Chapter 3
Learning Resources Development for Medical and Health Professions Education: The Challenges from Low Cost Materials to Modern Technology

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Abstract Countries that hold wide power-distance / socio-hierarchical cultures are mainly developing countries. They may have similar geographical characteristics, and various natural resources are available instead of high technology. By having adequate comprehension of the trends of the 4.0 era, in which digital information and app-based learning are prominent, we should not neglect that health professions may make the maximum use of the natural resources to develop appropriate learning resources for health professions education. Many international studies reported the effectiveness of simulated-based learning by integrating simulated patients with mannequins, for example, for the intravenous line insertion skills. In this kind of context, the mannequins can be replaced by available natural resources, affordable, fun, and more effective in diverse simulated practices and empowering the local community (community-industry). Teachers and students can also reproduce by themselves and will not be dependent on high-fidelity technology. This chapter will provide examples of natural resources and learning resources, one which received intellectual property rights and has been widely promoted in the health professions-education in the rural and remote areas.

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3.1 Introduction

Four themes of curriculum development

Technology has been changing rapidly in the last few decades. Various forms of information delivery have been promoting flexibility and convenience for consumers. Global network connectivity has enabled an individual to search for adequate knowledge from different parts of the world seamlessly. Furthermore, the healthcare system's development is as rapidly as novel medical devices to support essential services (Frenk et al. 2010).

Future society expects current educators to shape medical and health professionals proportionally. In terms of modernization, students are equipped with sophisticated learning media that nurture the academic atmosphere. Readiness, communication, collaboration, and ethics were several essential skills to be mastered among twenty-first-century learners. Coronavirus Pandemic has obliged campus to adapt with information technology to address the emerging challenges on top of this demand. Following trends of medical education and global development, four themes need to be considered for future curriculum development: the patient safety, competency-based education, community-based education, and the advance technology (Han et al. 2019).

First, in this chapter we will discuss the learning resources related to the patient safety practices with a humanist approach to motivate and facilitate collaboration. Previously, patients care was dominated by medical intervention, which focused on the doctors' centered care. This phenomena are common in a hierarchical and collectivistic context (Claramita et al. 2013). Shifting paradigm and practice that includes active patient participation leads to better overall health outcomes. Patient centered care (PCC) well-known terminology is introduced to allow patients to participate in decision-making and respect individual autonomy. PCC requires meaningful communication between providers and patients. More health professionals are involved in the care delivery resulting in increased patient recovery along with satisfaction (Green and Johnson 2015; Interprofessional Education Collaborative Expert Panel 2011; Nguyen et al. 2018). The medical curriculum should empower interprofessional education where multidisciplinary approach and collaborative practice were trained in the curriculum.

Secondly, we will discuss global medical education endorsed competency-based education, facilitating early clinical exposure in interprofessional, longitudinal, and integrated clerkships. Medical and health profession students frequently experienced anxiety and a lack of confidence during their first clinical encounter. Barriers include communication gap, inadequate patient information, and less proficiency in performing clinical procedures identified daily. Despite students already practicing in the pre-clinical setting, the first time applying knowledge, skills, and attitude to the actual patients is complicated. Early clinical exposure in medical and health professions education is successfully improved students' confidence, clinical reasoning, and interprofessional communication (Khabaz Mafinejad et al. 2016; Widyandana et al. 2012). The early exposure in the context of hierarchies and collectivistic should

emphasize on the delivery of constructive feedback and students' reflection. Again the two-way dialogue between students and teachers should be promoted since early medical education, especially in these cultural context.

Third, implementation of community-based education (CBE) is necessary to balance student exposure with the hospital setting. Students in the community setting were challenged to identify public health needs and recommend alternative solutions. Apart from being the driven solution, students are expected to empower the community and families to participate in the idea generation and decision-making. As the solution associated with public health outcomes, the community acts need to be developed in various methods, including participatory action research or participatory rural appraisals (Kakar et al. 2020; Ruszczyk et al. 2020; Smit et al. 2020). A more student-centered learning (SCL) should lead to a more patient-centered (PCC) and community-oriented empowerment. Both SCL and PCC have the key to inviting participations of the learners in the process of learning and decision-making. CBE was found to provide long-term benefits for society health at the time of adequate community participation (Diab et al. 2013). Along with the CBE program, students should be trained with a 'low-cost' learning resources that can easily be found nearby the community settings. Students can also facilitate the community to comprehend health problems via easy and understandable illustrations.

Fourth, we will discuss that students are facilitated with advanced technology that enables social interaction and promotes independent learning resources. Modern technology in medical and health professionals has been able to answer nurturing cognitive and skills learning. In the learning process, information and technology also assist college educators in establishing objective assessment and evaluation. Therefore, diverse technology applied in the learning activities sparks student interaction, which connects them to the educational outcomes. (BERGER 2016; Council for Adult and Experiential Learning 2013; Herold 2016; Lassnigg 2015; Makulova et al. 2015; Wallenstein et al. 2010). Students in the hierarchical and collectivistic culture are usually come from the southern hemisphere or developing countries. Lack of information technology facilities is challenging in this regard. However, the advance technology in information has been the main resource to connect people, even more during the pandemic in 2020 where most of the classes are nowadays online.

3.2 Patient Safety in a Collaborative Learning Environment

Over the past decades, patient safety in healthcare services has remarkably improved. However, this principle still needs to be enhanced across the medical, nursing, and health profession educations (Fereidouni et al. 2019; Gordon et al. 2017). Undergraduate and postgraduate education are promising to create safer and more reliable health care in the future. The patient safety initiatives are established in the diagnosis and treatment, prevention and rehabilitation, and care delivery. Common causes

of errors should be periodically identified, accident reporting system initiated, and various approaches highlighted for the safety culture.

Collaborative practice is presumably accepted due to the importance of a professional team-based approach for care delivery. Beginning with education; collaboration has been particularly identified as an enabler toward sustainable healthcare models. The practice suggested overcoming barriers, increasing specialization, and professional behavior. Collaboration breaks out a traditional system into a connected car service.

The function of learning resources for teachers is to direct all educational activities and set of competencies that should be taught to students. For students, learning resources offer guidance in the course of study whilst defining specific goals, skills, knowledge, and competencies. In terms of student evaluation, learning resources measure both educators' and learners' performance as it delivers valuable feedback for future improvements (Hagemeier et al. 2014; Lopreiato and Sawyer 2015).

Relevant teaching materials include instructions, objectives, assistive methods, links to external resources, exercises, evaluation, and feedback to grading (Littlejohn et al. 2008; Mazgon and Stefanc 2012; Roffey 2007). Several functions that learning resources serve are (1). increase learning productivity, (2). encourage and support individual learning, (3). provide more scientific foundation of learning, (4). engage learning processes, (5). present actual learning opportunity, and (6). extend broader learning possibilities.

Learning material should be produced wisely. Various considerations should be taken prior to learning outcomes establishment and type of the learning resources. A comprehensive understanding of vital principles is necessary to ensure the effectiveness and relevance of the learning resources. Five main characteristics of learning materials including self-instructional; self-contained; standalone, adaptive, and user-friendly (Bušljeta 2013; Maile 2018; Gagne et al. 2005; Horton 2006).

Patient engagement in medical and health professions is fundamental. Simulated and real patients are useful in teaching knowledge and skills with positive outcomes for both parties (Fejzic and Barker 2015; Smithson et al. 2015; Sorce and Chamberlain 2018). Patients diagnosed with chronic illnesses can be considered as an expert individual who can bring their illness experience and teach emotional, psychological, social, and economic aspects. Traditionally, patients have been actively involved in clinical teaching and assessment, often achieved by the standardized patient. This simulation aims to bring patient voices into the education regarding the illness and its impact on patient lifestyle, personal and psychological well-being, and socioeconomic aspects.

