1   **Technology enhanced learning in physical education? A critical review of the literature**

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4   **Abstract**

5   **Purpose:** In this review, the three components of pedagogy (i.e., teaching, learning, curriculum)

6   were used to critically investigate what is argued to be 'enhanced' by digital technology.

7   **Method**: Using a critical methodology, an answer was sought to the question of 'what aspect(s)

8   of pedagogy is claimed to be enhanced by the use of digital technology in PE?' The final set of

9   papers are presented in terms of the claimed technological enhancement in teaching, learning,

10   curriculum.

11   **Findings**: Interestingly, technology enhancements are presented most prevalently in terms of

12   'enhancing student learning' in areas such as health or motivational variables. Technology was

13   mainly used as a substitute for the teacher and not transformative teaching and learning.

14   **Discussion/Conclusion:** A critical analysis regarding what is done in the 'name of PE'. This

15   paper concludes by presenting suggestions on how to move the field forward and to debate the

16   roles of digital technology in PE.

17   **Keywords:** educational technology, digital technology, PE, pedagogy, TEL.

18

Introduction

This article was written at a time when online education and using different technologies to access educational materials from our homes came to the fore due to the COVID-19 pandemic. From this context, many are aware that technology offers education a number of opportunities, in terms of enhancing existing provisions, but also challenges such as creating inequalities (Howley 2021). Now, more than ever, there is a need to develop critical education technology agendas that address issues such as pedagogy which make use of recent theoretical and methodological approaches (Selwyn et al., 2020). Expanding further on this point, Selwyn et al. (2020) argue that it is important that academic work commits to engaging in sustained and collective conversations about how we might successfully drive critical educational technology scholarship throughout the 2020s. Reflecting on recent scholarship in relation to technology (e.g. iPad apps, smartwatches or videos) and its impact on areas of pedagogy, it is argued that the effect of using technologies such as mobile devices in education is better than when using desktop computers (Sung et al. 2016), that effective use of technology (e.g. through feedback and gamification) can mediate supportive pedagogies (Yates et al. 2021) and how technology can help enhanced authentic assessment (Jopp, 2020). The effectiveness of digital-based interventions has also been reported worldwide over different age groups such as pre-school, elementary, secondary or third level education, and in different subject areas such as mathematics (Benavides-Varela et al., 2020); music (Crawford, 2017); language (Parmaxi, 2020), or geography (Adedokun-Shittu et al., 2020).

Yet, in the field of PE, only recently has there been an engagement and critical discussion regarding the interrelationship between technology and pedagogy. Indeed, Casey et al. (2017) argue that a considerable gap exists in relation to the connection between digital technology and

42   pedagogy. Subsequently, it would seem pertinent to explore these three areas of curriculum,

43   learning, and teaching practice and how they relate to technological enhancement. That being

44   said, 'educational technologies have been known to positively impact teaching and learning in

45   physical education' (Phelps et al. 2021). For example, there are previous studies that explore

46   technologies such as Massive Open Online Courses (MOOCS) which have been demonstrated to

47   positively impact professional development (Griffiths et al. 2021) or how digital game design

48   can help to support students' learning experiences (Pill et al. 2021), but also, its use for digital

49   assessment (Penney et al., 2012).

50   Whilst there is not a consensus on the meaning of pedagogy, as it means "different things

51   to different people" (Tinning, 1992, p. 24), Kirk et al. (2006, p. xi) defines pedagogy in terms of

52   the three elements of "learning, teaching and curriculum". Considering these three elements in

53   turn, within learning, children and young people are foregrounded and the focus is on the

54   multitude of ways that they can be supported to learn, thrive and engage in effective knowledge

55   exchange (Armour, 2011; Casey, Goodyear, & Armour, 2017). Our views of learning align with

56   Quennerstedt et al. (2011, p.162) in viewing learning as "meaning making resulting in a more

57   specific repertoire or act". The teaching or teacher(s) dimension of pedagogy considers teachers

58   who are continuously critically reflecting on their personal and professional abilities to support

59   young learners (Armour, 2011; Casey et al., 2017). Our views of teaching align with Biesta

60   (2017), where teaching is understood as the responsibility of bringing something to the

61   educational situation that was not already there. Teaching understood as a process where teachers

62   have something to give to their students (Biesta, 2012; Quennerstedt, 2019). The final element of

63   curriculum is aligned with the view that it is as an educational experience; as a plan, that must be

64   lived, experienced, and embodied young people and teachers (Pinar, 2012).

