Chapter 2
Gaming, VR, and Immersive Technologies for Education/Training

Anthony Lewis Brooks

Abstract  Future digital lives are predicted to extend beyond mobile smart phones with devices appearing as standard eyeglasses having settings for Extended Reality (XR). This will be so that what one really experiences and what is computer-generated will be so tightly mixed together that a person will not be able to distinguish between what is real and what is an illusion. Rather than sliding a finger across a touch screen on a smart phone, it will be possible to make things happen by moving our eyes or by brainwaves. Talking with someone or playing an online game will involve seeing that person in the same room and being able to touch and feel him/her via tactile technology. XR will be used in a variety of education situations with head mounted displays (HMDs) in classrooms for all children and also in home environments where those being educated have their own headset and system; medical students and surgeons will be educated in practical skills by using virtual humans rather than cadavers; oilrig and wind-farm workers will understand how to handle maintenance, repairs, and emergencies, before they ever leave the home office (Abridged from original call for chapters for this book). This chapter reviews texts selected for this volume on Gaming, VR, and immersive technologies for education and in training. It begins with a brief introduction text speculating impact related to well-being.

Keywords  Gaming · Virtual reality · Immersive technologies · Education · Training

2.1 Introduction

This chapter introduces the first part of the third volume in the Technologies of Inclusive Well-Being series. Authors from around the globe submitted text from their work for inclusion that necessitated multiple peer reviews of amassed submitted works—it was a long and arduous task that has resulted in a select few that reside between the covers of this book. Ten chapters are selected for this opening part that includes
over thirty-five contributing authors. The book contents overall are segmented into four parts with chapters being selected to each. Specifically, Part 1: Gaming, VR, and Immersive Technologies for Education/Training; Part 2: VR/Technologies for Rehabilitation; Part 3: Health and Well-Being; and Part 4: Design and Development.

This chapter represents a focused, and sometimes extended, ‘miniscule-review of the field’ by introducing the chapters for readers. Source texts are cited and referenced to acknowledge use in creating these review snippets from the chapter authors to overview, introduce and inform readership of their contribution in the volume.

In closing this introduction, a brief text shares possible questioning of health-care systems where additional reader focus may be directed as and when appropriate. This in considering associated infrastructures where doctors are financially benefiting to promote drug company products whilst also financially benefitting as representational speakers.

This questioning, which herein is considered related to technologies for inclusive well-being, begins at the World Health Organization (WHO). Sharing the following is inspired from reading the first chapter ([1] in this opening part of the book and relating to the current Covid-19 pandemic where so much is yet unknown. Instructions to reduce Covid-19 pandemic transmissions are primarily recommendations to:—socially isolate by a distance (e.g. 1–2 m; no large gatherings); wash hands regularly and thoroughly; and don’t touch face area without washing hands. The WHO text may enlighten readers on specific aspects of an issue that could arguably link to the virus situation and imposed recommendations. The topic is health care-associated infection (HAI)—also called “nosocomial” or “hospital” infection. According to The World Health Organization, HAI refers to:

...an infection occurring in a patient during the process of care in a hospital or other health care facility which was not present or incubating at the time of admission. HAI can affect patients in any type of setting where they receive care and can also appear after discharge. Furthermore, they include occupational infections among staff. HAI represents the most frequent adverse event during care delivery and no institution or country can claim to have solved the problem yet. Based on data from a number of countries, it can be estimated that each year, hundreds of millions of patients around the world are affected by HAI. The burden of HAI is several fold higher in low- and middle-income countries than in high-income ones. There is also now a worldwide consensus that urgent action is needed to prevent and control the spread of antibiotic resistant organisms and in health care effective infection prevention and control (IPC) is one solution.

(WHO—https://www.who.int/gpsc/country_work/burden_hcai/en/).

