

Social media and teacher professional learning communities

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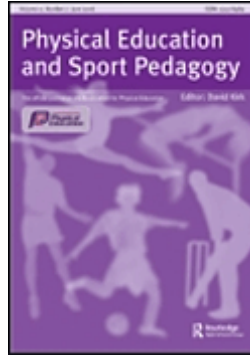
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Social media and teacher professional learning communities

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1 **Social media and teacher professional learning communities**

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For Peer Review Only

26 Abstract

27 *Background:* An extensive and international evidence base positions professional learning
28 communities (PLCs) as an effective continued professional development (CPD) mechanism
29 that can impact on teachers' practices and, in turn, students' learning. The landscape of
30 teacher PLCs is continuously developing; notably through teachers' uses of social media.
31 Yet, there is limited robust evidence identifying the characteristics of social media PLCs that
32 impact on teachers' learning and practice.

33
34 *Purpose:* This exploratory study examined the characteristics of a specific Twitter-based
35 professional learning community - #pechat. The research questions were: (i) **what is the**
36 **nature of a Twitter-based professional learning community?** and (ii) what characteristics of a
37 Twitter-based professional learning community develop learning and practice?

38
39 *Methods:* Data were generated from 901 tweets between 100 participants; and 18 in-depth
40 semi-structured elicitation interviews with participants and moderators of the Twitter-based
41 professional learning community. Data were analysed through a process of deliberation, and
42 a relativist approach informed quality.

43
44 *Findings:* Two themes are reported to explain the nature of the Twitter-based professional
45 learning community and the different types of characteristics of #pechat that developed
46 learning and practice. The first theme *engagement* shows how different participants of
47 #pechat engaged with discussions and how moderators played a key role in facilitating
48 discussions between participants. The second theme *shared practices* shows how discussions
49 between participants of #pechat led to the development of new practices that some teachers
50 were able to use to accomplish particular objectives in their physical education lessons.

51
52 *Conclusion:* The analysis of the data provided evidence to suggest that #pechat is a PLC and
53 is representative of an established group of practitioners. These characteristics should be
54 considered in the design of future online professional development experiences. Facilitator or
55 moderator training could support the development of social media based PLCs that
56 subsequently and positively impact on teachers' practices.

57
58 *Keywords:* *communities of practice; professional learning; constructivism; situated learning*
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3 66 It is extensively agreed that teacher professional development (PD) is an essential mechanism
4
5 67 through which to enhance the quality of teaching and, in turn, improve students' learning
6
7 68 outcomes (Armour et al. 2017; Sato and Haegele 2017). Yet, for a number of decades it has
8
9 69 been reported from diverse international and socio-economic contexts that physical education
10
11 70 teachers are rarely able to access and engage with effective PD, with time, cost, and a lack of
12
13 71 access to relevant content frequently cited as key barriers (Parker and Patton 2017,
14
15 72 Makopoulou 2017). **As a result, there are concerns about teaching quality and whether**
16
17 73 **classroom practices are evidence-based (Armour et al. 2017, Sato and Haegele 2017).** The
18
19 74 enduring issue of effective teacher PD is coupled with the ongoing marginalisation of the
20
21 75 subject (Pope, 2011, masked for peer review). For example, cuts to the time devoted to the
22
23 76 development of subject knowledge in graduate physical education teacher education
24
25 77 programs are becoming commonplace (Dudley and Burden 2019), alongside the reduction of
26
27 78 physical education teacher education programmes in leading international institutions^{1,2}. This
28
29 79 means that, across physical education teachers' careers, opportunities to learn and develop
30
31 80 their practices are becoming increasingly limited. The creation of new PD practices that
32
33 81 support teachers' learning needs, and navigate contextual barriers to PD, are therefore vital
34
35 82 for teachers and for those researching physical education.
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42 83 Social media has been reported as an increasingly 'popular' digital/online context
43
44 84 used by teachers for PD purposes (see Greenhow et al. 2018, Greenhow and Lewin 2016).
45
46 85 There is evidence that teachers use a range of different social media sites - such as Twitter,
47
48 86 Facebook and YouTube - to post and exchange pictures, resources and information
49
50 87 (Greenhow et al. 2018, Harvey and Hyndman 2018). Furthermore, teachers are reported to be
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52 88 forming communities on social media, and engaging in social-media based chats to share
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58 ¹ [https://www.thelantern.com/2018/02/physical-education-teacher-education-](https://www.thelantern.com/2018/02/physical-education-teacher-education-program-to-be-phased-out-by-2022/)
59 [program-to-be-phased-out-by-2022/;](https://www.thelantern.com/2018/02/physical-education-teacher-education-program-to-be-phased-out-by-2022/)

60 ² [MASKED FOR PEER REVIEW]

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3 89 information about their practices (Krukta and Carpenter 2016, Trust et al. 2016, Wesley
4
5 90 2013). Yet, there is limited robust evidence on the types of content, interactions and spaces
6
7 91 that support teachers' learning and practices (Britt and Paulus 2016, Carpenter and Krukta
8
9 92 2016, Krukta and Carpenter 2016). Despite almost a decade of research on social media and
10
11 93 teacher PD (Greenhow et al. 2018), the primary empirical focus has been on why teachers
12
13 94 engage with social media for PD (Britt and Paulus 2016, Carpenter and Krukta 2015, 2014,
14
15 95 Harvey and Hyndman 2018). There is very limited understanding about how *teacher learning*
16
17 96 occurs via social media and how social media operates as a form of PD that impacts on
18
19 97 practice.
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24 98 The purpose of this paper is to examine social media as a contemporary form of
25
26 99 teacher PD. The specific focus is on better understanding how teachers' engagement with
27
28 100 social media develops their learning and practice(s). The article reports on a case study of a
29
30 101 Twitter-based physical education chat - #pechat - and presents new data from over 100
31
32 102 international participants. **The concept of professional learning communities (PLCs) is**
33
34 103 **applied to explain the social media-based learning context(s).** The research questions were:
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36 104 (i) what is the nature of a Twitter-based professional learning community and (ii) what
37
38 105 characteristics inherent within that professional learning community develop learning and
39
40 106 practice?
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47 108 **Professional Learning Communities**

48
49 109 An extensive evidence-base reports on how the concept of PLCs can be applied to assist in
50
51 110 explaining the architecture of learning environments in group or community-based contexts
52
53 111 (Parker et al. 2012, MacPhail et al. 2014). PLCs are generally referred to as groups involving
54
55 112 members who share common learning/professional interests, in which interactions and
56
57 113 discourse take place over time through discussion, analysis and problem solving, that result in
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3 114 professional learning (MacPhail et al. 2014, Parker et al. 2012). The conceptual framework of
4
5 115 PLCs was, therefore, highly relevant the social media-based context of a bi-monthly Twitter
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8 116 chat, and was applied as an analytical framework for this study.

