Case Study

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Integration of Mobile Technologies in Higher EducationClasses in the Health Area

Integração das Tecnologias Móveis em Aulas de Cursos Superiores da Área da Saúde

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Abstract

The proliferation of mobile technologies with wireless Internet access and the flexibility of peer interaction, sharing, and authorship are rising trends in higher education in health. Thus, for the integration of these technologies into teaching practice, this study aimed to understand the perception of teachers of Physiotherapy and Nursing courses of a private higher education institution from the city of Fortaleza, Ceará, about the value of mobile technologies in the field. teaching and learning process, and the factors that influenced your decisions to adopt and integrate these digital and/or on-line resources into your classes. The research, qualitative approach and exploratory nature, opted for an online questionnaire composed of fifteen questions, divided into open and closed which consisted of identifying, among other elements, the integration of mobile technology in the classes. The results show that teachers believe that the use of mobile technologies can contribute significantly in the teaching and learning process. However, investing in teacher and in-service training is crucial.

Keywords: Mobile technology. Teaching practice. University education. Health education.

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Resumo

A proliferação do uso das tecnologias móveis como ferramentas didáticas em aulas de graduação em cursos superiores de saúde vem ampliando-se; no entanto, tais recursos precisam ser adotados com responsabilidade, considerando realidades específicas, com vistas a qualificar o ensino e a aprendizagem - temática que merece reflexão crítica. O estudo teve como objetivo discutir a compreensão dos docentes dos cursos de Fisioterapia e Enfermagem de uma instituição de ensino superior particular da cidade de Fortaleza, no Ceará, sobre a importância e a adoção das tecnologias móveis no processo de ensino e aprendizagem em suas aulas. A pesquisa, de abordagem qualitativa, do tipo estudo de caso, utilizou como técnica de coleta de dados um questionário on-line composto de 15 questões – abertas e fechadas – para identificar a importância atribuída à integração da tecnologia móvel nas aulas e a maneira como os docentes a utilizavam didaticamente. Os resultados mostram que os professores acreditam que a utilização de tecnologias móveis pode contribuir significativamente no processo de ensino e aprendizagem na área da Saúde; contudo, consideram fundamental investir na formação docente em serviço, pois inferem que não adianta apenas a Instituição de Ensino Superior possuir estrutura e recursos tecnológicos, se não há o conhecimento profissional necessário para uma utilização qualificada.

Palavras-chave: *Tecnologia móvel. Prática docente. Ensino superior. Educação em saúde.*

1. Introduction

In recent decades, there has been a growing integration of mobile technologies in the courses of Health in Higher Education (MASTER et al., 2016). These technologies, in this study, refer to Internet resources – learning objects, videos, augmented reality, simulators, learning platforms – web applications – educational games, information sharing, collaborative or individual production through Google Drive tools – text processing, spreadsheets, slide show, as well as the use of mobile devices. These objects make up the list of mobile technologies such as notebook, netbook, tablet and smartphone (ROSCHELLE; DIMITRIADIS; HOPPE, 2013).

Researchers such as Norris, Hossain and Soloway (2013) describe that the use of mobile educational technologies involves the use of mobile devices and their applications, as well as other digital web resources, in a consistent process that allows teachers and students to successfully use technology for a specific purpose in the classroom or in the context of teaching and learning.

Torres and Irala (2014) argue that the deployment of digital resources brings benefits to students, so that they may be able to develop skills to research and evaluate information and collaboratively produce knowledge to solve problems, approaching real contexts. In fact, an important component of the curriculum of undergraduate studies in the health area is clinical practice with emphasis on the development of skills and competences (CHANG; LAI; HWANG, 2018) - fact attributed to innovation in teaching and the improvement of various forms of evaluation (MASTER et al., 2016). On the other hand, it is pointed out that

the lack of technological investment and teacher training are frequent barriers in the educational process in health courses (CHANG; LAI; HWANG, 2018; MASTER et al., 2016).