A prior WHO review and meta-analysis [2] found that “The burden of health-care-associated infection in developing countries is high. Our findings indicate a need to improve surveillance and infection-control practices.” The first chapter “Experiential Training of Hand Hygiene Using Virtual Reality”, which reports on a technology (Virtual Reality) training initiative action is long overdue given the 2011 and 2017 WHO reports/call for actions [3, 4] (see Chap. 6 cited works) that associates to the 2010 document (ibid). For example, how to thoroughly wash hands within such health environments in order to prevent or minimize transmissions. However, to be clear this author is not an expert on such issues and only brings attention to position
the first chapter with its focus on hand hygiene in context of current global pandemic situation and the rules the public has been given, i.e. social distancing and regular washing of the hands, and content of this volume.

Considered beyond the opening chapter, aligned is an article by Sipherd [5] informing on how “more than 250,000 people in the U.S. die every year from medical errors. Other reports claim the numbers to be as high as 440,000. Medical errors are the third-leading cause of death after heart disease and cancer.” Again, this relates to the content of this book where simulation and technologies such as virtual reality are employed towards improvement of education and training. Also, potentially related is an article at a website called ‘Dollars for Docs’ informing how drug companies get doctors through cash payments, to “promote” (subscribe) their product[^1]—which seems frightening when taken in context of the previous ‘medical errors’ report.

Thus, it seems on one side we are indebted to healthcare staff for their ‘front-line’ efforts, especially in current times in respect of Covid-19. Yet, on the other side, should we not question if the healthcare facilities (hospitals, etc. including aged care institutions), where nurses, doctors and other medical staff are working within and wherein patients are treated, are appropriately modern, clean and sanitized with staff training of the highest level (even in hand cleaning)? This questioned attention towards as much as possible, preventing transmissions via HAI and to optimize survival and recovery alongside best conditions for staff health to not contract disease/infection. This, alongside other issues in healthcare such as the medical errors through potential lack of training (as related by chapters in this volume where contemporary technologies are used to improve educations and training), and a system that supports where doctors are benefiting via payments from drug companies beg questioning?

It is thus pertinent to comment that if this book series can contribute to questioning such healthcare issues related to technologies for inclusive well-being, then as editors we can feel we have in some small way contributed alongside those precious authors presented herein towards increasing reflections by readers on such important issues.

### 2.1.1 Experiential Training of Hand Hygiene Using Virtual Reality [1]

The first chapter in Part One is titled *Experiential Training of Hand Hygiene Using Virtual Reality* by authors Lauren Clack, Christian Hirt, Andreas Kunz, and Hugo Sax. The chapter is authored by two authors from the Human Factors Lab (human-labz) that is under the Infectious Diseases and Hospital Epidemiology, University Hospital Zurich, alongside two authors from The Innovation Center Virtual Reality, under The Swiss Federal Institute of Technology (ETH), both in Zürich, Switzerland. This contribution is timely given the current Covid-19 pandemic and recommendations for social distancing and (possibly more importantly) regular handwashing.

[^1]: https://www.propublica.org/article/profiles-of-the-top-earners-in-dollar-for-docs
ensuring a high quality of hygiene. Worrying is how the cited works inform that “Healthcare-associated infections (HAI) acquired during the course of treatment are the most frequent adverse events in healthcare delivery, affecting billions of patients worldwide” [3]. A call for action was subsequently announced titled “Global infection prevention and control priorities 2018–22: a call for action” [4]. There is no mention whether the call was actioned and then in 2019 Covid-19 (Corona Virus) pandemic started its global journey—however, this is also not subject of this text, rather a personal reflection given the widespread devastating impact in health, related economics, and society itself.

The text informs how the authors target use of experiential learning theory to guide the development of a virtual reality hand hygiene trainer to impact healthcare-associated infections (HAI) acquired during treatment. The virtual reality immersive trainer environment gave visual feedback about microorganism transmission and infectious outcomes. The goal of the work was to enhance experiential learning and increase intrinsic motivation to perform hand hygiene. In line with this work, the mission statement of the humanlabz includes to understand and to optimize the interactions between healthcare providers and their working environments in order to facilitate safer behaviours and to ultimately impact patient safety [6]. Towards this endeavour, the lab team consider the physical, built environment, as well as the cognitive and social environments. Taking a systems perspective to quality improvement, the lab personnel state how they recognize that modifications in any area of the work domain will have repercussions in other areas as they research to introduce evidence-based practice in order to effectively inform future quality improvement efforts.

