated as: Is the general, informal use of WhatsApp associated with the socio-professional measures of professional social capital, professional identity, professional isolation, job satisfaction and the inclination to search for a new job and knowledge transfer?

## **2.2 Intervention and study approach**

The study population consisted of recent graduates from five training institutions for nurses in Nigeria. The five schools were situated in Oyo state, in South-Western Nigeria, having very similar characteristics: All were accredited by the Nursing and Midwifery Council of Nigeria (NMCN). ([www.nmcn.gov.ng/portal](http://www.nmcn.gov.ng/portal)). The schools use the same curriculum and attract students who are predominantly young persons from comparable socio-economic backgrounds. The students were recruited during onsite visits by members of the research team at the individual schools shortly before their graduation, a process in which also written ethical consent was obtained (see the section below "Ethical consent"). The telephone numbers of participants were collected and this information was used to create the WhatsApp groups for the intervention cohort and to contact the participants of the control group to participate in the online survey.

To determine potential effects associated with the systematic and moderated use of instant messaging, this study adopted a quasi-experimental post-test approach. The randomisation at the school level was carried out to leverage pre-existing social ties in the digital spaces (Boyd & Ellison, 2007; Ellison, Steinfield & Lampe, 2007). Accordingly, out of the five pre-selected schools, participants from three institutions (n = 77) were randomly assigned to the intervention condition and the graduates from each school were invited to take part in one moderated WhatsApp group. The participants of the remaining two schools (n = 37) were assigned to the control condition, which was not subject of any treatment.

Before the start of the intervention, the project team developed a moderation script to aid the moderators in the facilitation and moderation of the WhatsApp groups. The content consisted of various topics which were selected based on the relevance they would have for nurses upon graduation. It included general professional topics such as career planning or safety in workplace. In addition, the topics also focused on practical clinical knowledge, such as the management of communicable diseases, pain assessment, bed making or the use of catheterisation. The clinical content was not new. Instead, it was a repetition of central topics which had been part of the school curriculum and which were viewed to be particularly relevant during the nurses' immersion into the practice settings upon graduation. The selection of the topics and the development of the content

were informed by students' suggestions during the recruitment process and by the advice of experienced nurse professionals, who formed part of the project team. Three moderators were recruited for the groups, all of which were experienced nurse practitioners. Before the start of the intervention, the moderators were trained in a four-hour onsite workshop organised by the research team. The topics taught included the nature and purpose of the WhatsApp group, ground rules for participation, the usage of the moderation script and key principles of an activating moderation.

The intervention took place for six months, from December to May 2017. Using the script as a guide, the moderators posted new content at the beginning of each of the 24 weeks. In addition to the pre-defined content, the moderators contributed in situ to the emerging discussions in the groups. Each topic was concluded with a quiz at the end of the week. The winner, i.e. the first respondent who provided the correct answer, was rewarded with a small amount of airtime. This was justified, especially because the participants did not receive any other compensation for the costs created through their participation in the study.

### **2.3 Participants**

A total number of 114 participants ( $M_{age} = 22.82$ ,  $SD = 2.31$ ,  $range = 20 - 30$ ; 14.0% male, 1 person did not specify) were included in the analysis. No significant differences between the two conditions were observed in terms of gender ( $\chi^2_{df=1} = 1.38, p = .95$ ) and age ( $t_{df=77.983} = -1.738, p = .086$ ). Most participants were working in a rural area ( $n=60$ ), township ( $n=10$ ), and only few in peri-urban ( $n=4$ ) or rural areas ( $n=3$ ,  $n=37$  did not specify). Also with regard to the general use of WhatsApp (outside of the intervention), no significant differences could be found between the intervention and the control group, neither concerning the writing nor reading. This underscores the comparability of the two groups.

### **2.4 Data collection and measures**

The data were collected through an online questionnaire using the platform survey monkey. A link to the questionnaire was posted in each WhatsApp group. The participants in the control condition were invited via the contact information that they had provided during recruitment. To maximise participation, each participant who completed the questionnaire was provided with an airtime credit of N500 (about US\$1.2).