Simulated patients (SPs) are an established education component, training, and further education in national and international health care. The specially trained actors credibly take on patients' roles and other functions in the healthcare system to facilitate teaching and examining medical education scenarios. First developed by Howard Barrows in the 1960s for neurology, the method is now used world-wide across the whole range of health professionals (May 2008; Sommer and Thrien 2019). One of the reasons for this wide adoption in medical education is its methodological advantages compared to real patients.

However, engaging patients in the preparation of medical and health professions education requires stronger partnerships between patients and institutions. Patients should be involved in the decision-making process. Adequate patient involvement enhances patient care, satisfaction, treatment adherence, and long-term health outcomes (Fell et al. 2017; Khuntia et al. 2017; Wilhite et al. 2019).

In the context of hierarchical and collectivistic culture, obtaining patients' feedback is uncommon. If there is a 360° feedback, the rating is usually used but forgetting the feedback for improvement. Patients in these cultural contexts are hesitated to provide feedback or comments to their doctors, so patients usually rate better ranks (i.e. 8 or 9 as a socially desirable answer) of 10 point-scale. As explained in the first two chapters that dialogue between teacher-student is rare and so is between doctor-patient. Therefore, the reflection of feedback should be emphasized in the use of real patients or simulated patients as learning resources for medical and health professions education in the cultural context of this edited volume. More about clinical education with real patients as learning resources will be discussed in Chap. 4.

3.3 Competency-Based Education Enhance Student Centered Learning

Competency-based medical education has been established as a successful learning model, especially in developing countries, and is increasing in gaining popularity in the global society. This educational model is intended to train students to become efficient graduates who work to take care of diverse clients in health care (Design 2015; Elsevier Education 2014; Galloway et al. 2016). Previously, it was known that education mainly concerns with intellectual aspects. Whilst medical and health professions are required to provide services and fulfill patient needs, necessary clinical skills are less likely to be trained in adequate ways. In the last decade, healthcare providers' soft skills have been strengthened in relation to communication, provider-patient relationship, and professional behavior.

Competence-based education proposes fostering students' ability, not only in the knowledge acquisition but also in skills performance. Healthcare providers are expected to perform various skills successfully and efficiently (Chongloi et al. 2017; Toader 2015). Thus, practice at the educational level is mandatory. Inevitably, the higher education institution needs to develop an approach to ensure that students are mastering essential competencies to meet patients' need in different care levels.

In terms of learning outcome achievement, time-based training promises a more beneficial end result for students (Balasooriya et al. 2013; Rawekar et al. 2016). This endorses the utilization of appropriate learning resources which are widely available, both natural and artificial. Numerous resources can be used to enrich the learning experience such as 'living learning resources', including simulated patients and peers. The implementation of such learning resources dominate in the life-science majors, including psychology, medical and health professions education. On the other

hand, human learning resources depicted in business and economics studies portray consumer behavior and preference.

As there are several skills that embody invasive procedures, competency-based education ensures that the environment is safe and sound. In a controlled skills laboratory, students are enabled to perform different procedures ethically and responsibly. While advanced devices and existing tools are available to support learning, simulations such as standardized patients or simulated patients are increasingly applied in the health sciences.

A simulated patient (SP) is a well-trained individual for educational purposes. SP is responsible for simulating a set of symptoms, problems, or attitudes based on the scenario. Learners are expected to perform a wide range of skills, such as communication, physical examination, and professionalism. In medical and health professions education, learners are encouraged to learn clinical reasoning and critical thinking as a basis for therapy. Moreover, peers are also a potential learning resource. Peers can work as simulated patient or a teacher. As a teacher, peers are able to facilitate student's learning (Havnes et al. 2016). Fellow students' advice and constructive feedback function as formative assessments. Learning with appropriate peers enable students to motivate each other. Peers' existence embraces a sense of understanding and familiarity between students and nurtures learning in a safe and comfortable environment.

In a complex world of health care, current challenges, bewildered by the double or triple burden of diseases, well-established teamwork produces a collaborative practice to accomplish a common goal. Traditionally, most of the work is presumably completed by a single profession, whereas current significant tasks are completed by a group of healthcare professionals, and many of them involve leading care providers. Today, Interprofessional collaboration is recognized as an essential skill to achieve effective and meaningful results. Diversity among the team members brings multiple individual and professional perspectives into the practice. This practice creates more comprehensive efforts than individual work, producing more significant knowledge. Knowledge generation is higher when students are working collaboratively, which is appreciated as a key ingredient for success in today's global health care.

Competency-based education can foster students' creativity. An innovative and creative outlook is required for personal and professional success in this modern day. Creativity and innovation are closely related to the other global skills. Innovation in this era involves adaptability, leadership, teamwork, and interpersonal skills to build upon fundamental skills. Today, innovation capabilities are linked to connecting with others and enabling concepts sharing through collaborative practice and excellent communication. The nature of a learning environment promotes creativity among students, especially when low-cost material exists and demanding the utilization of available resources into the healthcare services (Takase et al. 2019; Widyandana et al. 2011).

3.4 Community-Based Education in Low-Cost Setting

Community-Based Education (CBE) has many benefits both for learners and the people in the community (Claramita et al. 2019; Lee et al. 2014; Lubbers and Rossman 2017). CBE provides the necessary health data and a healthy environment that learners can use to understand the healthcare contexts and many kinds of diseases before students work in clinical settings. Learning and working with the community can also help to solve personal and community health problems. Short-term benefits for the community include community health service, community health education on preventive care or self-care, and home visits. In community-based Education, students are blended to patients', families', and clients' environment where they deliver services. This enables seamless knowledge application and skills practices.

Through the facilitation of learning in a controlled environment, CBE has successfully developed students' essential skills. Several skills pertinent to address present health challenges are critical thinking, communication, collaboration, and creativity.

In the provision of future healthcare providers, critical thinking skill is fundamental. Medical doctors are required to interpret clinical findings into a diagnosis. Nursing and other profession deliver care based on patient's responses and manifestations. Analysis, interpretation, precision, and accuracy are worth more than content knowledge to determine student success. CBE improves learners' abilities, including a higher level of concentration, deeper analytical aptitudes, and thought processing (Art et al. 2007).

The second essential competence present to healthcare providers is communication. As a global society, interaction among patients and professionals is built upon effective information exchange. Both patient and care providers need to express thoughts and feelings clearly, articulate opinions understandably, translate readable instructions, and motivate others. Despite the above-mentioned skills being valued highly in academia, today, especially in health education, the skills are even more critical and suitably enhanced by CBE (Bailey et al. 2015; Heestand Skinner et al. 2008).

*In CBE, a non-digital learning media mainly consist of paper-based sources, such as printed books, personal notes, handouts, and white-board. Although digital learning resources are extensively accessible in many subjects, the conventional learning method that embraces non-digital resources remains interesting for some extent of learners (*Bocconi et al. 2013*).*

In general, learning resources support the educational components and play a significant role in knowledge construction and comprehension among learners. When producing and choosing learning resources, one should consider many aspects, including fundamental principles that inspire effective and efficient learning processes to inspire students to embrace digital learning.

3.5 Locally Rooted Community-Based Education

In the context of health profession education, community-based learning offers several advantages (Dashash 2013). Community-based Education enables students to develop professional autonomy behavior. As a result of the education institution's intense approach, improvement of the local community health status was remarkably acknowledged. Students can integrate their psychological, cultural, and biomedical knowledge into practice.

