Exploration of the patterns of physical education teachers' participation within self-directed online professional development

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1   **Exploration of the Patterns of Physical Education Teachers' Participation within Self-**

2   **Directed Online Professional Development**

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ABSTRACT

Although physical education (PE) teachers have increased access to digital/online continuous professional development (CPD) activities, there are few robust accounts of how they engage with and experience these environments. ***Purpose***: The purpose of this study was to examine PE teachers' participation patterns within self-directed online PE-CPD activities using mobile instant messenger (MIM). ***Methods:*** Data were generated from (a) 5,246 messages exchanged in the MIM chatroom from 281 teachers, (b) semi-structured interviews with 10 teachers, and (c) 1,275 messages posted by the 10 interviewed teachers. Quantitative data were analyzed for measures of central tendency, and qualitative data were analyzed inductively. ***Findings:*** Five patterns of PE teachers' uses of MIM were identified: (a) ringmasters, (b) passive uploaders, (c) active uploaders, (d) requesters, and (e) bystanders. ***Discussion:*** The findings suggest that each engagement pattern illustrates the differential goals of learning, types of interaction, and forms of participation by teachers engaged in online CPD.

Key words: mobile instant messenger, digital, participation patterns, professional learning

34   There is extensive international evidence that Continuous Professional Development (CPD) is

35   a key mechanism for teachers to learn and develop their practices so as to meet the complex

36   needs of young people today (Darling-Hammond, Hyler, & Gardner, 2017; Groundwater-

37   Smith, 2017; Vangrieken et al., 2017). Ensuring that teachers have access to effective CPD is

38   therefore vital for the growth of teachers and students (Cordingly et al., 2015; Darling-

39   Hammond et al., 2017). Evidence suggests that CPD is most likely to support practitioner

40   learning when it is content-focused, incorporates active learning, supports collaboration, uses

41   models of effective practice, provides coaching and expert support, offers feedback and

42   reflection, and is of a sustained duration (Cordingly et al., 2015; Darling-Hammond et al.,

43   2017). Studies conducted in the area of physical education(PE) also echo these characteristics

44   that effective CPD is on-going and sustained (Parker, Patton, & Tannehill, 2012), includes

45   extended learning opportunites within community (O'Sullivan & Deglau, 2002), and

46   promotes active and collaborative learning (Armour & Makopoulo, 2012; Atencio, Jess, &

47   Dewar, 2012). Characteristics of effective professional development also include concepts of

48   agency and capacity building, whereby adult learners are prompted, encouraged and

49   supported to critically evaluate evidence, inquire into their practices, and develop new

50   insights that are aligned with the needs of their own contexts (Cordingly et al., 2015,

51   Vangrieken et al., 2017). Teacher communities are thereby a powerful context for

52   professional development (c.f. Vangrieken et al., 2017) that can be supported and developed

53   in online and digital spaces (Greenhow & Lewin, 2016; Marcia & Garcia, 2016).

54   A growing body of literature in PE and sport pedagogy recognizes online

55   environments as important contexts for CPD (see Cushion & Townsend, 2018; Gleddie et al.,

56   2016; Goodyear, Casey, & Kirk, 2014; Goodyear, Parker, & Casey, 2019; Harvey &

57   Hyndman, 2018). It has been reported that social media, blogs, and web-based chats

58   overcome some of the cost and time deterrents to engagement with CPD, and that online

59   environments provide ongoing professional support and new opportunities for teachers to

60   engage with the latest evidence-based practices (Calderón, MacPhail, & Meroño, 2019).

61   Calderon et al., 2019; Goodyear et al., 2019; 2014; Harvey & Hyndman, 2018). Nonetheless,

62   the body of evidence on online PE-CPD is limited and contradictory. In particular, there is

63   very limited robust research explaining how and why teachers engage with online PE-CPD or

64   identifying relationships and/or causal links between online PE-CPD, teacher learning, and/or

65   impacts on practice (Cushion & Townsend, 2018; Harvey & Hyndman, 2018). Much

66   uncertainty therefore remains about the effectiveness of online environments for PE-CPD and

67   how teachers should engage with online CPD to support their learning and practices.

68   This study contributes to knowledge about effective PE-CPD by offering

69   new and in-depth insights into South Korean PE teachers' engagement with a self-directed

70   online PE-CPD environment. The specific and original focus is on understanding teachers'

71   online interactions and the different ways in which they engage with self-directed online

72   CPD. A typology of teacher participation in online PE-CPD that explains how different forms

73   of teacher participation shaped engagement is presented. A rigorous mixed methods case

74   study design was utilized to explore 684 teachers' differential levels of engagement with a

75   specific online PE chat group on Kakao Talk, a mobile instant messenger (MIM) medium,

76   where teachers were able to exchange messages in a closed online forum. New data offer

77   insights into the potential benefits and limitations of online and self-directed PE-CPD.