The Innovation Center Virtual Reality (ICVR) team research and implement VR-Systems focusing upon the human user, in this case the healthcare worker. One can imagine, given the current pandemic Covid-19 situation and need for improved hand hygiene, how this system could disseminate publicly. For more see the chapter text and the lab website (http://www.en.infektiologie.usz.ch/research/research_groups/pages/hugo-sax.aspx) and center website (https://www.iwf.mavt.ethz.ch/research/virtual_reality/index_EN).

### 2.1.2 Useful, Usable and Used? Challenges and Opportunities for Virtual Reality Surgical Trainers [7]

The title of the second chapter in this part is *Useful, Usable and Used? Challenges and opportunities for virtual reality surgical trainers* by Chantal Trudel at the School of Industrial Design under the Faculty of Engineering and Design, Carleton University in Canada.

The text discusses design considerations in the development of virtual reality surgical training simulators in reference to a variety of case studies. Improved healthcare delivery, patient outcomes and training opportunities from use of virtual
reality are introduced including presenting how educational resources are challenged through simulator issues such as scarcity of cadavers for practicing and conducting repetitive tasks and the high costs associated with these models. Other challenges are associated in the text.

The chapter presents a preliminary framework outlining research priorities and areas that have been suggested by previous researchers to help focus the design development of virtual reality applications. Elements of this framework are discussed in reference to the case studies.

2.1.3 Four-Component Instructional Design Applied to a Game for Emergency Medicine [8]

The third chapter in Part One is authored by a trio from The Netherlands, namely Tjitske Faber and Mary Dankbaar from the University Medical Center Rotterdam, Institute for Medical Education Research Rotterdam, and Jeroen van Merriënboer from the School of Health Professions Education, Maastricht University, Maastricht.

This text informs of the original design and redesign of the abcdeSIM game that was developed in a close collaboration between medical practitioners, game designers, and educationalists (see [9]). The game is typically used as a preparation for courses on the ABCDE method that is used internationally to treat seriously ill patients as a guideline for performing the complex skill of resuscitation that is commonly trained in face-to-face-courses. In the game, players treat patients in a virtual emergency department.

The trio used the van Merriënboer and Kirschner [10] Four-Component Instructional Design theory (4C/ID) to redesign the existing game. In this chapter, they explain why the game was redesigned and how the components of this instructional design theory can be applied to designing a serious game for medical education. Interestingly Paul Gee’s ‘System Thinking’ and ‘Cycles of Expertise’ [11] are discussed alongside Hirumi et al.’s [12] concept of cycles of learning and mastery [13] to justify the game redesign.

Conclusions report that despite challenges, mainly visual screen space to display the reminders and tool information, several theoretically sound support options were achieved from the redesign.

