WHO Learning Strategy: Literature Review Report

12 December 2019

WHEtraining@who.int

Introduction

The World Health Organization (WHO) is developing a learning strategy to target staff and health workers around the world. The strategy aims to contribute to lifelong learning using the best practices of adult and digital learning. In order to understand existing research, policies and practices, a literature search was commissioned to capture leading examples of in-service training and continuing professional development, with focus on onsite, online, simulated, mobile delivery and hybrid learning environments.

Methods

Searches were carried out between 15 August and 11 September 2019, and covered materials from 2000 to the present. Databases searched included CABI Global Health, the Cochrane Database of Systematic Reviews, the Campbell Collaboration Database of Systematic Reviews, the Wiley Online Library, PubMed, CINAHL, the Joanna Briggs Institute EBP Database, Opengrey.eu, Worldcat.org, ERIC, Web of Science, and IRIS.

Keywords supplied by the technical team were used as the foundation of the search. These terms were used to identify relevant documents from which MeSH or other database-specific terms and keywords were extracted. Exact details of each search are provided in the Search Strategies tab of the Learning Strategy Lit Review Results Excel spreadsheet.

Search results were rapidly scanned for relevance and those meriting further examination were imported into EndNote for further consideration. When large numbers of results were returned, these were scanned in the order returned until potentially relevant items did not appear on 2 consecutive search results pages (or 50 citations).

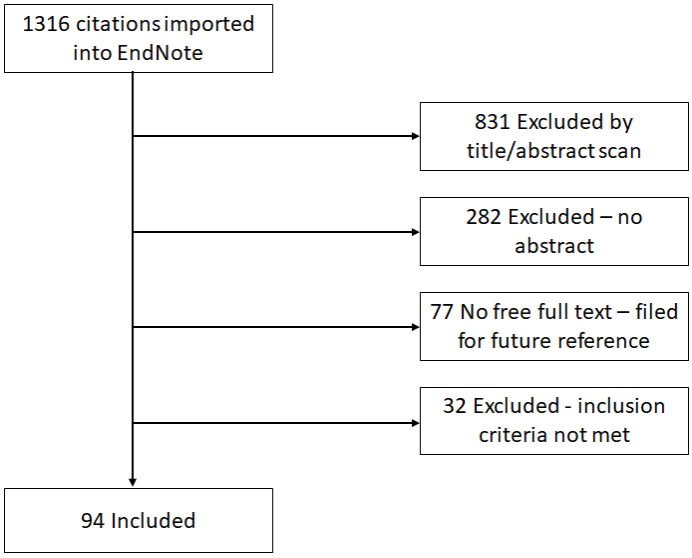
Citations were excluded if they focused exclusively on academic settings (early education through medical school) or specific clinical-or specialty continuing medical education (surgery techniques, etc.). To be included, citations needed to address adult learning methods, strategies, standards and evaluation outside a formal academic setting. News (or announcements) and opinion pieces were excluded, as were protocols of studies/reviews that had not been completed, biographical sketches, and other obviously irrelevant document types. If titles looked potentially of interest but no abstract was provided, documents were imported into EndNote and placed in a separate file.

Five articles were in non-English languages: two in Spanish, and one each in French, Portuguese and Japanese. These articles were submitted for translation to a translation service, and the translations were subsequently reviewed. One Spanish article provided description only, no lessons learned, and was excluded. The other four were included.

Results

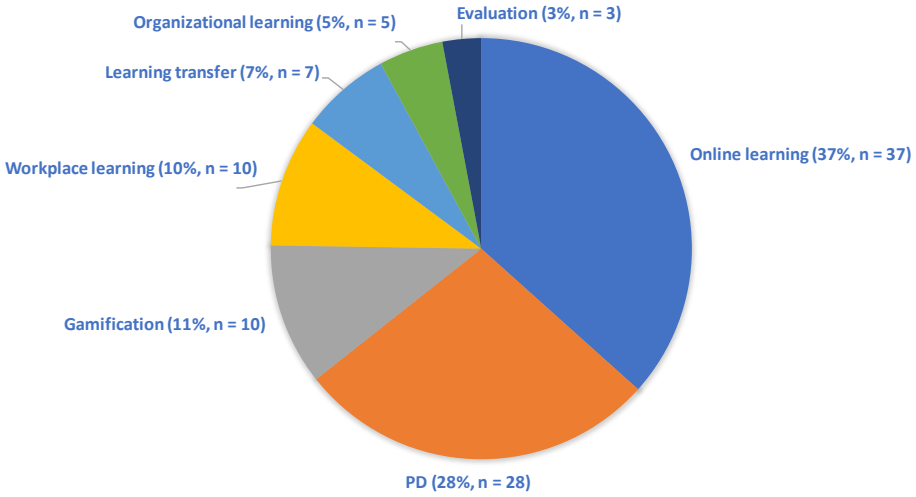
A total of 1316 articles were imported into EndNote, of which 831 were excluded based on a brief scan of titles and abstracts. An additional 282 had no abstracts and were excluded. The remaining 203 documents were sorted by free full-text access online or through WHO resources (Research4Life and GIFT). Seventy-seven articles did not have full text access and were excluded from this analysis and placed in a file for future reference. Of the remaining 126 articles, 32 were either focused exclusively on a university setting, did not include lessons learned, or otherwise did not meet inclusion criteria and were excluded. As shown in Figure 1, 94 articles met the inclusion criteria and were included.

Figure 1: Search results summary



The 94 included articles were reviewed and sorted into seven categories based on their content: Professional development (PD), Evaluation, Gamification, Learning transfer, Online learning, Organizational learning and Workplace learning. Figure 2 presents the articles' distribution through these categories. Six articles addressed more than one category.

Figure 2: Document distribution



The largest number of articles found (n = 37) addressed online learning, including massive open online courses (MOOC). Another 28 articles discussed success factors, barriers, recommendations and other topics related to professional development (PD) programs and were sorted into the PD category. Gamification (n = 11) and Workplace learning (n = 10) came next, while Learning transfer and Organizational learning garnered seven and five articles, respectively. Evaluation placed last, with just three articles.