It is assumed that the good use of mobile technologies in didactic mediation transforms teaching and learning practices, making them more meaningful and stimulating for students and enabling them to qualify the pedagogical experience (GRAZIOLA JUNIOR, 2009; Norris, NORRIS, NORRIS, NORRIS. HOSSAIN; SOLOWAY, 2013; BRAVE; ALMEIDA; GERALDINI, 2017). However, at the individual level, educators are likely to face several challenges when trying to adopt mobile technologies as tools to qualify health education, which may involve economic, technical, sociopolitical, atheistic and pedagogical issues, depending on the educational context in which it develops (TING, 2013).

It is questioned, therefore, what importance is attributed to the integration of mobile technologies and digital resources in the daily didactic scans by teachers and what factors interfere in the professional motivation for the adoption of these technologies in health courses. The objective was to discuss the understanding of the teachers of physiotherapy and nursing courses of a private higher education institution (HEIs) in the city of Fortaleza, Ceará, about the importance and adoption of mobile technologies in the teaching and learning process in their classes.

This research is relevant because it allows reflection on the possibilities of using, effectively, mobile devices and digital resources, considering technical and pedagogical factors (VALENTE; ALMEIDA; GERALDINI, 2017), teacher training (BEGO, 2016; LARA, 2016; BIRTH; CASTRO FILHO, 2016; Lima, LIMA; AZEVEDO, 2019) and organizational and financial support (CHEE et al., 2017). It allows to foster critical reflection on the challenges of using mobile technologies to assist the teaching and learning process, because, despite a growing enthusiasm to introduce such technologies in higher education courses, the use of digital tools in classes depends on the provision of adequate resources (XAVIER; FIALHO; LIMA, 2019) and the teacher's ability to address individual and collaborative, contextual and cultural dynamics, considering the reality in which the subjects are involved (ALMEIDA; VALENTE, 2014; ARAUJO; ESTEVES, 2017).

2. Methodology

The research has a qualitative approach and exploratory nature, since it does not provide for systematic procedures in search of generalizations; on the contrary, it seeks to deepen the understanding of a specific phenomenon, interpreting it and considering the singularities of the subjects' reality and their subjectivities (MINAYO, 2007). Thus, it focuses on investigating a single case, a private HEI, and, more specifically, the two undergraduate courses in the health area offered – Physiotherapy and Nursing – with a view to understanding the perception of teachers about the importance and adoption of mobile technologies. Thus, the case study on screen consists of an empirical investigation "[...] that investigates a contemporary phenomenon within its real-life context" (YIN, 2001, p. 32).

The choice of the particular HEI considered the following aspects: 1) nod of the HEI with the approval of the research project; 2) availability of mobile devices to benefit the teaching and learning process of teachers and students; 3) internet access; 4) use of digital technologies in teaching practice. In relation to the technological resources that support pedagogical activities, IES has, in addition to three computer labs, 90 notebooks and 30 tablets, as well as 12 routers with connection points, totaling 100Mbps of Internet access.

The courses - Physiotherapy and Nursing - were selected because they were the only ones in the health area offered at the institution. Regarding the subjects participating in the research, all 34 professors who worked in these two courses were considered. It should be clarified that no teacher was excluded, since all confirmed, in the initial contact by e-mail, the availability to participate in the research and the use of digital resources in their classes.

For data collection, an online questionnaire was applied consisting of 15 open and closed questions, "[...] a technique that is quite feasible and relevant to be used when it comes to problems whose research objects correspond to empirical questions, involving opinion, perception, positioning and preferences of the researched" (CHAER; DINIZ; RIBEIRO, 2011, p. 251). Before its application, at the beginning of August 2019, the free and informed consent form was made available via e-mail, in which the objectives of the research, the way of participation, the absence of direct benefits, the possibility of withdrawal at any time and possible losses – constraints, emotions, etc. were explained. After signing and resubmitting the term by the teacher, the link to the online questionnaire, elaborated in Google Docs, was made available. Data were collected within two weeks, totaling 28 respondents.