Ki Hajar Dewantara, the first Ministry of Education, Republic of Indonesia, published a learning philosophy relevant to the character of student-centered learning (Tauchid et al. 1962). Contextual and collaborative principles as the basis of student-centered learning were identified among his publication in the early twentieth century. This concept remains applicable to the global learning environment.

Learning resources should be able to establish equity between educators and learners. A more partnership relationship between students and teachers promotes two-way, dynamic, and fruitful dialog between teachers and students. However, Indonesian people's social and cultural context lies on a vertical hierarchy rooted deep in the community, as explained in previous chapters. Dewantara articulates equity principles in Education. The great perspective of Dewantara has gradually led to the changes in the education system.

Based on Dewantara's principles, community-based education facilitates students to learn meaningfully using local resources and culture. The use of cultural events and community aspects as relevant learning resources initiated by Dewantara, such as local musical instruments and dances (i.e. gamelan https://en.wikipedia.org/wiki/Gamelan), traditional games (i.e. pencak silat, https://en.wikipedia.org/wiki/Pencak_silat), and many more (Claramita 2016) can stimulate students to engage with the community's health needs. This learning strategy aims to enable students to reflect upon concrete experience and transfer it into an abstract understanding. The emphasis on learning from reality in the CBE program is linear to contextual and collaborative learning, which stands for student-centered learning. Box 3.1 explains an example of the use of local resources as a low-cost learning resources that is also involved community members.

While learning is facilitated more by the supervisor in clinical setting and campus, the promotion of self-directed learning is identified from the community-based Education. Community services highlighted the elemental principle that emphasizes facilitative work for students to learn from their experience through adequate reflection. Empowerment toward patients and family members is purposed to assist the development of intelligence from a responsible learner (Howe and Anderson 2003; Khuntia et al. 2017). More about CBE will be discussed in Chap. 5.

Box 3.1 Example of low-cost materials for learning resources

As an application of the Dewantara's principles of low cost materials obtained from local sources, we present the modification of the Zoe mannequin; inserted with local fabrics of uterus-form (which can be easily multiplied), to train midwifes, doctors, nurses, and other health professionals and traditional midwifes.

We collaborate with local tailors around a Ministry of Health Diploma of Midwifery School at Province of Riau, Sumatera, to create what we called Gamma MK3 (Patent-Indonesia No. 000059205). The development of this low cost materials resulted from a master thesis in medical education (Metha 2011) and then continue with the supports of Ministry of Education Republic of Indonesia and now has been used by hundreds of midwifery educational center in Indonesia and proven to provide benefits for local community as well as students.

The GammaMK3 model can be used to learn:

1. Normal delivery
2. Manual placenta
3. Maneuver delivery

3.6 Advanced Technology in Learning Resources

Past teaching modalities mainly concern with material produced by teachers. Previously, knowledge transfer occurs when educators wrote information on a board or paper sheets. The current teaching process is offered in different methods, encouraging teachers to combine both creativity and initiatives. Conventional in-class lectures are losing popularity, shifting into modern learning resources. The rationale that technology suggests significant contribution in the teaching process challenges educators to address learner's needs and preferences adaptively (Bocconi et al. 2013; Dziuban et al. 2018). Well-structured learning resources that attract student participation ultimately help educators improve teaching quality, increasing students' intellectual and emotional capacity. We should realize that learning resources are provided in

various forms. Based on the technology engagement, a distinction is made between digital and conventional learning. Digital learning is an education that is accompanied by technology or using teaching practices that utilize technology. Digital learning incorporates a broad spectrum of methods, including blended and virtual learning, while non-digital learning conserves learning without any technological assistance (Aschbrenner et al. 2019; Littlejohn et al. 2008). Both of the learning resources have distinct characteristics in the utilization of media. Existing digital learning resources have been endorsing educational purposes. These include electronic devices which allow information exchange through communication networks via a smartphone application (web-based or native), lecture slides, online test questions, Internet repository, podcasts, e-books, digital camera, laptop, and personal computers.

3.6.1 Virtual Reality Simulation

The digital learning resources include virtual simulation. The simulation produces a similar experience without encountering the real event. This learning resource depicts recreated reality on a computer screen, which involves an authentic system operator. It is a simulation that places people in a central role through decision-making, motor control, and communication skills exercise (Farra et al. 2015; Lopreiato and Sawyer 2015). Simulation opens up opportunities that are not available in real event learning, such as clinical apprenticeships, which provide a multifaceted safety environment for learning. A controlled environment is an essential consideration for learners, especially in professional training where students are encouraged to learn from mistakes without threat to occupational safety. In particular to clinical learning, simulations succeed in substituting real patient encounters or other clinical situations for learning purposes.

3.6.2 Augmented Reality

Medical and health professions education is organized through in-campus and workplace-based learning. Learning in these institutions involves the acquisition of complex skills tailored to professional behavior in a clinical environment. As practices may not always be established in the context of the actual setting due to safety, cost, or teaching reasons, alternative methods have been proposed.

Simulation is popular in terms of alternative learning methods. In this modern day, the simulation offers an advanced reality experience that supports complex skills learning. Augmented Reality (AR) adds digital content into the real world, depicting the reality perceived by students (Ke and Hsu 2015; Vaughn et al. 2016). Both undergraduate learning and postgraduate residency training benefit from the utilization of this advanced technology.

AR encourages meaningful learning experiences and boosts the transfer of knowledge and skills mastery. Therefore, several prerequisites should be completed prior to the technology implementation. Learning activity needs to build interaction between students and the world, in a clinical environment that facilitates learning. To develop student's ability, AR is intended to integrate prior knowledge and novel experiences and directed to goal achievement.

Augmented reality technology provides a bridge between two types of media, namely, textual and multimedia scenarios. This technology bridges the advantages of text scenarios to offer content and core information emphasis. This technology also bridges the flexibility of the multimedia scenario interaction. The bridge will cover the differences in students' understanding when reading writing. Students will feel less bored when they see a boring presentation. This technology also helps the module increase motivation in learning because interactive participation involves many senses (Luckin and Fraser 2011). Students' understanding of the module's content will also be improved. Students are given a more straightforward interpretation of information. The trick is that students combine the range of time, space, and context according to related information (Tettegah and Taylor 2006). Box 3.2 illustrated our findings of creating an AR scenario for a tutorial discussion for medical students which increased students' participation. Participation (with adequate feedback and reflection) is the key to better learning.

Box 3.2 an example of AR used in a tutorial session

Our study proved that AR for a tutorial session increases students' participation in the discussion significantly (observed and also from students' perception using the student-intrinsic motivation scale/ IMMS (Nugroho 2017). Learning media in the form of Augmented Reality influences the tutorial learning climate. This finding is medium, but several other technological learning activities corroborate the results. These studies show the strong positive influence of learning media on the learning climate in a large sample. Learning can be influenced by multimedia technology, which involves many human natural senses (listening, visualization, and even smells, except touching. So, AR provides the benefits of content interpretation and learning context. This convenience led to a more pleasant learning situation in these studies (Luckin and Fraser 2011; Tettegah and Taylor 2006; Pérez-lópez and Contero 2013). Thus, instructional media designers need to consider using scenarios using technology like augmented reality to increase the frequency of participation.

Digital learning resources also have their advantages and disadvantages. Although these resources are available anytime and anywhere as long as students have access to these resources and provide various learning styles and preferences, educators must anticipate student resistance that may arise to changes in the type of offering these learning resources. Students who are not used to operating specific software on a computer, for example, may need

enough time to recognize the software before finally following the lessons given. Even though it looks trivial, all the obstacles that occur in each learning process must be anticipated by the educator as a form of responsibility to ensure the readiness and completeness of learning in the lesson plan.