The survey included three main categories that related (1) to the participants' background (age, location etc.), (2) socio-professional connectedness, and (3) knowledge measurements including the perceived knowledge transfer from school to practice settings, and the actual knowledge score which was determined through a test. All off the measures presented below were assessed via 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree), unless otherwise noted.

**Knowledge score:** The participants' clinical knowledge was assessed with 14 multiple-choice questions. The questions addressed topics that were discussed before in the WhatsApp groups. The following question is one example: "The first line drugs for treatment of tuberculosis consists of all of the following except (a) Isoniazid; (b) Capreomycin (c) Rifampicin (d) Ethambutol." The calculation of

the knowledge score was based on Haque, Rahman, Itsuko, Mutahara and Sakisaka (2014), i.e., all correct answers were awarded with one point, wrong or missing answers received zero points. The maximum knowledge score that participants could achieve were 14 points.

**Knowledge transfer:** To measure the extent to which the learners perceived to be able to apply knowledge from their schools in their day-to-day practice, we used a shortened version of Xiao's (1996) scale on training transfer. The original scale was adapted to cover the transfer of the training knowledge into the workplace in the context under investigation. The four items focused on the frequency and ease of the transfer of knowledge gained from the previous training at the nursing school in the current job, as well as on the extent to which this knowledge helped to tackle daily work tasks. The four items showed acceptable internal consistency (Cronbach's alpha = .74).

**Professional social capital maintained with school connections:** Social capital is a powerful measure which is linked, inter alia, to peoples' career success (Adler & Kwon, 2002) or, in the field of nursing, it is viewed as an enabling factor for lifelong learning (Gopee, 2002). Recently, research on social capital has been reflective of the dynamics of the digital area (Williams, 2006), showing its connection to online engagement. For example, the use of Facebook has been associated with students' ability to maintain connections with members of a previously inhabited community, such as with former friends and colleagues from school (Ellison et al., 2007). Research from contexts similar to the present study has shown that mobile social media spaces can be serve as relevant resource for professionals to maintain connections with their former school colleagues to solve work problems and to discuss professional questions (Pimmer et al., 2014). Accordingly, a shortened version of William's (2006) validated social capital scale was used to determine the level of professional social capital that the learners would maintain with their former school connections (similarly to Ellison et al. (2007). The scale consisted of six items and showed good internal consistency ( $\alpha = .87$ ).

**Isolation from the professional community** was used to measure the learners' perceived separation from the professional community. It was assumed that the use of MIM, and especially its connective properties, would help learners in reaching out to and staying connected with friends and colleagues from their profession. To determine the level of isolation that learners perceived to have from their professional communities, a shortened version of the revised UCLA Loneliness Scale was used. The UCLA scale is a measure to assess people's isolation and loneliness (Russel, Peplau & Cutrona, 1980). The adapted measurement that we used originally consisted of five items. However, it showed poor internal consistency with Cronbach's alpha = .59. Internal consistency was slightly improved by excluding the item, "I am unhappy about being so cut off from other nurses", from further analysis ( $\alpha = .66$ ).

**Professional identity:** The formation of a professional identity is a complex process congruent to the development of a personal identity. Broadly speaking, it describes the ways in which a person feels that s/he is becoming part of a professional community (Cruess, Cruess, Boudreau, Snell & Steinert, 2015). The rationale to use the construct of professional identity was to determine whether, and, if

so to what extent the qualities of MIM to foster togetherness (Karapanos et al., 2016) would also impact the users' ability to connect with and to develop a sense of belonging to a professional community. The professional identity scale of Adams, Hean, Sturgis and Clark (2006) was shortened and contextualised (3 items), showing acceptable internal consistency ( $\alpha = .77$ ).

**Job satisfaction:** Although job satisfaction is a complex phenomenon, which is influenced by various personal and contextual factors (Spector, 1997), the study also sought to explore the potential linkage between the connectedness afforded through MIM and the participants' satisfaction with their current work. In line with previous studies which confirmed the validity of single-item measures (Scarpello & Campbell, 1983; Wanous, Reichers & Hudy, 1997), the following question was used: "Overall, how satisfied are you with your job?"

