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Online learning in health professions education. Part 2: Tools and practical application: AMEE Guide No. 163

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ABSTRACT

Part 1 of the AMEE Guide *Online learning in health professions education* focused on foundational concepts such as theory, methods, and instructional design in online learning. Part 2 builds upon Part 1, introducing technology tools and applications of these foundational concepts by exploring the various levels (from beginner to advanced) of utilisation, while describing how their usage can transform Health Professions Education. This Part covers Learning Management Systems, infographics, podcasting, videos, websites, social media, online discussion forums, simulation, virtual patients, extended and virtual reality. Intertwined are other topics, such as online small group teaching, game-based learning, FOAM, online social and collaboration learning, and virtual care teaching. We end by discussing digital scholarship and emerging technologies. Combined with Part 1, the overall aim of Part 2 is to produce a comprehensive overview to help guide effective use online learning in Health Professions Education.

KEYWORDS

Online learning; online education; distance learning; educational technologies; instructional technologies

1. Introduction

Part 1 of this Guide (MacNeill et al. 2023) introduced evidence, delivery methods, theories, and frameworks of online Health Professions Education (HPE). Part 1 also included online learner engagement, faculty development, design principles, accessibility, copyright, and privacy within the context of HPE.

Although Part 1 referred to online tools, it focused on educational principles and theory first, and technology second. Part 2 will focus on technology, but this "education first" approach continues to be the foundation, as we examine specific technologies and tools with practical examples for implementation.

In Part 2, we take the reader on a journey that begins with some familiar tools and experiences, and then moves them into more advanced concepts and tools, such as games, reusable objects, infographics, podcasting, video, websites, and social media. We then continue into clinical teaching areas, such as simulation and virtual patients, extended and virtual reality, digital scholarship, and end with a brief list of emerging trends in online education. We will discuss these tools in conjunction with contemporary issues, advantages and disadvantages, and relate their usage back to the relevant theories and frameworks. Practical examples will be at both beginner and advanced levels.

Intertwined are other topics such as small group teaching, online discussions, and online collaboration. As the topic of online learning in HPE is vast, we supplement several of the discussions with details and extra readings in the Appendix. In addition, given the nature of the topic, we have created a supporting website to demonstrate how

Practice points

- Effective use of educational technology begins with incorporating online educational theory, objectives, and instructional design, covered in Part 1. HPE should resist the urge to start with technology.
- Once the theory, objectives and design principles have been established, HPE should consider which technology tools may enhance delivery. Examples may include LMSs, podcasts, videos, infographics, websites, social media, discussion forums, online simulations, virtual patients, and extended and virtual reality.
- Each tool has its own advantages, disadvantages, and considerations, and is influenced by learners, teachers, content, and different clinical and educational settings.
- Teaching contexts, such as small group and virtual clinical teaching as well as facilitation strategies, such as gamification, social and collaborative learning are important to consider.

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different tools can be used to create HPE, including practical considerations, at: https://www.onlinelearninghpe.com/.

In essence, Part 2 provides the practical application of the foundational concepts explored in Part 1. (To ease the flow of Part 2, when we refer to a theory or aspect discussed in Part 1, we will simply note "(Part 1)" and assume that the reader has read or can refer to Part 1).

2. Learning Management Systems and MOOCs

We begin with Learning Management Systems (LMSs). These online platforms offer robust administrative functions for institutions, administrators, teachers and learners. Long recommended in medical education (Davis and Harden 2001), LMSs supply a relatively uniform, coherent and comprehensive environment, with built-in basic security and educational tools, such as file distribution, discussion forums, quizzes, surveys, activity tracking, and data analytics.

LMS examples include Canvas, Blackboard, Absorb, Brightspace and Moodle. Some (e.g. Moodle) are free/open source, but often require significant technical knowledge to install. Other simple LMSs (e.g. Google Classroom) have basic functionality, are free and user-friendly, but may lack features such as secure grading, tracking and securely stored learner data. Other options for basic course organisation include websites (explored later), such as simplified course shells (e.g. TedEd (https://ed.ted.com/)).

In Part 1, we spent some time explaining the *Passive-Interactive-Creative-Replaces-Amplifies-Transforms* (PICRAT) model. Tools in LMSs can meet many PICRAT demands, as illustrated in Figure 1. (Note: the tools are examples, and could be mapped into other areas also, depending upon their flexibility and availability in the LMS).

Figure 1 demonstrates reasons for the success of LMSs: learners, teachers and institutions with access to limited training and resources can replicate and amplify most educational F2F activities online. In addition, because activities are server- and browser-based, problems of accessibility to materials are reduced. (For a more detailed discussion of LMS material accessibility, see (Masters et al. 2022)). Limitations are media file-size and internet reliability when running synchronous classes, but these problems are reduced by recordings and reducing media file sizes (e.g. frame width/height/rate, resolution, bit/sampling rate), and allowing material to be downloadable.

Figure 1 also illustrates a problem of LMSs: the emphasis of standard tools on Replace and Amplify, with limited opportunities for creative learning due to its rigid structure. This encourages institutions to focus on course *management*, and remain in administrative comfort zones, forgetting that good online learning technology usage is driven by *educational*, rather than *technological* or *administrative* imperatives. If institutions remain in this conservative mode, LMSs become little more than PowerPoint distribution vehicles, aided by quizzes to meet the needs of some vague feeling of "interaction". Using theory-based approaches will transform online courses from passive content repositories to transformative classrooms.

Transformation begins with using advanced tools like reporting and analytics, micro-credentials, badges, big data (Ellaway et al. 2014) and integration with other tools (such as similarity checkers and data analytical processing tools), but institutions must prioritise education over data collection. Further effective LMS usage requires institutions to let educators drive technology selection and use, and adopt more expansive learning theories and approaches, such as Connectivism.

In Part 1, we discussed Connectivism in some detail, but the most pertinent aspect is that it assumes that we "derive

How does technology impact **teacher** pedagogy?	**Replace**	**Amplify**	**Transform**
Creative	Synchronous tool use such as group whiteboard annotation	Chat rooms, where learners are creating knowledge together Creative Games Student-led Glossaries Wikis	Competency-based lessons E-portfolios
Interactive	Synchronous tutorials Breakout-rooms/ Small-group work	Assignments Attendance Surveys, polls Discussion forums Interactive games eLearning modules	Ability to interact with learners in different time zones through asynchronous discussion boards
Passive	Course outlines, Lecture notes, presentations Feedback: text Glossaries Synchronous lectures	Feedback: audio, video, secure marks/grades, personal feedback distribution Links to external sources	Access to recorded lectures from all over the world and ability to bring large groups of learners to remote and limited settings (e.g. bedside, operating room) Ability to have all learning materials in one accessible place and track learner performance in real time
How do **learners** interact with technology?			

Figure 1. Mapping LMS tools to PICRAT categories.

our competence from forming connections" through networks, with "integration of principles explored by chaos, network, and complexity and self-organization theories" (Siemens 2005). Knowledge is constructed through connections, diversity and mentorship on a larger scale and more permanently than can be done by an individual.