65   In seeking to theoretically frame research in this area, one can often see the use of the

66   TPACK framework which seeks to explore both the technological, pedagogical and knowledge

67   aspects involved with technology integration. Examples include Krause and Lynch (2018) and

68   Meroño et al. (2021), who argued that preservice teachers and teachers have varying experiences

69   with instruction in relation to TPACK or Gawrisch et al. (2020) who recommend that teachers

70   build their knowledge and learn to value technology in physical education. Whilst the use of this

71   approach has been helpful in negotiating the aspects of technology and pedagogy, the views in

72   this paper align with Voogt et al. (2013) in arguing that the limited knowledge pertaining to use

73   and develop TPACK can result in a deficit view of teachers that are characterised as either

74   having or not having the relevant knowledge bases. For example, by critically exploring

75   technology enhanced learning (TEL) in relation to these areas of pedagogy, this paper can

76   address a notable gap in the literature and begin to systematically investigate areas that are of

77   pedagogical importance (Casey et al., 2017). Research that supports our understanding of

78   technology-enhanced learning in PE is still developing (c.f. Casey et al., 2017; Krause, O'Neil,

79   & Jones, 2019; Wyant & Baek, 2019). Whilst recent research suggests that the emerging focus

80   on instructional technology in society and education has not been effective in providing the basis

81   for widespread adoption in PE, its role in PE remains in question (Wyant & Baek, 2019).

82   As argued by Passey (2019) TEL covers much more than a focus on learning and is also

83   concerned with areas such as education, the management of education. Yet, in addressing this

84   gap, we are conscious of the need to problematise TEL more generally in relation to questioning

85   what is 'enhanced' and how do we know it is enhanced? (Kirkwood & Price, 2014). Others go as

86   far as the need to problematize the very ontological underpinnings of TEL (Bayne, 2015). Whilst

87   it is beyond the scope of this paper to attend to the nature of these debates, there remains the

88   need to critically review what aspect of pedagogy is claimed to be enhanced using digital

89   technology. Furthermore, *who* is the subject of the claim of enhancement such as the teacher,

90   learner, or educational bodies. Attending to such areas addresses a notable gap in the field of PE

91   and sport pedagogy and will serve as a recognized source of information to inform future

92   research and decision making in relation to the use of digital technology in PE. Therefore, the

93   purpose of this paper is to critically review TEL in the PE literature with specific relationship to

94   the notion of pedagogy.

95   **Methodology**

96   ***Situating the review theoretically***

97   This review utilises a 'critical methodology' (Cushion & Townsend, 2019) that draws upon some

98   principles of systematic review (Alexander, 2020). This approach was chosen as it has generated

99   interest in the field of education, including the field of educational technology (Bedenlier et al.,

100   2020) and to draw upon similar principles utilised in the literature such as Kirkwood & Price

101   (2014). It is particularly suited to this research area in PE as the term 'enhanced' is widely used

102   in the literature, but frequently considered un-critically (Kirkwood & Price, 2014). This

103   argument is further positioned in relation to conceptions of teaching, learning, and curriculum in

104   which the categories and the relationship between them are also left unquestioned (Casey et al.,

105   2017; Kirkwood & Price, 2014). The research question that guided this critical review is: What

106   aspect(s) of pedagogy (teaching, learning or curriculum) is claimed to be enhanced by the use of

107   digital technology in PE? This guiding question allows us to explore the different elements of

108   pedagogy that have been outlined in the introduction.