78   Evidence from this study has the potential to inform the development of new ways of

79   facilitating, investigating, and evaluating self-directed online PE-CPD, information that will

80   be relevant to researchers, policy makers, CPD providers (online and offline), schools, and

81   teachers. The research question addressed in this study was, what are South Korean PE teachers'

82   participation patterns within self-directed online PE-CPD activities using MIM?

83   **Teachers' Differential Engagement with CPD**

84   It is well established that teachers have different learning needs, and will engage with CPD in

85   different ways and to different intensities. For example, Goodyear (2017) demonstrated that

86 six teachers in the same PE department had very different learning experiences from the same

87 year-long CPD program delivered in their school and online via social media. Most studies to

88 date that examine online CPD, however, have failed to account for the varying ways in which

89 teachers participate in online environments (see Carpenter & Krutka, 2014; Harvey &

90 Hyndman, 2018). Data have been collected predominantly from surveys, which do not

91 provide sufficient evidence on the varied, multi-layered, complex, and dynamic ways in

92 which individuals participate in online environments (Greenhow & Lewin, 2016) and in CPD

93 (see de Vries, Jansen, & Grift, 2013; Goodyear, 2017; Yoon & Armour, 2017). To better

94 understand how contemporary teachers' learning and practices can be supported in optimal

95 ways, new and in-depth insights are required into the different ways in which different

96 teachers participate in self-directed online PE-CPD environments (Goodyear et al., 2019;

97 Harvey & Hyndman, 2018).

98 Similar to the analysis of teacher professional learning communities on social media

99 by Goodyear et al. (2019), the framework for the landscape of professional learning

100 communities (PLCs) developed by Parker, Patton, and Tannehill (2012) and MacPhail, Patton,

101 Parker, and Tannehill (2014) provided a conceptual map to guide an analysis of how different

102 teachers participate in online CPD. This category-based framework, which is grounded in

103 situated learning theory, identifies different forms of PLCs that are created from the practices

104 of different participants who together shape the characteristics of particular learning

105 environments. Depending on five cirtical characteristics of success, guideposts, faciliators,

106 roadblocks, and potential, the PLCs have been categorized as collection of teachers,

107 established groups, and communities of practice.

108 Notably, in the account given by Lave and Wenger (1991) of legitimate peripheral

109 participation in situated learning, two key groups of individuals within a group were

110 identified: newcomers and old-timers. These individuals learn the shared routines and

111   practices of a community through their participation within it, while their new and/or

112   old/traditional practices shape the shared practices of the collective community as it evolves.

113   To understand how different teachers engage with online CPD, Parker et al. (2012)

114   and MacPhail et al. (2014) suggested that we should consider the practices that exist within

115   different online groups or communities, and whether there are specific individuals who

116   exhibit particular practices. Hence, and building on the application of the framework by

117   Goodyear et al. (2019) to investigate a social media PLC, the professional learning landscape

118   was applied in the present study to interpret the different types of practices of teachers within

119   the MIM. For example, the framework guided an analysis of whether there were internal

120   leaders within the MIM, and/or which participants were involved in the acquisition of new

121   ideas. In the discussion, the framework is further explored to illustrate how the data analysis

122   process allows one to expand on the characteristics inherent within the PLC framework for

123   cases when online mediums are considered in relation to CPD.

124   **Methods**

125   **Research Design**

126   A case study design was adopted to provide a contextually grounded, holistic, and detailed

127   account (Hodge & Sharp, 2016) of South Korean PE teachers' participation within a self-

128   directed online PE-CPD community. In South Korea PE is a compulsory subject for children

129   and young people between the ages 9-16. A teacher competency evaluation system and

130   mandates for CPD also exist making the CPD participation rates for South Korean teachers

131   higher than the aveage for Organization for Economic Cooperation and Development (OECD)

132   countries (c.f. Lee et al., 2019). For example, following four years of employment, all PE

133   teachers are mandated to undertake 90 hours of formal CPD provided by the local education

134   office to progress in their professional grading. In addition, the Korean government provides

135   each teacher with $220 for CPD per year. As has been reported elsewhere (c.f. Lee et al.,

136   2019), PE-CPD tends to be institution-based and sport skills focused, where engagement is

137   influenced by teaching experience. In sum, there is a strong emphasis on accountability and

138   teacher quality within a formalized CPD policy, and thus a case study design was appropriate

139   to provide an in-depth analysis into the specific South Korean PE-CPD context.