**WhatsApp use:** The learners' use of WhatsApp followed the differentiation used by Cho (2014). Instead of measuring the intensity of use (as expressed in time, frequency of access etc.), we differentiated active and passive contribution patterns. In other words, the participants were asked to indicate the extent to which they contributed with written messages, and the extent to which they were reading messages on WhatsApp. Moreover, we discriminated the nurses' participation in the moderated WhatsApp group and their general use of WhatsApp outside of the intervention. To cover the first aspect, the following questions were used: "I have written many messages in the WhatsApp group "Nurses Connect [the name of the group]; I have frequently read messages of others in the WhatsApp group "Nurses Connect". The informal, day-to-day use of WhatsApp was addressed with the following questions: "In general, I write many messages on WhatsApp"; "In general, I frequently read messages of others on WhatsApp."

Finally, to determine the participants' inclination to search for jobs in more urban areas (as rural retention is a predominant concern in global health work (WHO, 2010)), we applied the single-item measure: "I intend to get a new job in a more urban area as soon as I can find one".

## **2.5 Ethical consent**

The Review Board of the University of Ibadan/University College Hospital approved the protocol of the study. In addition, the research team obtained permission from the administrators of each school before visiting the sites. In each school, the research team met with the students in a classroom and informed them about the study. They emphasised the voluntary nature of participation and highlighted that the data will be kept and presented in a confidential manner so that no linkages could be made to individual participants. After this process, written informed consent was obtained.

### 3 Results

In the first analytical step, to address RQ1, we compared the intervention group with the control group, i.e., the cohort that did not participate in the moderated WhatsApp spaces (See Table 1). Because most of the measures employed 5-point Likert scales and were not normally distributed, robust Wilcoxon signed-rank tests were used for all significance tests ( $\alpha = .05$ ).

In regard to the socio-professional measures, the feelings of professional isolation were significantly lower in the intervention group (Mdn = 1.75) compared with the control group (Mdn = 2.00),  $Z = 1.726$ ,  $p = 0.042$ ,  $r = .16$ . The intervention group also achieved better results concerning the knowledge score, which was significantly higher in the intervention group (Mdn = 11) compared with the control group (Mdn = 10)  $Z = -2.182$ ,  $p = 0.015$ ,  $r = .20$ .

No significant differences were found between the groups regarding the perceived knowledge transfer and the socio-professional indicators of job satisfaction, inclination to search a new job in a more urban area, professional social capital maintained with school connections, and professional identity. Although the medians of the last two measures were higher in the intervention group than in the control group, the results were not significant.

Table 1: Comparison between control and intervention cohort, and active intervention cohort

	Control				Intervention				Wilcoxon Test		Intervention (active)				Wilcoxon Test	
	n	M	SD	Mdn	n	M	SD	Mdn	Z	p	n	M	SD	Mdn	Z	p
Prof social capital	37	4.26	0.591	4.17	77	4.29	0.574	4.33	-0.129	0.449	42	4.46	0.356	4.50	-1.438	0.075
Prof identity	37	4.38	0.551	4.00	77	4.46	0.530	4.33	-0.973	0.165	42	4.56	0.573	4.67	-1.748	0.040
Prof isolation	37	1.99	0.628	2.00	77	81	0.519	1.75	1.726	0.042	42	1.71	0.544	1.75	2.279	0.011
Knowledge transfer	27	4.22	0.424	4.25	59	4.18	0.591	4.25	0.132	0.553	33	4.18	0.584	4.25	0.000	0.500
Job satisfaction	28	3.61	0.629	4.00	58	3.19	1.115	4.00	1.443	0.926	32	3.28	1.170	4.00	0.594	0.724
Rural job retention	28	4.00	0.770	4.00	59	4.08	1.134	4.00	-1.197	0.116	33	4.24	1.091	5.00	-1.779	0.038
General WA use (write)	37	3.81	1.101	4.00	77	3.88	0.959	4.00	-0.115	0.454	42	4.29	0.636	4	-1.805	0.036
General WA use (read)	37	4.16	0.898	4.00	77	4.17	0.768	4.00	0.335	0.631	42	4.40	0.497	4	-0.791	0.214
Knowledge score	37	9.89	1.505	10	77	7	1.743	11	-2.182	0.015	42	1	1.656	11	-2.643	0.004

In the next step, to address RQ2, the intervention cohort was controlled for active participation. That is, only respondents who agreed or strongly agreed with having made many written contributions in the facilitated WhatsApp group were included. (See columns Intervention (active) in Table 1). This reduced the number of the intervention group to  $n = 42$ , who were compared with the 37 participants in the control group. (For some measures, the sample size differs because of missing values).