9
10 117 An **international** literature base has sought to define and establish different types of
11
12 118 characteristics of PLCs (see Author 2015, Armour et al. 2017, Parker and Patton 2017, Yoon
13
14 119 & Armour 2017). Parker et al. (2012) identified three broad types of PLCs: (i) collections of
15
16 120 authentic teachers, (ii) established groups, and (iii) communities of practice (CoP) (see Table
17
18
19 121 1). **These different types of PLCs are defined by five characteristics with differing features:**
20
21 122 **(i) success; (ii) guideposts; (iii) facilitator; (iv) roadblocks; and (v) potential (see Table 1).**

22
23 123 The main differences between these five characteristics is the collaborative and co-
24
25 124 constructed nature of how individuals work together in groups. For example, whereas in the
26
27 125 collection of authentic teachers' success is determined at an individual level, in a community
28
29 126 of practice (CoP) success is integrated amongst the practices of group members (Table 1).
30
31 127 Parker et al. (2012), and later MacPhail et al. (2014), argued that the more groups adhered to
32
33 128 the constructs of CoPs deeper learning, more focussed the direction of learning, and stronger
34
35 129 growth in teachers and the community would be evident. The characteristics of CoPs can
36
37 130 therefore be used as aspirational criteria for the design of effective professional development
38
39 131 (MacPhail et al., 2014; Parker et al., 2012). In that context, we explain CoPs in a bit more
40
41 132 detail.

42
43 133 CoPs are grounded within situated learning perspectives (Parker et al., 2010). A CoP
44
45 134 can be summarized as 'groups of people who share a concern or a passion for something they
46
47 135 do and learn how to do it better as they interact regularly' (Wenger and Wenger-Traynor
48
49 136 2015, 1). CoPs are not haphazard groups (Lave and Wenger 1991). Groups evolve as
50
51 137 members come and go and as old members leave and new ones join. Lave and Wenger's
52
53 138 (1991) notion of legitimate peripheral participation can be used to describe how newcomers
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3 139 become fully participating community members. When members are new, learning is not so
4
5 140 much seen as knowledge acquisition as it is more of a process of social engagement as
6
7 141 learners ‘move toward full participation in the socio-cultural practices of a community’
8
9 142 (Smith 2009, no page). During legitimate peripheral participation, newcomers begin their
10
11 143 participation by engaging in activities that may appear simple, yet, are necessary for the
12
13 144 group. Through these peripheral activities, novices become acquainted with the tasks,
14
15 145 vocabulary, and organising principles of the community. In this phase there ‘is a concern
16
17 146 with identity, with learning to speak, act, and improvise in ways that make sense in the
18
19 147 community’ (Smith 2009, no page). In essence, ‘learning to talk the language of the
20
21 148 **community**’ is foundational to legitimate peripheral participation (Lave and Wenger 1991)
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26 149 and is representative of the process of newcomers.
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31 **Methods**

32
33 152 A case study design was adopted to provide rich and in-depth insights into teachers’
34
35 153 engagement the Twitter-based chat, #pechat (Hodge and Sharpe 2016). An iterative design
36
37 154 was adopted to provide both breadth and depth in the data generation process.
38
39

40 ***Site and Context***

41
42 156 The site of this study is Twitter and the context of Twitter that we explore is the
43
44 157 #pechat group. Twitter is a free micro-blogging site where members can post messages in the
45
46 158 form of tweets. At the time of the study, tweets were restricted to 140 characters but these
47
48 159 could include text, pictures and/or links to other websites. Various other functions are
49
50 160 available that enable Twitter users to share or view information with specific people and view
51
52 161 or engage with discussions with groups of Twitter members (Table 2). Hashtags can be
53
54 162 embedded within tweets and are used to signify a specific topic, a group of people, or to
55
56 163 tweet within a Twitter chat group. Twitter members can create their own hashtags or search
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3 164 for specific hashtags commonly used. When Twitter members search or use common
4
5 165 hashtags they can view other tweets about the specific topic (for example, #physed), they can
6
7 166 engage with a specific group of people (for example, #pegeeks), or they can engage with a
8
9 167 Twitter-based chat (for example, #pechat). Importantly, a Twitter user does not have to tweet
10
11 168 to view the posts that are made using the hashtag.
12
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14
15 169 [Insert Table 2 here]
16

17 170 #pechat is a Twitter based chat forum that uses the same hashtag for Twitter users to
18
19 171 engage in discussions. #pechat was founded in 2011 by a physical education teacher who was
20
21 172 also the founder of a professional development website (www.thephysicaleducator.com) that
22
23 173 is linked to and used to promote #pechat. At the time of the study #pechat (which had been
24
25 174 running for approximately three years) was hosted bi-monthly and occurred at 7pm across
26
27 175 five international time zones (Australian Eastern Time, Singapore Time, Greenwich Mean
28
29 176 Time, Eastern Standard Time, Pacific Standard Time) on a Monday evening. Each #pechat
30
31 177 was based around a specific topic with pre-defined questions for contributors to answer. The
32
33 178 topics and questions were usually selected by the founder of #pechat and were generated
34
35 179 through polls hosted on the website and shared through Twitter.
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40 180 For each of the five #pechat's a moderator was assigned; one for each of the time
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42 181 zones. The moderator's role was to tweet the pre-defined questions and to guide the
43
44 182 discussions by asking questions and prompting users to share their perspectives.
45
46