> The answers were analyzed based on the Content Analysis technique (BARDIN, 2002). In the pre-analysis, the floating reading and the organization of the most recurrent central themes were performed; then, the themes were grouped into categories, according to the frequency with which they appeared, to later condense similar categories. This procedure resulted in three categories: I) use of mobile technology and professional training; II) challenges in the use of mobile devices; III) intentions when using new technologies in teaching practice.

3. Results e discussion

In the last ten years, mobile learning has developed a lot; however, the m-learning community is still fragmented, because it has different conceptions, especially when it comes to the supply and use of mobile devices as pedagogical support by educational institutions, governmental organizations and their professionals (ANDRADE; ARAÚJO JUNIOR; SILVEIRA, 2017; MEHDIPOUR; ZEREHKAFI, 2013). Considering the pluralism of ideas and conceptions, it was important to understand and discuss the three categories emerging in this research to shed light on a specific reality of Higher Education in Health in an HEI of Ceará, because it is essential to understand the circumstances and conditions necessary for educators to take the technologies in their classes and with what pedagogical purpose such strategies can become fruitful.

3.1. Category I - Use of mobile technology and vocational training

Although all 28 teachers have claimed to use mobile technologies in their classes, it is important to infer that 21 teachers have indicated that they always seek to know new digital tools aimed at education in the health area and that they are open to test and plan, integrating them to the activities in their classes. On the other hand, seven teachers reported that they do not have time to research and find such resources, so they would like the IES to provide a list of applications in the health area to be tested in training meetings and, later, used in classes.

With reference to the effect of testing and planning the types of digital resources by teachers before using them, Falloon (2015) asserts the need to investigate the functionalities of these technologies in advance, because it must be verified whether they fit the teaching and learning objectives that one wants to achieve and whether students can use them autonomously. It also indicates that it is also possible to balance digital resources that promote affective social interactions and establish specific configurations of curriculum content with websites, software, applications more focused on specific learning situations (DUARTE, 2019). Therefore, it is not enough for IES to provide mobile technologies, it is necessary to ensure that teachers use them didactically, depending on the achievement of teaching and learning objectives.

Among the professionals surveyed, 24 teachers mentioned that they use some digital resources in their classes and that they help to involve students; in addition, they have said that they feel confident

in the integration of mobile technologies for various subjects worked in the classroom. It is noteworthy that the potential of integrating these technologies with other activities and materials, whose production of knowledge can occur collaboratively, allows, from the teaching attitude in making them available to its students, multiple authorship and the sharing of resources outside the classroom limits (ROSCHELLE; DIMITRIADIS; HOPPE, 2013), which makes it relevant not only to make use of technologies, but to qualify the way such resources are used (VALENTE; ALMEIDA; GERALDINI, 2017).

Teachers were asked to indicate whether they had done any training on the use of technologies in education and how they developed such employment. Twenty-two teachers reported that they had participated in at least one in-service training on this theme, and six stated that they had never had such an opportunity. It was observed that even those who did not have specific continuing education had used some digital resource in their classes, for example: slideshow, videos, and some Google Drive tools. Castro Filho (2016, p. 18) stresses that, regardless of continuing education, it is necessary to recognize the importance of teacher autonomy for "[...] seek the formation of communities of practice that allow discussions about their daily life and contents of their area". Mororó (2017), in fact, adds that training enables the improvement of dialogue and mediation in the creation of teacher autonomy, which enables a critical education, focused on the freedom and emancipation of the subject (VASCONCELOS; FIALHO; LOPES, 2018; PEREIRA, RIBEIRO, 2017; BANFIELD; Haduntz; MAISURIA, 2016).