3.7 Challenges in Development of Instructional Design for the use of Learning Resources

The adoption of appropriate learning resources is fundamental for an educational institution. Screening, prioritization, and feasibility study of learning resources should be made initial implementation to the teaching process. Each type of learning resource represents an individual value that provides different impacts on the learner. Therefore, institutions need to promote the creation of learning resources and experiences so that students' knowledge and skills are rapidly acquired and applied. In this context, the proper instructional design provides a practical and systematic approach to design an effective curriculum. It is also important to accommodate various learning styles for students. Encouraging the implementation of individual learning styles, boosting student's performance, and creating meaningful experience (Buşan 2014; Hernandez et al. 2020; Khanal et al. 2014).

Jeroen van Merrienboer specifies four components for the instructional design (4C/ID), namely 'learning task', 'supportive information', 'part-task practice', and 'just in-time information'. Students should have clear objectives by the end of learning period, i.e. a semester, a block curriculum, or at the end of year, and tasks to complete the objectives. Tasks are the effective way to invite participation of the students and teachers, to engage in a more meaningful learning, in an active cooperation and collaboration learning. Furthermore, to complete the tasks, students should also be supported with other three components of the ID. So the learning tasks are the main 'stream' in the curriculum, and the other components are complimentary. To make sure that the resources are properly established, validation of these four components is essential for educators (Findyartini et al. 2020; van Merriënboer and Kester 2014).

There are several considerations to design an advanced learning modality. The designer must define a task-achievement among students in order to ensure that learning outcomes are completely attained (Van Merrienboer et al. 2002; van Merriënboer and Kester 2014). Educators are also required to measure the amount of the delivered information in the resource and reflect students' ability. For sure, in this development, learning resources should engage between abstracts and substantial experience where learners enable to connect their knowledge and behavior. Finally, in terms of nurturing the value of care providers in medical and health professions, the clinical practice remains vital to endorse skills acquisition.

Students are expected to understand and realize the learning outcomes. In a complex learning process, learning tasks are defined sequentially. Students are encouraged to promote schema construction. Excellent learning task will confront learners with all constituents to approach the attainment of the whole complex skill. Inductive processing of the learning task stimulates students to shape a comprehension of a concrete experience.

During the study, it is vital to supply students with an adequate amount of information. Educational processes bridge students' prior knowledge and existing learning task. Supportive information components elaborate on previous information, thereby allowing students to establish a connection between newly presented information elements and prior knowledge. The elaboration process produces highly complex schemata for a deep understanding of the particular subject.

Learning stimulation should be done at least once. Learning resources are supposed not to hinder knowledge acquisition. Valuable learning resources provide students with the essential step-by-step knowledge to take control over recurrent skills. This information promotes the compilation of situation-specific knowledge into cognitive rules for the students. Foundation of the four components of instructional design can be assembled upon the opportunity of experiences, information displays, demonstration, and also corrective feedback.

Most of the resources focused on fostering learner intelligence. However, skills and attitudes may not be neglected since those aspects are connected to each other. Repeated practice of the skills in learning tasks facilitates the compilation of recurrent elements from a complex skill. In a rare episode, a high level of automaticity requires frequent repetition to strengthen the particular aspect of learning. Implementation of the part-task practice to promote learners' skill need to consider several aspects: practice items, JIT information for part-task practice, and overtraining.

Various instructional designs in learning resources development are presented in Table 3.1. Ensuring the appropriateness of media for learning purposes is fundamental. Thus, to effectively facilitate achieving learning outcomes, the following methods need to be implemented properly. As the technology changes rapidly, institutions are required to take into consideration any enabler and risk to the teaching processes.

The learning process is complex and requires the interaction of various factors and that these factors occur together in the classroom environment is very important and sensitive. Important factors involved in the classroom's learning process are the physical, emotional, and personality state of students, teachers, training content, etiquette training, storage space, and, most importantly, assistive devices. These factors are, as theory and practice, clinical skills aids coordinating a special place involving an atmosphere such as a clinical setting (clinical simulation). Appropriate teaching aids will make the material presented in a language structure suitable for students. In this regard, the simulator as a teaching aid/teaching aid with appropriate technology should be based on the following four points:

Table 3.1 Instructional design and implementation to the learning resources development

Approach	Steps	Implementation	Example
NINE STEPS GAGNE	9 steps: – Gain attention – Inform student with information – Stimulate recall of prior knowledge – Present the content – Provide learning guidance – Elicit the performance – Provide feedback – Assess the performance – Enhance retention and transfer to task	1. Provide a video or narrative that guides the media clearly, interestingly, and according to their needs 2. Come up with tasks and pieces of information that will be used when using media 3. Do the question and answer prior learner's knowledge 4. Simulate the media 5. Give the necessary book references 6. Empower the media so that they can be used independently by learners 7. Empower the media to be able to provide feedback 8. Empower the media to be able to measure learner competencies 9. Link the results of media use with the needs of the learner	Buscombe (2013), Hricko (2011)
ASSURE	6 steps: – Analyze learners – State Objectives – Select methods, media, and materials – Utilizing technology, media, and materials – Requirement learner's participation – Evaluate and revise	1. Analysis of student needs 2. Determine student achievement 3. Choose learning media around you and their delivery methods, such as drawing pears to study the blood circulation of the heart 4. Add text, ornaments, or functions of the media such as drawing pears to show the location of blood vessels and heart space 5. Invite students in the activity of drawing the pears 6. Give questions and feedback	Smaldino et al. (2004)

(continued)

Table 3.1 (continued)

Approach	Steps	Implementation	Example
ADDIE Model	5 steps: – Analysis – Design – Development – Implementation – Evaluation	1. Make and analyze a list of learning objectives, learning activities, and assessments 2. Perform e-learning design according to the resulting analysis pattern 3. Develop the form of delivery and e-learning companion modules 4. Carry out trials and implementations 5. Make note of improvements to the results of the implementation that is not in accordance with the design	Cheung, (2016), Widyastuti and Susiana (2019), Woo (2018)
ARCS	4 steps: – Attention – Relevance – Confidants – Satisfaction	6. Give an introduction that raises the interest of learners for example introducing learning applications 7. Explain to learners the relationship of applications to learners' needs 8. Asking active learners to use the application, ask about their confidence when facing a situation that is simulated by the application 9. Evaluating learner satisfaction about the knowledge they get. Be careful not to focus too much on media use but on learning experiences	Boonphadung (2013), Jenkinson (2009), Keller (2008)

(continued)

Table 3.1 (continued)

Approach	Steps	Implementation	Example
4C/ID	Consist of 4 steps: – Learning tasks – Supportive information – JIT information – Part-task practice	1. Inform the learning tasks that should be achieved in the end of learning 2. Give information that can bridge learners' prior knowledge toward learning tasks 3. Give additional information for learners to engage learning 4. Provide plenty of time for learners to practice to achieve automation of competency by providing appropriate learning resource	Van Merriënboer et al. (2002)

a. Realistic

The reliability of teaching aids is the primary or main criterion in developing these teaching aids. With useful tools, students can imagine the original form of, for example, human anatomy so that learning can be given as if it were in a real setting.

b. Cheap

Inexpensive teaching aids will support student learning programs because there will be so many procurements of goods and the students themselves. When students' ratio and assistive devices become smaller, students can use tools more often to achieve the required level of competence.

c. Durable

Assisting devices should be developed from materials that do not break or tear easily so that students can use the utmost care. This tool's durability also supports students to learn clinical skills repeatedly so that they can achieve the competencies taught by clinical supervisors or class teachers. The equipment's durability is one of the criteria determined by an item because new goods' procurement to replace damaged goods will be less frequent.

d. Safe

With a safe device, students will maintain patient safety principles in clinical action. Tools that use relatively safe materials without the involvement of dangerous chemicals or objects with surfaces will not injure students who are practicing using these tools.