109   ***Search strategy and parameters***

110   Literature was selected from searching the databases of Web of Science, Scopus, and Dialnet,

111   through a title and abstract search procedure. Following Alexander (2020) directions these

112   database searches were limited to peer-reviewed publications that were published between 2015

113   and 2020. The main search keywords were a combination of both a technology based key word

114   and an identifier from PE in both the abstract and title. The search terms were used in both

115   English and Spanish. For example, some of the search terms we used were a combination of

116   'technology-enhanced learning' AND 'physical education', and 'physical education' AND

117   'digital technology'[1]. A manual search of the list of references of selected articles was also

118   performed, not resulting in the inclusion of more papers to the ones yielded through the database

119   search.

120   ***Inclusion and exclusion criteria***

121   Given the authors backgrounds, this critical review considered empirical English and Spanish-

122   language research undertaken between 2015 and 2020 that was published in print or digital

123   formats, in peer-reviewed articles relevant to the research question. The rationale for this

124   timeframe is to encompass five years of rapid technological development and the relatively

125   nuanced nature of the work on technology in the PE field, and the growing number of

126   technology-based interventions. Encompassing published papers in both English and Spanish

127   ensures that a greater balance of international perspectives and covers a body of literature

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[1] The full list of search terms and the search strategy included:
(1) "physical education" OR "PE"
(2) "educación física" OR "EF"
(3) 1 AND 2
(4) "technology" OR "digital technology" OR "technology-enhanced learning" OR "ICT"
(5) "tecnología" OR "tecnologia digital"
(6) 4 AND 5
(7) 3 AND 6
The last database search was completed on July 21st 2021

128   covered by those reviews that have only explored English literature (Alexander, 2020). To

129   further focus our review, several exclusion criteria were used: those papers which could not be

130   freely accessed through either the databases or the university library, peer-reviewed papers not

131   published between 2015-2020, peer reviewed papers that were not published in English or

132   Spanish, peer reviewed papers that were not focused on the PE context, those that were not

133   focused on school/college-based PE (e.g., physical education teacher education or higher

134   education), those papers that were review pieces or theoretical based, those that did not include a

135   technology-based intervention, and those where PE is delivered completely through online

136   courses. Only papers where PE takes place on a regular face-to-face or blended approach were

137   included. A total of 1909 papers were identified through databases (n=755, after duplicates).

138   From those, 534 were excluded after the initial screening (first stage) due to not meeting any of

139   the inclusion criteria. 221 papers were examined in the full text analysis before 33 papers were

140   finally included in the review.

141   *Analysis*

142   Following Kirkwood and Price's (2014) and Cushion and Townsend's (2019) approaches,

143   selected papers were analyzed deductively. This approach was chosen as it allowed the capturing

144   of the often iterate and nonlinear nature of reviews and to explore alternative paths to the

145   findings (Alexander, 2020). A two-stage approach to this critical review of the literature was

146   chosen to align with reviews such as Cushion and Townsend (2019) and to provide a semi-

147   structured approach. The first stage involved mining the databases using our inclusion/exclusion

148   criteria. Prior to individual coding, we completed a sub-sample of papers together to establish

149   consistency between our approaches. Then, the authors individually reviewed and coded the title

150   and abstracts, using Rayyan website tool for systematic reviews. The coding was then compared

151 between the authors and any points of clarity or conflicts were discussed and agreed. The second

152 'quality screening phase' involved a creation of a descriptive matrix of the literature to provide a

153 map of the TEL field (Cushion et al., 2010; Cushion & Townsend, 2019). The initial map

154 involved reading and filtering the full articles in terms of the article focus (and coverage) of

155 technology (e.g., the platform, device, software of study) and the three areas of teaching (e.g., a

156 detailed description of the intervention), learning (e.g., evidence of learning), or curriculum (e.g.,