The success of any pedagogical intervention depends largely on the skills and knowledge of educators (NASCIMENTO; CASTRO FILHO, 2016), therefore, it was found that it is important to invest in continuous training for health teachers, with the objective that all teachers of the HEI can know the mobile technologies available in the HEI and can better know the way of use. All teachers attest to the importance and considered the possibility of using mobile technologies, pointing out as obstacles the limitation of knowledge and the lack of time in self-teaching such resources and knowledge about their uses; however, it is important to share a mutual sharing of knowledge and experiences to qualify collective work and maximize teaching and learning through in-service training.

3.2. Category II - Mobile device usage challenges

Teachers were asked about their involvement with web resources. All reported that they use social networks and specific applications in personal and professional situations; after all, mobile devices are not restricted to the internal environments of the educational institution; virtual information can be integrated into the real environment, since learning from web-based activities enables different real scenarios (LIU; Lin; PAAS, 2014).

Information sharing and cloud storage were the most cited features, with the claim that they help manage time, especially during class preparation. According to Nascimento e Castro Filho (2016), regardless of equipment and/or operating system, cloud storage enables the recording of information, photos, videos, links and everything else you want to maintain, changing the way information is being organized and shared.

While all teachers have recognized that these technologies were not created exclusively for education, they agreed that integrating them into class offers a set of fruitful opportunities for students, who can understand subjects in different ways, whether through videos, simulators, animations, learning objects, and tools that encourage collaborative production. They also inferred that, given the new and constant challenges presented by mobile technologies, teachers need to understand that mobility and connectivity are facilitating elements of learning in different contexts, which, according to Norris, Hossain and Soloway (2013), allow their students to become active, not passive recipients.

For Valente, Almeida and Geraldini (2017), the challenges of using mobile devices are related to pedagogical strategies applied to develop activities involving mobile technologies in classes. In view of this, the author reveals that the teacher does not need to be an expert in computer systems or know all the functionalities of a digital resource; the fundamental is that it recognizes its role in the face of a constantly changing social reality and, thus, is always open to the new, seeking the use of this technology in its teaching work, providing students with different learning contexts.

Although relatively familiar with some technological resources, 19 teachers pointed out specific difficulties in the adequacy of such resources in a pedagogical environment. They pointed out that they are forced to deal with unexpected situations, such as the new version of the app or the new access policy to it, which makes some of its features go from free to paid; the installation of programs and the distribution of applications change on different operating systems - Windows, Android, Linux; the oscillation in the wireless connection resulting from the poor distribution of the wireless network in the HEI; the scarcity of teacher training for pedagogical and technical qualification. That is, in addition to the openness to the new, seeking the use of this technology in its teaching work to provide students with varied learning contexts, there are operational barriers that permeate the need for professional training for the acquisition of specific knowledge and structural adaptations of the HEI that presuppose technical investments and human resources (VALENTE; ALMEIDA; GERALDINI, 2017).

3.3. Category III - Intentions when using new technologies in teaching practice

In the teaching conception, students are more interested in activities involving mobile devices and applications, so teachers admitted that they use technologies to make classes more engaging and collaborative, contributing to more meaningful teaching. Fialho, Machado and Sales (2014) assert the idea that a stimulating and contextualized teaching generates more meaningful learning.

Teachers reported that training students using technological resources offers more advantages than disadvantages, since it allows to train a ubiquitous individual, because the services and computational facilities used in different localization situations convey a feeling of omnipresence that can facilitate the teaching and learning process at any time and in various places, exceeding classroom time. This inference asserts what Park postulates (2011) when teaching that, when one has at hand a device that favors information in any space and time, mobility can present a range of physical and virtual paths. Santaella (2013, p. 15) reinforces that this facility causes the student to exchange learning experiences in an unprecedented way, since "[...] this provides a type of ubiquitous, pervasive and, at the same time, embodied and multi-situated communication ... in the space-time displacements of individuals."