Findings

Professional development (PD)
PD comprises a variety of activities: traditional lectures, collaborative learning, problem-based learning, journal clubs, reflection or experiential learning, distance learning, including online learning, and blends of distance and in-person activities. With the exception of two articles comparing problem-based learning with traditional curricula (1, 2), the literature did not speak to comparative effectiveness. Still several themes appeared across the diversity of activities as enhancing or hindering the learning experience. Factors that contribute to successful PD are presented in Table 1.

Table 1 Factors for successful PD

Factor	Number of articles
Projects/learning application (3-13)	11
Build relationships (3-7, 10-12, 14)	9
Tailored courses/materials (3, 4, 6, 7, 10-12, 15, 16)	9
Reflection (3, 12-14, 17-20)	8
Skillful faculty/trainers (3, 4, 10, 12, 14, 15, 19)	7
Interactive (3, 4, 10-12, 19)	6
Supportive environment (3, 6, 12, 13, 15)	5
Blended learning strategies (3, 11, 12, 19)	4
Mentoring (3, 5, 11, 15)	4
Safety, respect and equality (4, 13, 14)	3
Learner-centered (3, 4)	2

For PD, one size does not fit all (6). Use of tailoring and work-based projects keeps the PD program grounded in participants' real needs and cements learning through doing (12). Four programs made projects drawn directly from participants' work central to the PD process. Participants selected a problem from work for their project, applied skills and concepts presented in the course to these problems, and reported back to the group for feedback (3-5, 11). In addition, Richards et al reported the success of a PD program consisting entirely of participant-selected collaborative projects (9), and Cornice found that peer discussion and problem solving of real-life examples in person or online fostered learning (8). Although focused on shorter trainings, Salas also emphasized the importance of hands-on practice simulating real-life situations as closely as possible (6).

Building relationships encompassed networking (3, 4, 7) collaboration (3, 5, 6), collective problem solving (5, 6), learning circles, conference calls and list-servs (4). Learning participants' stories and encouraging equality by leaving titles outside training further build the sense of community that makes it safe to learn (4).

One goal of PD is for participants to learn from experience through reflection and critical thinking (12, 13, 19, 20). The reflective cycle, also called transformative or experiential learning (18), involves an experience, followed by reflective observation of the experience, noting the details of the experience, one's thoughts, emotions and assumptions. One then analyzes the situation from the perspective of the other(s), and seeks to understand and make sense of it. Finally, one plans what can be done differently, thereby beginning another reflective cycle (13, 18). Reflection can be written or verbal, an individual or facilitated group activity, and may involve participants' own experiences or case studies (17). Outcomes of reflection include increased self-confidence, competence, knowledge, self-awareness and professional maturity, as well as improved communication and teamwork (13, 17, 18, 20). Van Wyk found this process so important, she stipulated that assignments should make learners reflect on cases presented, and grading should be based on such reflection, not merely on regurgitation of facts (12). She also stated that instructors should encourage

learners to evaluate them to model the reflective process and help learners feel less threatened by it (19).

The literature identifies two kinds of support that are integral to successful learning and capacity development. Called interaction in Table 1, the first type of support refers to the interaction between learners in a PD program and the instructors and mentors leading the courses. Faculty model the skills and behaviors being taught, answer learner question, and backstop the learners as they implement the skills and concepts in their projects. They also provide tailored, timely feedback and encourage discussion about the feedback (6, 12, 21). Perrone and colleagues reported assigning mentors for every 1-2 learners, with mentors spending 1-2 hours per participant per week in discussions (11). Although optimally provided in person, interaction over distance can be facilitated through virtual office hours, phone, fax, audio teleconferences, interactive television (12, 19), Skype and online (11). Interactive also means allowing ample time for discussion (10) and keeping learning two-way, learning from participants what works locally (4).

Labeled supportive environment in Table 1, the second type of support comes from supervisors and organization leadership. This includes dedicating staff time and budget funds for PD (15) and ensuring structural support to integrate learning into practice (5, 6, 11, 15, 22). Leaders can maximize learning through reinforcement on the job (6, 11), and credit or promotions may be held until the implementation of learning into practice has been confirmed (16).

Although the literature demonstrated no unanimous preferences for learning styles (1, 2, 5), that PD programs should be student-centered and blend a variety of approaches was a recurrent theme throughout the literature. Four articles recommended a blend of in-person and distance learning (3, 11, 12, 19). Pre-course orientations and generous initial guidance and support can assuage the anxiety self-directed learning can cause in learners new to it and help them develop the requisite attitudes and skills (5, 12). Distance learning options include podcasts (23), correspondence, audio and video tapes, satellite or cable television, computers, teleconferencing, interactive and compressed video (12). For in-person modules, faculty can travel, or PD programs can establish temporary campuses near learners as alternatives to students having to travel (19). For nurses at least, journal clubs have also proven an effective form of PD (10, 14, 24, 25).

Barriers to successful PD include lack of time, staff capacity, leadership buy-in, and follow-up to ensure integration of learning into practice (10, 15, 22), limited funds, technological challenges for online programs (15, 22), language issues (14, 22), irrelevant topics (10, 22) and participants' fear of appearing unknowledgeable (10). Opperman and colleagues note that no consistent model for calculating return on investment for PD currently exists, while Aiga and Banta recommend including a feedback loop about learning being implemented into practice, not only to inform future PD, but also to prove cost-effectiveness and reduce vulnerability to budget cuts (16, 26).

For treatment of rapid PD rollout in response to a public health emergency, see Butlar's article, Education Emergencies: A Plan for Success (27).

Online learning

The advent of online learning created visions of global access to free education, dreams that have yet to materialize. Currently Massive Open Online Courses (MOOCs) present average completion rates of only 5-10% (28-33), and most remain the domain of high-income countries (33, 34). Despite this discouraging record, the literature noted several programs that defy this trend.