A demonstrable example of Connectivism in education is the Massive Online Open Course (MOOC), with its original goal "to facilitate the transition from a neat, constrained and centralised learning management system to a distributed environment in which students and instructors employ multiple online services and applications" (Downes 2010). Early MOOCs emphasised the role of Connectivism, originally seen as central to HPE MOOCs (Masters 2011).

Connectivism in MOOCs demonstrates a transformative mindset: because of a deeper exploration using multiple sources and opinions, it moves away from information-broadcast models of institutional officially supported LMSs, to activities of deeper questioning and reflection (inter-disciplinary, challenges and controversies). These approaches are not add-ons, or "elective" learning, but are integral to the course. For example, rather than have a "Humanities" portion of the course, free reign encourages learners to integrate external ideas into their materials.

It should be noted, however, that there is a split between Connectivist MOOCs (cMOOCs) and instructor-led MOOCs (xMOOCs). xMOOCs resemble F2F teaching and rely on instructor-provided materials (Siemens 2012). xMOOCs now dominate HPE, and the distinction between cMOOCs and xMOOCs has faded (Hendriks et al. 2019). xMOOCs risk becoming simple F2F classes offered to many people online. Connectivism is also important in small group teaching, as discussed in the next section.

3. Small Group Teaching

From expansive MOOCs, we move to Small Group Teaching (SGT). SGT has long been used in HPE and ranges from informal "group work" to more formal types such as Case-Based Learning (CBL), Problem-Based Learning (PBL), and Team-Based Learning (TBL) (Steinert 1996; Edmunds and Brown 2010).

The theoretical principles of Community of Inquiry (Part 1) are essential for understanding SGT, as almost all SGT forms have common features in which groups or teams of 6-12 highly engaged learners are encouraged to interactively focus on tasks, usually solving practical problems within defined scenarios. While the role of the teacher might vary from instructor to facilitator, SGT aims to be less didactic and more learner-led, relying on self-discovery through inquiry-based discussions (Steinert 1996; Edmunds and Brown 2010).

Online or electronic SGT (eSGT) presents great opportunities for HPE. Through PICRAT (See discussion above), almost everything in F2F SGT is accomplished in eSGT, but the beginner should take heed: as with all teaching methods raised in Part 1, one should not merely attempt to transplant F2F SGT to eSGT. For further guidance on eSGT, the reader should refer to Part 1 (Synchronous Learning), (Kasai et al. 2021) and (O' Leary et al. 2023).

For those working in the clinical setting, (Kasai et al. 2021) give a useful illustration of how electronic PBL is conducted through a standard LMS in clinical training. Their study also emphasises the need for careful planning to reduce the common problems identified in Part 1, including accessibility, interaction and motivation. A balanced view is offered by (O' Leary et al. 2023), who show the potential, while warning about a strong preference for F2F PBL, and that too naively believing that one can simply replicate everything online can lead to disappointment.

The theoretical principles of Community of Inquiry provide guidance for moving beyond simple "group tasks" to guided inquiry-based learning through facilitated discourse with the interplay of social, cognitive, and teaching presence elements. At a broader level, eSGT should function as part of a common educational approach that encourages learners to own their learning, incorporating engaging activities (frequently through common LMS tools), such as self-assessments, games and puzzles, small group or whole-class presentations.

For the more advanced and well-resourced teacher, the opportunities outlined in the Part 1 discussion on Connectivism encourage groups to work tangentially, and exploring sources and tools outside the officially-supported LMS is essential (Malik and Malik 2022). In addition, flipped-classroom approaches are equally applied in TBL, CBL and PBL. This does, however, require careful planning. See Appendix 8 for further reading. Still more advanced, within the context of HyFlex (Part 1), HyFlex eSGT presents further opportunities, but also greater complexities.

In both broad (MOOCs) and narrow (SGT) approaches described above, an overriding challenge faced by teachers is encouraging interaction and participation in a meaningful way, and keeping learners engaged in the process. For an example of such activities, we turn to Game-Based Learning, in the next section of this Guide.

4. Game-Based Learning

The challenges with interaction, engagement and collaboration in online environments have led to a steady increase in the use of serious games for HPE in the last two decades (Maheu-Cadotte et al. 2021). In this section, we differentiate types of Game-Based Learning (GBL) that are employed to individual learners or teams.

A game includes rules, goals and challenges for the purpose of amusement, while *serious games* have an explicit, carefully thought-out educational purpose to improve specific learning outcomes (Maheu-Cadotte et al. 2021).

Serious games incorporate fun elements of games, such as visual cues, interactivity, engagement, motivation, while fulfilling needs of adult learners, allowing for autonomy, control and a sense of achievement. Learners progress through challenges with different levels, receiving immediate feedback, acquiring skills, and receiving rewards for accurate responses. Serious games enable positive affect, motivation and behaviour with increased learner satisfaction, and knowledge retention when compared to traditional approaches (Gleason 2015) and promote deliberate practice (e.g. Virtual Reality for procedural skills training).

Gamification, on the other hand, is the use of game-based elements to non-game contexts, and has been shown to improve engagement with educational content and learning outcomes (van Gaalen et al. 2021). Although it uses game elements, such as rewards, the intention of gamification is not to create a game, but rather to increase self-motivation towards desired behaviours.

Educational designers must be aware that a challenge of using gamification is that competition can detract learners from the real learning tasks and outcomes. They may instead focus on winning a group activity, leading to "cheating" to win. If the player is unable to proceed to the next level, frustration can inhibit learning or require intervention from the teacher. Figure 2 shows a summary of the learning activities (with examples) of serious games and gamification. For further reading on Gamification, see Appendix 8.

4.1. Frameworks

Several frameworks, such as Flow theory, Self-determination theory and Goal Setting theory (Huang and Hew 2018) and the nine characteristics outlined by Bedwell (Bedwell et al. 2012) have been employed in GBL. Providing context to the game and orienting the learner to the steps to follow to progress through the game is vital in orienting the learner to the game activity. Most theories underpinning GBL highlight the need for achieving goals,

Learning Activity	Serious Game	Gamification
Goal	Achieving a specific learning objective, skill.	Learner motivation of desirable behaviours and attitude.
Example	*Teaching fundamental concepts of a lesson through a step wise game.*	*Award points for team participation in learning activity.*
Progress	Progress through different levels to achieve a particular skill.	Addition of game elements to a regular learning activity.
Example	*Start at novice level and move to mastery for procedural skills training.*	*Move through different types of badges for participation to sustain engagement.*
Game elements	Has a game built into learning activity; choices have consequences.	Not a true game, but rewards for demonstrating desirable behaviour.
Example	*Board game such as GridlockED - managing patients in ED, each step has consequences and player needs to decide patient outcomes based on decision making during game.*	*Different teams within a classroom during a semester, team with most points wins a reward from educator.*
Motivational aspects	Relies on intrinsic motivation of the team or individual to progress and complete task.	Motivation is mainly extrinsic.
Example	*Learner needs to engage in different challenges and is motivated to get to end of the task.*	*Learner can be motivated due to peer engagement in learning activity.*
Educator content creation	Whole new learning activity to achieve a learning objective.	Addition of game elements like rewards to an existing learning activity.
Example	*Beginner: Educator creates crossword puzzle to teach concepts. Advanced: VR based procedural skill training for mastery of skills.*	*Beginner: Kahoot with winner announced at the end of quiz activity. Advanced: Microteaching modules where participants leading with highest scores win a prize.*
Assessment of learning	Can be measured directly within the game as the learner progresses through steps.	Cannot directly measure learning, but can measure contextual skills like behaviour, motivation and attitude.
Example	*Quiz within game to show progress.*	*Quiz within game, certification on completion of game*