However, when we think about learning resources, *'Have all educators who have different cultural differences always prepare themselves to equip themselves with lesson plans and completeness before stepping into the classroom to teach?'* This question is fundamental to ponder because the most important thing in learning related to learning resources is not books or other primary learning sources. Still, educators are essential learning resources that always direct students to determine the appropriate learning resources besides the educator for these students.

As an affirmation, both print and non-print, digital or non-digital, or online and offline learning resources must have their respective advantages and disadvantages. Therefore, in writing a learning plan, educators must have understood the list of advantages and disadvantages. The learning resources introduced to students will be right on target, from a personal perspective of the student itself, which may be closely related to cultural factors and the availability of these learning resources.

3.8 Future Development of Learning Resources

Learning resources are required to meet the instructional attributes of learning facilitation, which employs students' autonomous learning behavior. The resources must clearly define its goals to meet the self-instructional principle, either specific or broad objectives. Also, learning resources are expected to facilitate students' study course by providing relevant knowledge in particular units and activities (Tomlinson 2011).

Well-structured learning resources should be built upon a relevant subject that specifies particular competence or sub-competence to accomplish the learning objectives. The entire package contains complete relevant information related to the topic. Containment of detailed knowledge helps learners deeply comprehend and further modify individual perspectives, values, beliefs, and behaviors (Carneiro and Steffens 2013).

The third fundamental aspect of learning resources is self-sufficient or self-sustaining. This principle requires an independent material which conceivable to be learned discretely, not rely on another resource (Christiansen et al. 2013; Littlejohn et al. 2008). Without any additional reference, a standalone material should be sufficient to represent unit or sub-competencies.

Since global development occurred in the last few decades, learning resources are projected to be adaptive toward science and technology progression. Learning resources must contain materials which the potential to enhance students' knowledge related to specific subjects. Therefore, the digital learning environment's rapid growth offers opportunities to produce agile, flexible, and upgradeable resources (Lalima and Lata Dangwal 2017; Sinclair et al. 2016; Voutilainen et al. 2017).

While previous fundamental aspects of learning resources focused on functionality, the latest principle mounted on the learners' perspective. Educators need to pay attention to user experience. Learning instructions and information are intended to help students in a friendly, convenient, and purposeful manner. The materials must promote seamless knowledge acquisition and transparent transfer of information (Kennedy 2014; Littlejohn et al. 2008).

Different forecasts present streamlined trends in which information technology is widely applied in the future. Friedman et al. (2016) suggested that advanced healthcare services will result in two major themes, documentation and biomedical knowledge. Consistent care documentation in digital versions in the near future, as well as shared big data across national infrastructure, can improve learning within the health system. Biomedical knowledge cloud soon integrated into healthcare facilities, provided easy access for medical personnel and patients, family, or the community. Future learning resources development should have followed general direction and prerequisites to ensure its purpose with the education (Ryan et al. 2019).

Several aspects need to be considered, including meeting the users' profile, connecting interactive technology, being flexible, blended with synchronous activity, and adapting to changes. Students' level of knowledge and specific needs should be answered with the existence of learning resources. Suitable media improved student's

motivation and enhanced lesson comprehension. In particular to knowledge retention, appropriate learning resources can assist students in short-term and long-term memory management, which benefits future recall.

Imminent students are demanding more interactive technology. While smartphones, tablets, and desktops being an integral part of daily life, younger educators are increasingly engaged with digital learning resources (Camilleri and Camilleri 2017). The growing interaction between students and the learning contents is increasing critical thinking. In many ways, interactive technology supply learning motivation, induce curiosity, and approaching the targeted outcomes. Recently, game-based learning was found to suit with millennials generation, where they are accustomed to gaming. The young age nowadays could spend hours playing with video games. The habits with the notion of education should have been switched over learning activity.

5 Giga mobile networks offer lower latency and faster response times of Internet connection. For educational purpose, learners will be free from any limitation, borderless to the global sources of knowledge, and linked without geographical barriers. Mobile technologies offer a high impact on teaching and learning processes (Toktarova et al. 2015). Easier access, open-source, affordable yet high-quality materials will be available for learners around the world. Electronic learning became a strategic objective to transform the conventional educational methods into more electronic-based learning.

Despite distant interaction between educators and learners, reflecting all of the educational process components through interactive devices accessible, face-to-face sessions remain the gold standard, especially for clinical skills teaching in medical and health professions education (Mccutcheon et al. 2015). Skills are defined as a set of actions to complete a purposeful procedure. In general, students may perform well in the communication and history taking skills both in distance learning or in-class. However, such a complex skill of communication is challenging to be comprehensively mastered. Other skills such as physical examinations, wound care, and cardiopulmonary resuscitation are also required more intense interaction between students and tutor for constructive feedback and reflection. While interactive devices offer various benefits in the context of clinical skills acquisition, students reported lack of engagement compared to conventional on site laboratory (Ke and Hsu 2015; Vaughn et al. 2016).

The existence of virtual reality and artificial intelligence boost the advantages of technology for learning purposes. Basic forms of media, including text, picture, video, and audio recordings, exist and support current educational activities. Virtual reality in medical and health professions education aptitude the future of skills simulation. Rather than performing different procedures with basic tools in a standardized environment, virtual reality portrays artificial patients and surroundings in a healthcare setting (Farra et al. 2015). A tutor will be able to write and execute many scenarios following the learner's competence and the objectives. Virtual reality constructs learner's procedural knowledge and trains various skills.

Given that the technology is rapidly changing over time, it is essential to ensure that applied learning resources can be updated. The learning resources should

adapt to global trends and continuously developed. Poorly maintained technology thereby losing its existing users. Research and development play a significant role in answering upcoming challenges and variations. Learners and educators are also expected to periodically enhance their knowledge regarding up-to-date technologies as they will take advantage of the learning resources.

Within the context of significant culture changes due to the introduction of advanced communication and information technology as disputed by Hofstede et al. (2010), adjustment of the teaching and learning materials is demanding over time. Old-fashioned learning resources have been transformed into modern and digital products. Despite these educational materials offered in various types and cast for different purposes, individual learners will likely interpret and apply their knowledge in their own way. Therefore, it is essential to design inclusive and effective instructional strategies for the education process.

Medical and Health Profession education proposes the equilibrium between small and large power distance societies. As the truth in this subject mostly generated from evidence-based-findings, wisdom and expertise transfer by lecturer or health professionals may not be neglected. Combination of aforementioned models is efficient to strengthen theoretical understanding as well as reflects on practical experience in the field. While learning resources support the individualist dimension and urge the needs of independence in terms of SCL, students are expected to act collectively in the care delivery system. Shared decision-making and collaboration in professional practice should be endorsed earlier to facilitate student's growth of both hard skills and soft skills. Thus, proper development of content delivery is necessary to promote learners achieving competencies beyond the learning outcomes.

Indeed, there is much room for improvement. Key points of the learning resources development are intended to transform conventional education methods into an interactive way of learning. Students' motivation, accessibility, and affordability of the learning resources make the consequence of learning more meaningful and enhance knowledge comprehension, which appropriately constructs cognitive knowledge among students (Dent and Harden 2013; Epignosis 2014; Simionescu et al. 2017).

3.9 Summary

Any collection of materials provided by educators in terms of organizing teaching activities is intended to achieve learning outcomes. The learning resources that account for tangible and intangible aspects facilitate students to develop specific knowledge, skills, and attitudes. At the developmental stage, learning resources follow several criteria to meet the eligibility. To some extent, lecturers or teachers also need to adapt to the available learning environments, whether in the context of high-fidelity technology or in a low-cost setting.