One prominent success was an online course in nursing leadership in the Americas reported by Ortega and colleagues, with a 74-84% completion rate and a mean score of 90% on the final exam (35). An online course in lab leadership and management in the Middle East and North Africa reported similar performance (11), and a virtual campus in Mexico (36), a cultural sensitivity training for rural Australia (37), and online journal clubs (38) also proved successful. Robson demonstrated online problem-based learning's success in changing general practitioners' practices (39), Murugesan and colleagues saw a completion rate of five times the average in a MOOC with majority LMIC participation (28), and Laurillard reported a MOOC reaching 27 of the 47 most educationally-challenged countries (40).

The literature attributed online learning success to a number of factors, as shown in Table 2.

Table 2 Factors for successful online learning

Factor	Number of articles
Interactive course elements (28, 31, 40-48)	11
Customized content (28, 43-45, 49-51)	7
System ease of use (43, 45, 46, 49, 52)	5
Timely instructor response (28, 42, 43, 45, 52)	5
Organizational support (43, 45, 49, 52)	4

Interactive course elements (chat rooms, instant messaging, online discussion boards and email), customized course content, such as topics (34), real-life work experiences, and cultural appropriateness (35, 45), how easy a system is to use, timely instructor response and organizational support all contributed to success, as did access to technical support (45, 46). A sense of flow or being absorbed in the task when using the online learning system increased nurses' intent to use online learning(43). In addition, for video lessons, Wang and colleagues found that gaze guidance (instructors alternating their gaze between looking directly into the camera and looking at the content presentation area) helped learners focus and improved learning performance (53).

The literature reported split opinions about the inclusion of multimedia content, especially video. Seven articles recommended its inclusion (11, 37, 43, 48, 54-56), although Pickering and colleagues recommended limiting videos to 6-7 minutes and cautioned against information overload in them (56). Three articles dealing specifically with creating MOOCs for LMIC recommended either excluding video and other high-bandwidth formats, or else ensuring content accessibility offline, for example by creating an offline archive or being able to download material for later use (28, 51, 57). Interestingly, one study found that the number of videos watched did not predict learner course completion, whereas interaction did (41).

Other format and content recommendations included synchronous classrooms (47, 48, 58), webinars (48, 55), the flipped classroom (34, 55), small group work (46), introducing learners to academic literature (46, 55, 59), using case studies (46, 48) and coaches/mentors (46, 52), and providing a pre-course orientation to online learning (28, 58). Although recommended as both a learning tool and a necessary practicality for large courses, peer assessment can present quality and technology challenges (such as difficulty meeting deadlines due to connectivity issues). If peer assessment is used, the literature recommended randomly assigning three peer assessors per learner and providing assessment guidelines and samples (28, 40, 42, 44).

The literature listed a number of challenges for online learning. Obvious ones include lack of infrastructure and computer literacy present in many LMIC (12, 50, 51), technical failures (31, 58) cultural/linguistic barriers (50, 51), and issues surrounding cheating, fraud, assessment, accreditation and certification acknowledgement (31, 42, 47, 51). Online learning platforms also may not facilitate group work and other resources may be required to fill this need (40). More nuanced challenges include gaining and maintaining support from

institutional leadership (36), cost-benefit economics (29, 31), translating online learning into real-life application (47, 55, 58), and time management issues (31, 35, 36, 60). Lack of adequate instructor support can also leave learners to founder (31).

Similar to overall PD, the literature about online learning recommended a blended approach as better than either online only or in-person only (11, 51, 52, 54, 57, 60). It also recommended ensuring that pre- and post-tests are paired in order to check for statistical significance, and making pretests required to access course content and posttests required for certification (35). In cases of wrong answers, online platforms should automatically provide explanations and refer learners to the appropriate course materials (56). Two studies also noted that online learning appears poised to improve gender balance: not only is gender balance is better in online than in-person courses (28), women perform better than men in MOOCs (50).

Programs and platforms mentioned in the literature included Padlet, Diigo, Skype, Googledocs, Coursera, Blackboard™ Collaborate, Cisco® Webex™, Adobe® Connect™, MOODLE (Modular Object-Oriented Dynamic Learning Environment), and Canvas™ (11, 40, 48, 58).

Gamification

For gamification, the search returned 11 articles, five of which were literature reviews. One review examined factors that influence intent to use educational games, another compiled gamification elements suitable for higher education and their benefits, and three compared curricula including gamification with non-gamified curricula in terms of learner performance. Three additional articles reported on studies also comparing gamified with non-gamified learning.

Factors that influenced intention to use an educational game system included usefulness (ease of use, learning opportunities and socialness), hedonic value, attitude and enjoyment (61). According to Subhash and Cudney's review, using game elements such as points, leaderboards, levels, badges, feedback and graphics improved learner attitude, engagement, and performance (62). The literature was not unified about the impact of gamification on educational and practical outcomes.

Of the three reviews comparing gamified with non-gamified curricula, two reported slightly better test performance by learners using gamification; however, one reported on a single small study (n = 34) (63), and one reported low-quality data (64). The third review found no conclusive evidence of difference (65). Similarly, two of the three comparative effectiveness studies showed gamification performing better, not without qualification, however. One study found that learners who used games gave fewer incorrect answers, but noted that this might be simply because these learners answered fewer total questions (66). Another found no significant difference in learner performance, although learners using gamification posted to forums more frequently (67). The one study that showed a dramatic improvement with gamification had a very small sample size (n = 15) (68). Gentry and colleagues noted that no gamification methods stood out as better than others, no studies considered its economic effectiveness, and none focused on gamification in LMIC (64). These same criticisms applied to the one study about virtual reality (69). Finally, one article reported the success of turning a hospital's new staff orientation into a game, however, this was not a computer-based or online game, but a physical one, involving a treasure hunt throughout the hospital campus, and it also failed to address economic effectiveness (70).

Papadimitriou and Niari listed six types of available badges (Mozzilla, Moodle, Open Education Resources (OER), Photodentro, SAMEWORLD, European eTwinning Network) and noted a need to develop a common system of standards and accreditation for badges (71).