Figure 2. Learning activities and examples of serious games and gamification.

allowing learner autonomy to choose the level and rate of progress, and emphasizing learner experience, usability and engagement (Petri et al. 2017). Gamification on the other hand uses the elements of motivation such as goals, access, feedback, challenge and collaboration, to progress through different levels through rewards for achievements (Huang and Hew 2018).

4.2. Application of GBL Depends on the Learning Outcomes

Figure 3 shows teaching activities and examples of serious games and gamification, separated into Novice and Advanced.

GBL can be used to teach what is otherwise a boring lecture to something that challenges, motivates and engages students with team-based activities or individual challenges. A challenge with developing games is that they are resource-intensive, and frequently require collaboration or accessing external materials. A partial solution to this problem lies in sharing and repurposing online resources as discussed in the next section.

5. Reusable Learning Objects and FOAM

A benefit of online learning is the breadth of modifiable and accessible teaching resources that can be repurposed and reused in different global and learner contexts. This is especially important for teachers and learners who have limited access to technical and financial resources. For this, we turn to Reusable Learning Objects (RLOs), and their medical education sub-set: Free, Open-Access Medical (or Medical Education) resources (FOAM).

Learning Objects are "instructional components that can be reused a number of times in different learning contexts" and are "generally understood to be digital entities deliverable over the Internet" (Wiley 2002). They exist as all media types, and have associated metadata to enable searching and re-use, irrespective of where on the Internet they are stored. Reusability is crucial, and for that reason, they are frequently referred to as *Reusable* Learning Objects (RLOs).

In an extension of RLOs, FOAM (Twitter: #FOAMEd) originated in 2012, originally focusing on the use of social media in medical education: "the idea is to get medical education and all the information up in the Cloud down to those people who need it." (Cadogan 2012). Although originally in Emergency Medicine, FOAM expanded to many areas of medical education (Grock et al. 2021). In addition, the COVID-19 pandemic led to increased FOAM materials usage (Boreskie et al. 2022).

FOAM encourages the development, use, sharing and modification of online medical education materials, including websites, videos, podcasts, blogs, infographics, online journal clubs, and games (Wolbrink et al. 2019). Additionally, the opportunity to provide varied and flexible learning options using various media aligns with Universal Design for Learning Principles (Part 1).

A criticism of FOAM is that some resources are not peer-reviewed with variable scholarly quality (Brindley et al. 2022) and undeclared conflicts of interests (Niforatos et al. 2019). Without quality indicators, curating good quality FOAM can be overwhelming.

On the other hand, if quality appraisal and curation tools are utilised for FOAM (Ting et al. 2020), there are multiple advantages of having easy access to these resources, such as:

- Many benefits and theoretical approaches of online learning rely on the free availability and re-useability of HPE materials, and FOAM is the epitome of that theory in action.

	Teaching Activity	Serious Game	Gamification
NOVICE	Understanding theoretical/ factual concepts.	Cross word puzzle that helps learners progress from simple to complex.	Point rewards for completion of pre-class activity.
		Playing a jeopardy game to learn concepts with a score for performance.	Assigning stars/ badges to students on completion of microteaching activity.
	Poll everywhere	Learning a specific skill by answering poll everywhere questions that provides feedback to responses.	Rewarding top student for performance. Teacher recognition awards during the module to motivate learners to participate.
ADVANCED	Procedural skills	VR based instruction that provides feedback and assessment of mastery of skills.	Teams compete in a challenge against each other in escape room activity to find all equipment needed to perform a procedure.
		Assessment, competency check list to perform a procedural skill using XR.	Highest scoring team on a task is rewarded.

Figure 3. Teaching activities and examples of serious games and gamification.

- FOAM can give remote and less-well-resourced institutions access to high-quality material, although these are typically authored in, and in the context of, high-income countries.
- Learners can choose from a variety of resources, tailoring learning to different interprofessional needs and levels, while still promoting group learning goals.
- Although there are many dedicated FOAM websites, decentralisation is a key element, and finding FOAM material can be easy, especially through Twitter (#FOAMed).
- Using FOAM materials can help decentralise the teacher as the "only" expert, and provide diversified opinions and perspectives, although teachers need to be supported and promoted for creating diverse and novel curricula, rather than feeling they need to produce solo and standardised materials to prove their expertise.

(Appendix 8 gives details of further reading).

The following sections discuss some common tools used in FOAM.

6. Infographics

Infographics are among the many RLOs that have gained popularity of late. Infographics combine graphics, images, and text to visually present information, ideas, and/or data. Well-designed infographics convey complex information clearly and concisely in a manner that is easily understood (Balkac and Ergun 2018). Infographics may convey a story, describe a process, compare and contrast, illustrate relationships, or interpret data. They are typically digital files that are easily shared *via* social media or websites. Alternatively, they may be printed and used as a communication tool on a smaller scale, for example, as a poster displaying hand hygiene procedures within a clinical environment.

Infographics are effective teaching and learning tools when designed to help learners select, organise and integrate information. Using the principles of Mayer's Cognitive Theory of Multimedia Learning (Part 1), the demand on the learner's working memory is reduced, and information is more readily retained.

Infographics are widely used as tools to educate patients and the public about their health. Infographics are also being increasingly used to support the dissemination of new research by means of visual abstracts (visual representations of a research study's abstract) at conferences and on social media (Spicer and Coleman 2022). A beginner example of infographic use in HPE could be (re)using them as learning aids, similar to tip sheets.

A more advanced example of infographic use in HPE includes having learners create infographics as an active learning strategy, synthesizing and summarizing complex information. These are used as evidence to evaluate learning, a means to provide peer teaching and/or create a resource for patient education.

There are numerous peer reviewed guides and tips that offer best practices regarding the planning and creation of effective infographics (Scott et al. 2017; Hernandez-Sanchez et al. 2021; Spicer and Coleman 2022). An infographic summarizing these tips can be found on our supporting website: https://www.onlinelearninghpe.com/.

Apart from researching, collating and synthesizing knowledge, ideas, information or data, translating this content into a visual design using graphics, images and text no longer requires highly trained technical expertise. Online infographic creation tools have multiplied in recent years and have become easier and simpler for content creation. Examples include Canva, Visme, Piktochart, Genial.ly, Easel.ly, and Infogram. Learners can begin designing with a blank page and selecting appropriate colours, fonts and layout according to their own design, or selecting a tool that provides numerous editable and reusable templates.