The analysis shows that the effects regarding lower levels of professional isolation in the WhatsApp condition were even more pronounced,  $z = 2.279$ ,  $p = 0.011$ ,  $r = .25$ . In addition, the active part of the

intervention group (Mdn = 4.67) had also significantly higher levels of professional identity than the control group (Mdn = 4.0),  $Z = -1.748$ ,  $p = 0.04$ ,  $r = .20$ . Moreover, the active contributors in the intervention group exhibited a significantly higher inclination to search for a new job in a more urban area (Mdn = 5.00 vs a Mdn = 4.00 in the control group;  $Z = -1.779$ ,  $p = 0.038$ ,  $r = .23$ ). Again, the medians of the measures of professional social capital and professional identity were higher in the intervention group than in the control group, but the results did not reach the level of significance ( $p = 0.075$ ). And, no differences were found between the groups regarding job satisfaction and the perceived knowledge transfer. The latter is again in contrast to the knowledge score which was assessed through a test. There, the advancement of the intervention group was even more pronounced ( $Z = -2.643$ ,  $p = 0.004$ ,  $r = .30$ ).

In the third step, to address RQ3, we measured whether, and if so, to what extent, the general use of WhatsApp across intervention and control groups would correlate with the socio-professional and knowledge measures. Results with Kendall rank correlation show that nearly all the socio-professional measures including job satisfaction and the intention to find a new job as well as knowledge transfer were associated with the general and active use of WhatsApp (i.e. writing messages). The most significant associations were found for professional social capital ( $\tau_b = .23$ ,  $p < .01$ ), professional isolation ( $\tau_b = .22$ ,  $p < .01$ ) and professional identity ( $\tau_b = .23$ ,  $p < .01$ ). Similarly, the general reading behaviour on WhatsApp (passive use), was correlated with the socio-professional indicators of professional social capital, professional identity and professional isolation, albeit less strongly than the active WhatsApp use. However, no correlations could be found between the general reading behaviour on WhatsApp and knowledge transfer, job satisfaction and the intention to find a new job in a more urban area. Unsurprisingly, the general WhatsApp use did not correlate with the knowledge score.

Table 2: Kendall rank correlations of all measures

Measure	1	2	3	4	5	6	7	8
1. Prof social capital	-							
2. Prof identity	0.28**	-						
3. Prof isolation	-0.39***	-0.36***	-					
4. Knowledge transfer	0.17*	0.3***	-0.2*	-				
5. Job satisfaction	-0.06	0.07	-0.09	0.13	-			
6. New job	0.21*	0.22*	-0.19*	0.29**	-0.06	-		
7. General WA use (write)	0.23**	0.23**	-0.22**	0.23*	0.2*	0.2*	-	
8. General WA use (read)	0.18*	0.21*	-0.22**	0.14	0.12	0.17	0.34***	-
9. Knowledge score	0.11	0.06	-0.07	0.06	0.10	0.06	0.11	0.10

## 4 Discussion

In essence, the facilitated use of MIM during learners' school-to-work transition can enhance knowledge and decrease professional isolation in comparison with a control group (RQ1). When controlling for the active participation, the differences regarding knowledge and professional

connectedness were more pronounced, and broader, i.e., including also the development of a professional identity. No differences could be found regarding the measure of professional social capital maintained with school connections. One interpretation of this can be found in the answers to RQ3, i.e., the strong associations between the general WhatsApp use and the socio-professional measures (RQ3). More precisely in the finding that the general use of WhatsApp outside of the intervention accounted strongly for the high levels of connectedness with former school friends, and thus the the intervention could do little to accentuate ties further.