2.1.3.1 A Review of Virtual Reality-Based Eye Examination Simulators [12]

The fourth chapter in this first part of the book is a truly international group of authors with the first three Michael Chan, Alvaro Uribe-Quevedo, and Bill Kapralos affiliated to Ontario Tech University in Canada; with Michael Jenkin affiliated to York University, Toronto, Canada; with Kamen Kanev affiliated under Shizuoka University in.
Hamamatsu, Shizuoka, Japan; and Norman Jaimes being affiliated under the Universidad Militar Nueva Granada, Bogota, Colombia. The text informs on a review of direct ophthalmoscopy simulation models for medical training where the co-authors highlight the characteristics, limitations, and advantages presented by modern simulation devices for eye examination. The history and challenges in the field of eye examinations are introduced, with simulators in the field described. The authors’ reasoning behind the limited adoption of simulators was due to the cost associated with the software and hardware. As society advances technologically, simulated clinical experiences become more functional and affordable, providing students with a wide variety of opportunities to learn new skills, practice team communication, and refine clinical competencies [14]. Such trends in medical training include SPs, models and part-task trainers, computer-based simulation, and virtual reality-based systems. This chapter closes by reviewing the remarkable advances that have occurred in the development of training and simulator systems. Relatedly, in browsing Online it is informing (for this author at least) to explore and identify the complexity of such environments via e.g. a product titled ‘EyeSim—Ophthalmology VR’—see https://eonreality.com/portfolio/online-medical-training/ and the challenges that exist such as when traditional 2D training tools are representation of 3D problems relating complex subject matter, such as Visual Pathways, that are poorly represented in standard teaching material and the time to master these subjects could be shortened. Another challenge is the ‘hands-on’ training and online medical training such that students currently practice on real patients (actors) or dissect a cadaver. Both are suboptimal, as a cadaver does not function like a live subject and practicing on real patients can potentially compromise the safety of the patient. This limits the amount of practice students receive while in the classroom. A further challenge is the limited number of dysfunctions that are in such simulators whereby instructors are limited in how dysfunctions and diseases are demonstrated in classroom settings. These examples are often presented as case studies with limited hands on exploration.

2.1.4 Enhanced Reality for Healthcare Simulation [15]

The fifth chapter is titled Enhanced Reality for Healthcare Simulation links Italy, Switzerland, and North America. Authors Fernando Salvetti and Barbara Bertagni have a double affiliation between Centro Studi Logos, Turin, Italy, and Logosnet, Lugano, Switzerland, and Houston, TX, USA. Author Roxane Gardner is multi-affiliated under The Center for Medical Simulation in Boston, and The Brigham and Women’s Hospital/Children’s Hospital/Massachusetts General Hospital and Harvard Medical School, Boston, USA. Rebecca Minehart is affiliated to The Massachusetts General Hospital, Harvard Medical School, and The Center for Medical Simulation, all in Boston, USA. The multiple image chapter informs of enhanced reality for immersive simulation (e-REAL®) that is the merging of real and virtual worlds: a mixed reality environment for hybrid simulation where physical and digital objects co-exist and interact in real time, in a real place and not within a headset. The
The first part of this chapter discusses e-REAL: an advanced simulation within a multi-sensory scenario, based on challenging situations developed by visual storytelling techniques. The e-REAL immersive setting is fully interactive with both 2D and 3D visualizations, avatars, electronically writable surfaces and more: people can take notes, cluster key-concepts or fill questionnaires directly on the projected surfaces. The second part of this chapter summarizes an experiential coursework focused on learning and improving teamwork and event management during simulated obstetrical cases. Effective team management during a crisis is a core element of expert practice: for this purpose, e-REAL reproduces a variety of different emergent situations, enabling learners to interact with multimedia scenarios and practice using a mnemonic called Name-Claim-Aim. Learners rapidly cycle between deliberate practice and direct feedback within a simulation scenario until mastery is achieved. Early findings show that interactive immersive visualization allows for better neural processes related to learning and behaviour change. An enhanced hybrid simulation in a mixed reality setting, both face-to-face and in telepresence is shared.

e-REAL is a futuristic solution based upon a mixed reality set up at the Center for Medical Simulation in Boston, designed to be “global”, “liquid”, “networked” and “polycentric”, as well as virtually augmented, mixed, digitalized and hyper-realistic. The key-words that are summarizing the main drivers that guided the design of this solution, and that are leading the further developments, are presented as: Digital mindset; Visual thinking; Computer vision; Advanced simulation; Multi-media communication; Immersive and interactive learning; Augmented and virtual reality; Human and artificial intelligence cooperation; Cognitive psychology and neurosciences; Anthropology and sociology of culture; Hermeneutics; Narratology; Design thinking applied to andragogy and pedagogy; and Epistemology.