Irrespective of method, learners should select colour and font pairings that are accessible using tools such as https://contrastchecker.com/ or https://webaim.org/resources/contrastchecker/ and ensure images and graphics are appropriately labelled with alternative text (Part 1) in keeping with Universal Design for Learning and accessibility principles.

In the spirit of FOAM, learners can choose to encourage the use, and sharing of their infographics by assigning a creative commons license, (https://creativecommons.org) (Part 1) dictating how their original material can be shared, reused, and posted to social media.

7. Podcasting

Podcasting is a popular audio-based medium that allows for the distribution of HPE content in an on-demand and easily accessible format (Cho et al. 2017).

The educational theories behind the use of podcasting in HPE include Communities of Inquiry and Connectivism (Part 1). Learners can actively engage in the cognitive process by listening, reflecting, and applying information to their unique clinical experiences. Through transcription, hyperlinks, social media, and other interactive features, they can access content, external resources, and experts in the field.

Podcasts offer a self-paced way to access educational content at any time and place, making them ideal tools for providing "just-in-time" (Part 1) and self-directed learning. This is particularly useful for those who are unable to attend traditional classes, have long commutes or other life commitments, or for providing up-to-date clinical information (Cho et al. 2017). Furthermore, podcasts can be made available for streaming or downloading from various platforms such as SoundCloud, iTunes, and Spotify, allowing a wider audience to be reached, from undergraduate to Continuing Professional Development learners.

Beginner examples of podcasting in HPE learning include using them as:

- part of the "flipped classroom", where learners listen to podcasts as pre-class preparation and engage in active, PBL activities during class time (Cho et al. 2017);
- a tool for Continuing Professional Development, providing healthcare professionals with a convenient way to stay current on the latest developments in their field,
- a tool to allow learning to occur when visual information cannot be processed (e.g. limited access to bandwidth or data, learning while doing household chores, commuting, or during self-care activities such as exercise).

A more advanced way of using podcasts include as:

- formative assessment, allowing learners to listen to, and reflect on, their own performances during simulated patient encounters (Drew 2017),
- a tool to anonymously hear the narratives and perspectives of marginalised populations with reflection exercises.

While podcasting has many benefits as an educational tool in HPE, several challenges should be considered, including quality control and the potential for misinformation (Boreskie et al. 2022). These are addressed by using established critical appraisal scores, such as the ALiEM AIR score (Chan et al. 2016).

Additionally, evaluating the efficacy of podcasting as an educational tool is crucial in determining the extent to which the intended objectives are being met. One method for evaluating the effectiveness of podcasts is through pre- and post-test assessments (Berk et al. 2020). Another approach includes altmetrics, which measure the engagement and impact of the podcast, such as the number of downloads, shares, and views (Zhang et al. 2022). Furthermore, the incorporation of quality indicators, such as those outlined in the modified Delphi consensus recommendations, can aid in ensuring that the podcast adheres to quality standards (Lin et al. 2015).

To ensure that podcasting is used effectively in HPE, it is important to follow best practices: they should be accurate, evidence-based, and appropriate for the intended audience (Berk et al. 2020), audio quality must be high so that the podcast is easily audible (Lin et al. 2015), structure must be clear and logical and flow easily from one point to the next. Ultimately, because podcasts are a form of independent learning, they should be part of a larger curriculum that incorporates feedback and collaborative learning for deeper understanding and shared perspectives.

Further technical and practical application information is supplied on our supporting website at: https://www.onlinelearninghpe.com/.

8. Video

Similar to podcasts, multimedia with videos are increasingly used in HPE. They are an example of dual channel learning (Part 1), which uses visual (images and graphics) and auditory stimuli (narration) in complementary ways to make learning more effective (Mayer 2008). With the use of smartphones and freely available editing tools, video creation has become easily accessible to HPE (Dong and Goh 2015; Rana et al. 2017). Videos can reduce the time required to assimilate content, improve self-efficacy with procedural skills and reach a wide number of learners. As with podcasts, learners progress at their desired pace and engage in a storytelling approach that can enhance affective (feeling, emotional and attitudinal) learning goals (Part 1).

Moving beyond a beginner example of passively watching a video, we use PICRAT to move from Passive Replacement (PR) to Interactive Amplification (IA), when learners post clarifying questions on key concepts (Dong and Goh 2015). A more advanced example includes learners' creating their own videos to clarify conceptual knowledge. This moves learning further along PICRAT to Creative Amplification (CA).

In all examples, the educator should pay close attention to the duration and size of the video, considering bandwidth problems and file size. If the instruction needs to be longer, "chunking" helps collating information that cannot be fitted under 6 min (Guo et al. 2014). Narration for videos should be conversational and engaging with subtitles.

Visual interactivity, such as drawing on a digital tablet, is perceived as more engaging compared to PowerPoint slides or screen-casting (Mayer 2021). Newer forms of video creation use virtual simulation, allowing for virtual immersion of the learner in the simulated environment. Information using animations is increasingly used in patient education efforts, improving knowledge, health literacy and outcomes (Dahodwala et al. 2018; Feeley et al. 2023), and can simplify facts about diagnosis for patients with low health literacy. Micro videos (TikTok, YouTube shorts) are increasingly used in social media and explored for education. With the exponential increase of content available online, educators need to ensure the validity and quality of education, such as using the r-METRIQ scoring (Colmers-Gray et al. 2019) and be aware of copyright.

Further examples of advantages, disadvantages and practical application tips for video creation are provided on our website https://www.onlinelearninghpe.com/ and in the Appendix. It is important to remember that the planning and preparation of video creation is most of the work and should be carefully considered to avoid excessive editing after the audio and video recording has occurred.

9. Websites and content curation

We have described RLOs and how they are used in HPE, including how FOAM can redefine how we use, share and repurpose learning. However, issues such as curation, collaboration and dissemination can hinder the full potential of these tools, and websites may provide a solution to some of these problems.

There are many ways to organise, disseminate, link and collaborate around online learning resources. Some examples include YouTube, Reddit, or MedEd Portal (https://www.mededportal.org/). In this section, we focus on websites to curate, organise, link, and discuss content.

Websites can host blogs and discussion boards to support "informal and conversational dialogue on a variety of topics" (Khadpe and Joshi 2016) and provide education administrative functions (similar to basic LMSs) such as calendar of educational events, and links to resources or people. Websites are used to promote educational programs, or as ePortfolios to highlight educational scholarly work or portray a learner's educational journey. Add-in (plug-in) features such as social media integration, allow seamless dissemination of current information to subscribers. Lastly, eModules can be hosted on websites created using software such as Articulate Rise, Storyline, Captivate, Adapt, dominKnow, or H5P (such as the Preceptor Education Program https://preceptor.ca/ or Supplementary Emergency Medicine Experience https://www.semedfcm.com/interactive-online-learning-modules) to provide interactive learning.