140   The case was defined at the level of a Kakao Talk chatroom that included 684 Korean

141   PE teachers at the time of the study. Kakao Talk provides not only the chat feature, through

142   which users can exchange text, but also a range of other functions, such as photo and video

143   sharing and group discussion. PE teachers in South Korea have been utilizing Kakao Talk as

144   an unofficial and voluntary CPD tool for the past decade (Lee, Choi, Son, & Lee, 2018). A

145   Kakao Talk chatroom was therefore selected as an appropriate case study to examine South

146   Korean teachers' participation in self-directed online PE-CPD, with the case study focus

147   considered to be transferable to other teachers' usage of online mediums for CPD in different

148   international contexts.

149   **Ethics**

150   The research protocol was reviewed and approved by the institutional review board of the first

151   author's university. Data collection procedures and methods aimed to ensure participants'

152   safety, privacy, and dignity while promoting their autonomy. Passive consent was sought

153   from all members of the PE Kakao Talk chat group. Similar to other Internet research studies

154   (see McKee & Porter, 2009), passive consent was obtained by posting a message in the group

155   notifying teacher participants that the chat group was part of a research study. Participant

156   teachers were notified that the messages posted in the group from January 2017 to December

157   2017 would be analyzed for research purposes. The passive consent information also stated

158   that the messages posted by teacher participants would not be individually quoted, and that

159   only general quantitative trends and overall patterns were to be analyzed. Furthermore, the

160   passive consent message informed teachers that if they did not want their data to be included

161   in the research they should individually contact the lead researcher by clicking the link that

162   was provided in the message, which led the user to an online form. None of the teacher

163   participants refused to participate in the study. To generate in-depth insights into the chat

164   community, active informed consent was sought from 10 teacher participants who were

165   selected by the researchers for interviews. These selected teachers participated in interviews

166   and provided consent to collect, analyze, and report on their messages within Kako Talk.

167   Legal conditions were followed for exporting data from the chat group. Pseudonyms have

168   been used in the reporting of the findings.

169   **Participants and Data Sources**

170   At the time of this study (2017), Kakao Talk had 684 PE teacher users. Data were collected

171   between January 2017 and December 2017. The data collection took place in three phases,

172   with an iterative design used to ensure the rigor and generalizability of participants' reported

173   experiences of Kakao Talk.

174   The purpose of Phase 1 was to understand the general pattern and trends of teacher

175   participation within Kakao Talk by analyzing the messaging behavior of all members. During

176   the 12 months of data collection, 5,246 messages were posted and subsequently exported for

177   analysis.

178   The purpose of Phase 2 was to understand the different ways in which teachers

179   participated in Kakao Talk and the teachers' perceived value of participation in MIMs for

180   online PE-CPD. For Phase 2, a purposeful sampling strategy was adopted to select 10

181   teachers for interview. The sampling criteria were based on balancing gender, academic

182   degree, participation styles in Kakao Talk (as identified in Phase 1), and teaching experience.

183   Despite the differences in the number of teachers among five different participation styles, an

184   equal number of participants (n=2) was selected from each group to represent balanced

185   perspectives among the 10 participants. Although the vast majority of teachers were either

186   bystanders or requesters, the average number of messages posted by individual teachers

187   within these two groups (bystanders and requesters) was much lower than those identifying as

188   ringmasters and uploaders, which provided rationale for selecting equal number from each

189   participation style. The gender and teaching experience distribution of selected teachers were

190   similar to the overall distribution of chatroom participants.

191   The background information of the 10 participants selected to be interviewed is shown

192   in Table 1. The activities the teachers conducted in the MIMs, the materials exchanged in the

193   MIMs, and the advantages and disadvantages of using MIMs for CPD were discussed during

194   the semi-structured interviews. The face-to-face interview took approximately one hour per

195   participant. It also were recorded and transcribed verbatim.

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197   **Place Table 1 About Here**

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199   The purpose of Phase 3 was to better understand the content of the messages that the

200   10 teacher participants shared in the MIM chatroom. In addition to the interviews, the content

201   of the messages exchanged in the MIM chatroom by the 10 teachers were analyzed. A total of

202   1,275 messages were posted by the 10 teachers. The messages were then exported as text and

203   analyzed for content and characteristics.