47 183 **Data Generation**

48 184 Data were generated from two sources: Twitter and interviews. The contextual focus
49
50 185 was on five different international #pechats that took place on the same day in March 2014.
51
52 186 The broad topic of the #pechat was 'a cry for help' and was focussed on how practitioners
53
54 187 could help other teachers to develop and change their practices. The moderators were
55
56 188 provided with a series of questions to guide discussions.
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3 189 First, similar to the approach adopted by Author (2017), data were generated from
4
5 190 tweets made during the five chats using the application Twitonomy³. The aim of generating
6
7 191 data from Twitter was to provide an illustrative example of the types of interactions within
8
9 192 the Twitter chat. The hashtag #pechat was used to search for and gather tweets. Data from
10
11 193 Twitonomy were exported to an Excel file and the participants and the content of each
12
13 194 participant's tweets were identified. Across the five #pechat's a total of 901 tweets were
14
15 195 made by 100 different people. The tweets generated informed the selection of participants for
16
17 196 interviews and the content of interview questions, and the tweets were later combined with
18
19 197 the interview data during analysis. The tweets therefore provided an additional layer of rigor
20
21 198 in this study. Methodologically, the tweets directed and maximised the focus on the
22
23 199 relationship between social media and teacher learning. Empirically, the tweets strengthened
24
25 200 the robustness of the findings, where evidence is reported from real time (tweets) and
26
27 201 retrospective data (interviews) (Author 2017).
28
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32

33 202 Secondly, data were also generated from 18 individual interviews, that took place
34
35 203 following the #pechat. The aim of generating data from interviews was to interpret how the
36
37 204 participants engaged with the #pechat, and how they had engaged with #pechat over time (i.e.
38
39 205 beyond the specific chat in March 2014). A purposeful sampling approach was adopted using
40
41 206 a criterion-based technique (Sparkes and Smith 2014). This approach was selected to ensure
42
43 207 that the participants of this study were representative of range of #pechat participants, but that
44
45 208 had all participated in #pechat over a period of time. The criteria used was based on different
46
47 209 intensities of engagement, in terms of participants' role in #pechat and the number of tweets
48
49 210 participants made. Following this approach, a sample of 18 was considered to provide a level
50
51 211 of rigor (Sparkes and Smith 2014). The sample selected included; (a) moderators (n=4) and
52
53 212 (b) participants (n=14) who engaged with the #pechat at high (50 or more tweets), moderate-

3 www.twitonomy.com/

1
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3 213 high (20 or more tweets) and low (less than 10 tweets) levels. The criterion sampling
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5 214 approach also sought to ensure an appropriate balance in gender and geographical location
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7
8 215 (see Table 3).
9

10 216 The interview process was initially informed by an elicitation approach to provide
11
12 217 depth in the participant responses through the use of text-based data to trigger responses and
13
14 218 memories (Phenoix and Rich 2016). Participants were asked to read the tweets they made
15
16 219 during the #pechat and then discuss their interpretations of these. Following this, questions
17
18 220 were asked in a semi-structured format about how #pechat had supported their engagement
19
20 221 and learning. Each interview was conducted via Skype and lasted between 45-60 minutes.
21
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23
24 222 [Insert Table 3 here]
25

26 223 *Ethics*

27
28 224 Ethical approval was provided by the Institutional Review Board and Twitter's terms
29
30 225 of service were consulted prior to data generation. Passive consent was sought from
31
32 226 participants to access tweets made during the #pechats. Passive consent occurred via an
33
34 227 information statement posted by the moderators and the first and third author prior to, during,
35
36 228 and at the end of each #pechat. The statement was also posted to one of the author's website.
37
38 229 The information statement informed participants that tweets made during the #pechat could
39
40 230 be used for research and participants' names and specific tweets could be used in the
41
42 231 reporting of the findings. Given the public nature of Twitter, the traceability of tweets and,
43
44 232 subsequently, the limited effectiveness of de-identification processes in social media research
45
46 233 (see Author 2017), anonymization strategies were not employed in the writing of this paper.
47
48 234 The information sheet, however, did state that participants had the right to contact the
49
50 235 research team via Twitter or email if they did not want their name or tweets to be used in the
51
52 236 reporting of the findings. None of the participants of #pechat contacted the research team and
53
54 237 in the reporting of the data from Twitter participants first names are used to represent their
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3 238 Twitter handle (e.g., @Adam) and tweets presented verbatim. Active consent and anonymity
4
5 239 procedures were followed for data generated from interviews. Participants provided written
6
7 240 informed consent and participants were de-identified from the interview transcripts, due to
8
9 241 the sensitivity and confidentiality of some of the information they shared.

242 *Data Analysis*

243 The characteristics of PLC's identified by MacPhail et al. (2014) and Parker et al.
244 (2012) (see Table 3) were used to analyse the data. Following this framework, the authors
245 were guided by concepts of success, guideposts, facilitator, roadblocks and potential, where
246 analytical questions derived from the framework were deliberated, decided upon and used by
247 the authors. This process ensured that the research questions remained a central focus while
248 also remaining open and reasonable to emerging understandings. The analytical questions
249 constructed and utilised were: (i) what is the nature of success, guideposts, facilitator,
250 roadblocks and potential in #pechat; and (ii) how does success, guideposts, facilitator,
251 roadblocks and potential support and develop learning and practice?

252 The first analytical step involved the organisation of the Twitter data. In order to
253 interpret ongoing discussions between participants and groups of participants, tweets and
254 conversations were grouped by; (i) separate #pechat's, (ii) singular tweets, and (iii)
255 conversations, that involved a series of two or more tweets. The second step of analysis was
256 informed by the analytical questions. A deliberative strategy was used, inspired by Tracey's
257 (2010) end goals for excellent qualitative research, as well as the work of Englund (2006) and
258 Author (2017). The analytical questions were used by the researchers to independently
259 analyse the data. Each researcher formulated codes and themes, and these became the basis
260 for deliberation between all three authors. The aim was to ensure that themes represented
261 something 'in common' (Author 2017, p. X) about the answers to the analytical questions.
262 The deliberative process resulted in two themes: (i) engagement and (ii) moderation.