The main resource used by teachers was the social network in teaching, as 25 teachers reported using YouTube, followed by Facebook and Instagram. These technologies were used in order to allow the pedagogical intervention of the teacher for the dissemination and discussion of knowledge, providing mediation and interaction with the student. Santaella (2013, p. 16) explains that social networks emerge to ubiquity, since these devices "[...] offer the possibility of perpetual presence, near or far [...]".

Moran (2012, p. 2) states that the teaching role changes when using digital technologies, because "[...] he leaves the center, from the board, to circulate, guiding students individually or in small groups." It also points out that mobile devices challenge educational institutions to invest in a more global teaching with different resources and more integrated learning, with face-to-face moments and other virtual ones, encouraging more collaborative projects.

4. Conclusion

The aim of this study was to discuss the understanding of the teachers of physiotherapy and nursing courses in a private HEI in the city of Fortaleza, Ceará, about the importance and adoption of mobile technologies in the teaching and learning process in their classes. To contemplate this scope, a qualitative case study was developed, which used the online questionnaire as a data collection instrument and content analysis as a technique for compiling and discussing the results.

Three categories emerged from content analysis: use of mobile technology and professional training; challenges of using mobile devices; intentions when using new technologies in teaching practice. These results showed that the professors of the Nursing and Physiotherapy course indicated that they consider the use of mobile technologies as a didactic tool to mediate teaching and learning relevant, especially because they make the class more dynamic, contextualized with the student's reality and significant, providing ubiquity and greater collective collaboration. However, they pointed out institutional, technical and individual difficulties for the use of technologies that related, respectively, to the poor distribution and oscillation of the Internet in the HEI, to the installation and updating of programs in different operating systems and to the limited knowledge of specific technological resources, since they required time to seek, learn, test and plan programs in constant updating.

Teachers already made use of mobile technologies in their personal and professional life, because they recognized that they enable updates and interactions between students and teachers in any space and time, and social networks, to share information and knowledge, are the most used tool. However, there was a relative consensus that inferred that mobile technologies require considerable input from teacher training, evaluation of selected digital resources, planning and production of appropriate materials. After all, an integration of mobile applications and devices in the classroom depends not only on the provision of resources, but especially on the level of knowledge and technological skills of teachers (NORRIS; HOSSAIN; SOLOWAY, 2013; ROSCHELLE; DIMITRIADIS; HOPPE, 2013).

The professors asserted that the lack of skills to work with mobile technologies is due to the limitation of opportunities for continuing education on the use of digital tools in the classroom and the lack of time to self-teachactically seek such knowledge. This claim signals the need for ies to promote in-service training in order to promote the updating of teachers and the proper planning of the use of digital technologies, with resources and programs that are renewed every day.

The potential of the integration of technologies with other activities, materials and environments, whose production of knowledge can happen collaboratively, lead to the sharing of knowledge during classes and even outside the limits of the HEI, maximizing teaching and learning. However, in addition to the socialization of knowledge through sharing in social networks - a practice already learned by teachers - it is important to use mobile technologies with aptitude, with their varied resources and programs, in order to promote greater quality in knowledge mediation, which would only be possible if the teacher had the opportunity to know the varied programs that could adapt to their contents and the appropriate ways of using them.

Teachers showed a good level of knowledge about the handling of mobile devices, which would probably help them overcome problems while using programs to work on specific content. As technological advances occur in an accelerated manner, the management of higher education courses in the health area should promote training and/or meetings that discuss strategies for the good appropriation of these advances in teaching practice. After all, teachers were open to becoming familiar with new technologies in order to expand the range of didactic possibilities. It is essential, however, that teachers actively participate in in-service training promoted by the HEI in their working hours, since self-taught, at other times, they did not show possibility or interest in seeking training. In addition, the formations raise collective discussions and exchange of knowledge and experiences that foster the optimization of planning, as well as the execution and evaluation of strategies mediated with mobile technologies.