These results add to the emerging field of MIM research, a widespread but under-investigated phenomenon (Tang & Hew, 2017, p. 85). The finding that socio-professional connectedness could be improved through the use of WhatsApp extends insights from qualitative studies that attribute heightened levels of social and emotional presence in the educational use of MIM platforms (Henry et al., 2015; Timmis, 2012).

Importantly, the results also shed light on the modes of MIM use that impact potential outcomes, and they might help to understand better the inconclusive findings of prior studies highlighted, for example, in Tang and Hew's (2017, p. 85) review. The present study suggests that, in addition to the intensity of participation (Lai, 2016), it is the mode, i.e., the level of active (vs passive) engagement which appears to impact the socio-professional and knowledge indicators measured in this study. While we took the differentiation between writing and reading from Cho (2014), the underlying idea can be already traced back to Watt's (1967) study on opinion change. He demonstrated that, over time, the active-participation condition (writing an argument) showed clear superiority over passive participation (reading an argument), and also resulted in greater involvement in and superior recall of the topic. In the domain of technology-enhanced learning, this discrimination has been taken up rarely. One exception is the study of Rovai and Barnum (2007) who found that, in contrast to passive engagement (the number of accesses to the discussion boards), only active engagement, i.e., the number of messages posted by students per week, was a significant predictor of perceived learning. However, no actual learning gains were assessed and no other validated measures were used in this study. Remarkably, this differentiation is also neglected by many of the current social and mobile media studies, including some of the most erudite works (Ellison et al., 2007, p. e. g. ; Valenzuela, Park & Kee, 2009), which measure the intensity of social media use, e.g. expressed in terms of frequency, the number of connections, or time spent in the digital space. In contrast, the findings of this study reiterate the need to discriminate the different modes of engagement, and, more precisely, they point to the value of active modes of engagement in mobile social media spaces.

The fact that the general, and thus informal, use of MIM alone can be associated with socio-professional measures and knowledge transfer is another finding that requires contextualisation and discussion. It underscores the relevance of MIM as part of students' (inter)personal learning environments (Pimmer et al., 2018; Timmis, 2012). Observations of this kind are still rare in the extant literature, especially in the field of nursing, where, for example, a recent international study on nursing students' personal learning environments did not even consider the use of MIM (Patterson et al., 2017). To some the association between informal MIM use and socio-professional

connectedness reflects findings of Sigalit et al. (2017), who found correlations between learners' informal use of a range of social media platforms and resilience. They conceive the emotional and social peer support, which can be provided through social media platforms during stressful events of placements, as a relevant source for personal and group resilience (Sigalit et al., 2017), which might be also applicable to the present investigation. More directly, this study corroborates the findings from Pimmer et al.'s survey study (2018), who also identified linkages between informal WhatsApp during placements and students' maintained professional social capital, the development of their professional identities, their placement satisfaction and reduced feelings of isolation from professional communities.

The finding that socio-professional connectedness is linked to and can be enhanced by MIM use is of particular relevance from a more practical perspective, as many health professionals, especially in rural and remote areas, are affected by professional isolation (WHO, 2010). As the phenomenon of professional isolation is not limited to health but concerns many other domains, such as teacher training (Dussault, Deaudelin, Royer & Loïselle, 1999), the study's findings are likely to be of more general interest. For example, in one study teachers indicated that they engaged in informal online communities to avoid the feeling of professional isolation. However, the expectation that strengthened professional networks would alleviate the problem of retention of a rural workforce (WHO, 2010), could not be confirmed by this study. The intervention-based WhatsApp activities did not appear to exert effects on job satisfaction and rural retention. Moreover, the general (active) use of WhatsApp correlated even positively with the intention to search a new job in an urban area, and in the same way, with professional social capital, professional identity and (lower) levels of professional isolation. This implies that, despite enhanced job satisfaction, strengthened professional networks are associated with a higher tendency of professionals to search for a new job. This seemingly contradictory pattern might be explained by Granovetter's sociological network theory on the Strength of Weak Ties. Granovetter (1973, 1983) posits that weak ties facilitate the circulation of information including new ideas across larger networks. He observed that weak ties, i.e. connections among acquaintances and colleagues, like the former school friends involved in the present study, result in enhanced opportunities for (job) mobility, because such information is much more likely to be spread among distant these ties (Granovetter, 1983).