157 findings related back to extract of curriculum documentation or analysis of how curriculum

158 extracts have been applied in practice using technology). In order to capture the outcomes of this

159 screening phase, a similar technique to Araujo, Mesquita, and Hastie (2014) was employed

160 whereby a formal quality score for each study was completed on a two point scale by assessing

161 the paper value of 0 (none present or inadequately described) or 1 (present and explicitly

162 described) in relation to each of the following areas described by Cushion et al. (2010) and

163 Cushion and Townsend (2019): (a) the appropriateness of the paper focus for answering the

164 review question (i.e. topic relevance), (b) the trustworthiness of the results assessed by the

165 quality of the study (i.e. methodological and theoretical rigour), (c) appropriateness of the study

166 for addressing the research question (i.e. relevance). The scores (which can be viewed in table 1)

167 were initially scored individually by each author (87.8% of agreement was reached which is 29

168 of 33 papers) before coming together to review the scores to reach consensus. Scores with a total

169 of 1 or less were excluded and those with an average score of 2 or more were included.

170 **Findings**

171 In table 1, we present the details of the final set of papers selected in the review process and

172 present them in terms of the research purpose, participants and context, study design, data

173 gathering, the description of the TEL intervention, the key findings, and the quality score

174   (Araujo et al., 2014). The findings in relation to the analysis of technology in relation to

175   enhancements in teaching, learning and curriculum, and the main themes identified are presented

176   in more detail below.

177   **<Insert Table 1 about here>**

178   We thematically present the key findings presented in Table 1 through our discussion of

179   technology enhancements in teaching, learning and curriculum.

180   *Technological enhancement in teaching: Using technology as a substitute of teachers but not*

181   *as transforming teaching and learning practices*

182   Technology was largely seen as a support and a substitute in relation to enhancing existing

183   teaching practices in PE. Technology was closely reported in line with what students had learnt

184   because of the use of technology in teaching. The technologies that were claimed to enhance

185   teaching varied from videos to exergames, apps, and tablets. They were used mainly in

186   elementary education, but also with secondary and post-secondary samples. The most prevalent

187   of these were apps followed by exergames and videos. Aspects of teaching that were claimed to

188   be enhanced by technology included areas such as video-feedback and performance

189   (Kretschmann, 2017; Palao et al., 2015), the ability to create new cultures for students (Andre &

190   Hastie, 2018), and the direction of learning (Maivorsdotter & Quennerstedt, 2019). Some of

191   these technological enhancements were linked to the ways that teachers could harness the use of

192   technology towards assessment purposes. Studies that had a key teaching component to them

193   tended to explore how the technology was implemented into the PE lesson or course in terms of

194   the methodology of the study but then tended to focus more on the outcomes for students rather

195   than the teachers themselves. For example, Lee and Gao (2020) reported on the variables in

196　terms of students' physical activity, Lindburg et al. (2016) discussed student engagement

197　alongside variations in heart rate and Segura-Robles et al. (2020) focused on student satisfaction

198　and motivation. It is interesting therefore, that when technology is viewed towards enhancements

199　in teaching, we are more likely to see a focus on bringing about a change in terms of students'

200　learning that was not already there, rather than say a change in pedagogical approach,

201　instructional strategies, philosophies or critical thinking.

202　***Technological enhancement in learning: Using technology to improve motor skills, health and***

203　***motivation***

204　　　Several different types of technology were beneficial for enhancing student learning (e.g.

205　videos, exergames, apps, wearables, activity monitors or websites). Whilst technology was

206　explored in relation to learning in a variety of ways, some of the most prevalent outcomes was to

207　enhance students' health/physical aspects of learning or on motivational related outcomes. For

208　example, McGann et al. (2020) reported on how students made significant improvements in

209　locomotor skills when using exergames, whereas Potdevin et al. (2018) and Palao et al. (2015)

210　found that students made significant progress in their motor skill or athletics development and

211　self-assessment ability when using video-feedback. Enhancements in learning were largely

212　viewed from the perspective of learning in the physical domain or enhancing areas such as motor

213　competence (Kretschmann, 2017). In relation to health-related aspects, technology in the form of

214　exergames was reported to enhance students' self-esteem or mood (Andrade et al., 2020),

215　knowledge of step count and calorie burning targets provided by a wearable fitness device

216　encouraged young people to do more physical activity (Goodyear, Kerner, & Quennerstedt,

217　2017), or knowledge of energy balance and healthy diets (Chen et al., 2016).