Educators may wish to follow websites, contribute to peer-edited websites or develop their own. There are

published quality indicators for blogs (Paterson et al. 2015) and best practices for website curriculum design (Sisson et al. 2010; Youhasan et al. 2022). We have created a sample website summarizing these tips at: https://www.online-learninghpe.com/.

There are many website creation tools, such as Wix, Squarespace, Google Sites and WordPress that cater to a wide range of users from beginner to advanced. A beginner example may be learners creating ePortfolios to contain reflection exercises, curation of learning resources or a skills log. These portfolios can help supervisors assess learners' progress and gain a snapshot of learners' levels of training.

More advanced example of websites include FOAM websites such as *Life in the Fast Lane* https://litfl.com/ or *Academic Life in Emergency Medicine* https://www.aliem.com/ which, similar to journals, utilise the expertise of multiple authors and editorial teams, and allow for free, open source and rapid dissemination of practical topics. This level of successful website requires a commitment to constantly maintain and upgrade materials, keeping content relevant, and upholding standards and processes for content curation, ethically-sourced materials and peer reviewed, valid, trustworthy and reliable information.

We now turn to social media, which, using FOAM principles, can help disseminate and provide opportunities for feedback and collaboration with RLOs.

10. Social media (SoMe)

In recent years, there has been a growing interest in the utilisation of SoMe in HPE, as more HP educators have recognised the advantages and opportunities that these platforms can offer (Chan et al. 2021; Lu et al. 2021).

In the spirit of Connectivism (Part 1), SoMe provides a platform where all components of the HP educational ecosystem can interact, collaborate, connect, share ideas, resources and participate in the discussion (Chan et al. 2021; Lu et al. 2021). More importantly, SoMe plays a central role in societal connections in Generation Z and Alpha. If HPE want to fulfil learners' expectations, it is imperative to use SoMe as a strategy to meet learners where they are.

SoMe is used to create and share RLOs, making it an effective tool for content curation, knowledge translation and dissemination (Chan et al. 2020). We encourage HP educators to define the goals of the learning experience and then commit to understanding and using one or two platforms such as Twitter, LinkedIn, Instagram or TikTok to enhance instruction. In some vanguard institutions, academics use SoMe to promote research, increase citations and altmetrics nurturing new avenues for digital scholarship and tenure (Luc et al. 2021).

By allowing learners to actively construct their own understanding of different concepts and by highlighting the importance of self-directed learning, both Constructivism and andragogy learning theories are at play when using SoMe in HPE (Taylor and Hamdy 2013; Sandars et al. 2015).

While SoMe is a powerful connecting tool in HPE, professional and ethical concerns need to be considered. Lack of regulation and oversight can lead to the spread of misinformation, cyberbullying and privacy concerns for educators, learners and patients alike (D'Souza et al. 2021). HP educators should be aware of these concerns and take steps to address them by creating guidelines for the use of social media in learning environments and by providing training to HPE peers and learners on how to use social media safely and responsibly (D'Souza et al. 2021).

SoMe can be a source of distraction and can negatively impact learner engagement (Cheston et al. 2013). Furthermore, the evaluation of the effectiveness of SoMe in the classroom and conferences is difficult, particularly since use can only be optional due to its public nature. If a HPE experience requires a more closed forum for discussion and evaluation purposes, discussion boards or forums may be a better choice, and are explored next.

11. Online discussion forums

Online discussion forums are virtual venues for facilitating discussion and information exchange among educators and learners. They enable engagement through open dialogue, questioning, resource sharing, and collaborative projects. Forums complement traditional and online synchronous classroom settings by facilitating ongoing communication through Interactive Amplification (PICRAT) beyond class time, allowing for individual reflection and research of ideas. They enable communication and collaboration among geographically disparate individuals attending online classes, promoting social connectedness and fostering a sense of community for learners who may otherwise feel isolated (van Lankveld et al. 2021).

Although most LMSs contain discussion forums, HP educators may wish to expand beyond the LMS confines. A beginner use of a discussion forum may be a closed Slack channel to discuss reflections after a lecture or module on socioeconomic impacts on health outcomes. Slack (and others, such as Circle or Microsoft Teams) offer opportunities for asynchronous discussion, file sharing, and integrations with other tools through its organised channels and direct messaging features. Other tools used to share ideas and resources, collaborate, and reflect include Padlet, Wakelet and video blogging with Flip.

To optimise the use of these platforms, HP educators should establish clear guidelines and expectations for learner participation, regularly monitor discussions to ensure topic relevance and accuracy of information, while encouraging peer feedback and support to improve the learning experience (Rovai 2007) (Part 1: Asynchronous Learning).

A recent study by van Lankveld et al. (2021) examined the use of social media in HPE and found that privacy and security concerns were a major concern among teachers. Public discussion boards such as Reddit have additional concerns around privacy and security, particularly when sensitive or confidential information is shared online.

A more advanced use of online discussion forums is virtual Communities of Practice (VCoP), rooted in Lave and Wenger's community of practice (Wenger 1998). VCoP have a common goal: use existing knowledge/resources of the group, and work together while acquiring and refining new skills and building relationships among community members. While theoretically powerful in its ability to connect communities independent of geography and time zones, VCoP can be difficult to establish, and to maintain. Discussion forums are one way to establish a VCoP, but need well-defined, jointly-negotiated, and

useful community goals, and maintenance of relationships to retain members' returning and contributing to discussions. Developing a VCoP around educational scholarship is an example of an advanced way of using discussion forums (Yarris et al. 2019).

Related to discussion forums are newsletters discussed in Appendix 3.

Online discussion forums and newsletters are a simple yet powerful way to connect learners and promote social and collaborative learning, which is discussed in the following section.

12. Online social and collaborative learning

Online social and collaborative learning may negate some of the challenges of online learning such as social isolation, screen fatigue, self-regulation, engagement, interactivity, and feedback. Although it may not come as naturally as in F2F environments, it is even more important to carefully design, explicitly facilitate, and cultivate a safe environment for learning.

12.1. Online collaborative learning (OCL)

OCL has been defined as "an interdependent and democratic online group process grounded in constructivist pedagogy in which students debate and reflect on shared knowledge, to construct new understanding of relevant information" (Breen 2013).

Different from cooperative learning, where learners work on independent parts of a larger project, OCL requires negotiating ideas together to construct creative solutions to problems they could otherwise not have accomplished on their own. This leads to improved higher order thinking and teamwork skills which are essential in HPE (Breen 2013).

An introductory use of collaborative tools may be to use Google Docs in breakout groups to co-create answers to questions which are shared and discussed with the larger group. A more advanced use of collaborative tools may be to use Twitter to create a virtual community of practice (VCoP) (Yarris et al. 2019). See Appendix 4 for contexts, methods, tools and considerations in OCL.

OCL, when compared to online individual learning in HPE, has been shown to increase understanding of diverse perspectives and real-world learner problems and solutions, stimulate external motivation to learn, and produce richer learning outcomes, however learning is more complex and requires compromise of individual learning objectives (MacNeill et al. 2014). Knowledge transmission or simple problem solving is likely more efficient when done individually online, however more complex and deep learning is best achieved by OCL.