Workplace Learning
Professional development that takes place through workplace activities is called workplace learning, and the literature identified several keys to its success. Management are central to successful workplace learning (72-77). Managers must ensure not only protected time for learning (73, 76-78), but also the good governance practices essential to workplace learning, such as assessment, goal setting, supervision, performance tracking and reflection (73, 74, 76, 78). In addition, they can provide challenging assignments that allow staff to put their learning into practice (73, 76-78). A workplace design that facilitates interaction between different professions and encourages conversations around "artifacts" such as workflow charts or patient records also contributes to workplace learning (73, 78).

Good interpersonal relationships characterized by egality, trust and the attitude that learning is everyone's job contribute to enhanced workplace learning (73-75, 77, 78), as do the availability of role models who can offer new expertise and knowledge (72, 73, 76, 78) and clear career pathways (73). Workplace learning is also enhanced when staff are exposed to the whole work process, are aware of practice problems and participate in problem solving (74, 76, 78). Combining workplace learning with formal learning further improves success (73, 76, 78, 79).

Workplace learning is hindered by heavy workloads (73, 74, 78), lack of management support (73, 76, 77), lack of access to technology (73) and the inability to effect change (77).

Learning Transfer
Given that only roughly 10% of learning gained through training transfers into the workplace (80), everything possible should be done to improve this. According to the literature, a supportive environment plays the most important role in learning transfer. This includes upper leadership and supervisor support, autonomy, low workload pressure, sufficient resources and peer support (80-83). The perceived relevance of training (80, 82), projects to apply learning and opportunities to share learnings with colleagues also improved transfer, as did post-training follow-up, building cues into the workplace, and linking training content to job performance (80). Laycock and colleagues found that engaging in a dialogic, collaborative, co-creative process increased transfer (84), while Sparr and colleagues reported interaction between reflection and feedback seeking, resulting in the greatest learning transfer when both were present (85).

Barriers to transfer included non-supportive organizational structure (80, 81), interference, lack of enforcement on the job and instructor follow-up, perceived impracticality of the training, and discomfort with or peer pressure against change (80).

The literature agreed that more research needed to be conducted in this area, with the systematic review conducted by Scott and colleagues finding all evidence of too low a quality and insufficiently conclusive to find one transfer method superior to others (86).

Organizational Learning
One might expect organizational learning to flow naturally from individual learning. However, even the presence of organizational learning mechanisms such as self-reviews, lessons learned and strategic planning reports do not guarantee organizational learning (87). Duffield and Whitty proposed the Systemic Lessons Learned Knowledge (SYLLK) model, based on Reason's Swiss cheese model. The SYLLK model states that in order for organizational learning to occur, the slices of cheese must align so the holes match and learning can pass through. The slices of cheese are learning, culture, social, technology, process and infrastructure (88).

Factors that encourage organizational learning include active communication (88-90), a supportive environment and leadership (87, 88, 90), openness to new ideas, a willingness to

learn from each other (88, 90), delegation of power (89, 90), positive coaching (88, 89), and acknowledgement and reward of achievement (88, 90). Inhibitors include blame (89), caution (89, 90), myths of rugged individualism, hierarchy and focus on goal achievement and strict timelines (90). In order for an organization to learn, lessons must be disseminated and applied (87, 88).

To develop organizational learning, Duffield and Whitty recommend the following process: First, workshop, brainstorming or focus group techniques should be used to identify the facilitators and barriers for each model element or cheese slice (learning, culture, social, technology, process and infrastructure). Then knowledge management practices that address these facilitators and barriers should be identified and how well they work noted. In instances where knowledge management practices either do not exist or do not work well, action research cycles (plan, act, observe, reflect) should be used to develop and implement effective knowledge management practices (91).

Evaluation

Evaluation of PD programs, especially online PD programs, has tended to focus on learner satisfaction and perception of having gained knowledge. But while important, these are insufficient to determine the PD's effectiveness (92). According to Desilets and Dickerson, five levels of evaluation exist: process, content, outcome, impact and total program, and all five should be addressed for a comprehensive evaluation (93). Salas and colleagues note that learning outcomes, behavior changes and results such as patient survival rates should be considered when evaluating a training (6). Specifically for online PD, Ruggeri and colleagues recommend that an evaluation consider participants' baseline skills and knowledge in addition to the program's costs, benefits, and barriers, any suggestions for future improvements, and how learners are assessed and audited after the course (92).

Discussion

According to Webster-Wright, despite a growing body of research about how professionals learn, much PD still focuses on content, not on enhancing learning. Knowledge is viewed as something transferred to health professionals, as if filling empty containers. Focus needs to shift to learning, and the recognition that no matter where it takes place (daily work or PD activity), learning is the same, holistic activity dependent on "an interaction among the learner, the context and what is learned." Research shows that most professionals are enthusiastic learners who should be listened to and supported, rather than denied, hindered and controlled. Organizations should embrace the diversity and complexity of people's learning experiences, rather than trying to standardize them (94).

Williams echoes this opinion, noting that learning is about lighting a flame of inspiration, not just transferring a commodity from one head or barrel to another. The progress of the individual journey matters more than a pre-determined outcome. Managers tend to feel less safe about this type of learning, because it challenges the status quo (identifying problems with the way things are), requires change and the risk any change brings, and can be messy; but it is the only kind of learning that has potential to change practice (77).

Limitations

Time served as the primary limitation of this literature review. Standard review processes were followed; however, they were time restricted, thereby reducing their thoroughness. Document quality was also not assessed. Thus, although these results present an overview of available learning literature, they should not be construed as possessing the robust depth and authority of a systematic review.

Conclusion

Wherever one focused the research lens in this literature review, similar themes appeared. If real learning is to occur, all levels of leadership must support it in word, deed and resource allocation. Staff need dedicated time and management support for reflection and projects that allow application of learning. Formal training should blend a variety of methods, encourage interaction between instructors/mentors, learners and peers, be customized for local needs, and be linked to daily practice and informal learning. Even at the organizational learning level these themes appeared, albeit with the additional factors of technology, process and infrastructure. All of this reinforces the concept of learning as a holistic, organic process, not unlike gardening. Given the sunshine of relevance, the water of reflection, the soil of a supportive environment, and the weeding of barrier removal, people will learn and grow.