Although this qualitative research has a reduced analysis lens, because it is about understanding the adoption of mobile technologies in the teaching and learning process of only two health courses in a particular HEI, it is opportune because it allows to visualize the need for continuing training in service, as well as ways to invest in the transformation of a specific reality. At the macro level, although it does not allow generalizations, because it is a case study, it sheds light on everyday reflections about digital technologies and how they can contribute to teaching practice, with the purpose of creating a more interactive learning environment conducive to meaningful education. It demonstrates that self-teaching is insufficient for the good appropriation and use of technologies aimed at didactic mediation and how essential it is to provide collective formative moments for updating and professional training in service, a reality that goes beyond the need for a single institution and deserves debates and investments, including new studies that investigate other realities.

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References

ALMEIDA, M. E. B.; VALENTE, J. A. Currículo e contextos de aprendizagem: integração entre o formal e o não formal por meio de tecnologias digitais. **Revista Científica e-Curriculum**, São Paulo, v. 12, n. 2, p. 1162-1188, 2014. Disponível em: http://ken.pucsp.br/curriculum/article/view/20355. Acesso em: 10 jan. 2020.

ANDRADE, M. V. M.; ARAÚJO JÚNIOR, C. F.; SILVEIRA, I. F. Estabelecimento de critérios de qualidade para aplicativos educacionais no contexto dos dispositivos móveis (M-Learning). **EaD em Foco**, Rio de Janeiro, v. 7, n. 2, p. 178-193, 2017. Disponível em: https://eademfoco.cecierj.edu.br/index.php/revista/article/view/466. Acesso em: 25 fev. 2020.

ARAÚJO, R. M. B.; ESTEVES, M. M. F. A formação docente, inicial e contínua, para o trabalho com adultos em Portugal: o olhar dos professores. **Educação & Formação**, Fortaleza, v. 2, n. 4, p. 18-35, 2017. Disponível em: https://revistas.uece.br/index.php/redufor/article/view/121/104. Acesso em: 10 de out. 2019.

BANFIELD, G.; HADUNTZ, H.; MAISURIA, A. The (im)possibility of the intellectual worker inside the neoliberal university. **Educação & Formação**, Fortaleza, v. 1, n. 3, p. 3-19, 2016. Disponível em: https://revistas.uece.br/index.php/redufor/article/view/110/93. Acesso em: 10 de out. 2019.

BARDIN, L. **Análise de conteúdo**. Lisboa: 70, 2002.

BEGO, A. M. Políticas públicas e formação de professores sob a perspectiva da racionalidade comunicativa: da ingerência tecnocrata à construção da autonomia profissional. **Educação & Formação**, Fortaleza, v. 1, n. 2, p. 3-24, 2016. Disponível em: https://revistas.uece.br/index.php/redufor/article/view/98/80. Acesso em: 10 de out. 2019.

CASTRO FILHO, J. A. Formação docente na era da cibercultura. **Revista Tecnologias na Educação**, [*S.l.*], v. 8., n. 16, p. 1-21, 2016.

CHAER, G.; DINIZ, R. R. P.; RIBEIRO, E. A. A técnica do questionário na pesquisa educacional. **Evidência**: olhares e pesquisas em saberes educacionais, Araxá, v. 7, n. 7, p. 251-266, 2011. Disponível em: http://www.educadores.diaadia.pr.gov.br/arquivos/file/maio2013/sociologia_artigos/pesqusia_social.pdf. Acesso em: 25 fev. 2020.

CHANG, C.; LAI, C.; HWANG, G. Trends and research issues of mobile learning studies in nursing education: A review of academic publications from 1971 to 2016. **Computers & Education**, [*S.l.*], v. 116, p. 28-48, 2018. Disponível em: https://www.sciencedirect.com/science/article/pii/S0360131517301999. Acesso em: 10 jan. 2020.