OCL can feel uncomfortable and contradictory to traditional assessment strategies that promote individual performance. Conflict resolution can be difficult when social cues are diminished in text- or video-based environments. OCL can also be frustrating for group members if one learner has poor self-regulation of learning. Therefore, pedagogical design of online collaborative learning should reward group interaction, negotiation, open communication and conflict resolution, while still providing a safe learning space to share and connect with others.

12.2. Online Social Learning

Social learning is often neglected as an important educational outcome (Allen et al. 2020), and Online Social Learning is often not explicitly incorporated into curriculum planning. Figure 4 highlights some of the benefits of Online Social Learning to consider, and Figure 5 showcases methods and tools that could be used to achieve them.

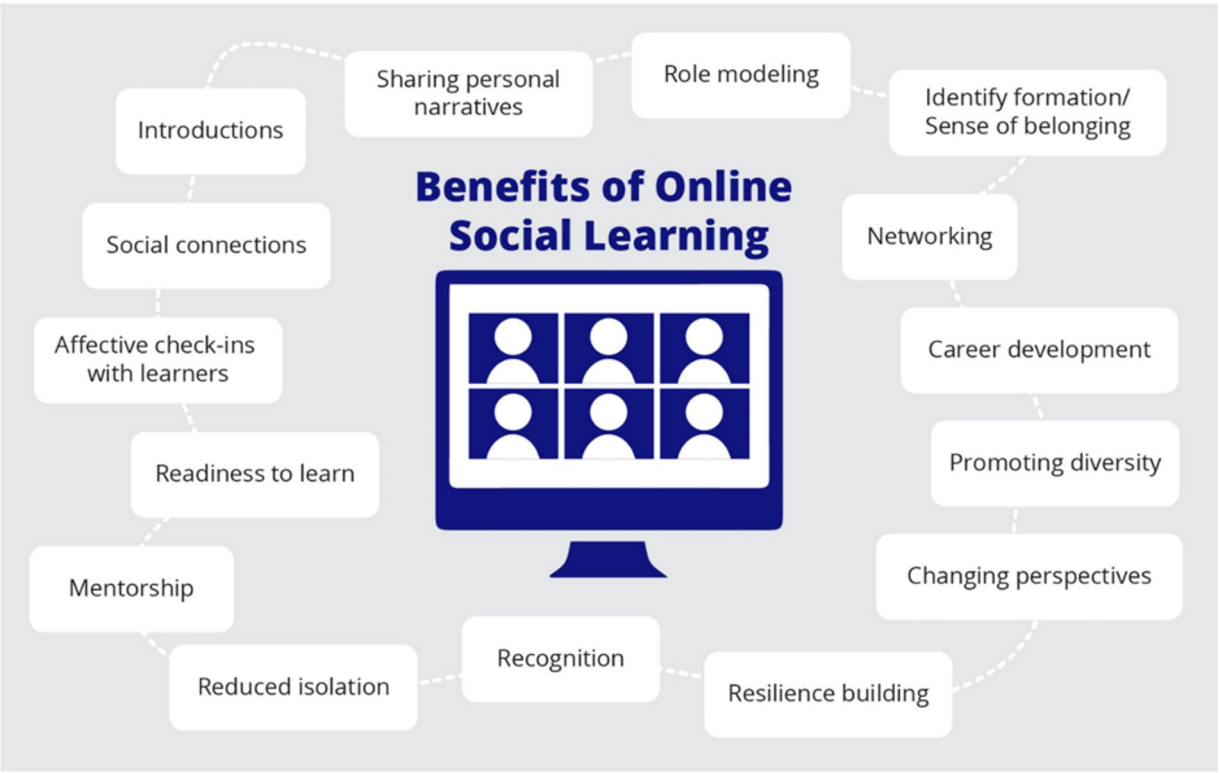

Figure 4. Benefits of online social learning.

Social/collaborative learning outcome	Method	Tool
Introductions, social connections	Video discussion board to create social presence online Use flexible virtual meeting spaces, where you can "wander" and meet/ learn about others	Flip Wonder.me, Gathertown
Affective check-ins with learners, readiness to learn	Visual/artistic representation or annotation of image that represents their current motivation 	Miro, Annotation and Whiteboard in Zoom, Avatars
Mentorship	Synchronous meetings, brainstorming, concept mapping	Zoom, Google Docs, Miro, WhatsAp
Sharing personal narratives	Podcast, video, discussion board	Apple podcasts, Google podcasts, Flip, Slack
Role modeling	Virtual simulation	Zoom, GatherTown, Second Life, Slack
Identity formation/ sense of belonging	Virtual community of practice (VCoP)	Slack, Twitter
Networking, career development	Open microblogging, VCoP Virtual flexible synchronous meeting spaces Networking during online conferences	Twitter, LinkedIn Wonder.me, Gathertown Conference Management Software
Promoting diversity, changing perspectives	Closed and anonymous facilitated discussion board	Slack, Discussion Board in LMS
Reduced isolation	Virtual sharing of anonymous cases	Figure 1, Zoom , Project ECHO (https://hsc.unm.edu/echo/)
Resilience building	Peer support	Slack, Twitter, Flip
Recognition	Digital badges, upvoting of conference posters	Credly, LinkedIn, Conference management software

Figure 5. Examples of methods/tools to obtain select social learning outcomes.

In conclusion, online social and collaborative learning are essential to meaningful and deep learning and help to negate disadvantages of online learning, although sometimes requires more time for group processes and careful curriculum planning.

These ideas, and those in the previous sections, form a background from which to move into more sophisticated tool usage, especially in the clinical environment. We will cover these in the next sections.

13. Virtual care teaching

In Part 1, we reviewed the concept that online learning at its core is just learning, with the caveat that we need to consider designing our instruction differently to reveal the full potential of online and blended learning. We now turn our attention to teaching in virtual care environments, keeping in mind these same principles.

Definitions of Virtual Care Teaching (VCT) are varied (Stovel et al. 2023), but here we will define it as teaching about how to provide patient care in virtual environments including *via* videoconferencing, telephone, remote monitoring or asynchronous patient communication. Learners may be in the same physical space as their supervisor or remotely located, and teaching may include bedside ("webside"), clinic or informal teaching.

Good VCT should incorporate the same principles as good clinical teaching (e.g. feedback, formal and informal dedicated teaching, graduated autonomy, and mentorship), while thinking differently about how virtual environments

can be optimised. A competency-based approach (Stovel et al. 2023) may help to guide VCT.

Many resources outline practical tips for integrating learners into virtual care within a formal curriculum (Hovaguimian et al. 2022; Noronha et al. 2022). A scoping review on learner telemedicine curriculum needs found that curricula that included both practical application and multimodal teaching opportunities were more successful (Stovel et al. 2020). Using blended clinical teaching options may provide both care and teaching opportunities not afforded otherwise, with increased flexibility and accessibility options for patients and learners in dispersed or remote locations.