204   **Data Analysis**

205   The MIM messages and in-depth interviews were analyzed through inductive categorical

206   analysis (Corbin & Strauss, 2008). First, the chatroom messages were retrieved as text and

207   entered into the NVivo program. Descriptive analysis was conducted regarding the function

208   (e.g., encouraging, sharing) of messages. The analysis of the function of the messages

209   revealed the styles of each teacher's participation in the chatroom. Five different patterns of

210   participation emerged through text analysis, and the number of teachers identifying with each

211   participation style and the number of messages posted by each participation style group were

212   counted for the general trend analysis.

213   Second, the transcribed interview data from the 10 selected teacher participants were

214   repeatedly read while separately marking meaningful words and sentences. Initial codes were

215   created based on repeated words and keywords, then compared with each other to categorize

216   them into groups with the same attributes for focused coding. The appropriateness of the

217   classification was checked based on the similarity between the codes through consultation

218   between the researchers, and the analytic memos taken to reflect on the concepts. In addition,

219   all messages posted by the 10 teachers who participated in the interviews were exported as

220   text, and the content, format of exchanged material, and function of the messages were

221   analyzed and counted to reveal specific trends. Overall, through this analysis process five

222   themes and five participation styles were identified. These are reported in the findings section,

223   and they are theorized in relation to PLCs in the discussion.

224   **Validity**

225   A relativist approach was applied to guide validity of the data anlaysis process and to extend

226   the robustness of traditional measures of quality, such as trustworthiness (Smith & McGannon,

227   2018). In this study, therefore, a list of characterizing traits were selected by the research team

228   to guide validity, rigor, credibility, and coherence. The validity was guided by the originality

229   and significance of the topic, and the rigor was checked in relation to the breadth of the

230   dataset, collected from different sources and diverse participants. The credibility was guided

231   through the analytical process being undertaken by multiple researchers from diverse

232   disciplinary and international contexts, which strengthened the generalizability and

233   transferability of the research findings. Finally, the coherence was checked through the

234   alignment between aims, methods, and outcomes, and in relation to the appropriate definition

235   and critical engagement with theory (i.e., PLCs and situated learning).

236   **Findings**

237   Five themes were identified and thus five different ways in which the teachers participated in

238   Kakao Talk: (a) ringmasters, (b) active uploaders, (c) passive uploaders, (d) requesters, and

239   (e) bystanders. Table 2 outlines these different types of participation and explains their

240   characteristics. Among the 684 teacher participants in Kakao Talk at the time of the study,

241 most were categorized as bystanders (*n* = 403; 58.9%), followed by requesters (*n* = 170;

242 23.9%), passive uploaders (*n* = 56; 8.2%), active uploaders (*n* = 53; 7.7%), and ringmasters (*n*

243 = 2; 0.3%). However, the majority of messages were posted by uploaders, followed by

244 requesters and ringmasters, with no visible traces from bystanders (see Table 2).

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246   Place Table 2 About Here

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248 **Ringmasters**

249 Ringmasters are the teacher participants who created and managed the MIM chat on Kakao

250 Talk. This category of teacher participants was the smallest of the five participant groups,

251 which included only two participants (0.3%). These teachers were identified as leaders and

252 "experts" in PE.

253   In terms of leadership skills, there was evidence that Kakao MIM chat was created by

254 the ringmasters to enhance teacher learning: "I made the chatroom using Kakao Talk because

255 I wished communications and sharing among teachers to occur more quickly and actively"

256 (Interview, T1, male, 43 years old). The ringmasters' knowledge and status were reported to

257 be influential in terms of encouraging other teachers to engage with the MIM chat. According

258 to one participant interviewd,

259   There should be no PE teacher who does not know him. He appeared in TV programs

260   on the subject of PE and published physical education textbooks. I think that

261   hundreds of persons participate in the Kakao Talk because he created the chatroom.

262   (Interview, T7, Female, 24 years old)

263   The ringmasters also played a key role in facilitating dialogue among the teacher

264 participants. Despite there being very few teachers in the ringmaster category, these teachers

265 accounted for 7.8% (*n* = 409) of all messages exchanged during the academic year. The

266 ringmasters' messages were primarily focused on managing interactions and discussions, and

267 maintaining an appropriate code of conduct for online interactions. For example, the

268 ringmasters aimed to protect the confidentiality of the teacher participants (e.g., "Please do

269 not post material including personal information"—Message from T2) while also encouraging

270 the teacher participants to share resources (e.g., "Teachers, please do not hesitate to share the

271 class materials. Through your courage, our community grows"—Message from T1). Through

272 these interactions, the ringmasters played a key role in formulating the ongoing interactional

273 dynamic of MIM chat.