218   Using technology to enhance motivational variables was also a key focus. There was

219   evidence of aspects such as video-feedback that claimed to increase students' motivation (Roure

220   et al., 2019), accelerometers that were a motivating factor for some students to increase their

221   physical activity (Marttinen et al., 2019) and increases in intrinsic motivation through the use of

222   gamification and Flipped Learning (Østerlie & Kjelaas, 2020; Østerlie &Mehus, 2020; Segura

223   Robles et al., 2020). Video guided technologies resulted also very positive to significantly

224   improved the academic self-concept of adolescents with hearing impairment. As such, the use of

225   technology to enhance student's motivation for either the subject more broadly or more

226   specifically taking part in the physical learning tasks was a key pedagogical outcome when

227   technology was implemented, particularly with elementary students, but also with secondary and

228   post-secondary ones.

229   ***Technological enhancement in curriculum: Using technology to facilitate the enactment of***

230   ***new curriculum***

231   The use of technology to enhance either the application, development or understanding of

232   the curriculum would not seem to be a pertinent area of focus in the PE literature studies

233   included in this review. Only Calderón and Tannehill (2020) presented a proposal where, a

234   sample of PE teachers, used an ad hoc designed mobile app, to facilitate the enactment of a new

235   curriculum framework. They reported that the engagement in a learning community of inquiry

236   was paramount to these teachers' development of effective practices when enacting a new

237   models-based curriculum enhanced using one mobile app (Calderón & Tannehill, 2020). It

238   seemed that whilst the papers may be implicitly reflecting on how the technology enhancements

239   might impact on curriculum, the main focuses were on the students' learning aspect of pedagogy.

240   In addition, when looking at the curriculum contexts studies were mainly emanating out of

241 Europe followed by Asia, the USA and the UK. Elementary or primary PE was the most studied

242 curriculum in terms of schooling.

243 **Discussion**

244 This paper sought to critically explore what areas of pedagogy are claimed to be enhanced by

245 digital technology in PE. It presented how technology was largely seen to enhance students'

246 learning in relation to both health and motivational variables. Nonetheless the areas presented

247 remain aligned with Casey et al. (2016; 2017). It highlighted the lack of new forms teaching or

248 indeed a limited presentation of the context of the curriculum. Indeed, in looking at Puentedura's

249 (2013) Substitution Augmentation Modification Redefinition (SAMR) model, most of the papers

250 seemed to replicate existing practices, such us, using tablets as whiteboards or some apps to

251 creates time intervals and signals (Lee & Gao, 2020). Technology was mainly used as substitute

252 for the teacher (c.f. Papastergiou et al., (2020)) but not as transforming teaching and learning

253 practices by allowing for significant task redesign or the creation of new tasks previously

254 inconceivable without the use of technology. It is important to note however, that these studies

255 used tablets and apps as instructional support and are not necessarily associated with poor

256 teaching. The teacher, in these cases, could complement the app inputs, and spend more time in

257 other teaching aspects such us giving feedback, suggesting task adaptations, and encouraging

258 reflection. They could even create teachable moments based on certain situations and adapt their

259 teaching given some of the apps used are not pedagogically framed and/or designed based on the

260 individual students needs or interests (Selwyn et al., 2020).