One area for further research is comparing the effectiveness of different types of gamification and more traditional learning methods. The same holds true for MOOCs: the examples of success reported here should be tested for replication in different settings. Learning transfer is another area that would benefit from high quality studies.

References

1. Al-Azri H, Ratnapalan S. Problem-based learning in continuing medical education: review of randomized controlled trials. Can Fam Physician. 2014;60:157-65. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3922562/pdf/0600157.pdf, accessed 11 September 2019).
2. Newman MJ. Problem based learning for continuing professional education : an exploration of the method and its effectiveness. London: Middlesex University; 2003 (http://eprints.mdx.ac.uk/6711/, accessed 26 August 2019).
3. Baldwin CD, Chandran L, Gusic ME. Building Sustainable Professional Development Programs: Applying Strategies From Implementation Science to Translate Evidence Into Practice. J Contin Educ Health Prof. 2017;37:106-15. doi: 10.1097/CEH.0000000000000151.
4. Burdick WP. Global faculty development: lessons learned from the Foundation for Advancement of International Medical Education and Research (FAIMER) initiatives. Acad Med. 2014;89:1097-9. doi: 10.1097/ACM.0000000000000377.
5. O'Shea E. Self-directed learning in nurse education: a review of the literature. J Adv Nurs. 2003;43:62-70. doi: 10.1046/j.1365-2648.2003.02673.x.
6. Salas E, DiazGranados D, Weaver SJ, King H. Does team training work? Principles for health care. Acad Emerg Med. 2008;15:1002-9. doi: 10.1111/j.1553-2712.2008.00254.x.
7. Burdick WP, Diserens D, Friedman SR, Morahan PS, Kalishman S, Eklund MA et al. Measuring the effects of an international health professions faculty development fellowship: the FAIMER Institute. Med Teach. 2010;32:414-21. doi: 10.3109/01421590903394587.
8. Cronise R. Collaborative learning: A next step in the training of peer support providers. Psychiatr Rehabil J. 2016;39:292-4. doi: 10.1037/prj0000218.
9. Richard L, Torres S, Tremblay MC, Chiocchio F, Litvak E, Fortin-Pellerin L et al. An analysis of the adaptability of a professional development program in public health: results from the ALPS Study. BMC Health Serv Res. 2015;15:233. doi: 10.1186/s12913-015-0903-3.
10. Lachance C. Nursing journal clubs: A literature review on the effective teaching strategy for continuing education and evidence-based practice. J Contin Educ Nurs. 2014;45:559-65. doi: 10.3928/00220124-20141120-01.
11. Perrone LA, Confer D, Scott E, Livingston L, Bradburn C, McGee A et al. Implementation of a mentored professional development programme in laboratory leadership and management in the Middle East and North Africa. EMHJ-Eastern Mediterranean Health Journal. 2016;22:832 - 9. (https://apps.who.int/iris/handle/10665/260279, accessed 10 September 2019).
12. van Wyk N. Development of critical thinking skills through distance learning in developing countries. Health SA Gesondheid. 2002;7:36-44. (https://hsag.co.za/index.php/hsag/article/view/642, accessed 11 September 2019).
13. 倉岡有美子[Yumiko Kuraoka]. [Manager's experiential learning: conceptual analysis]. 管理者の経験学習：概念分析. Journal of St Luke's Society for Nursing Research. 2019;22:5-12. (http://arch.luke.ac.jp/dspace/bitstream/10285/13176/1/SLNR22%281-2%295-12.pdf, accessed 11 September 2019).

14. Kupferschmid S, Pauly CB, Roulin MJ. Apports et difficultes lies a la participation d'infirmieres experimentees a un journal club: une analyse de contenu qualitative. [Contributions and difficulties of experienced nursing participating in a journal club: a qualitative research analysis]. Rech Soins Infirm. 2013:79-85. (https://www.ncbi.nlm.nih.gov/pubmed/24236401, accessed 11 September 2019).
15. Brownson CA, Allen P, Yang SC, Bass K, Brownson RC. Scaling Up Evidence-Based Public Health Training. Prev Chronic Dis. 2018;15:E145. doi: 10.5888/pcd15.180315.
16. Aiga H, Banta JE. Emerging crisis of continuing professional education: becoming a dead letter between external pressure and personal incentive? Int J Health Plann Manage. 2003;18:267-71. doi: 10.1002/hpm.714.
17. Miraglia R, Asselin ME. Reflection as an educational strategy in nursing professional development: an integrative review. J Nurses Prof Dev. 2015;31:62-72; quiz E6. doi: 10.1097/NND.0000000000000151.
18. Tashiro J, Shimpuku Y, Naruse K, Maftuhah, Matsutani M. Concept analysis of reflection in nursing professional development. Jpn J Nurs Sci. 2013;10:170-9. doi: 10.1111/j.1742-7924.2012.00222.x.
19. van Wyk N. Reflective learning through distance education: a critical reflection on the possibilities in developing countries. Online Brazilian Journal of Nursing. 2003;2:5p-p. (http://www.objnursing.uff.br/index.php/nursing/article/view/4887, accessed 11 September 2019).
20. Welp A, Johnson A, Nguyen H, Perry L. The importance of reflecting on practice: How personal professional development activities affect perceived teamwork and performance. Journal of Clinical Nursing (John Wiley & Sons, Inc). 2018;27:3988-99. doi: 10.1111/jocn.14519.
21. Eva KW, Armson H, Holmboe E, Lockyer J, Loney E, Mann K et al. Factors influencing responsiveness to feedback: on the interplay between fear, confidence, and reasoning processes. Advances in Health Sciences Education. 2012;17:15-26. doi: 10.1007/s10459-011-9290-7.
22. Mennin S, Kalishman S, Eklund MA, Friedman S, Morahan PS, Burdick W. Project-based faculty development by international health professions educators: practical strategies. Med Teach. 2013;35:e971-7. doi: 10.3109/0142159X.2012.731096.
23. Wei K, Ram J. Perceived usefulness of podcasting in organizational learning: The role of information characteristics. Computers in Human Behavior. 2016;64:859-70. doi: 10.1016/j.chb.2016.08.003.
24. Nesbitt J. Journal clubs: a two-site case study of nurses' continuing professional development. Nurse Educ Today. 2013;33:896-900. doi: 10.1016/j.nedt.2012.08.011.
25. Ravin CR. Implementation of a journal club on adult learning and nursing professional development. J Contin Educ Nurs. 2012;43:451-5. doi: 10.3928/00220124-20120702-16.
26. Opperman C, Liebig D, Bowling J, Johnson CS. Measuring Return on Investment for Professional Development Activities: 2018 Updates. J Nurses Prof Dev. 2018;34:303-12. doi: 10.1097/NND.0000000000000483.
27. Butlar M. Education Emergencies: A Plan for Success. J Nurses Prof Dev. 2015;31:292-6. doi: 10.1097/NND.0000000000000190.