274 **Active Uploaders**

275 Active uploaders refer to the teacher participants who uploaded materials voluntarily and

276 without requests from other teacher participants. This category included 53 teacher

277 participants (7.8%), who sent 2,402 messages during the data collection period, accounting

278 for 45.8% of the messages exchanged. Data collected from the interviews identified that the

279 active uploader teacher participants were driven to share their resources to support other

280 teachers' learning and practices. A major advantage of the chat was that it could overcome

281 some of the drawbacks of accessing resources shared in offline CPD workshops. For example,

282 an active uploader teacher observed,

283   Every time I go to the workshop, I see a long line of teachers with USBs who want to

284   download material presented in the session. Like, can I download it with my USB?

285   That is why I post my material in this chatroom to quench their thirst for material

286   quick and easy. (Interview, T3, female, 42 years old)

287   The active uploader teacher participants uploaded a range of different content in the

288 form of materials to Kakao Talk (see Table 2). Most of the material shared was related to

289 lesson content, for example, tactical gameplay suggestions and teaching materials to support

290 dance-based activities. The materials were posted at appropriate times for annual school

291 events. For example, "teachers, here comes the athletic event season! Please refer to attached

292 documents for organizing a tournament" (Message from T4). Although there were advantages

to the active uploaders sharing resources, at times, this caused some teacher participants to feel overwhelmed with the vast amount of resources. In some cases, participants considered leaving the chat group because of the constant sharing of content. For example, "sometimes one person indiscriminately sends dozens of materials at a time. Honestly, who would read them? Only reminders keep ringing. At such times, I really feel like leaving the Kakao Talk chatroom" (Interview, T9, male, 41 years old).

In summary, the active uploader teacher participants posted material without being asked by others, and this provided a foundation for the MIM chatroom resource bank. Despite good intentions, unidirectional posts made by active uploaders were sometimes perceived by others as frustrating due to the challenges of navigating vast amounts of content.

Passive Uploaders

Passive uploaders refer to the teacher participants who uploaded materials when requested by another participant. This category comprised 56 teacher participants (8.2%; see Table 2). These participants sent 1,731 messages, which accounted for 33% of the messages exchanged during the data collection period. These teacher participants perceived that they could only be a member of the Kakao Talk if they uploaded materials. For example,

I did not have my presence in the Kakao Talk, where hundreds of people were active.

I came to think that I became a member of this chatroom only after I uploaded

materials and I began to actively participate thereafter. (Interview, T5, male, 31 years

old)

Uploading resources or ideas did not occur immediately. The teacher participants reported that they needed to observe what other materials had been uploaded to overcome feelings associated with shame or embarrassment. For example,

I wrote a long message about a question related to the student athletic club. But I

could not press the "send message" button. I was ashamed of the fact that others

would read my message as I am not smart and I was embarrassed without reason.

319   (Interview, T5, male, 31 years old)

320   Before I upload my material, I compare it with others' materials. When others'

321   materials seem better, I give up bravely. Why should I upload it when it will make

322   me feel ashamed? (Interview, T6, male, 32 years old)

323   In addition to sharing materials, the teachers in the passive uploader category

324 mediated conversations between teacher participants. The passive uploader teacher

325 participants identified and introduced teacher participants to share relevant expertise. For

326 example, when a teacher shared difficulty in teaching physical expression activities, a passive

327 uploader posted a message such as, "teacher Kim is an expert in expressive activities. If you

328 need help, I can connect you to him" (Message from T5). In this way, passive uploader

329 teacher participants bridged requesters and expert teachers. In addition, when teachers shared

330 an issue of student resistance or disengagement issue, the passive uploader teacher provided

331 encouragement such as, "you should have been much distressed. However, you should not

332 lose your courage and take heart until the end" (Message from T6).

333 Overall, the passive uploader teacher participants played a key role in contributing to the

334 developing practices of the chat group through sharing materials and offering support to other

335 teacher participants.

336 **Requesters**

337 Requesters refer to the teacher participants who asked questions and requested materials from

338 other participants of Kakao Talk. This category included 170 teacher participants (24.9%),

339 who shared 704 messages (13.4%) during the data collection period. The requester teacher

340 participants sought out a range of different information from Kakao Talk teacher participants.

341 Similar to the active uploaders, most of the material requested related to lesson content and

342 administrative tasks.

343   The requester teacher participants reported that a key advantage of the Kakao Talk

344 community was the accessibility of information. In particular, it was reported that information

345   could be obtained immediately. For example,

346   I think I came to rely on the community further because information has been

347   provided more quickly than when I asked my fellow teacher at the same school. In

348   some cases, it takes really less than 10 seconds for a question to be answered.