263

264 **Validity**

265 A relativist approach was applied to **inform validity** and determine quality (Burke 2016). A
266 relativist approach extends the robustness of traditional measures of quality drawn from
267 criteriological approaches (Burke 2016), such as trustworthiness, as it offers a framework for
268 determining quality in a way that aligns with the contextual circumstances of the study. In
269 applying a relativist approach and, following the work of Smith and McGannon (2017),
270 universal criteria for judging the quality of research are not applied (e.g. dependability,
271 confirmability). Instead, criteria are selected from an ongoing list of characterising traits that
272 relate to the context of the research (Smith and McGannon 2017). The following criteria
273 were selected as representations of quality and validity within this research: the worthiness of
274 the topic; the significant contribution of the work; width, that is, the comprehensiveness of
275 evidence and the use of multiple and numerous data sources from a wide sample of
276 participants (n=100); and credibility through the first and third authors' familiarity with the
277 #pechat group, as well as the rigorous analytical process involving deliberation. As part of a
278 list of characterising traits for enhancing the quality of this work, this study also aimed for
279 coherence. In other words, how well the study hung together in terms of purpose, methods
280 and results, as well as its strong underpinning of theory, i.e. PLCs through CoPs. Evidence of
281 quality and validity in this study are therefore aligned with the contextual circumstances of
282 the research.

283

284 **Results**

285 Two themes represent the nature of the Twitter-based professional learning community and
286 the different types of characteristics of #pechat that developed learning and practice: (i)
287 *engagement* and (ii) *shared practices*.

288

1
2
3 **289 Engagement**

4 290 Two overarching and contrasting forms of engagement were identified: *active* and
5
6
7 291 *observational*. *Active* engagement was associated with participants of #pechat who held an
8
9 292 identity as a “big name on Twitter” (participant 1 interview). *Observational* engagement was
10
11 293 associated with participants who were referred to as lurkers.

14 294 The “big names on Twitter” were those who were identified as being “active in social
15
16 295 media” (participant 1 interview) and were often the high or mid tweeters and/or the
17
18 296 moderators (Table 2). The big names shared firm and dominant views and were individuals
19
20 297 who other participants attempted to connect with through replies, retweets (RTs) or favourites
21
22 298 (see Table 1). For example:

25 299 Adam: Activities and learning opportunities are differentiated for readiness
26 300 level. Students can choose within that framework #pechat
27
28 301 Naomi: RT
29 302 Andy: @Adam Amen! #pechat
30 303 Naomi: @Adam Agree!... That was well said! #pechat (tweets)
31
32 304

33 305 High levels of connectivity with the big names was associated with these participants
34
35 306 having “something worthwhile to say” (participant 2 interview). The high levels of
36
37 307 interactivity were also associated with the number of tweets sent by the big names. Most of
38
39 308 the big names tweeted in more than one of the five #pechat’s. For example, Andy, who made
40
41 309 a total of 65 tweets during the five #pechat’s, tweeted his opinion on a particular topic more
42
43 310 than once. For example, he re-shared his views from the Singapore chat in the Canada chat, :
44
45 311 ‘as I said in last night’s chat, she’s taking responsibility which is great I think. Not so much
46
47 312 blaming herself #pechat’ (tweet).

50 313 Despite the “**big names**” connectivity being associated with a valued voice and
51
52 314 opinion, it was acknowledged that others connected with them because they “think that it is
53
54 315 the right thing to do” (moderator 1 interview). The big names held a certain identity within
55
56 316 the #pechat community and were described as “those types of people that will say something
57
58 317 and people will buy into it right away” (participant 3 interview). This identity, however, was

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2
3 318 not only attributed to the number of tweets, knowledge, or confidence. The big names were
4
5 319 described as being white males that was perceived to provide them with a certain privilege
6
7 320 for their voice to be heard: “It’s a certain gender, it’s a certain ethnicity, so it’s an interesting
8
9 321 question because some voices are heard based on our privilege and based on who we are”
10
11 322 (participant 4 interview). The data indicate that the nature of the learning was shaped by
12
13 323 positions of power and influence.
14
15

16
17 324 At the other end of the engagement spectrum were participants identified as “lurkers”
18
19 325 (participant 5 interview). Lurking involved observing tweets and commenting only when
20
21 326 something was interesting or engaging.
22
23

24 327 I’m basically a lurker.... So I look at everyone’s ideas, like whenever I have
25 328 downtime I’m on Twitter I’m scrolling through the hashtags seeing what people are
26 329 saying and then if I see something that’s like really really cool or really inspiring I’ll
27 330 comment on it. (participant 6 interview)
28 331

29 332 The reason for lurking was often associated with participants feeling like they did not
30
31 333 have something worthy to contribute. For example, “I don’t feel like I have much to add to or
32
33 334 I’ll listen but I won’t add to things so I’ll just lurk a little bit!” (participant 5 interview).
34
35 335 Lurkers averaged between one and three tweets (Table 2) and rather than sharing opinions,
36
37 336 their tweets often involved asking questions: “how do I give choice to some while still
38
39 337 maintaining structure for others in the same class #pechat” (Joe, tweet).
40
41

42
43 338 Despite a number of participants suggesting that they or others lurked, lurking wasn’t
44
45 339 seen as a problem. For example, one lurker was quite open to the #pechat group that he/she
46
47 340 had lurked and tweeted, “enjoyed lurking and following along - good discussion all”
48
49 341 (coachdeneef, tweet). For the more active users of Twitter, lurking was an accepted form of
50
51 342 engagement because it was positioned as a way of helping Twitter members to learn about
52
53 343 Twitter, what to tweet, and with whom to interact. In other words, it was a form of
54
55 344 apprenticeship or work-place learning. Lurking was seen as a process that would enable
56
57 345 people to develop their own professional learning network:
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1
2
3 346 You get on, you lurk, you have to find people, you have to find groups to follow
4 347 topics to follow and you lurk and you read and you know ... then all of a sudden you
5 348 like something. You favourite something, you retweet something and then comes your
6 349 big ... you know either a reply to somebody else cos I think that's what I did first, I
7 350 post somebody ... sent ... reply...that's an awesome idea so that was the first thing I
8 351 wrote. And then from there it was kind of like, ok so I'm gonna put something out
9 352 there, you kind of put your feelers out there and your PLN [Professional Learning
10 353 Network] grows. (participant 7 interview)
11
12 354