28. Murugesan R, Nobes A, Wild J. A MOOC approach for training researchers in developing countries. Open Praxis. 2017;9:45-57. doi: 10.5944/openpraxis.9.1.476.
29. Liyanagunawardena TR, Adams AA, Williams SA. MOOCs: A systematic study of the published literature 2008-2012. The International Review of Research in Open and Distributed Learning. 2013;14:202-27. doi: 10.19173/irrodl.v14i3.1455.
30. Jordan K. Initial Trends in Enrolment and Completion of Massive Open Online Courses. International Review of Research in Open and Distributed Learning. 2014;15. (<Go to ISI>://WOS:000342405800008, accessed 11 September 2019).
31. Hew KF, Cheung WS. Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges. Educational Research Review. 2014;12:45-58. doi: 10.1016/j.edurev.2014.05.001.
32. Sneddon J, Barlow G, Bradley S, Brink A, Chandy SJ, Nathwani D. Development and impact of a massive open online course (MOOC) for antimicrobial stewardship. J Antimicrob Chemother. 2018;73:1091-7. doi: 10.1093/jac/dkx493.
33. Veletsianos G, Shepherdson P. A Systematic Analysis and Synthesis of the Empirical MOOC Literature Published in 2013-2015. International Review of Research in Open and Distributed Learning. 2016;17:198-221. (<Go to ISI>://WOS:000380034400012, accessed 11 September 2019).
34. Liyanagunawardena TR, Williams SA. Massive open online courses on health and medicine: review. J Med Internet Res. 2014;16:e191. doi: 10.2196/jmir.3439.
35. Ortega J, Hooshmand M, Foronda C, Padron M, Simon D, Waters M et al. Developing nurse leaders across the Americas: evaluation of an online nursing leadership course. Revista Panamericana de Salud Publica. 2018;42:1-8. doi: 10.26633/RPSP.2018.152.
36. Ramos Herrera I, Alfaro Alfaro N, Fonseca León J, García Sandoval C, González Castañeda M, López Zermeño MdC et al. Virtual Campus of Public Health: six years of human resources education in Mexico. Revista Panamericana de Salud Publica. 2014;36:342-7. doi: dx.doi.org/S1020-49892014001000009.
37. Lau M, Woodward-Kron R, Livesay K, Elliott K, Nicholson P. Cultural respect encompassing simulation training: being heard about health through broadband. Journal of Public Health Research. 2016;5:36-42. (http://www.jphres.org/index.php/jphres/article/view/667/292, accessed 11 September 2019).
38. Palan J, Roberts V, Bloch B, Kulkarni A, Bhowal B, Dias J. The use of a virtual learning environment in promoting virtual journal clubs and case-based discussions in trauma and orthopaedic postgraduate medical education: The Leicester experience. Journal of Bone & Joint Surgery, British Volume. 2012;94:1170-5. doi: 10.1302/0301-620X.94B9.28780.
39. Robson J. Web-based learning strategies in combination with published guidelines to change practice of primary care professionals. Br J Gen Pract. 2009;59:104-9. doi: 10.3399/bjgp09X395102.
40. Laurillard D. The educational problem that MOOCs could solve: professional development for teachers of disadvantaged students. Research in Learning Technology. 2016;24. doi: 10.3402/rlt.v24.29369.