2.1.5 MaxSIMhealth: An Interconnected Collective of Manufacturing, Design, and Simulation Labs to Advance Medical Simulation Training [16]  

The sixth chapter in Part One is a product from the maxSIMhealth laboratory under Ontario Tech University, Canada. At the time of writing this chapter, the maxSIMhealth (www.maxSIMhealth.com) group consisted of (in alphabetical order): Artur Arutiunian, Krystina M. Clarke, Quinn Daggett, Adam Dubrowski, Thomas (Tom) Gaudi, Brianna L. Grant, Priya Kartick, Shawn Mathews, Pamela T. Mutombo, Guoxuan (Kurtis) Ning, Argyrios Perivolaris, Jackson Rushing, Robert Savaglio, Mohtasim Siddiqui, Andrei B. B. Torres, Samira Wahab, Zhujiang Wang, and Timothy Weber. 

maxSIMhealth is a multidisciplinary collaborative manufacturing, design, and simulation laboratory at Ontario Tech University in Oshawa, Canada combining
expertise in Health Sciences, Computer Science, Engineering, Business, and Information Technology, aiming at building community partnerships to advance simulation training. The team focus is on existing simulation gaps, while providing innovative solutions that can change the status quo, thus leading to improved healthcare outcomes comprised of cutting-edge training opportunities. maxSIMhealth utilizes disruptive technologies (e.g., 3D printing, gaming, and emerging technologies such as extended reality) as innovative solutions that deliver cost-effective, portable, and realistic simulation catering the high variability of users and technologies, which is currently lacking. maxSIMhealth is a novel collaborative innovation with aims to develop future cohorts of scholars with strong interdisciplinary competencies to collaborate in new environments and to communicate professionally for successful medical-tech problem solving. The work being conducted within maxSIMhealth is predicted to transform the current health professional education landscape by providing novel, flexible, and inexpensive simulation experiences. In this chapter, a description of maxSIMhealth is provided along with an overview of several ongoing projects.

2.1.6 **Serious Games and Multiple Intelligences for Customized Learning: A Discussion** [17]

Authors of the seventh chapter in Part One are:- Enilda Zea from Universidad de Carabobo, Carabobo, Venezuela; Marco Valez-Balderas from Laurier University, Waterloo, Ontario, Canada; and finally, Alvaro Uribe-Quevedo affiliated to Ontario Tech University, Oshawa, Ontario, Canada. Titled as ‘Serious games and multiple intelligences for customized learning: A discussion’, this text states how teaching strategies need to swiftly respond to abrupt changes in delivery modes that provide engaging and effective experiences for learners. The introduction to this piece states “Life in the twenty-first century requires radical changes in teaching models that correspond to current learners’ behaviours due to the ubiquitous nature of current digital media” [18]. The current Covid-19 pandemic has made it evident the lack of readiness of several academic sectors when moving from face-to-face to online learning. While research into understanding the use of technologies have been gaining momentum when innovative tools are introduced, it is important to devise strategies that lead to effective teaching tools. Recently, user experience (UX) has been influencing content development as it considers the uniqueness of users to avoid enforcing one-size-fits-all solutions. In this chapter, the authors discuss multiple intelligences in conjunction with serious games and technology to explore how a synergy between them can provide a solution capable of capturing qualitative and quantitative data to design engaging and effective experiences.
2.1.7 **Mobile Application for Convulsive and Automated External Defibrillator Practices [19]**

This contribution as the eighth chapter in Part One has a strong representation from the Universidad Militar Nueva Granada, in Bogota, Colombia, with authors Engie Ruge Vera, Mario Vargas Orjuela, Byron Perez-Gutierrez and Norman Jaimes. Author Alvaro Uribe-Quevedo is affiliated under the Ontario Tech University, in Oshawa, Ontario, Canada. The text ‘Mobile game for convulsive and automated external defibrillator practices’ informs that adoption of simulation in medical training aims at improving health care delivery as in the US alone, more than 400,000 deaths are caused each year by medical errors. This number being the third cause of death followed by cardiovascular diseases and cancer [20]. The chapter informs how simulation has proven effective in reducing deaths caused by some medical errors and in different scenarios towards realizing best practices. A timeline of manikins used in simulation training across different situations is presented alongside argument for how interdisciplinary teams further improve the training platforms and trainee educations. Extended (Virtual, Augmented, Mixed…) Reality technologies offers simulation developers new opportunities to improve simulation trainings. In this chapter, the authors present the development of two virtual manikin mobile applications, one for resuscitation employing a virtual automated external defibrillator and another for convulsive training treatment. The authors’ goal is to provide a mobile virtual approach to facilitate complementary practices via handheld devices by reproducing the tasks involved in each situation through a touch screen and motion-based interactions. To increase user engagement, the authors have added game elements that add realism to the simulation training by incorporating goals and metrics taken to assess performance and decision making. To evaluate engagement and usability, they have employed the System Usability Scale and the Game Engagement Questionnaire. A preliminary study shows that both apps are usable, engaging, and may help refreshing information about the procedures.