Although this study corroborates and extends prior work, a number of limitations in the study design need to be taken into account and addressed by future research. Firstly, the study was randomised at school but not at student level. While this approach was viewed relevant so as to leverage pre-existing social ties (Boyd & Ellison, 2007; Ellison et al., 2007), it is linked to the typical limitations of a quasi-experimental design in which results are less robust compared with the randomisation of individual subjects. Accordingly, future research might involve student cohorts large enough so that the randomisation can be carried out within (and not between) schools; and more generally, involve larger student numbers. Another limitation is that the use of MIM was measured through self-reported measures, which is prone to bias (Junco, 2013). We thus encourage future research to

measure the actual use of MIM. Although this could be done quite simply for writing (based on a quantitative content analysis), the tracking of learners' reading behaviour requires the use of more complex technical measures or apps. Finally, the comparison was made between a MIM intervention group and a group which was not subjected to any treatment. While the findings suggest significant effects of the intervention, they say nothing about the suitability of MIM in comparison with other digital and mobile social media tools. Although prior work points to the capabilities of MIM to afford intimate conversations more than other social media channels (Karapanos et al., 2016), the question of media comparison was outside of the scope of this research and should be addressed in future studies.

## **5 Conclusions**

The study examined the educational use of MIM, a massive but under-investigated phenomenon, to support learners in their school-to-work transitions. These transitions are one of the most critical developmental phases, marked by knowledge gaps and low levels of professional connectedness. The findings add to the extant literature by showing the effects of moderated WhatsApp use on knowledge and professional immersion, confirming and extending a number of prior, mostly qualitative studies. Another central insight is the association between the general, informal use of WhatsApp, outside of the intervention activities, and socio-professional and knowledge measures. These connections underpin the relevance that MIM has achieved as part of learners and professionals (inter)personal learning environments. Another contribution that this study makes is the identification of active participation (writing contributions), as a key influencing factor across moderated and informal MIM use.

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# Appendices

## Measures and questions

### Transfer of knowledge

(5-point Likert from Strongly Disagree to Strongly Agree)

- I frequently apply theory/ knowledge gained from my training at my nursing school or department of nursing in my current job.
- It is easy to transfer the theory/ knowledge gained from my training at my nursing school or department of nursing in my current job
- The theory/knowledge gained from my training at my nursing school or department of nursing helps me to improve my work in my current position.
- The theory/knowledge gained from my training at my nursing school or department of nursing is relevant to tackling daily work tasks in my current job.

### Professional social capital maintained with former school colleagues

(5-point Likert from Strongly Disagree to Strongly Agree)

- I feel connected with friends from my nursing school whom I trust.
- There are friends from my nursing school I could turn to for advice about making important decisions.
- I turn to friends from my nursing school to discuss professional or job-related problems.
- Interacting with many friends and colleagues from my nursing school makes me feel like part of a larger community.
- I frequently discuss questions related to my work with friends and colleagues from my nursing school.
- I frequently discuss questions related to the profession of nursing with friends and colleagues from my nursing school.

### Professional isolation

- I feel distant from other nurses
- I feel isolated from other nurses.
- It is easy for me to get in touch with other nurses.
- I am unhappy about being so cut off from other nurses.\*
- I feel part of a group of nurses.

\* This item was excluded from further analysis to improve internal consistency.