41. Bonafini FC. The effects of participants' engagement with videos and forums in a MOOC for teachers' professional development. Open Praxis. 2017;9:433-47. doi: 10.5944/openpraxis.9.4.637.
42. Phan T, McNeil SG, Robin BR. Students' patterns of engagement and course performance in a Massive Open Online Course. Computers & Education. 2016;95:36-44. doi: 10.1016/j.compedu.2015.11.015.
43. Cheng YM. Exploring the roles of interaction and flow in explaining nurses' e-learning acceptance. Nurse Educ Today. 2013;33:73-80. doi: 10.1016/j.nedt.2012.02.005.
44. Johnson SD, Aragon SR. An Instructional Strategy Framework for Online Learning Environments. New Directions for Adult and Continuing Education. 2003;2003:31-43. doi: 10.1002/ace.117.
45. Masoumi D, Lindström B. Quality in e-learning: a framework for promoting and assuring quality in virtual institutions. Journal of Computer Assisted Learning. 2012;28:27-41. doi: 10.1111/j.1365-2729.2011.00440.x.
46. Struchiner M, Roschke MA, Ricciardi RM. Formacao permanente, flexivel e a distancia pela Internet: Curso de Gestao Descentralizada de Recursos Humanos em Saude. [Ongoing, flexible distance learning through the Internet: course on decentralized management of human resources in health care]. Rev Panam Salud Publica. 2002;11:158-65. doi: 10.1590/s1020-49892002000300004.
47. Trevena LJ. Problem-based learning in public health workforce training: a discussion of educational principles and evidence. N S W Public Health Bull. 2007;18:4-8. (https://www.publish.csiro.au/nb/pdf/NB07007, accessed 11 September 2019).
48. Tronchin DM, Peres HH, Lima AF, Alavarce DC, Prata AP, Santos MR et al. Desenvolvimento do curso de gerenciamento em enfermagem on-line: experiencia exitosa entre Brasil e Portugal. Development of an online nursing management course: successful experience between Brazil and Portugal. Rev Esc Enferm USP. 2015;49 Spec No:162-7. doi: 10.1590/S0080-623420150000800023.
49. Byun S, Mills JE. Exploring the creation of learner-centered e-training environments among retail workers: a model development perspective. Cyberpsychol Behav Soc Netw. 2011;14:65-9. doi: 10.1089/cyber.2009.0066.
50. Ma L, Lee CS. Investigating the adoption of MOOCs: A technology-user-environment perspective. Journal of Computer Assisted Learning. 2019;35:89-98. doi: 10.1111/jcal.12314.
51. Liyanagunawardena TR, Aboshady OA. Massive open online courses: a resource for health education in developing countries. Glob Health Promot. 2018;25:74-6. doi: 10.1177/1757975916680970.
52. Marrinan H, Firth S, Hipgrave D, Jimenez-Soto E. Let's Take it to the Clouds: The Potential of Educational Innovations, Including Blended Learning, for Capacity Building in Developing Countries. Int J Health Policy Manag. 2015;4:571-3. doi: 10.15171/ijhpm.2015.121.
53. Wang H, Pi Z, Hu W. The instructor's gaze guidance in video lectures improves learning. Journal of Computer Assisted Learning. 2019;35:42-50. doi: 10.1111/jcal.12309.
54. Kulier R, Gulmezoglu AM, Zamora J, Plana MN, Carroli G, Cecatti JG et al. Effectiveness of a clinically integrated e-learning course in evidence-based

medicine for reproductive health training: a randomized trial. JAMA. 2012;308:2218-25. doi: 10.1001/jama.2012.33640.

55. Jones-Bonofiglio KD, Willett T, Ng S. An evaluation of flipped e-learning experiences. Med Teach. 2018;40:953-61. doi: 10.1080/0142159x.2017.1417577.
56. Pickering JD, Henningsohn L, DeRuiter MC, de Jong PGM, Reinders MEJ. Twelve tips for developing and delivering a massive open online course in medical education. Med Teach. 2017;39:691-6. doi: 10.1080/0142159X.2017.1322189.
57. Onime C, Uhomoibhi J, Radicella S. Transferring On-line Science and Engineering Courses for Use in Developing Countries. Restivo MT, Cardoso A, Lopes AM, editors2015 (<Go to ISI>://WOS:000441197800021, accessed 11 September 2019).
58. Nelson L. Harnessing the Power of the Synchronous Classroom in Staff Development. J Contin Educ Nurs. 2017;48:62-4. doi: 10.3928/00220124-20170119-05.
59. Erlandsson K, Osman F, Hatakka M, Egal JA, Byrskog U, Pedersen C et al. Evaluation of an online master's programme in Somaliland. A phenomenographic study on the experience of professional and personal development among midwifery faculty. Nurse Education in Practice. 2017;25:96-103. doi: 10.1016/j.nepr.2017.05.007.
60. Jirovsky E, Hoffmann K, Mayrhuber EA-S, Mechili EA, Angelaki A, Sifaki-Pistolla D et al. Development and evaluation of a web-based capacity building course in the EUR-HUMAN project to support primary health care professionals in the provision of high-quality care for refugees and migrants. Global Health Action. 2018;11:1-. doi: 10.1080/16549716.2018.1547080.
61. Baptista G, Oliveira T. Gamification and serious games: A literature meta-analysis and integrative model. Computers in Human Behavior. 2019;92:306-15. doi: 10.1016/j.chb.2018.11.030.
62. Subhash S, Cudney EA. Gamified learning in higher education: A systematic review of the literature. Computers in Human Behavior. 2018;87:192-206. doi: 10.1016/j.chb.2018.05.028.
63. Bhoopathi PS, Sheoran R. Educational games for mental health professionals. Cochrane Database Syst Rev. 2006:CD001471. doi: 10.1002/14651858.CD001471.pub2.
64. Gentry SV, Gauthier A, Ehrstrom BLE, Wortley D, Lilienthal A, Car LT et al. Serious Gaming and Gamification Education in Health Professions: Systematic Review. Journal of Medical Internet Research. 2019;21:N.PAG-N.PAG. doi: 10.2196/12994.
65. Akl EA, Kairouz VF, Sackett KM, Erdley WS, Mustafa RA, Fiander M et al. Educational games for health professionals. Cochrane Database Syst Rev. 2013:CD006411. doi: 10.1002/14651858.CD006411.pub4.
66. Paiva R, Bittencourt II, Tenório T, Jaques P, Isotani S. What do students do on-line? Modeling students' interactions to improve their learning experience. Computers in Human Behavior. 2016;64:769-81. doi: 10.1016/j.chb.2016.07.048.
67. Tan M, Hew KF. Incorporating Meaningful Gamification in a Blended Learning Research Methods Class: Examining Student Learning, Engagement, and Affective Outcomes. Australasian Journal of Educational Technology. 2016;32:19-34. doi: 10.14742/ajet.2232.