In Health Profession Education, learning resources are classified into three groups based on the product, delivery method, and object. Product categories consist of digital and non-digital resources, which include Internet databases and printed books,

respectively. Online learning, compared to offline learning, divides the resources based on their delivery method. Since health education at the end of the day is expected to provide service for the human being, human learning resources (in the form of patient-simulation) are required. The last category differs from the subject of learning.

Health professional education has significantly grown in the past decades. Beyond this age, utilization of learning resources offers opportunities and pose challenges to the nature of learning. Modern learning resources promote student-centered learning where lecturers play a role in supporting and directing students during their journey. Later, the selection of the learning resources is one of the processes that may not intentionally be ignored. The philosophy of learning theories is required to match with the instructional design. The maintenance of the learning resources management cycle is proven to benefit educators and learners. Frequent updates to the learning materials help students to understand the subject material. Professionalism is also promoted through the relevant learning resources.

As a diverse region that accounts for hundreds of millions of global population, learning resources are demanded to embed multicultural aspects in health profession education. However, the learning media is supposed to provide clear and concise guidelines of this concept. Three concepts of (1) 4C-ID, (2) twenty-first-century four competence, and (3) the local context of education are provided in this chapter. The concepts are inter-related to various learning theories and instructional design. Any form of learning activities, including series of practices, is mandatory to seize multicultural education.

The Industrial 4.0 Revolution took health profession education into different development stages. Current learning resources are seamless, with high technology, yet affordable. Adaptation in the learning trends has made teachers and students move forward in the post-modern era. As a global community, vast information distribution and emerging health issues challenge academia to adapt to the situation quickly. However, in a successful health service delivery, the emotional touch and psychological intervention remain invaluable as part of the humanistic approach.

Key Learning Points

- Medical and health professions education widely implement advanced technology to support teaching and learning processes. However, local wisdom and cultural context should be embedded in the technology adaptation
- Current resources provide alternatives for the educators and learners to select and customize their most appropriate teaching–learning materials
- Adapting high fidelity technology for the learning resources implies a determination to enhance effectiveness and efficiency in achieving learning outcomes.
- Well-developed learning resources promotes the simulation of the real-world setting for students in illustrating future career and challenges

References

Art B, Deroo L, De Maeseneer J (2007) Towards unity for health utilising community-oriented primary care in education and practice. Educ for Health: Change Learn Pract 20(2)

Aschbrenner KA, Pratt SI, Bond GR, Zubko L, Naslund JA, Jue K, Williams G, Kinney A, Cohen MJ, Godfrey MM, Bartels SJ (2019) A virtual learning collaborative to implement health promotion in routine mental health settings: protocol for a cluster randomized trial. 84(July). https://doi.org/10.1016/j.cct.2019.105816

Bailey RJ, Baingana RK, Couper ID, Deery CB, Nestel D, Ross H, Sagay AS, Talib ZM (2015) Evaluating community-based medical education programmes in Africa: a workshop report. Afr J Health Professions Educ 7(1 Suppl 1):140–144. http://www.ncbi.nlm.nih.gov/pubmed/26523230

Balasooriya C, Olupeliyawa A, Iqbal M, Lawley C, Cohn A, Ma D, Luu Q (2013) A student-led process to enhance the learning and teaching of teamwork skills in medicine. Educ Health: Change Learn Pract 26(2):78–84. https://doi.org/10.4103/1357-6283.120698

BERGER (2016) Whitepaper summary: skill development for Industry 4.0. Roland Berger GMBH. BRICS Skill Development Working Group, India Section, 1–50. http://indiainbusiness.nic.in/newdesign/upload/whitepaper-summaryskill-development-for-industry-4-0.pdf

Bocconi S, Kampylis P, Punie Y (2013) Framing ICT-enabled innovation for learning: the case of one-to-one learning initiatives in Europe. Eur J Educ 48(1):113–130. https://doi.org/10.1111/ejed.12021

Boonphadung S (2013) ARCS for Critical Inf Retrieval Dev 7(9):1282–1286

Buşan A-M (2014) Learning styles of medical students - implications in education. Curr Health Sci J 40(2):104–110. https://doi.org/10.12865/CHSJ.40.02.04

Buscombe C (2013) Using Gagne's theory to teach procedural skills. Clin Teacher 10(5):302–307. https://doi.org/10.1111/tct.12051

Bušljeta R (2013) Effective use of teaching and learning resources. Czech-Polish Historical Pedagogical J 5(2):55–69. https://doi.org/10.2478/cphpj-2013-0014

Camilleri MA, Camilleri AC (2017) Digital learning resources and ubiquitous technologies in education. Technol, Knowl Learn 22(1):65–82. https://doi.org/10.1007/s10758-016-9287-7

Carneiro R, Steffens K (2013) International handbook of metacognition and learning technologies 28:601–614.https://doi.org/10.1007/978-1-4419-5546-3

Cheung L (2016) Using the ADDIE model of instructional design to teach chest radiograph interpretation. J Biomed Educ 2016:1–6. https://doi.org/10.1155/2016/9502572

Chongloi N, Thomas P, Hansaram A, M., & Deepak, K. K. (2017) Attitudes of undergraduate nursing students toward objective structure practical examination: an exploratory study. Int J Nurs Sci 4(1):68–72. https://doi.org/10.1016/j.ijnss.2016.12.003

Christiansen ET, Kuure L, Morch A, Lindstraom B (2013) Problem-based learning for the 21st century. In Aalborg University

Claramita M (2016) Revealing "Tut Wuri Handayani"—a student-centred learning approach- by ki hajar dewantara from the early 20th century: a literature review 5(1):1–14. https://doi.org/10.22146/jpki.25295

Claramita M, Setiawati EP, Kristina TN, Emilia O, Van Der Vleuten C (2019) Community-based educational design for undergraduate medical education: a grounded theory study. BMC Med Educ 19(1):1–10. https://doi.org/10.1186/s12909-019-1643-6

Claramita M, Nugraheni MD, van Dalen J, van der Vleuten C (2013) Doctor-patient communication in Southeast Asia: a different culture?. Advances in health sciences education: theory and practice, 18(1):15–31. https://doi.org/10.1007/s10459-012-9352-5

Council for Adult and Experiential Learning (2013) 2013 CAEL forum & news: competency-based education. Council for adult and experiential learning. http://ezproxy.bethel.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED547415&site=ehost-live&scope=site

Dashash M (2013) Community-oriented medical education: bringing perspectives to curriculum planners in Damascus University. Educ Health (abingdon, England) 26(2):130–132. https://doi.org/10.4103/1357-6283.120708

Dent JA, Harden RM (2013) A practical guide for medical teachers (C. Livingstone (ed.); Fourth). Elsevier

Design S (2015) The nature of knowledge competency-based learning capabilities sample design implementations description

Diab PN, Naidu T, Gaede B, Prose N (2013) "Cross-cultural medical education: using narratives to reflect on experience." African J Health Professions Educ 5(1):42–45

Dziuban C, Graham CR, Moskal PD, Norberg A, Sicilia N (2018) Blended learning: the new normal and emerging technologies. Int J Educ Technol Higher Educ 15(1):1–16. https://doi.org/10.1186/s41239-017-0087-5

Elsevier Education (2014) Competency-based education. Achieving superior outcomes through flexible, personalized learning. In: Elsevier Education. elsevieradvantage.com/perspectives

Epignosis (2014) e-learning Concepts, Trends, Applications. Book, 5. https://www.talentlms.com/elearning/elearning-101-jan2014v1.1.pdf%0Ahttp://www.talentlms.com/elearning/elearning-101-jan2014-v1.1.pdf