2.1.8 **Lessons Learned from Building a Virtual Patient Platform [21]**

The ninth chapter presents insightful reflections on ‘Lessons Learned from Building a Virtual Patient Platform’. The authors, Olivia Monton and Allister Smith are affiliated to McGill University in Montréal, and Amy Nakajima is affiliated to Simulation Canada, in Toronto, as well as the Bruyère Continuing Care, The Ottawa Hospital, Wabano Centre for Aboriginal Health and University of Ottawa, in Ottawa, Ontario, Canada.

In this work, Virtual Patients (VPs) and Simulation-based medical education (SBME) are introduced alongside the resulting company realized from the team’s initiative. These are acknowledged as an effective way to educate trainees at the
provider, team, and systems-level, addressing different learning needs and fulfilling a variety of functions [6, 22]. The authors inform how simulation at the individual-level promotes knowledge acquisition and skill-development of a healthcare provider, whereas systems-level simulation takes a broader view, exploring issues related to the components of healthcare, a complex, socio-technical system consisting of multiple and multiply interacting components, including the environment, the organization, the work itself, and persons, which include providers, patients and families. The text shares the journey to create the VP software platform, Affinity Learning, and a content-based VP company titled as ‘VPConnect’. The authors discuss experiences from partnering, as medical students, with members of academia, research, clinicians and industry to create a VP platform. Their insightful reflections are shared that specifically highlight—(a) The virtual environment as an effective, safe, and cost-efficient way to educate medical trainees; (b) The requirements behind a successful VP platform; (c) The obstacles and challenges faced in medical education innovation; and (d) future work.

2.1.8.1 Engaging Learners in Pre-simulation Preparation Through Virtual Simulation Games [23]

The final and tenth contribution in Part One is a chapter titled ‘Engaging learners in pre-simulation preparation through virtual simulation games.’ The authors are all based in Ontario, Canada, they are namely, Marian Luctkar-Flude and Deborah Tregunno, who are affiliated to Queen’s University, School of Nursing, in Kingston; Jane Tyerman and Michelle Lalonde, who are affiliated to the University of Ottawa, School of Nursing, in Ottawa; Lily Chumbley, who is affiliated to Trent University, in Peterborough; and Laurie Peachey, who is affiliated to Nipissing University, School of Nursing, in North Bay. The text informs on the use of technology in the form of VSGs (virtual simulation games) in nurses’ education where educators must carefully assess learning outcomes associated with various components of clinical simulation. Pre-simulation preparation, the authors inform, is a critical aspect of simulation education that has not been well-studied and that traditionally preparation activities include readings, lectures, and quizzes and non-traditional activities include video lectures, online modules, and self-assessments. However, in the authors’ experiences, learners may fail to adequately prepare for simulation such that there is a need for innovative approaches to optimize learning during the simulation. Whilst medical and nursing educations have seen increased use of virtual simulation and gaming this is not the case in pre-simulation preparation activities for clinical simulation. The chapter informs how over 30 validated clinical simulation scenarios have previously been developed by nurse educators from across Ontario for senior nursing students to enhance their transition to clinical practice. Each scenario is implemented with self-regulated pre-simulation preparation guided by a scenario-specific learning outcomes assessment rubric. The development of a series of VSGs aims to further enhance pre-simulation preparation for undergraduate nursing students participating in these scenarios. The authors propose that VSGs used for pre-simulation preparation will
prove to be more engaging to learners, resulting in better preparation and improved performance during live simulations with the result that the use of virtual simulation for pre-simulation preparation may translate to improved performance in real clinical settings with a positive impact on patient safety and well-being.