13 355 The mid tweeters' engagement in #pechat contributed to the momentum of
14
15
16 356 discussion. These participants' engagement might best be described as sharers. The mid
17
18 357 tweeters would often respond to a moderator's question by sharing their opinions or by
19
20 358 providing examples from their own practices. The mid-tweeters would ask questions and
21
22 359 interact with others during #pechat to understand how they could do particular practices
23
24 360 others had shared. Nicholas asked Adam and Andy (both high tweeters) to explain how he
25
26 361 could use the ideas they had shared in lessons; '@Andy @Adam I only see my 4-6gr. [grade]
27
28 362 classes 30 times in #physed during the year...how do I learn what motivates my S's
29
30 363 [students] #pechat' (Nicholas, tweet).
31
32

33
34 364 Regardless of the form of engagement it seemed that moderators played a key role in
35
36 365 facilitating the different types of participants' engagement. Moderators described their role as
37
38 366 being about "trying to get people involved... guiding discussions" (moderator 2 interview).
39
40 367 For some moderators this meant ensuring that all participants knew how to engage in
41
42 368 #pechat. The moderators would do this by RTing the pre-determined questions for the
43
44 369 #pechat or RTing the @physical.educator.com's tweet on how to engage with #pechat: "RT
45
46 370 @phys_educator: Not sure how #pechat works? Want to join in the discussion? Check out
47
48 371 our #pechat 101 video here: [link to website removed]" (tweet). During the chats the
49
50 372 moderators posed the topic questions but they also aimed to respond to and develop the
51
52 373 discussions. One moderator spoke of how she aimed to "try to put myself in their shoes to
53
54 374 continue to explain...I try to make them feel emotionally safe" (moderator 3 interview). This
55
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375 moderator acknowledged that there were different types of practitioners involved in the
376 discussions who had different experiences and levels of knowledge.

377 Sometimes people ask a question and I feel like doh you don't have that foundational
378 piece, but those are the people I want to support and encourage the most. I am not
379 sure that everybody feels that way. Tone can sometimes get lost, I am the person that
380 would rather take five tweets to make sure my tone is clear as opposed to the someone
381 who might take one and not worry about that (moderator 3 interview)

382
383 The moderator's role was also seen as being about creating discussions (i.e. a series of
384 tweets) and encouraging participants to move beyond solitary statements (i.e. one tweet). As
385 one moderator commented, he needed to question participants as a means for them to
386 describe and discuss their practices in further detail:

387 Often people will respond with a pretty closed response. I guess the role of the
388 moderator is to question that again and say ok well why, how or when would you do
389 this rather than just accepting that, otherwise you end up with, well its not really a
390 conversation its just a series of statements (moderator 1 interview).

391
392 In summary, two predominant forms of engagement and types of practitioners existed
393 within #pechat; active engagement (big names) and observational engagement (lurkers). The
394 mid tweeters, known as 'sharers', supported the momentum of discussion and the moderators
395 played a key role in encouraging practitioners to share practices.

396 **Shared Practices**

397 Shared practices refers to how participants generated new understandings, new ideas,
398 and new practices that could be transferred into their lessons. While #pechat was described as
399 a form of PD, #pechat discussions did not support all participants learning or practices.

400 Most of the discussions in #pechat involved sharing practices around the pre-defined
401 topic. Many of the tweets were focused on offering different ways of doing similar things.
402 These types of tweets were described as being useful to practitioners as they could gain
403 different ideas that they could transfer into lessons.

404 Naomi: we use e-portfolios in our school & have video and pics #pechat
405 Tish: videos, blogs, go to school board, NP anything to highlight #pechat

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2
3 406 Jennifer: I use @socrative to get info. Kids use phones. Took abt 15 min and
4 407 gave me great data to use #pechat (tweets)
5 408

6 409 I have an idea or an opinion and so often somebody adds extra value to that or brings
7 410 that different perspective that I hadn't thought of, you know, for context and it's
8 411 like... fantastic I'm gonna try that. (participant 8 interview)
9 412

10 413 Participants did not always agree on all practices. The moderator was positioned as
11
12
13 414 someone who would "make the boat rock a bit" (participant 9 interview) and encourage
14
15 415 participants to question their own or each other's beliefs and/or practices.
16
17

18 416 He was playing devil's advocate sometimes, to expand your thinking and kind of take
19 417 the opposite side, whether they agree with it or not. (participant 9 interview)
20 418

21
22 419 The following series of tweets provides an example of how the moderator would

23
24 420 "play devil's advocate" (participant 9 interview). The tweet discussion begins with a

25
26 421 participant sharing the idea of students developing their own games (tweet 1). The moderator

27
28 422 challenged the participants by asking them to explain the learning environment (tweet 3) and

29
30 423 by then suggesting that students developing games is a messy process (tweet 5). Tweet 7

31
32 424 invited other participants into the discussion but the moderator continued to challenge the

33
34 425 participants by raising issues of Moderate to Vigorous Physical Activity (MVPA) (tweet 6).
35

36
37 426 As the discussion continued (tweets 8 - 13), the participants expanded on the original point

38
39 427 about students developing games and began to discuss how lessons could be structured to

40
41 428 accommodate MVPA. The tweet discussion continued beyond the 13th tweet used as in the

42
43 429 illustration below, but as the 13th tweet indicates, after the moderator had "rocked the boat"

44
45 430 (tweet 5 and tweet 6) the moderator began to agree with the suggestions for practice made by

46
47 431 the participants.
48
49

50
51 432 Tweet 1: (Matt): @Moderator @Nicholas hand the group a bag of equipment.
52 433 Let them develop the game. Also, use 7 parts of the game as
53 434 guide #pechat

54
55 435 Tweet 2: (Nicholas): limited opportunities for creativity within their educational
56 436 experience. Expecting more rules/guidelines from me #pechat

57 437 Tweet 3: (Moderator): @Nicolas so how can you create a culture of learning that
58 438 embraces the opposite
59
60