349   (Interview, T7, female, 24 years old)

350   Besides the accessibility of information, requesters believed that the quality of

351   information provided in the chatroom would be trustworthy because it was being constantly

352   cross-checked by other chatroom members. For example,

353   I am sure that the information posted here will be high quality because people can't

354   share material in a chatroom with hundreds of teachers without confidence. There

355   will be always someone who is smarter and let us know when it is incorrect.

356   (Interview, T8, male, 36 years old)

357   Although the accessibility of information was valued, some of the teacher

358   participants were concerned about their visibility and presence in Kakao Talk. Concerns were

359   noted that others could see their questions. For example,

360   When I ask a question, more than 600 teachers see my question at the same time. I

361   am afraid that my weakness may be revealed in this chatroom. So every time I post a

362   question, I check whether it is appropriate or not. It's kind of self-censorship.

363   (Interview, T7, female, 24 years old)

364   Overall, the requesters contributed to the maintenance of the community by

365   promoting the sharing of information and resources. The requesters were attracted to the

366   online environment because they could obtain rapid responses and reliable information from

367   multiple people.

368   **Bystanders**

369   Bystanders refer to the teacher participants who did not post any messages to Kakao

370   Talk. This teacher category consisted of 403 (58.9%) teacher participants. Bystanders stayed

371   in the chatroom due to a sense of belonging and psychological safety arising from

372   connectedness with other teachers. For example, "I think I feel some psychological stability

373   just from the fact that I belong to this space together with physical education teachers all over

374   the country (Interview, T9, male, 41 years old). Another teacher also said, "I cannot easily

375   leave the room. Many physical education teachers are gathered there, who may be helpful

376   someday. It is insurance" (Interview, T10, female, 25 years old).

377   Regarding their reasons for staying invisible in the Kakao Talk chatroom, bystander

378   teachers indicated that the size of the chatroom, shyness, and minimizing interruption by

379   avoiding duplicate messages led them to remain silent. For example, "It is the biggest

380   chatroom among PE teachers. Just imagining the message I posted is shared with hundreds of

381   teachers made me overwhelmed. It is different with small-scale chatrooms. Plus I am an

382   introverted person" (Interview, T9, male, 41 years old). Similarly, another bystander

383   observed,

384   I don't feel the need to post messages because most of the information I need is

385   already there. There is always someone who either requests or provides material that I

386   need. If I post a message, it will be redundant and interrupt other people. (Interview,

387   T10, female, 25 years old)

388   Although they left no visible traces of activities in the chatroom, bystander teachers

389   searched for and retrieved relevant information from the chatroom and spread the material to

390   other teachers in offline contexts. They even invited other teachers to the chatroom, as they

391   recognized the benefits of participating. For example,

392   I tried to download material as much as possible because it can be useful someday.

393   Sometimes, I pass around the material obtained from chatroom to my colleagues as

394   needed. In addition, I invited many of my juniors to join. When I told them that just

395   looking at the materials exchanged should be greatly helpful for them in adapting to

396   school life as newly appointed teachers, all of them were pleased. (Interview, T10,

397   female, 25 years old)

398   In summary, bystanders used the chatroom to obtain a sense of belonging and stay up

399   to date on the latest information without posting any messages. The bystander teacher

400   participants shared the information they had obtained from the chatroom with other teachers

401   offline. It shows that bystander teachers are engaged in MIM chatroom in a strategic way to

402   meet their needs yet play a role for the maintenace of the chatroom by inviting other teachers

403   and spreading information.

404   **Discussion**

405   The purpose of this study was to examine PE teachers' participation patterns within self-directed

406   online PE-CPD activities using mobile instant messenger (MIM). From gathering data on teachers'

407   perspectives and their online interactions, five engagement patterns were identified:

408   ringmasters, active uploaders, passive uploaders, requesters, and bystanders. Each

409   engagement pattern illustrates the different goals of learning, types of interaction, and forms

410   of participation within the chatroom, which ranged from individual enrichment to community

411   building, and from being a recipient to being a major contributor. Although there were

412   different levels of engagement, as indicated by the frequency of messages posted in the

413   chatroom, each group of teachers played unique roles in the sustainable development of the

414   mobile chatroom group by, for example, leading discussions, sharing resources, requesting

415   and responding to messages, and promoting the group to other teachers and/or inviting other

416   teachers to the online group. The key challenge for the development, organization, and

417   facilitation of online self-directed PE-CPD is therefore to ensure that online environments are

418   designed and developed in ways that promote and support teachers' varying purposes in

419   joining the group, diverse learning needs, and online engagement patterns.