68. Popil I, Dillard-Thompson D. A game-based strategy for the staff development of home health care nurses. J Contin Educ Nurs. 2015;46:205-7. doi: 10.3928/00220124-20150420-14.
69. Schott C, Marshall S. Virtual reality and situated experiential education: A conceptualization and exploratory trial. Journal of Computer Assisted Learning. 2018;34:843-52. doi: 10.1111/jcal.12293.
70. Freudig T, Tiggelaar D, Richardson S, Gardner D, Boyle K. Germ Blasters and Gameful Thinking: Saving New Employee Orientation One Mission at a Time. Nurse Leader. 2019;17:117-20. doi: 10.1016/j.mnl.2018.12.007.
71. Papadimitriou ST, Niari MI. Open Badges as Credentials in Open Education Systems: Case Studies from Greece and Europe. Journal of Learning for Development. 2019;6:49-63. (https://files.eric.ed.gov/fulltext/EJ1212520.pdf, accessed 9 September 2019).
72. Ahadi S, Jacobs RL. A Review of the Literature on Structured On-the-Job Training and Directions for Future Research. Human Resource Development Review. 2017;16:323-49. doi: 10.1177/1534484317725945.
73. Lloyd B, Pfeiffer D, Dominish J, Heading G, Schmidt D, McCluskey A. The New South Wales Allied Health Workplace Learning Study: barriers and enablers to learning in the workplace. BMC Health Serv Res. 2014;14:134. doi: 10.1186/1472-6963-14-134.
74. Attenborough J, Abbott S, Brook J, Knight RA. Everywhere and nowhere: Work-based learning in healthcare education. Nurse Educ Pract. 2019;36:132-8. doi: 10.1016/j.nepr.2019.03.004.
75. Walker R, Cooke M, Henderson A, Creedy DK. Using a critical reflection process to create an effective learning community in the workplace. Nurse Educ Today. 2013;33:504-11. doi: 10.1016/j.nedt.2012.03.001.
76. Matovu JK, Wanyenze RK, Mawemuko S, Okui O, Bazeyo W, Serwadda D. Strengthening health workforce capacity through work-based training. BMC Int Health Hum Rights. 2013;13:8. doi: 10.1186/1472-698X-13-8.
77. Williams C. Understanding the essential elements of work-based learning and its relevance to everyday clinical practice. J Nurs Manag. 2010;18:624-32. doi: 10.1111/j.1365-2834.2010.01141.x.
78. Mertens F, de Groot E, Meijer L, Wens J, Gemma Cherry M, Deveugele M et al. Workplace learning through collaboration in primary healthcare: A BEME realist review of what works, for whom and in what circumstances: BEME Guide No. 46. Med Teach. 2018;40:117-34. doi: 10.1080/0142159X.2017.1390216.
79. Lardinois R. Learning "While" Working: Success Stories on Workplace Learning in Europe. 2011. (https://files.eric.ed.gov/fulltext/ED542558.pdf, accessed 6 September 2019).
80. Austin MJ, Weisner S, Schrandt E, Glezos-Bell S, Murtaza N. Exploring the Transfer of Learning from an Executive Development Program for Human Services Managers. Administration in Social Work. 2006;30:71-90. doi: 10.1300/J147v30n02_06.
81. Dobbins M, Greco L, Yost J, Traynor R, Decorby-Watson K, Yousefi-Nooraie R. A description of a tailored knowledge translation intervention delivered by knowledge brokers within public health departments in Canada. Health Research Policy & Systems. 2019;17:N.PAG-N.PAG. doi: 10.1186/s12961-019-0460-z.

82. Nafukho FM, Alfred M, Chakraborty M, Johnson M, Cherrstrom CA. Predicting workplace transfer of learning. European Journal of Training and Development. 2017;41:327-53. doi: 10.1108/ejtd-10-2016-0079.
83. Ottoson JM, Patterson I. Contextual influences on learning application in practice. An extended role for process evaluation. Eval Health Prof. 2000;23:194-211. doi: 10.1177/016327870002300205.
84. Laycock A, Bailie J, Matthews V, Bailie R. Using developmental evaluation to support knowledge translation: reflections from a large-scale quality improvement project in Indigenous primary healthcare. BioMed Central; 2019; 17: N.PAG-N.PAG (https://health-policy-systems.biomedcentral.com/track/pdf/10.1186/s12961-019-0474-6, accessed 11 September 2019).
85. Sparr JL, Knipfer K, Willems F. How Leaders Can Get the Most Out of Formal Training: The Significance of Feedback-Seeking and Reflection as Informal Learning Behaviors. Human Resource Development Quarterly. 2017;28:29-54. doi: 10.1002/hrdq.21263.
86. Scott SD, Albrecht L, O'Leary K, Ball GD, Hartling L, Hofmeyer A et al. Systematic review of knowledge translation strategies in the allied health professions. Implement Sci. 2012;7:70. doi: 10.1186/1748-5908-7-70.
87. Popper M, Lipshitz R. Organizational Learning. Management Learning. 2016;31:181-96. doi: 10.1177/1350507600312003.
88. Duffield S, Whitty SJ. Developing a systemic lessons learned knowledge model for organisational learning through projects. International Journal of Project Management. 2015;33:311-24. doi: 10.1016/j.ijproman.2014.07.004.
89. Cuffa D, Steil AV. Organizational learning in public organizations: an integrative review. Navus - Revista de Gestão e Tecnologia. 2019;9:112-23. doi: 10.22279/navus.2019.v9n3.p112-123.875.
90. Senaratne S, Victoria MF. Building a Supportive Culture for Sustained Organisational Learning in Public Sectors. In: Building a Competitive Public Sector with Knowledge Management Strategy2014:118-34 (Advances in Human Resources Management and Organizational Development, <Go to ISI>://WOS:000404662200006, accessed 11 September 2019).
91. Duffield SM, Whitty SJ. Application of the Systemic Lessons Learned Knowledge model for Organisational Learning through Projects. International Journal of Project Management. 2016;34:1280-93. doi: 10.1016/j.ijproman.2016.07.001.
92. Ruggeri K, Farrington C, Brayne C. A global model for effective use and evaluation of e-learning in health. Telemed J E Health. 2013;19:312-21. doi: 10.1089/tmj.2012.0175.
93. Desilets LD, Dickerson PS. Another look at evaluation models. J Contin Educ Nurs. 2010;41:12-3. doi: 10.3928/00220124-20091222-02.
94. Webster-Wright A. Reframing Professional Development Through Understanding Authentic Professional Learning. Review of Educational Research. 2009;79:702-39. doi: 10.3102/0034654308330970.