Conclusions in the text point to how virtual simulation games are considered as an innovative pre-simulation preparation strategy that engages learners providing them with immediate feedback on their clinical decision-making. By the authors creating their own VSGs they were able to provide content aligned with intended learning outcomes and levelled to the learner experience level in order to better prepare trainees to participate in a live simulation where they could demonstrate their competence within a given clinical scenario. The authors note their anticipation of the advantages to using VSGs for pre-simulation preparation as they could include the promotion of self-regulated learning, enhanced knowledge, decreased anxiety, and enhanced preparation and performance during a live simulation scenario. Additionally, they anticipate that standardized pre-simulation preparation will reduce faculty preparation time and student assessment time and may decrease instructional time in the simulation laboratory. Collaboration and sharing of VSGs across nursing schools they predict will mediate the development costs and result in cost savings in the long-term. In closing they state how further research is needed to demonstrate the impact of VSGs on learning outcomes and transfer to practice.

2.2 Conclusions

In concluding this first part of the book that has presented a brief introduction review for readers to get an idea of each chapter and its author(s) positioning—this reviewing has been via extracting as direct quotation or paraphrasing from the original works—as cited. ‘Gaming, VR, and immersive technologies for education/training’ (especially simulation use) are presented and disclaimer to this ‘topic categorization’ is stated as being conducted to the best of the editor’s abilities in order to segment the volume. It is anticipated that scholars and students will be inspired and motivated by these contributions to the field of Technologies of Inclusive Well-Being towards inquiring more on the topics and where appropriate to cite in their own research and studies. Whilst the opening statement informed how education/training and medical errors (plus potentially greed) impact well-being of society, there are also ongoing major advances in how to train staff and treat people and how to target optimal patient experiences and outcomes across situation that include in hospital, private practices and homes. The second part of this book follows the ten chapters—it is themed ‘VR/technologies for rehabilitation’—enjoy.

Acknowledgements Acknowledgements are to the authors of these chapters in this opening part of the book. Their contribution is cited in each review snippet and also in the reference list to support reader cross-reference to the cited work. However, the references are without page numbers as they
are not known at this time of writing. Further information will be available at the Springer site for the book/chapter [24].

References

1. Clack, L., Hirt, C., Kunz, A., Sax, H.: Experiential training of hand hygiene using virtual reality. In Brooks, A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: Virtual Patients, Gamification and Simulation. Springer Intelligent Systems Reference Library 196 (2021)

2. Allegranzi, B., Bagheri Nejad, S., Combesecure, C., Graafmans, W., Attar, H., Donaldson, L., Pittet, D.: Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. Elsevier (2010). https://doi.org/10.1016/S0140-6736(10)61458-4

3. WHO (World Health Organization).: Report on the burden of endemic health care-associated infection worldwide (2011). https://www.who.int/infection-prevention/publications/burden_hcai/en/

4. WHO (2017). World Health Organization: Global infection prevention and control priorities 2018–22: a call for action. https://doi.org/10.1016/S2214-109X(17)30427-8

5. Sipherd, R.: The third-leading cause of death in US most doctors don’t want you to know about (2018). https://www.cnbc.com/2018/02/22/medical-errors-third-leading-cause-of-death-in-america.html

6. Auerbach, M., Stone, K.P., Patterson, M.D.: The role of simulation in improving patient safety. In: Grant, V.J., Cheng, A. (Eds.) Comprehensive Healthcare Simulation. Pediatrics, Springer (2016)

7. Trudel, C. (2020). Useful, usable and used? Challenges and opportunities for virtual reality surgical trainers. In Brooks, A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: Virtual patients, gamification and simulation. Springer Intelligent Systems Reference Library 196