Anderson et al. (2022) employed the Replace-Amplify-Transform (RAT) model, which PICRAT (Part 1) builds upon, to examine experiences of postgraduate medical education learners and supervisors in telehealth during COVID-19. Like the pivot to online learning, initial telemedicine experiences "replaced" F2F clinical training, and were challenging due to different knowledge, skills and communication required. However, as the learner-supervisor dyad evolved, technology amplified the experience. This included supervisors' turning off their cameras to promote learner autonomy during the patient encounter, and development of new or honed skills, such as virtual history-taking. Some found technology transformed learning, including getting exposure to patients with disabilities that precluded in-person visits, questioning F2F ways of learning and practicing, and forcing feedback to be more explicit, systematic, and prioritised.

Other benefits and challenges of VCT and learner considerations are summarised in Appendix 5, and should be considered when designing VCT experiences.

14. Online simulation and virtual patients

In the previous section, we explored the importance of educating learners in VCT. Here, we explore virtual environments to practice skills and learn from errors prior to clinical exposure.

Online medical simulation (OMS) in HPE is defined as the use of digital technologies to simulate clinical scenarios. This provides learners with a safe and controlled environment to practice realistic patient care scenarios without the risk of harming real patients. OMS can be synchronous or asynchronous, and include virtual patients and environments that allow learners to practice clinical skills, decision-making, and communication skills (McGaghie et al. 2010; Cook et al. 2011; Kononowicz et al. 2019).

OMS provides many advantages including:

- flexibility and convenience for learners to practice at their own pace, schedule, and skill level (e.g. asynchronous virtual patients);
- instant feedback which helps learners reflect and adjust their approach;
- the ability for procedural skills training of high-risk procedures without compromising patient safety;
- tailored scenarios depending on the decisions learners make, lessening the time to master a skill or procedure, and
- standardisation of training due to inconsistencies in patient exposures and clinical sites during clinical teaching.

Using the ADDIE model and COI framework (Part 1), the design and development of interactive online simulation experiences allows training on basic skills, such as interpreting vital signs, medication management, or communication skills, to more complex procedures, such as surgical interventions or emergency response.

The use of Virtual Patients is a type of OMS that uses interactive simulations to provide a realistic experience of caring for patients in a variety of clinical situations (Liaw et al. 2014). Virtual Patients can simulate various conditions, from simple to complex, allowing learners to practice their skills and decision-making abilities, especially for rare or complicated conditions difficult to replicate in F2F clinical simulations (Kononowicz et al. 2019).

14.1. Instructional Design for OMS

OMS should include realistic scenarios with interactivity, immediate feedback and repetition to improve clinical reasoning and decision-making skills. Using the principles of Cognitive Theory of Multimedia Learning and Universal Design for Learning (Part 1), designers include text together with illustration, diagram, video, or animation. OMS should be customisable to the specific needs, experiences and different levels of learners. A novice learner may need more guidance and medical information with immediate feedback provided during simulation, with easier decision-making tasks compared to a more advanced learner, where the simulation would advance quicker with less information, and multiple branching decision points. OMS also provides an opportunity to design and model learning experiences with diverse patients and inclusive language.

Similar to blended learning, OMS can be combined with F2F teaching to improve outcomes compared to using either delivery method alone. For example, online simulation can prepare learners in a psychologically safe environment prior to F2F group simulation activities. Appendix 6 (Table 5) provides examples of technologies used for OMS and Virtual Patients.

In summary, OMS in HPE has the potential to improve patient safety and outcomes, enhance learners' skills and confidence, provide standardised educational experiences, and reduce the cost and risk associated with F2F clinical training. Next, we will explore extended reality as other safe and standardized solutions in HPE.

15. Extended Reality

Extended reality (XR) is an umbrella term used to describe immersive technologies that merge physical and virtual worlds (VW). In essence, these technologies extend the reality we experience and can simulate real-world environments, objects, and events in a digital context. They include virtual reality (VR), augmented reality (AR), and mixed reality (MR), all of which are rapidly developing with the potential to transform HPE. Appendix 7 shows the types of XR technologies and levels of immersion.

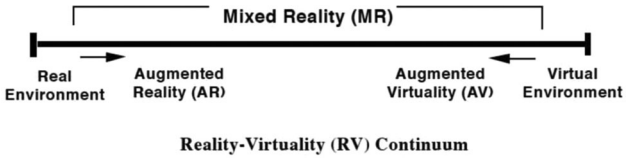

Figure 6. Reality-Virtuality Continuum (Adapted from (Milgram and Kishino 1994)).

Figure 6 shows an adaptation of the Reality-Virtuality Continuum by Milgram and Kishino (1994). XR includes MR and VR to the far right of the continuum.

XR provides educators and designers with the ability to create immersive and realistic learning experiences. For example, medical students can practice performing a surgery without the need for a cadaver or patient, reducing the risk of error or harm (Parsons and MacCallum 2021).

XR helps learners develop essential skills such as communication, teamwork, and problem-solving in high stakes environments. In addition, XR enables learners to simulate situations that are too dangerous, costly, or logistically challenging to replicate in real life, enabling them to experience similar levels of stress as in real-life scenarios (Kaplan et al. 2021). For example, a learners can practice working as part of a team during a simulated emergency scenario, enhancing their ability to communicate effectively and collaborate with others in a high-stress environment.

As discussed in Part 1 and in the section on Learning Management Systems and MOOCs above, Connectivism indicates that learning is not solely an individual activity, but rather a process that involves making connections with others and with information sources to acquire knowledge and skills. XR technologies provide learners with immersive, interactive learning in team environments that encourage collaboration, the exchange of knowledge, and the opportunities to find and filter information, make connections, and adapt to change.

Creating high-quality XR experiences can be expensive, and not all educational institutions have the resources (financial and technical expertise) to invest in such technology. Additionally, the need for specialised equipment such as VR Head-Mounted Displays can be an obstacle for some learners and institutions. Another challenge is the lack of empirical evidence supporting the effectiveness of XR in health professions education (Logeswaran et al. 2021). Although there are numerous anecdotal reports of improved learning outcomes, there is limited research on the impact of XR on knowledge retention and skill acquisition (Gerup et al. 2020; Zhao et al. 2020).

15.1. Practical applications of XR in HPE

When educators choose to apply XR to their delivery of educational experiences, it is important to explore the following factors: technical expertise, time, budget, scalability, level of control, configuration and maintenance, availability of suitable XR learning content, pedagogical alignment, security and privacy, output tools and the degree of immersion that is to be achieved (Meccawy 2022). Keeping this in mind, the application of XR should be used because the technology is appropriate for the learning objectives and must be leveraged for where it is most useful. An example for a novice learner may be using a Microsoft Hololens AR/MR headset for anatomy education. With more advanced learners, they can be fully immersed with a VR Head-Mounted Display performing a medical procedure with haptic feedback as they perform various procedural skills. See Appendix 7 for other applications of XR in HPE.