Farra SL, Miller ET, Hodgson E (2015) Virtual reality disaster training: translation to practice. Nurse Educ Pract. https://doi.org/10.1016/j.nepr.2013.08.017

Fejzic J, Barker M (2015) Implementing simulated learning modules to improve students' pharmacy practice skills and professionalism 13(3):1–8. https://doi.org/10.18549/PharmPract.2015.03.583

Fell N, Clark A, Jackson J, Angwin C, Farrar I, Bishop C, Stan H (2017) The Evolution of a Community-Wide Interprofessional Fall Prevention Partnership: Fall Prevention as a Vehicle for Community and University Collaboration and Interprofessional Education. 8:47–51. https://doi.org/10.1016/j.xjep.2017.05.006

Fereidouni Z, Sarvestani RS, Hariri G, Kuhpaye SA, Amirkhani M, Kalyani MN (2019) Moving into Action: the Master Key to Patient Education 27(1):1–8

Findyartini A, Soemantri D, Greviana N, Hidayah RN, Claramita M (2020) Guide Book for Adaptation of medical and health professions education during Pandemic Covid 19 era. Buku Panduan Adaptasi Pendidikan Kedokteran dan Profesi Kesehatan di Era Pandemi Covid-19. UI Publishing

Frenk J, Chen L, Bhutta ZA, Cohen J, Crisp N, Evans T, Fineberg H, Garcia P, Ke Y, Kelley P, Gates M (2010) Health professionals for a new century : transforming education to strengthen health systems in an. 1923–1958. https://doi.org/10.1016/S0140-6736(10)61854-5

Gagne RM, Wager WW, Golas KC, Keller JM, Russell JD (2005) Principles of instructional design (5th edn). Performance improvement, 44(2):44–46. https://doi.org/10.1002/pfi.4140440211

Galloway DA, Laimins LA, Division B, Hutchinson F (2016) HHS Public Access 26(3):87–92. https://doi.org/10.1016/j.coviro.2015.09.001.Human

Gordon M, Fell CWR, Box H, Farrell M, Stewart A (2017) Learning health 'safety' within non-technical skills interprofessional simulation education: a qualitative study. Med Educ Online 22(1):1–9. https://doi.org/10.1080/10872981.2017.1272838

Green BN, Johnson CD (2015) Interprofessional collaboration in research, education, and clinical practice: working together for a better future. 29(1):1–10. https://doi.org/10.7899/JCE-14-36

Hagemeier NE, Hess R, Hagen KS, Sorah EL (2014) Impact of an interprofessional communication course on nursing, medical, and pharmacy students' communication skill self-efficacy beliefs. Am J Pharm Educ 78(10):186. https://doi.org/10.5688/ajpe7810186

Han ER, Yeo S, Kim MJ, Lee YH, Park KH, Roh H (2019) Medical education trends for future physicians in the era of advanced technology and artificial intelligence: an integrative review. BMC Med Educ 19(1). https://doi.org/10.1186/s12909-019-1891-5

Havnes A, Christiansen B, Bjørk IT, Hessevaagbakke E (2016) Peer learning in higher education: patterns of talk and interaction in skills centre simulation. Learn, Cult Soc Interact 8:75–87. https://doi.org/10.1016/j.lcsi.2015.12.004

Heestand Skinner DE, Onoka CA, Ofoebgu EN (2008) Community-based education in Nigerian medical schools: students' perspectives. Education for Health (Abingdon, England)

Hernandez JE, Vasan N, Huff S, Melovitz-Vasan C (2020) Learning styles/preferences among medical students: kinesthetic learner's multimodal approach to learning anatomy. Med Sci Educ 30(4):1633–1638. https://doi.org/10.1007/s40670-020-01049-1

Herold G (2016) Leadership in the fourth industrial revolution. Stanton Chase Bus J 22(12):15

Horton W (2006) e-Learning by design. Wiley

Howe A, Anderson J (2003) Involving patients in medical education. BMJ: Br Med J

Hricko M (2011) Gagne's nine events of instruction. Encyclopedia of information technology curriculum integration, pp 353–356.https://doi.org/10.4018/978-1-59904-881-9.ch058

Interprofessional Education Collaborative Expert Panel (2011) Core Competencies for Interprofessional Collaborative Practice: Report of an Expert Panel

Jenkinson J (2009) Measuring the effectiveness of educational technology: what are we attempting to measure? Electron J e-Learn 7(3):273–280. https://doi.org/10.2307/1164231

Kakar R, Combs R, Ali N, Muvuka B, Porter J (2020) Enhancing the design and utilization of asthma action plans through community-based participatory research in an urban African American community. Patient Educ Couns 2019:6–11. https://doi.org/10.1016/j.pec.2020.08.032

Ke F, Hsu YC (2015) Mobile augmented-reality artifact creation as a component of mobile computer-supported collaborative learning. Internet Higher Educ 26:33–41. https://doi.org/10.1016/j.iheduc.2015.04.003

Keller JM (2008) First principles of motivation to learn and e 3 -learning. Distance Educ 29(2):175–185. https://doi.org/10.1080/01587910802154970

Kennedy J (2014) Characteristics of massive open online courses (MOOCs): a research review, 2009–2012. J Interact Online Learn 13(1):1–16. http://search.proquest.com/docview/1651864883?accountid=14624%5Cnhttp://resolver.rero.ch/unige?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&sid=ProQ:ProQ:ericshell&atitle=Characteristics+of+Massive+Open+Online+Courses+(MOOCs

Khabaz Mafinejad M, Mirzazadeh A, Peiman S, Khajavirad N, Mirabdolhagh Hazaveh M, Edalatifard M, Allameh SF, Naderi N, Foroumandi M, Afshari A, Asghari F (2016) Medical students' attitudes towards early clinical exposure in Iran. In J Med Educ 7.https://doi.org/10.5116/ijme.5749.78af

Khanal L, Shah S, Koirala S (2014) Exploration of preferred learning styles in medical education using VARK modal. Russ Open Med J 3(3):1–8. https://doi.org/10.15275/rusomj.2014.0305

Khuntia J, Yim D, Tanniru M, Lim S (2017) Patient empowerment and engagement with a health infomediary. Health Policy Technol 6(1):40–50. https://doi.org/10.1016/j.hlpt.2016.11.003

Luckin R, Fraser DS (2011) Limitless or pointless? An evaluation of augmented reality technology in the school and home. Int J Technol Enhanced Learn 5(3):15

Lalima D, Lata Dangwal K (2017) Blended learning: an innovative approach. Univers J Educ Res 5(1):129–136. https://doi.org/10.13189/ujer.2017.050116

Lassnigg L (2015) Competence-based education and educational effectiveness: a critical review of the research literature on outcome-oriented policy making in education. December. http://www.ssoar.info/ssoar/handle/document/46739

Lee SWW, Clement N, Tang N, Atiomo W (2014) The current provision of community-based teaching in UK medical schools: an online survey and systematic review. BMJ Open 4(12):e005696.https://doi.org/10.1136/bmjopen-2014-005696

Littlejohn A, Falconer I, Mcgill L (2008) Characterising effective eLearning resources. Comput Educ 50(3):757–771. https://doi.org/10.1016/j.compedu.2006.08.004

Lopreiato JO, Sawyer T (2015) Simulation-based medical education in pediatrics. Acad Pediatr 15(2):134–142. https://doi.org/10.1016/j.acap.2014.10.010

Lubbers J, Rossman C (2017) Satisfaction and self-confidence with nursing clinical simulation: novice learners, medium-fidelity, and community settings. Nurse Educ Today 48:140–144. https://doi.org/10.1016/j.nedt.2016.10.010