- 1
2
3 439 Tweet 4: (Matt): kids set own goals. They are becoming self-motivated to learn
4 440 and move #pechat
5 441 Tweet 5: (Moderator): @Nicholas @Matt I do have personal bias against this idea.
6 442 Same with peer teaching. Always messy #pechat
7 443 Tweet 6: (Moderator): @Nicholas @ Matt and always loses tons of MVPA....
8 444 Tweet 7: (Andy): @Nicolas @Matt @Moderator LEARNING IS MESSY
9 445 YAHOOO!! #pechat
10 446 Tweet 8: (Moderator): @Nicholas @Matt @Andy hah! I am absolutely ok with
11 447 messiness – IF there is a purpose behind it #pechat
12 448 Tweet 9: (Andy): @Nicholas @Matt @Moderator it also doesn't have to loose
13 449 MVPA when done well
14 450 Tweet 10: (Nicholas) @Matt @Moderator @Andy Students HR's during class today
15 451 over 150. Their games = more passion! Creating thinkers, not
16 452 just doers! #pechat
17 453 Tweet 11: (Andy) @Matt @Moderator @Nicholas so you give them a goal to get
18 454 HR 150+ for majority of the time, get them monitoring it
19 455 #pechat
20 456 Tweet 12: (Matt) @Moderator @Nicolas @Andy set up a goal/focus that toward
21 457 MVPA. This is an item the teacher can help students develop
22 458 #pechat
23 459 Tweet 13: (Moderator):@Andy @nicholas @Matt I suppose anything will work if
24 460 done correctly. I am a HUGE believer in peer feedback #pechat
25 461 (Twitter conversation)
26 462

27 463 The ability to engage in a series of tweets where participants offered different
28 464 perspectives had not always been part of #pechat. The participants described how there had
29 465 been a shift from resource sharing toward interactions and the development of shared
30 466 practices; “it started off being all about resources but now it’s more about concepts or idea
31 467 sharing. It’s definitely evolved for me” (participant 10 interview). Importantly, there was a
32 468 distinct difference between learning through using Twitter and engaging with #pechat. The
33 469 latter made learning associated with collaboration and discussions possible.

34 470 Social media is not professional development. Social media is a platform.
35 471 Professional development for me is the interactions I have with people. The
36 472 conversations that I have with people. And the collaboration that it kind of leads to.
37 473 So PE-Chats – I think if you are engaging in a PE-Chat and you’re having
38 474 conversation – even if you’re lurking you’re definitely learning something. You’re
39 475 seeing different perspectives for different people. So yes. So I’d say that it’s a form of
40 476 professional learning. (participant 11 interview)
41 477

42 478 Despite somewhat widespread agreement that #pechat was a form of PD, the growth
43 479 and popularity of #pechat from its initial introduction had caused some participants to
44 480

1
2
3 480 consider that their learning wasn't always supported. As one participant suggested, "a lot of
4
5 481 us who started on it [#pechat] feel that it's too big at this point" (participant 10 interview).

6
7
8 482 Moreover, #pechat was described as being "much more congested" (participant 12
9
10 483 interview):

11
12 484 By the time you've seen something you'd like to engage with 50 other people have
13 485 jumped in and taken that part of the conversation away so it's just about impossible to
14 486 actually keep up (participant 12 interview)

15 487
16 488 Some individuals were accessing other social media sites and/or developing smaller
17
18
19 489 groups on Twitter. There were other connections forming that were described as "close-knit
20
21 490 groups" where participants considered people in these groups as "not just colleagues but
22
23 491 friends" (participant 13 interview). The following highlights one participant's engagement
24
25 492 with the social media site Voxer and how the community on Voxer enabled her to change and
26
27 493 develop her lesson within the same day.

28
29
30
31 494 I got on Voxer and you know, in between classes I'd have five minutes, I got on and
32 495 said hey, don't know if any of you played this it's a great warm up game bla bla bla
33 496 so I wasn't even asking for any help... but...in two to three minutes I had two or three
34 497 other people who got on and who replied with hey I do that but I do a variation like
35 498 this... And the very next class I switched and I added that. So I have five minutes
36 499 between classes and within that time period I learned a new variation that
37 500 incorporated adding math to my lesson and then a grade in other content areas and I
38 501 mean the kids loved it just the same. (participant 14 interview)

39 502
40
41 503 Overall participants of #pechat developed shared practices through their responses to
42
43 504 particular questions and/or through the moderator challenging the participants' discussions.
44
45 505 Although #pechat was valued as a form of PD, many participants engaged with other social
46
47 506 media sites to collaborate with smaller groups of members from #pechat.

51 507 **Discussion**

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53 508 This exploratory study into a Twitter-based PLC has demonstrated that social media
54
55 509 can operate as a form of PD for teachers that develops their learning and practices. There was
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57 510 evidence that observing and/or actively **participating** in Twitter-based discussions supported
58
59 511 teachers to develop new understandings and shared practices. In some cases, practices that