CHEE, K. N. *et al*. Review of mobile learning trends 2010-2015: A meta-analysis. **Journal of Educational Technology & Society**, [*S.l.*], v. 20, n. 2, p. 113-226, 2017. Disponível em: https://eric.ed.gov/?id=ej1137658. Acesso em: 15 mar. 2020.

DUARTE, E. C. C. A importância da afetividade durante as interações em disciplinas *online*. **EaD em Foco**, Rio de Janeiro, v. 9, n. 1, p. 1-14, 2019. Disponível em: https://eademfoco.cecierj.edu.br/index.php/revista/article/view/796. Acesso em: 25 fev. 2020.

FALLOON, G. What's the difference? Learning collaboratively using iPads in conventional classrooms. **Computers & Education**, [*S.l.*], v. 84, p. 62-77, 2015. Disponível em: https://www.sciencedirect.com/science/article/pii/S0360131515000354. Acesso em: 10 jan. 2020.

FIALHO, L. M. F.; MACHADO, C. J. S.; SALES, J. A. M. As correntes do pensamento geográfico e a Geografia ensinada no Ensino Fundamental: objetivos, objeto de estudo e a formação dos conceitos geográficos. **Educação em Foco**, Belo Horizonte, v. 17, p. 203-224, 2014. Disponível em: http://revista.uemg.br/index.php/educacaoemfoco/article/view/432. Acesso em: 25 fev. 2020.

GRAZIOLA JUNIOR, P. G. Aprendizagem com mobilidade na perspectiva dialógica: reflexões e possibilidades para práticas pedagógicas. **Renote**: Revista Novas Tecnologias na Educação, Porto Alegre, v. 7, n. 3, p. 115-124, 2009. Disponível em: http://repositorio.jesuita.org.br/handle/unisinos/1986. Acesso em: 25 fev. 2020.

LARA, A. M. Políticas de redução da desigualdade sociocultural. **Educação & Formação**, Fortaleza, v. 1, n. 3, p. 140-153, 2016. Disponível em: https://revistas.uece.br/index.php/redufor/article/view/118. Acesso em: 05 jan. 2020.

LIMA, A.; AZEVEDO, M. L. Processo de institucionalização da política nacional e estadual de formação docente: proposições e resistências no Paraná. **Educação & Formação**, Fortaleza, v. 4, n. 12, 2019. Disponível em: https://revistas.uece.br/index.php/redufor/article/view/1126. Acesso em: 05 fev. 2020.

LIU, T.; LIN, Y.; PAAS, F. Effects of prior knowledge on learning from different compositions of representations in a mobile learning environment. **Computers & Education**, [*S.l.*], v. 72, p. 328-338, 2014. Disponível em: https://www.sciencedirect.com/science/article/pii/S0360131513003047. Acesso em: 20 jan. 2020.

MASTERS, K. *et al*. Mobile technologies in medical education. **Medical Teacher**, [*S.l.*], v. 38, n. 6, p. 537-549, 2016. Disponível em: https://www.ncbi.nlm.nih.gov/pubmed/27010681. Acesso em: 25 fev. 2020.

MEHDIPOUR, Y.; ZEREHKAFI, H. Mobile Learning for Education: Benefits and challenges. **International Journal of Computational Engineering Research**, [*S.l.*], v. 3, n. 6, p. 93-101, 2013. Disponível em: http://www.ijceronline.com/papers/vol3_issue6/part%203/p03630930100.pdf. Acesso em: 25 fev. 2020.

MINAYO, M. C. S. **O desafio do conhecimento**: pesquisa qualitativa em Saúde. Rio de Janeiro: Abrasco, 2007.

MORAN, J. M. **Tablets e netbooks na educação**. São Paulo: USP, 2012.

MORORÓ, L. P. A influência da formação continuada na prática docente. **Educação & Formação**, Fortaleza, v. 2, n. 4, p. 36-51, 2017. Disponível em: https://revistas.uece.br/index.php/redufor/article/view/122. Acesso em: 10 jan. 2020.