Makulova AT, Alimzhanova GM, Bekturganova ZM, Umirzakova ZA, Makulova LT, Karymbayeva KM (2015) Theory and practice of competency-based approach in education. Int Educ Stud 8(8):183–192. https://doi.org/10.5539/ies.v8n8p183

Maile CA, Cooper MS (2018) The CIMC guide to developing modules for self-paced learning a handbook for teachers

May W (2008) Training standardized patients for a high-stakes clinical performance examination in the California Consortium for the Assessment of Clinical Competence. Kaohsiung J Med Sci 24(12):640–645. https://doi.org/10.1016/S1607-551X(09)70029-4

Mazgon J, Stefanc D (2012) Importance of the various characteristics of educational materials: different opinions, different perspectives. Turk Online J Educ Technol 11(3):174–188

Metha JM (2011) Development and validation of insertion of uteri-form local resource into Zoe mannequin for midwifery training. Magister of Medical Education study program, Faculty of Medicine Universitas Gadjah Mada, Yogyakarta

Nguyen Q, Tong M, Brennan H, Goodwin J, Gimeno T (2018) Implementation of a student-led interprofessional education clinic at a safety net community health center. J Interprofessional Educ Practice 11:74–79. https://doi.org/10.1016/j.xjep.2018.02.009

Nugroho D (2017) Innovation of tutorial discussions using augmented reality scenarios. Magister of Medical Education study program, Faculty of Medicine Universitas Gadjah Mada, Yogyakarta

Pérez-lópez D, Contero M (2013) Delivering educational multimedia contents through an augmented reality application: a case study on its impact on knowledge acquisition and retention 12(4):19–28

Rawekar A, Jagzape A, Srivastava T, Gotarkar S (2016) Skill learning through early clinical exposure: an experience of indian medical school. J Clin Diagn Res 10(1):JC01–4. https://doi.org/10.7860/JCDR/2016/17101.7022

Roffey S (2007) Creating learning materials for open and distance learning

Ruszczyk HA, Upadhyay BK, Kwong YM (Connie), Khanal O, Bracken LJ, Pandit S, Bastola R (2020) Empowering women through participatory action research in community-based disaster risk reduction efforts. Int J Disaster Risk Reduction 51(August):101763.https://doi.org/10.1016/j.ijdrr.2020.101763

Ryan TJ, Grimes T, Henman MC, Sheachnasaigh EN, Dwyer MO, Roche C, Ryder SA, Sasse A, Walsh JJ (2019) Design and implementation of an integrated competency-focused pharmacy programme: a case report

Simionescu S, Šuníková D, Kubincová Z (2017) Gamification of peer assessment in learning management system. In: 2017 18th international carpathian control conference, ICCC 2017, pp 571–575.https://doi.org/10.1109/CarpathianCC.2017.7970465

Sinclair PM, Kable A, Levett-Jones T, Booth D (2016) The effectiveness of Internet-based e-learning on clinician behaviour and patient outcomes: a systematic review. Int J Nurs Stud 57(1):70–81. https://doi.org/10.1016/j.ijnurstu.2016.01.011

Smaldino SE, Russell JD, Heinich R, Molenda M (2004) Instructional technology and media for learning 8th edition (p 432)

Smit BHJ, Meirink JA, Berry AK, Admiraal WF (2020) Source, respondent, or partner? Involvement of secondary school students in participatory action research. Int J Educ Res 100(February):101544.https://doi.org/10.1016/j.ijer.2020.101544

Smithson J, Bellingan M, Glass B, Mills J (2015) Standardized patients in pharmacy education: an integrative literature review. Curr Pharm Teach Learn 7(6):851–863. https://doi.org/10.1016/j.cptl.2015.08.002

Sommer M, Thrien C (2019) Simulated patients in medical education—a survey on the current status in Germany. Austria and Switzerland 36(3):1–16

Sorce G, Chamberlain J (2018) Evaluation of an education session using standardized patients and role play during perinatal bereavement. J Neonatal Nurs, August, 0–1. https://doi.org/10.1016/j.jnn.2018.11.007

Takase M, Niitani M, Imai T, Okada M (2019) Students' perceptions of teaching factors that demotivate their learning in lectures and laboratory-based skills practice. Int J Nurs Sci 6(4):414–420. https://doi.org/10.1016/j.ijnss.2019.08.001

Tauchid M, Soeratman S, Lahade RS, Soendoro SA (1962) The culture—Book 2 (1st edn) (1st Editio). Taman Siswa Pub.

Tettegah S, Taylor K (2006) Can virtual reality simulations be used as a research tool to study empathy, problems solving and perspective taking of educators?: theory, method and application. Educators 522–523.https://doi.org/10.1145/1179295.1179331

Toader E (2015) Clinical simulations for learning medical skills: a work-based approach to simulators. Procedia—Soc Behav Sci 197(February):2443–2448.https://doi.org/10.1016/j.sbspro.2015.07.408

Tomlinson B (2011) Introduction: principles and procedures of materials development. Mater Dev Lang Teach 1–31

Van Merrienboer JJG, Clark RE, De Croock MBM (2002) Blueprints for complex learning: the 4C/ID-model. Educ Tech Res Dev 50(2):39–64. https://doi.org/10.1007/bf02504993

van Merriënboer JJG, Kester L (2014) The four-component instructional design model: multimedia principles in environments for complex learning. The Cambridge Handbook of Multimedia Learning, Second Edition, pp 104–148.https://doi.org/10.1017/CBO9781139547369.007

Vaughn J, Lister M, Shaw RJ (2016) Piloting augmented reality technology to enhance realism in clinical simulation. CIN: Comput, Inf, Nurs 34(9):402–405. https://doi.org/10.1097/CIN.0000000000000251

Voutilainen A, Saaranen T, Sormunen M (2017) Conventional vs. e-learning in nursing education: a systematic review and meta-analysis. Nurse Educ Today 50:97–103. https://doi.org/10.1016/j.nedt.2016.12.020

Wallenstein J, Heron S, Santen S, Shayne P, Ander D (2010) A core competency-based objective structured clinical examination (OSCE) can predict future resident performance. Acad Emerg Med: Official J Soc Acad Emerg Med 17(Suppl):2. https://doi.org/10.1111/j.1553-2712.2010.00894.x

Washington DC Interprofessional Education Collaborative, May, 1351. https://doi.org/10.1097/ACM.0b013e3182308e39

Widyandana D, Majoor GD, Scherpbier AJJA (2011) Comparison of three clinical environments for pre-clinical clinical skills training. Med Teacher.https://doi.org/10.3109/0142159X.2011.558141

Widyandana D, Majoor G, Scherpbier A (2012) Preclinical students' experiences in early clerkships after skills training partly offered in primary health care centers: a qualitative study from Indonesia. BMC Med Educ 12(1):35. https://doi.org/10.1186/1472-6920-12-35

Widyastuti E, Susiana (2019) Using the ADDIE model to develop learning material for actuarial mathematics. J Phys: Conf Ser 1188(1). https://doi.org/10.1088/1742-6596/1188/1/012052

Wilhite JA, Velcani F, Watsula-Morley A, Hanley K, Altshuler L, Kalet A, Zabar S, Gillespie CC (2019) Igniting activation: Using unannounced standardized patients to measure patient activation in smoking cessation. Addict Behav Rep 9(March):0–5.https://doi.org/10.1016/j.abrep.2019.100179

Woo WH (2018) Applying ADDIE model to ideate precision medicine in a polytechnic biomedical science programme. J Biomed Educ 2018:1–5. https://doi.org/10.1155/2018/4268517