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3 512 were co-constructed between teachers during Twitter-based discussions transferred into a
4
5 513 teacher's lessons demonstrating that social media has the potential to be a very powerful form
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7 514 of contemporary PD that impacts on practice. Yet, the Twitter-based professional learning
8
9 515 community did not influence all participants learning and practices. The participants had
10
11 516 different learning needs, contexts, knowledge and practices, and they engaged in #pechat in
12
13 517 different ways (active, moderate engagement and passive) and to different intensities (high,
14
15 518 mid, low tweets). The differences between the participants resulted in variance in how
16
17 519 learning was facilitated and structured within #pechat. The challenge for the field of PD is
18
19 520 understanding how to support and develop teacher learning in digital spaces when there are
20
21 521 mass numbers of participants with different needs and different intensities of engagement.
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26 522 Identifying the characteristics of the Twitter-based PLC provides a way to determine
27
28 523 how learning can be structured and supported on social media. The original contribution of
29
30 524 this study is the empirically rich data that identifies the nature of PLC characteristics (i.e.
31
32 525 success, guideposts, facilitator, roadblocks and potential – see Table 3), and evidence of how
33
34 526 the characteristics that impacted on learning and practice. This study shows that #pechat is an
35
36 527 established group. It was evident that there was an accomplished objective of achieving
37
38 528 shared practices where individuals, to varying intensities, were empowered to engage with
39
40 529 discussions. Furthermore, the data demonstrated that there was continuous interaction
41
42 530 between participants, where moderators and mid-level tweeters supported the flow of
43
44 531 discussion. The moderators also acted as the role of facilitators, where individuals with
45
46 532 higher status on Twitter were also influential. Finally, and in smaller interactional groups,
47
48 533 issues were identified and resolved between participants. In this sense, social media was a
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50 534 space that supports professional development in a way that impacts on learning and practice
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52 535 by enabling practitioners to form established groups.
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3 536 Although the Twitter chat acted as a form of PD, the data demonstrate a number of
4
5 537 challenges for practitioners using social media as a PD tool. It should be noted that
6
7 538 engagement with Twitter chats does not support all practitioners' learning and practices.
8
9 539 Clear challenges were evident with regard to the mass, open and many-to-many forms of
10
11 540 communication, where interactions became disconnected and fragmented due to high
12
13 541 numbers of participants. To navigate against this issues, social media sites that enable smaller
14
15 542 groups of participants to come together in more refined spaces are an option. The data from
16
17 543 this study suggests that in such spaces, participants can develop richer professional relations
18
19 544 and deeper discussions about practice occur. Due to these capabilities of smaller groups, it
20
21 545 can be suggested that these spaces of social media may be more representative of legitimate
22
23 546 peripheral participation and the constructs of CoPs. To further develop understandings of the
24
25 547 social media as a PD tool, future research should examine the characteristics of these smaller
26
27 548 and refined PLCs on social media.
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33 549 Another challenge was related to influence and self-presentation. The data suggested
34
35 550 that individuals with high status can hijack discussions and direct conversations to issues that
36
37 551 they deem important, but may not be representative of the whole community. Issues of
38
39 552 gender and ethnicity also provided a level of power in relation to PLCs. The role of the
40
41 553 facilitator in PLCs is to seek a balance between new concepts with prior experiences and to
42
43 554 push teachers at appropriate points in an effort to maximize learning (Poekert 2011).
44
45 555 Effective facilitators guide rather than direct, question rather than show the way, and listen
46
47 556 rather than tell (Patton & Parker 2014; Parker and Patton 2017), yet have the critical role of
48
49 557 managing group dynamics (Molle 2013). Among other things, in order to develop trust and
50
51 558 respect, participants should have an equal voice in conversations (Hunuk, Ince and Tannehill
52
53 559 2013) and actions must be taken to equalize opportunities and engagement where a power
54
55 560 differential traditionally exists (Patton, Parker and Neutzling, 2012). Armour and Yelling
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3 561 (2007) described the intricacies of doing this stating that effective, professional development
4
5 562 providers 'need to tread a careful line, simultaneously being leaders (providing expert input,
6
7 563 helping teachers to work together) and followers' (195). While these issues occur in face-to-
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9
10 564 face communities, controlling and limiting the domineering behaviours presented in social
11
12 565 media environments may be more complex and require even more skill in facilitation. These
13
14 566 findings therefore further stress the importance of professional development for facilitators or
15
16 567 moderators in social media contexts (Makopoulou, 2017).

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19 568 Although this study has demonstrated impact, several limitations exist. Firstly, only a
20
21 569 small sample of practitioners were interviewed from a broader sample of participants. While
22
23 570 the potential for generalizability was addressed, a wider sample could have provided further
24
25 571 insights. A second limitation concerns the generation of empirical data from one collective
26
27 572 #pechat. [To understand the nature and form of a PLC over time, data could be generated](#)
28
29 573 [from Twitter over a series of #pechats.](#)

30 31 574 **Conclusion**

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34 575 Teachers access to, and engagement with high quality, PD has been an enduring issue. Social
35
36 576 media can overcome some of the barriers to teacher PD. The findings reported are from a
37
38 577 diverse and international sample and provide evidence on how teacher learning occurs via
39
40 578 social media, and the characteristics of social media-based groups or communities that
41
42 579 influence knowledge and behaviour change. Hence, the findings indicate that social media is
43
44 580 a contemporary form of professional development that can address the clear challenges
45
46 581 associated with teacher learning and, in turn, enhance the quality of teaching and improve
47
48 582 student learning outcomes.

49 50 583 51 52 584 **References**

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We would like to thank the reviewers for their helpful comments on revising this article. Below we have identified where these comments have been addressed. In addition, we have now revised the length of the paper and it is now 7490 words

Reviewer 1	
Comment	Addressed
2/36-7 - 'characteristics inherent within' – why 'inherent'? The term strikes me as not altogether necessary and potentially confusing.	Inherent has been deleted – and changed to what is the nature of a Twitter-based professional learning community and
2/53 – 'evidence to suggest that #pechat is a PLC' – who decides if it IS a PLC? Should the authors use language to show that it is their labeling/theorizing that makes #pechat a PLC? This would be more in line with their discussion of a relativist approach on p. 12.	While we agree with the change. We have chosen not to make this change as it would alter the tenses that we have used in the manuscript and do not feel that we/our would be representative of the paper.
3/73 – 'evidence-based practices are being transferred to the classroom' – I would expect practices to take place in the classroom. If this is the case, what is being transferred?	We have modified this sentence and it now reads As a result, there are concerns about teaching quality and whether classroom practices are evidence-based (Armour et al. 2017).
4/111 – 'the architecture' – sounds like a theoretical/specialist term but is not accompanied by any explanation. I can't say that I had anything but a vague idea of what it referred to.	This sentence has been changed to The concept of professional learning communities (PLCs) is applied to explain the social media-based learning context(s).
5/117 – 'an extensive evidence-base reports' – this sentence would be clearer with an actor doing the reporting. Maybe 'A number of researchers have reported...'	We feel that the suggested change conveys the same meaning and we have chosen not to make the change
5/125 – 'extensive and international' – one of the terms is redundant	We have deleted extensive
5/127-37 – I don't follow how the three types of PLCs and the five distinguishing characteristics fit together. Do the three types have different characteristics? Some clarification here would be greatly appreciated.	Due to space we have not elaborated on these fully but have signposted to the Table for further information
7/170 – 'Learning to talk' – suggestion: 'learning to talk the language of the community'.	This change has been made
9/216-18 – this sentence does not describe the topic of the chat in very much detail. It could be that the topic was not very specific but if that is the case, it should be made clear for the reader.	We have chosen not to elaborate on this due to space
9/232 – 'the sample size was consistent with research undertaken in sport, exercise and	Please see changes made on page 8 Following this approach, a sample of 18 was considered to