## Professional identity

- I am pleased to belong to the nursing profession.
- Being a member of the nursing profession is important to me.
- I feel that I am a valuable member of the professional community of nurses

- Adams, K., Hean, S., Sturgis, P., & Clark, J. M. (2006). Investigating the factors influencing professional identity of first-year health and social care students. *Learning in Health and Social Care*, 5(2), 55-68.
- Adler, P. S., & Kwon, S.-W. (2002). Social capital: Prospects for a new concept. *Academy of Management Review*, 27(1), 17-40.
- Boyd, D., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer Mediated Communication*, 13(1), 210-230.
- Chang, C.-Y., Lai, C.-L., & Hwang, G.-J. (2018). Trends and research issues of mobile learning studies in nursing education: A review of academic publications from 1971 to 2016. *Computers & Education*, 116, 28-48.
- Cho, J. (2014). Will Social Media Use Reduce Relative Deprivation?: Systematic Analysis of Social Capital's Mediating Effects of Connecting Social Media Use with Relative Deprivation. *International Journal of Communication*, 8, 23.
- Christmas, K. (2008). How work environment impacts retention. *Nursing Economics*, 26(5), 316.
- Clark, C. M., & Springer, P. J. (2012). Nurse residents' first-hand accounts on transition to practice. *Nursing outlook*, 60(4), e2-e8.
- Cruess, R. L., Cruess, S. R., Boudreau, J. D., Snell, L., & Steinert, Y. (2015). A schematic representation of the professional identity formation and socialization of medical students and residents: a guide for medical educators. *Academic Medicine*, 90(6), 718-725.
- Dussault, M., Deaudelin, C., Royer, N., & Loiselle, J. (1999). Professional isolation and occupational stress in teachers. *Psychological reports*, 84(3), 943-946.
- Eick, S. A., Williamson, G. R., & Heath, V. (2012). A systematic review of placement-related attrition in nurse education. *International Journal of Nursing Studies*, 49(10), 1299-1309.
- Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "friends:" Social capital and college students' use of online social network sites. *Journal of Computer Mediated Communication*, 12(4), 1143-1168.
- Evans, J., Boxer, E., & Sanber, S. (2008). The strengths and weaknesses of transitional support programs for newly registered nurses. *Australian Journal of Advanced Nursing*, The, 25(4), 16.
- Gopee, N. (2002). Human and social capital as facilitators of lifelong learning in nursing. *Nurse Education Today*, 22(8), 608-616.
- Granovetter, M. (1973). The strength of weak ties. *American journal of sociology*, 78(6), 1360-1380.
- Granovetter, M. (1983). The strength of weak ties: A network theory revisited. *Sociological theory*, 1(1), 201-233.
- Haque, S. E., Rahman, M., Itsuko, K., Mutahara, M., & Sakisaka, K. (2014). The effect of a school-based educational intervention on menstrual health: an intervention study among adolescent girls in Bangladesh. *BMJ Open*, e004607. doi:10.1136/bmjopen-2013-004607
- Henry, J., Winters, N., Lakati, A., Oliver, M., Geniets, A., Mbae, S. M., & Wanjiru, H. (2015). Enhancing the Supervision of Community Health Workers With WhatsApp Mobile Messaging: Qualitative Findings From 2 Low-Resource Settings in Kenya. *Global Health: Science and Practice*. doi:10.9745/GHSP-D-15-00386
- Jayarajan, N., Lee, A., & Mwaikambo, L. (2017). WhatsApp as a Platform for Continued Professional Development. Baltimore, MD: Johns Hopkins Center for Communication Programs. Retrieved from <https://www.k4health.org/resources/whatsapp-platform-continued-professional-development>