420   Overall, the data illustrated how PE teachers' participation in self-directed online PE-

421   CPD was influenced by technological and professional factors. The technological affordance

422   of MIM helped teachers exchange multimedia resources, including text, documents, music,

423 and video clips, without the limitations of time and place that are often reported as barriers to

424 engaging in professional development in offline contexts (Armour, Quennerstedt, Chambers,

425 & Makopoulou, 2017). Unlike offline formal CPD, participants controlled their degree of

426 participation because both autonomy and anonymity were supported by the features and

427 structure of the MIM chatroom (Blitz, 2013; Tang & Hew 2019). Furthermore, the data

428 reported in this study indicated that the PE teachers participated in self-directed online CPD

429 for professional reasons, including the ability to access instructional resources to develop their

430 teaching practices and network with other teachers to obtain social support. Interestingly, the

431 self-directed online CPD environment met the needs of teachers who felt isolated in their

432 school contexts, and the online environment was also a preferred learning method for PE

433 teachers who struggled to engage with face-to-face learning (Kim, 2003; Lee & Kim, 2010).

434 These findings build on previous studies conducted with other online tools, such as social

435 media (e.g., Twitter; Goodyear et al., 2014; Goodyear et al., 2019; Harvey & Hyndman, 2018;

436 Willet, 2019), and further highlight the value and importance of online PE-CPD in the lives

437 and careers of the current generation of PE teachers.

438   Based on the data generated and reported, the findings demonstrate how the MIM-

439 based online PE-CPD was representative of an established group of teachers (MacPhail et al.,

440 2014). Similar to CoPs and the notion of a shared repertoire, there was evidence that different

441 teacher participants had different roles that contributed to the overarching aim of the

442 chatroom, which is to offer professional development. There was also a sense of legitimate

443 peripheral participation as teachers were invited to join the chatroom and moved from being

444 newcomers into one of the engagement pattern roles. As for guideposts supporting the success

445 of online PE-CPD, there was evidence of expressions of gratitude and recognition from other

446 teachers and of social support, which is similar to the findings from studies of off-line CPD

447 (Parker et al., 2012). However, a key limitation of the established group was that there was no

448 system to verify the quality of information in the chatroom because teachers were reluctant to

449   mention the quality of information in the many-to-many online chatroom (Jensen & Helles,

450   2011). This lack of verification of information can be considered a serious roadblock because

451   there is no way to identify whether posted resources are the original creation of uploaders or

452   material obtained from other teachers, or whether they reflect evidence-based knowledge.

453   Another barrier and a potential roadblock is the shame and embarrassment experienced by

454   passive uploaders given that the establishment of trust and a safe but challenging learning

455   environment (Patton & Parker, 2017) is essential to professional learning community.

456   Similarly, requester teachers were concerned about revealing their weakness in the chatroom

457   thus practiced a high level of self-censorship.

458   The analysis of the data in relation to the framework proposed by MacPhail et al.

459   (2014) and concepts related to facilitation, success, and potential further illustrate that the

460   MIM was an established group. Firstly, the chatroom was facilitated by the ringmasters, who

461   set the norms of the online community and encouraged the exchange of ideas. Previous

462   research, however, suggests in addition to providing the basic communication structure and

463   encouraging active and positive communication between participants, facilitators should

464   provide thoughtful and in-depth questions to guide teachers' reflections if they are to support

465   impacts on learning and practice (Patton, Parker, & Pratt, 2013). Although some pedagogy of

466   facilitation strategies identified from formal offline CPD programs can be beneficial, the

467   nature of massive online CPD requires specific strategies relevant to the online environment.

468   Secondly, and in relation to the concept of success, evidence from the MIM participants

469   highlights that the MIM had an accomplished objective, and that different members of MIM

470   supported empowerment. For example, there was a clear shared purpose that engagement in

471   MIM was for CPD, and that sharing resources was a central mechanism of learning and

472   supporting other MIM participants. Thirdly, in relation to potential, the data suggest that the

473   MIM groups were at an intermediate phase of changing isolated classroom practices and

474   change in school culture and PE. There was evidence of both in the data sets, and further in-

475   depth data collected over a sustained period of time could have provided more definitive

476   answers on the positioning of success in relation to the framework. For these reasons and

477   because of the factors related to success, guideposts, roadblocks, facilitators, and potential the

478   chatroom is conceptualized as an established group.