OMS and XR can offer unique opportunities for promoting equity, diversity, inclusion, and accessibility (EDIA) in HPE. They can be designed to promote EDIA by incorporating diverse case scenarios, learner avatars, cultural contexts, and diverse patient partners as part of the design and content creation team. This can help to ensure that learners are exposed to a wide range of experiences and perspectives, which can foster greater understanding and empathy for people from different backgrounds.

XR offers an exciting potential to transform HPE, but given the significant resources needed to develop these XR educational experiences, collaboration and digital scholarship is essential, as covered in the next sections.

16. Digital Scholarship

Digital Scholarship has different meanings and definitions (Raffaghelli 2017), including ways we research and disseminate using technology, how we develop our digital professional identities, collaborate with digital networks, and teach using new technology enhanced approaches such as learner centred, participatory, collaborative, and open access methods.

For the majority of academic HPE institutions, the use of digital scholarship for academic promotion is a new concept, and may not fit into the traditional domains of clinical care, research and education (Johng et al. 2021).

The concepts of digital scholarship (open, networked, collaborative) can be at odds with traditional institutional views of scholarship (siloed, individualised). In addition, there is limited literature to guide faculty development in digital scholarship such as frameworks or competencies required, institutional strategies or policies and resources and activities to promote digital scholarship development (Raffaghelli 2017), although some consensus guidelines are available (Sherbino et al. 2015; Husain et al. 2020).

Some institutions have accepted digital scholarship and updated their promotion and tenure policy (Johng et al. 2021), but the majority have not. This behaviour overlooks important contributions made by faculty, and may lead to widening of the digital divide between faculty and learners, and the stigma of using digital platforms to disseminate scientific information to peers and the public. For example, use of Social Media to promote research has also shown to significantly increase citations and altmetrics (Luc et al. 2021), so, if institutions are not nurturing appropriate use of Social Media in academics, they may be missing an opportunity for substantial impact.

The challenge of how to quantify and compare digital scholarship contributions for promotion and tenure remains elusive. Using SoMe as an example: is it more important to have followers (influence) comments/retweets (impact), or reach community needs (advocacy, innovation and resources)? How do these numbers compare across various forms of social media such as Twitter, YouTube, Instagram or TikTok? The same comparisons can

be made for multimedia materials such as podcasts, videos or websites.

One way to negate this challenge is by using metrics (such as altmetrics) (Luc et al. 2021), creating portfolios of digital scholarship (Goh and Sandars 2019) and using well-defined criteria for defining scholarship as above.

Digital scholarship may also help us move away from subjective learner feedback surveys for teacher promotion, to more objective methods of evaluating teaching effectiveness, such as multi-source data on changes in learner online summative and formative assessments, digital analytics (e.g. time spent watching videos or number of posts on discussion forums), and portfolios of learners' created artifacts or learning reflections. Care, however, must be taken to ensure that one does not merely chase numbers, but that one is mindful of the educational processes and theory behind the activities. So far, we have journeyed through a wide range of existing ideas, scenarios and tools. Newer possibilities are always on the horizon, and, in the next section, we try to peek over that horizon.

17. Emerging trends in online education

We end this guide with look to the future. Predictions in educational technology are difficult, but some trends are receiving increased attention; we raise these ideas so that readers may consider future possibilities. As educational technology is a rapidly evolving field, we also suggest readers also refer to ongoing annual reports such as Educause Horizon Report (Educause 2022), or the Changing Landscape of Online Education (Garrett et al. 2022).

- *Artificial Intelligence* (AI): AI in HPE is still being explored (Rampton et al. 2020; Randhawa and Jackson 2020; Masters 2023). At this stage, most educators are aware of AI, and institutions recognise a need to teach the concept, and are training their learners to use AI systems. The recent launch of ChatGPT and other publicly available AI systems indicates that AI in HPE will receive great attention, but ethical use by both learners and the institution need to be addressed (Masters 2023). AI has far-reaching implications for accessibility, assessment, multisourced learner and teacher feedback, adaptive teaching, and individualised or personal (yet standardised and automative) training, and is important for models such as competency-based training, patient-case scenarios, workplace assessment and promotion, and curriculum design (Educause 2022). When combined with other sophisticated tools, such as virtual patients, the possibilities are even more profound.
- *Dominance of blended or HyFlex*: Within a few years, these modes may dominate in education, with a minority of learners receiving fully online or F2F learning (Garrett et al. 2022).
- *Micro-credentialling:* According to Garrett et al. (2022), higher education is shifting towards "more flexible, modular and personalized learning experiences". This is also in keeping with HPE shift towards competency-based education, learner centred, life-long and workplace learning. Stepwise, digital badge use has shown "growing momentum" and "evidence for learner-centred, competency-based model of medical education" (Noyes et al. 2020). Badges typically include metadata outlining training, assessments or requirements completed, typically of non-formal or extra-curricular experiences, which is easy to share and access. This may foster a shift from traditional grade and classroom-based models to diverse skills sets and experiences of self-directed HPE learners.
- *Planetary Health and EDIA*: These concerns will increase in prominence, and decisions regarding travel and F2F courses and conferences will need to be considered (Goshua et al. 2021; Windrim et al. 2022). Similarly, issues of accessibility (Masters et al. 2022) will continue to grow, especially as the imperative to diminish differences between the Global North and South continues.
- *Increased skillset*: As forms of online teaching and learning become the norm, teachers' skillset will need to grow to meet this need. Faculty development will be essential to the development of these contemporary educator competencies.
- *New positions*: For more specialised tasks, new positions, such as community-manager (in charge of social media and discussion forums), digital content production expert and others may also evolve.
- *Full immersion virtual reality (VR)*: Full immersion VR holds some promise for HPE. Although all education could benefit (Schott and Marshall 2020; Upadhyay and Khandelwal 2022) clinical teaching could have specific value of realistic simulation without compromising patient safety.
- *New theories and greater flexibility***:** new theories allowing greater expansion are emerging and required (Downes 2022), and a shift from the LMS to portals, or the Learning eXperience Platform (LXP) (Isaías 2018; Foreman 2022; Valamis 2022). This will place greater control of learning in the hands of the learners, as they seek education that is modular and allows for personalised learning with badges, and other micro-credentials. Sites like Merlot (https://www.merlot.org/merlot/) further encourage faculty and learners to expand away from the LMS.

18. Conclusion

As is apparent from Part 1 and Part 2 of this Guide, the field of online learning in HPE is vast and rapidly changing. In this Part, we have attempted to complement the foundational focus of Part 1, with a discussion of tools and techniques at the disposal of HP educators. In discussing each tool, we have attempted to demonstrate how its use completes the promise of online theories; showcasing a wide range of implementation considerations, based on reader expertise, prior knowledge and experience, in order to benefit all readers, from novice to advanced. In many cases, we have supplemented the discussion with further information in the appendices and the supporting website https://www.onlinelearninghpe.com/.

We believe that the result is a comprehensive overview to help guide all those who wish to effectively use and transform online learning in Health Professions Education.

Because of the changing nature of the topic, a single document will never be the last word, but we believe that this is the first of many steps on a worthwhile journey.

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