- Junco, R. (2013). Comparing actual and self-reported measures of Facebook use. *Computers in Human Behavior, 29*(3), 626-631.
- Karapanos, E., Teixeira, P., & Gouveia, R. (2016). Need fulfillment and experiences on social media: A case on Facebook and WhatsApp. *Computers in Human Behavior, 55*, 888-897.
- Koen, J., Klehe, U.-C., & Van Vianen, A. E. (2012). Training career adaptability to facilitate a successful school-to-work transition. *Journal of Vocational Behavior, 81*(3), 395-408.
- Lai, A. (2016). Mobile immersion: an experiment using mobile instant messenger to support second-language learning. *Interactive Learning Environments, 24*(2), 277-290.
- Levett-Jones, T., Lathlean, J., Higgins, I., & McMillan, M. (2009). Staff–student relationships and their impact on nursing students’ belongingness and learning. *Journal of Advanced Nursing, 65*(2), 316-324.
- Meleis, A. I. (2010). Transitions theory. *Nursing theories and nursing practice, 361*.
- O'Hara, K., Massimi, M., Harper, R., Rubens, S., & Morris, J. (2014). *Everyday dwelling with WhatsApp*. Paper presented at the 17th ACM conference on Computer supported cooperative work & social computing Baltimore, MD, USA.
- Patterson, C., Stephens, M., Chiang, V., Price, A. M., Work, F., & Snelgrove-Clarke, E. (2017). The significance of personal learning environments (PLEs) in nursing education: Extending current conceptualizations. *Nurse Education Today, 48*, 99-105.
- Pimmer, C., Brühlmann, F., Odetola, T. D., Dipeolu, O., Gröhbiel, U., & Ajuwon, A. J. (2018). Instant messaging and nursing students' clinical learning experience. *Nurse Education Today, 64*, 119–124
- Pimmer, C., Brysiewicz, P., Linxen, S., Walters, F., Chipps, J., & Gröhbiel, U. (2014). Informal mobile learning in nurse education and practice in remote areas. A case study from rural South Africa. *Nurse Education Today, 34*(11), 1398-1404.
- Raiman, L., Antbring, R., & Mahmood, A. (2017). WhatsApp messenger as a tool to supplement medical education for medical students on clinical attachment. *BMC Medical Education, 17*(1), 7.
- Rovai, A. P., & Barnum, K. T. (2007). On-line course effectiveness: An analysis of student interactions and perceptions of learning. *International Journal of E-Learning & Distance Education, 18*(1), 57-73.
- Rudd, P. (1997). From Socialisation to Postmodernity: a review of theoretical perspectives on the school-to-work transition. *Journal of education and work, 10*(3), 257-279.
- Rush, K. L., Adamack, M., Gordon, J., Lilly, M., & Janke, R. (2013). Best practices of formal new graduate nurse transition programs: an integrative review. *International Journal of Nursing Studies, 50*(3), 345-356.
- Russel, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *Journal of personality and social psychology, 39*(3), 472-480.
- Scarpello, V., & Campbell, J. P. (1983). Job satisfaction: Are all the parts there? *Personnel psychology, 36*(3), 577-600.
- Sigalit, W., Sivia, B., & Michal, I. (2017). Factors Associated With Nursing Students' Resilience: Communication Skills Course, Use of Social Media and Satisfaction With Clinical Placement. *Journal of Professional Nursing, 33*(2), 153-161.
- Spector, P. E. (1997). *Job satisfaction: Application, assessment, causes, and consequences* (Vol. 3): Sage publications.
- Statista. (2017). Most famous social network sites worldwide as of August 2017, ranked by number of active users (in millions). Retrieved from <https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/>
- Tang, Y., & Hew, K. F. (2017). Is mobile instant messaging (MIM) useful in education? Examining its technological, pedagogical, and social affordances. *Educational Research Review, 21*, 85-104.
- Timmis, S. (2012). Constant companions: Instant messaging conversations as sustainable supportive study structures amongst undergraduate peers. *Computers & Education, 59*(1), 3-18.

- Valenzuela, S., Park, N., & Kee, K. F. (2009). Is there social capital in a social network site?: Facebook use and college students' life satisfaction, trust, and participation. *Journal of Computer-Mediated Communication*, 14(4), 875-901.
- Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: how good are single-item measures? *Journal of applied Psychology*, 82(2), 247.
- Watts, W. A. (1967). Relative persistence of opinion change induced by active compared to passive participation. *Journal of personality and social psychology*, 5(1), 4.
- WhatsApp Blog. (2017). Connecting One Billion Users Every Day. Retrieved from <https://blog.whatsapp.com/?l=en>
- WHO. (2010). Increasing access to health workers in remote and rural areas through improved retention. Global policy recommendations. Retrieved from <http://www.who.int/hrh/retention/guidelines/en/index.html>
- Williams, D. (2006). On and off the'Net: Scales for social capital in an online era. *Journal of Computer-Mediated Communication*, 11(2), 593-628.
- Xiao, J. (1996). The relationship between organizational factors and the transfer of training in the electronics industry in Shenzhen, China. *Human Resource Development Quarterly*, 7(1), 55-73.