479   Building on the theoretical framework of PLCs, grounded in situated learning

480   theories (see McPhail et al., 2014), the data generated from this study elucidate the

481   importance of a better understanding of the notion of bystanders (or "lurkers;" see Goodyear

482   et al., 2019): those who engage passively and do not actively interact within communities

483   (Table 2). Furthermore, lurking and the behaviors of the bystander participants (Table 2) are

484   particularly important to understand within Korean culture, where teachers often avoid

485   standing out and refrain from asking questions because these actions can be considered a sign

486   of weakness. The "vicarious response" is a prevalent aspect of the culture among Korean

487   teachers and is a way to maintain harmony within a group by withholding individual opinions

488   (Lee & Kim, 2010). However, many of the concepts across theoretical frames focus on the

489   relationship between learning and interactions, with a lack of interaction (or active

490   participation) often associated with limited engagement and, in turn, little or no impact on

491   learning and practice. Furthermore, bystanding or lurking is often perceived in a negative

492   sense as indicating a lack of a willingness to learn and contribute to the community. Data

493   from this study, however, challenge how we conceptualize the relationships between

494   interaction and learning in online communities for passive participants. It was evident in the

495   data that bystander teacher participants were contributing to the goals of the community

496   although their level of learning cannot be assumed and was not a focus of this study.

497   Therefore, it seems that different metrics and concepts should be used to measure bystanders'

498   engagement and learning, and in ways that focus on more passive forms of engagement, with

499   such concepts likely to challenge the social constructivist/situated learning perspectives that

500   are often used to explain community-based approaches.

Conclusion

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502   This study examined PE teachers' participation patterns within self-directed online PE-CPD activities

503   using MIM. The online environment comprised different groups of teachers who had different

504   motivations and needs for professional development. It showed the potential for the rapid

505   exchange of ideas and resources and for controlling the degree of participation based on the

506   different needs and motivations of different teachers. In addition, the emphasis on speed

507   rather than quality of information, the pursuit of quick fixes rather than the exchange of

508   critical discourse and reflection, replicated the individualistic school cultures in offline

509   contexts (Lee et al., 2019). Accordingly, this study builds on established features of effective

510   CPD in general (c.f. Darling-Hammon et al., 2017) and in PE-CPD (Armour et al., 2017) by

511   illustrating them in an online context.

512   The findings of this study have the following implications for future online-based

513   CPD research. First, this study only examined teachers' engagement patterns with a single

514   year of data and the five engagement patterns identified in this study can be transient rather

515   than static; future studies should explore how the roles and functions of individual teachers

516   change over a longer term. Tracking the engagement patterns of individual teachers over a

517   long period will provide insights into how teachers are learning and growing within the online

518   environment.

519   Second, studies on the spillover effects of self-directed online PE-CPD should be

520   explored. Although the majority of participants may remain silent, the ideas exchanged in the

521   online environment can be a catalyst for their self-reflection, or serve as seed beds for small

522   group online communities and/or offline teacher learning communities. These studies will

523   provide information on the impact and influence of self-directed online CPD on teachers'

524   professional development beyond online communication.

525   Finally, given that this study only examined how and why teachers are participating in

526   self-directed online CPD, future research should explore how this participation influences

527 teachers' changes in knowledge and practices as well as student learning outcomes.

528 Specifically, teachers' changes and the impact on student learning should be examined in

529 relation to teachers' participation patterns because different groups of teachers have different

530 ways of learning and participating. Such research will inform researchers and practitioners in

531 developing facilitation strategies tailored to each group of teachers to maximize teachers'

532 learning and student learning outcomes.

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634   Table 1. In-depth interview participants' background information

Category		Number
Gender	Male	6
	Female	4
Academic degree	Bachelor's	5
	Master's	5
Teaching experience	1–5 years	4
	6–10 years	2
	11–15 years	3
	16 years ~	1

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639   Table 2. Styles of physical education teachers' participation in MIMs

Participation styles		Chatroom behaviors	Number of teachers (%)	Number of messages posted by teachers (%)
Ringmasters		Creates and manage the chatroom	2 (0.3)	409 (7.8)
Uploaders	Active	Voluntarily uploads material in the chatroom without request from other teachers	53 (7.7)	2,402 (45.8)
	Passive	Uploads material when requested by another participant	56 (8.2)	1,731 (33)
Requesters		Asks questions and requests material from other teachers	170 (24.9)	704 (13.4)
Bystanders		Presents in chatroom but makes no comment	403 (58.9)	0 (0)
Total			684 (100)	5,246 (100)

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