8. Faber, T.J.E., Dankbaar, M., van Merriënboer, J.J.G.: Four-Component Instructional Design applied to a game for emergency medicine. In Brooks, A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: Virtual patients, gamification and simulation. Springer Intelligent Systems Reference Library 196 (2021)

9. Erasmus MC/VirtualMedSchool (2012). https://virtualmedschool.com/abcdesim

10. Merriënboer, J.J.G. van, & Kirschner, P.A.: Ten steps to complex learning: a systematic approach to four-component instructional design, 3rd ed. Routledge (2017)

11. Gee, J.P.: Learning by Design: Good Video Games as Learning Machines. E-Learning Digit Media 2, 5–16 (2005)

12. Hirumi, A., Appelman, B., Rieber, L., Eck, R.V.: Preparing Instructional Designers for Game-Based Learning: Part 1. TechTrends 54, 27–37 (2010)

13. Ryan, R.M., Deci, E.L.: Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being Self-Determination Theory. Am Psy 55, 68–78 (2000)

14. So, H.Y., Chen, P.P., Wong, G.K.C., Chan, T.T.N.: Simulation in medical education. Journal of the Royal College of Physicians of Edinburgh 49(1), 52–57 (2019)

15. Salvetti, F., Gardner, R., Minehart, R., Bertagni, B.: Enhanced Reality for Healthcare Simulation. In Brooks, A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: Virtual patients, gamification and simulation. Springer Intelligent Systems Reference Library 196 (2021)

16. maxSIMhealth.com - (Lab/group submission) maxSIMhealth: An interconnected collective of manufacturing, design, and simulation labs to advance medical simulation training. In Brooks,
A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: Virtual patients, gamification and simulation. Springer Intelligent Systems Reference Library 196 (2021)

17. Zea, E., Valez-Balderas, M., Uribe-Quevedo, A.: Serious games and multiple intelligences for customized learning: A discussion. In Brooks, A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: Virtual patients, gamification and simulation. Springer Intelligent Systems Reference Library 196 (2021)

18. Prior, D.D., Mazanov, J., Meacheam, D., Heaslip, G., Hanson, J.: Attitude, digital literacy and self efficacy; Flow-on effects for online learning behaviour: the Internet and Higher Education 29, 91–97 (2016)

19. Vera, E. R., Orjuela, M. V., Uribe-Quevedo, A., Perez-Gutierrez, B., Jaimes, N.: Mobile game for convulsive and automated external defibrillator practices. In Brooks, A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: Virtual patients, gamification and simulation. Springer Intelligent Systems Reference Library 196 (2021)

20. Jones, F., Passos-Neto, C. E., Braghiroli, O. F. M.: Simulation in medical education: brief history and methodology. Principles Prac Clinical Res 1(2) (2015)

21. Monton, O., Smith, A., Nakajima, A.: Lessons Learned from Building a Virtual Patient Platform. In Brooks, A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: Virtual Patients, Gamification and Simulation. Springer Intelligent Systems Reference Library 196 (2021)

22. Petrosoniak, A., Brydges, R., Nemoy, L. Campbell D. M.: Adapting form to function: can simulation serve our healthcare system and educational needs? Advances in Simulation 3(8) (2018)

23. Luctkar-Flude, M., Tyerman, J., Chumbley, L., Peachey, L., Lalonde, M., Tregunno, D.: Engaging learners in presimulation preparation through virtual simulation games. In Brooks, A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: virtual patients, gamification and simulation. Springer Intelligent Systems Reference Library 196 (2021)

24. Chan, M., Uribe-Quevedo, A., Kapralos, B., Jenkin, M., Kanev, Jaimes, N.: A review of virtual reality-based eye examination simulators. In Brooks, A.L., Brahnam, S., Kapralos, B., Nakajima, A., Tyerman, J., Jain, L.C. (Eds.) Recent Advances in Technologies for Inclusive Well-Being: Virtual Patients, Gamification and Simulation. Springer Intelligent Systems Reference Library 196 (2021)