261 The 'enhanced' forms of student learning in relation to health and motivational variables

262 were a key aspect of the findings. That being said, it raised critically awareness that

263 enhancements in students' learning was seen from a rather narrow lens of what might be termed

264 'learning' in terms of health, physical, and motivational aspects. Indeed, as Quennerstedt (2019)

265 discusses, a focus on activity levels and heart rate puts questions of education into the

266 background. There was a real shortage of papers that explored students or teachers' emotional or

267 social learning. In addition, there was little discussion about the pedagogical use of technology to

268 promote areas such as social justice, critical or democratic thinking or lifelong enjoyment of

269 movement. Interestingly, this is a common pattern in technology-based research in other subjects

270 such as mathematics (Benavides-Varela et al., 2020); music (Crawford, 2017); language

271 (Parmaxi, 2020), or geography (Adedokun-Shittu et al., 2020), and indeed, it will be an

272 interesting aspect to explore further. Furthermore, given the large focus on studies from a

273 European context, one has to consider these 'enhancements' as having pockets of impact rather

274 than being experiences as necessarily equal and global.

275   Taking this critical perspective further, one could argue that it seems that what the field

276 of PE finds meaningful for students' learning with technology is that it develops learning of a

277 physical component. There was very little evidence of technology enhancing students' experience

278 of technology as supporting fun, social interaction, challenge, or delight, considering the notion

279 (and aligned research design) of learning as meaning (Quennerstedt et al., 2011). Arguably, Lee

280 and Gao (2020) and Steinberg et al. (2019), would be two examples of technology enhancing

281 student's enjoyment and cooperation respectively, despite the TEL intervention was not

282 intentionally designed with that purpose. With this in mind, one might question what meaning

283 students' take from this focus on technology to enhance motor competence and whether the use

284 of technology to support or enhance students' learning.

285   In relation to technology enhanced learning and teaching in PE, there was evidence of

286 small, but nonetheless enhancements of areas such as the creation of new cultures for students

287   and (video) feedback. It is encouraging, however, to see the findings of papers like

288   Maivorsdotter and Quennerstedt (2019) that sought to demonstrate that the teachers' presence in

289   the teaching and learning process with technology is important to ensure that traditional norms

290   and values are challenged. This is because the digital tools themselves are unlikely to spur any

291   radical changes in teaching merely by their presence. Furthermore, it is encouraging to see the

292   extent to which certain refined exergames could enhance the user's play experience (McGann et

293   al., 2020), or the way the pedagogical use of certain apps can enrich a debate of ideas to enhance

294   students' shared understanding of tactical concepts (Koekoek et al., 2019). Other examples

295   include the way certain apps (such us #digitanz) can stimulate movement ideas, promote

296   students' agency and cooperation, but also create fears and obstacles related to data protection

297   and privacy (Steinberg et al., 2019). All of these are illustrative examples of using technology for

298   transformative teaching where the use of technology allowed for significant task redesign

299   (Puentedura, 2013), but also add a level of pedagogical complexity where the role of the teacher

300   is critical to promote good teaching. In other words, teaching was understood as a process where

301   teachers bring something new and are key elements of the educational encounter (Biesta, 2012).

302   That being said, the exploration of technology enhanced 'teaching and learning' (including

303   assessment) in PE still has a long route towards enhancement. A point that was recently argued

304   by Martinnen et al. (2020) claiming that close attention must be paid to the ways in which

305   teachers' perceptions could be augmenting or limiting the educational value of digital

306   technologies in PE, and also, to realistically evaluate the strengths and constraints that

307   technology-integrated PE lessons may pose in a traditional environment (Zhu & Dragon, 2016).

308   It is hoped that technology does continue to enhance teachers teaching but, perhaps its progress

309   is underpinned by the need for technology to be seen to enhance the PE curriculum before this

310   change can be more widespread.