1 2 3 4 5 6 7 8 9 10 11 12 13	health' – there is quite simply a massive amount of research undertaken in this discipline, and many approaches to sampling. The authors need to find some specific support for their method of sampling. Was it convenience, probability, purposive/targeted, snowball...? Then the authors can include a short statement of why this was suitable for this investigation and provide a reference.	provide a level of rigor (Sparkes and Smith 2014).
14 15 16	9/233 – 'robust' is used too often throughout the paper.	The term is only used on 4 occasions and we feel that is acceptable
17 18 19 20 21	11/279 – sounds to me like this was the first part of the analytical process (followed by the second part), rather than two distinct processes taking place(?)	We have changed terminology to steps
22 23 24	12/293 – 'guide validity' – can validity be guided?	This change has been made
25 26 27	14/347 – I think there is an apostrophe missing.	This change has been made
28 29 30	18/472 – either 'rock the boat' or 'play devil's advocate' is redundant.	Changed
31 32 33	21/571 – 'participation' should be 'participating'	Changed
34 35 36	22/585-88 – different font.	Changed
Reviewer 2		
37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	<p>I would like to thank the authors for addressing the issues raised in my initial review. The resubmitted paper has been amended to respond to a number of these points and I would suggest it presents useful data that highlights the potential of twitter as a valuable feature of teachers' professional learning. In particular, as in the initial submission, the paper offers important observations about the roles that different teachers play in the #PEchat sessions and how these sessions offer the opportunity for different practice ideas to be shared.</p> <p>In my original review I commented on the need for more clarity about PLCs and their role in this study. While more detailed and helpful background about PLCs is now included in the text, I would suggest that this background highlights the key issue with the study. On page 5 the authors highlight how PLCs have their basis on "interaction and discourse over time through discussion, analysis and problem</p>	<p>Thank you for raising this issue. We agree that CoPs are not haphazard groups – and claims cannot be made based on examinations of workshops. In the revisions we have made extra steps to navigate this interpretation of the data, and ensure that the claims we make about PLCs are grounded in data that does reflect PD participants on-going learning experiences. Indeed, the tweet data are representative of interactions on Twitter at a specific moment in time, the interview data however, is reflective of participants experiences of #pechat over time. We do feel that further evidence on on-going interactions is required and have suggested this as a way forwards for future research in the discussion.</p> <p>The changes we have made are:</p> <p>Page 7 line 173</p>

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solving". From this critical point, I would suggest that the study being reported is not investigating the nature of #PEchat as a PLC but a series of one-off professional learning events in different parts of the world. As I note above, the paper makes valuable observations about the potential of #PEChat and twitter as a form of teachers' professional development but I do not believe it is able to make claims about the nature of these one-off sessions as PLCs. The conclusion to the paper would seem to support this point as there is little mention of PLCs. I am not suggesting that #PEchat is not a PLC but that to investigate the nature of #PEchat as a PLC the data would need to be collected over an extended period of time. I appreciate that that the authors have put considerable work into this resubmission but would suggest they need to re-think the basis upon which this data set is analysed and reported in the future.

At the time of the study #pechat (which had been running for approximately three years) was hosted bi-monthly and occurred at 7pm across five international time zones (Australian Eastern Time, Singapore Time, Greenwich Mean Time, Eastern Standard Time, Pacific Standard Time) on a Monday evening

First, similar to the approach adopted by Author (2017), data were generated from tweets made during the five chats using the application Twitonomy⁴. The aim of generating data from Twitter was to provide an illustrative example of the types of interactions within the Twitter chat.

Secondly, data were also generated from 18 individual interviews, that took place following the #pechat. The aim of generating data from interviews was to interpret how the participants engaged with the #pechat, and how they had engaged with #pechat over time (i.e. beyond the specific chat in March 2014). A purposeful sampling approach was adopted using a criterion-based technique (Sparkes and Smith 2014). This approach was selected to ensure that the participants of this study were representative of range of #pechat participants, but that had all participated in #pechat over a period of time.

To understand the nature and form of a PLC over time, data could be generated from Twitter over a series of #pechats.

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Table 1. Landscape of professional learning*

	Collection of Authentic Teachers	Established Groups	CoP
Success	Acquisition of new ideas	Accomplished objective + empowerment	Accomplished objective +empowerment
Guideposts	When together	Continuous	Continuous
Facilitator	External/internal leaders and or workshop leaders. Dispenser of knowledge	Internal leaders and workshop leaders; some shared facilitation	Shared facilitation and workshop leaders
Roadblocks	Leader attempts to sort arising issues	Issues identified by group; solved by leader or shared facilitators	Issues identified by and solved by group
Potential	Change in isolated classrooms		Change school culture and physical education

*MacPhail et al. (2014, p.44)

Table 2: Functions of Twitter

Function	Description
Tweet	A post of up to 140 characters
Follow	A Twitter member can follow other Twitter members
Home Page	All of the tweets posted by members that are followed by a Twitter member can be viewed on their home page in chronological order
Retweet	A Twitter member can re-post a tweet made by another member to show appreciation and to share this tweet with their followers
Favorite	A Twitter member can favorite someone else's tweet to show appreciation. All tweets that the Twitter member has 'favorited' are stored in the favorites section to the site
@name	A tweet can be targeted at specific or several people by including the other members Twitter name into their tweet. For example, @MrSmith
Notification	When another member is tweeted, their post is retweeted or 'favorited' the Twitter member will receive a notification to inform them of this
Hashtag	A hashtag can be embedded into a tweet to identify a specific topic, a community, or to engage in a Twitter-based chat
Message	Twitter members can send private messages to other Twitter users that they are followed by. This message can only be viewed by the people within the message

Table 3 Characteristics of Interview Participants

Participant	Role in #pechat	Gender	Location	No of tweets
1	Participant	Female	South Korea	31
2	Participant	Male	USA	22
3	Participant	Male	UK	21
4	Participant	Female	USA	18
5	Participant	Female	Canada	21
6	Participant	Male	China	65
7	Participant	Male	Australia	17
8	Participant	Female	USA	16
9	Participant	Male	Singapore	3
10	Participant	Male	USA	3
11	Participant	Male	Canada	2
12	Participant	Female	USA	1
13	Participant	Male	USA	1
14	Participant	Male	USA	1
15	Moderator	Male	Singapore	51
16	Moderator	Female	Canada	57
17	Moderator	Male	UK	202
18	Moderator	Male	Canada	60