NASCIMENTO, K. A. S.; CASTRO FILHO, J. A. Dispositivos móveis na educação: ensinando e aprendendo em diferentes contextos. In: CONGRESSO BRASILEIRO DE INFORMÁTICA NA EDUCAÇÃO, 27., 2016, Uberlândia. **Anais**... Uberlândia: SBIE, 2016. p. 1225-1234.

NORRIS, C.; HOSSAIN, A.; SOLOWAY, E. Supplemental versus Essential use of computing devices in the classroom: An analysis. Reshaping learning. **Springer Berlin Heidelberg**, p. 321-340, 2013. Disponível em: https://link.springer.com/chapter/10.1007/978-3-642-32301-0_14. Acesso em: 10 jan. 2020.

PARK, Y. A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types. **The International Review of Research in Open and Distributed Learning**, [*S.l.*], v. 12, n. 2, p. 78-102, 2011. Disponível em: http://www.irrodl.org/index.php/irrodl/article/view/791. Acesso em: 10 jan. 2020.

PEREIRA, A.; RIBEIRO, C. S. A culpabilidade pelo fracasso escolar e a interface com os "problemas de aprendizagem" em discurso. **Educação & Formação**, Fortaleza, v. 2, n. 5, p. 95-110, 2017. Disponível em: https://revistas.uece.br/index.php/redufor/article/view/138. Acesso em: 07 jan. 2020.

ROSCHELLE, J.; DIMITRIADIS, Y.; HOPPE, U. Classroom orchestration: synthesis. **Computers & Education**, [*S.l.*], v. 69, p. 523-526, 2013. Disponível em: https://www.sciencedirect.com/science/article/pii/S0360131513001036. Acesso em: jan. 2020.

SANTAELLA, L. **Comunicação ubíqua**: repercussões na cultura e na educação. São Paulo: Paulus, 2013.

TING, Y. Using mobile technologies to create interwoven learning interactions: An intuitive design and its evaluation. **Computers & Education**, [*S.l.*], v. 60, n. 1, p. 1-13, 2013. Disponível em: https://www.sciencedirect.com/science/article/abs/pii/S0360131512001637. Acesso em: 10 jan. 2020.

TORRES, P. L.; IRALA, E. A. F. Aprendizagem colaborativa: teoria e prática. In: TORRES, P. L.; IRALA, E. A. F. **Complexidade**: redes e conexões na produção do conhecimento. Curitiba: Senar, 2014. p. 61-93.

VALENTE, J. A.; ALMEIDA, M. E. B.; GERALDINI, A. F. S. Metodologias ativas: das concepções às práticas em distintos níveis de ensino. **Revista Diálogo Educacional**, Curitiba, v. 17, n. 52, p. 455-478, 2017. Disponível em: https://www.redalyc.org/pdf/1891/189154955008.pdf. Acesso em: 10 jan. 2020.

VASCONCELOS, J. G.; FIALHO, L. M. F.; LOPES, T. M. R. Educação e liberdade em Rousseau. **Educação & Formação**, Fortaleza, v. 3, p. 210-223, 2018. Disponível em: https://revistas.uece.br/index.php/redufor/article/view/278. Acesso em: 25 fev. 2020.

XAVIER, A. R.; FIALHO, L. M.; LIMA, V. F. Tecnologias digitais e o ensino de Química: o uso de *softwares* livres como ferramentas metodológicas. **Foro de Educación**, Salamanca, v. 17, n. 27, p. 289-308, 2019. Disponível em: https://www.forodeeducacion.com/ojs/index.php/fde/article/view/617. Acesso em: 10 jan. 2020.

YIN, R. K. **Estudo de caso**: planejamento e métodos. 2. ed. Porto Alegre: Bookman, 2001.