311   It is perhaps surprising to see such a gap in studies exploring technologies enhancement

312   of curriculum in PE. As Araujo et al. (2020) argue, educators and policy makers in the field of

313   PE are still adjusting local curricula to reflect the different technological changes and there

314   remains a lack of knowledge in how these digital developments have been undertaken in

315   different contexts. It would subsequently seem that how digital technologies are incorporated

316   into, interpreted through, and help inform the field's understanding of PE curricula is still an

317   important aspect for future research. In thinking about future research in terms of exploring TEL

318   and indeed in PE, experimenting with, developing and reflecting on the use of technology-

319   enhanced pedagogy or what Passey (2019) recently termed technology-enhanced education

320   would allow for researchers and educators to seek to broaden out the investigation of technology

321   and the often overlapping areas of teaching, learning, and curriculum that underpin its use. We

322   are conscious and acknowledge certain limitations of this review. These include our

323   interpretation and judgement of the quality criteria used to review the studies, the incorporation

324   of studies in languages other than English or Spanish, database/full text access, or books and

325   conference papers. Furthermore, the exclusion of papers focusing on completely online PE is a

326   limitation. That being said, we aware of recent literature from Goodyear et al. (2021) that

327   somewhat addresses this gap in knowledge. Despite these, we embrace the idea of, and related

328   research about online-only PE. We believe that there is still a large research arena to explore the

329   realities of digital technology for teaching and learning in regular (and blended) PE. Future

330   research that explores a greater diversity of curriculum contexts and technologies would also

331   allow for a broader perspective on how the use of these technologies can be adapted. By seeking

332 to deploy pedagogical approaches that attempt to incorporate technology within their core design

333 is key. Another area which could be worrying and promising at the same time would be the use

334 of virtual worlds as arenas for embodied experiential learning to happen (Loke & Golding,

335 2016). Currently, many studies advocate for the use of teaching and learning approaches based

336 on virtual worlds as powerful experiences that benefit students' learning and disciplinary

337 understanding (Pellas & Mystakidis, 2020). Exploring further the pedagogical approaches being

338 used in completely online PE and their implications for student learning might be a worthwhile

339 research focus as well (Kooiman, et al., 2016). Perhaps in broadening the use and exploration of

340 digital technologies there can be movement towards addressing Quennerstedt's (2019) ambition

341 to develop a pedagogy of meaning which seeks to focus on meaningful experiences and the

342 process of making new and holistic meaning out of experience, both in physical or virtual

343 worlds.

344 **Conclusion**

345 In critically reviewing technology and its claims of enhancement with teaching, learning, and

346 curriculum in PE, the question remains, what should be enhanced? In relation to what areas and

347 with what focus? Literature (c.f. Passey, 2019) suggests that TEL encompasses more than just

348 learning. Yet, from the findings within this review it seems that students' 'learning' in relation to

349 physical and motivational domains remains the focus in the context of PE. It would seem that

350 this focus is reflective of the current status of technology use in the field and rather the findings

351 of this review act as a platform for consideration of what has been achieved and what could be

352 achieved in the future.

353   As a backdrop to this review, the context of the COVID-19 pandemic is likely to have

354 spurred the field even further to reflect upon what the current state and use of technology within

355   pedagogy *has been* and where it *could be* when the schooling environment is augmented. Indeed,

356   the boundaries of the gymnasium or sports field can be expanded with digital technology whilst

357   exacerbating digital inequalities. A better understanding and picture of the small ways in which

358   different types of technology can be used to enhance areas of teaching and learning is being

359   developed. An area that very little was reported on a decade ago. Yet now, more than ever,

360   adopting Casey et al.'s (2017) advice to be braver and bolder in critical thought regarding what

361   outcomes are being sought to enhance through the use of technology and planning aligned

362   teaching and learning experiences accordingly. If our predominant use of technology in the field

363   is towards enhancing students' physical and motivational aspects of learning, then there is a need

364   to be conscious of the sort of educational process or future students are being guided towards.

365   **Statement on conflict of interest**

366   No potential conflicts of interest were noted by the authors.

367

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