

A RESEARCH REPORT

Learning in a Digital World: Applications to Nurse Learning and Education



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1. Introduction

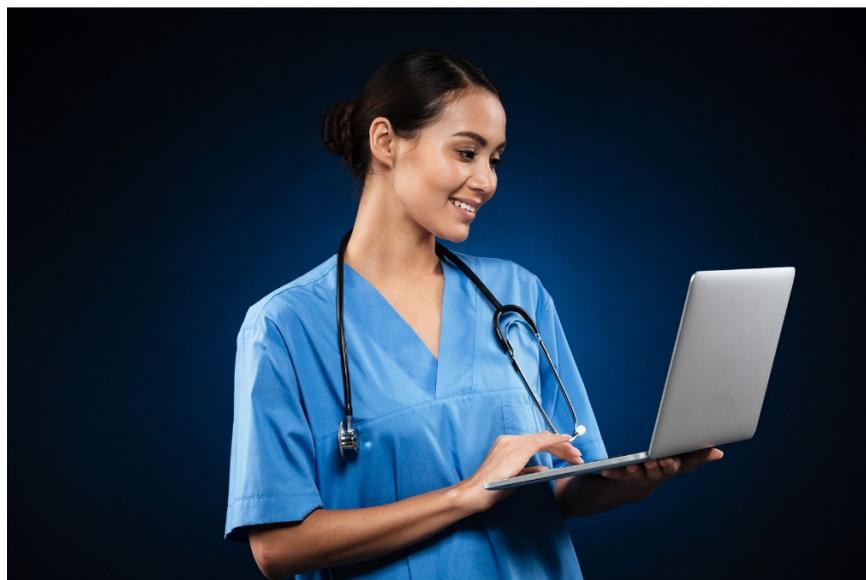
Everywhere around the world, people across all genders, ages and professions are surrounding themselves with various forms of digital technology. Simply put, digital technology is transforming almost every aspect of human life. In the education sector, technology has the ability to positively transform teaching, learning as well as the relationship between educators and students (ED, 2017).

However, to reap the benefits of digital technology in the education system, students and educators must be digitally literate. Digital literacy is defined as the ability to (Cordell, 2013):

- Find, understand, evaluate, create and communicate digital information in different formats.
- Use different types of digital technology appropriately and effectively for purposes of searching, retrieving and evaluating digital information.

- Use digital technology for communication and collaboration with peers family and colleagues.
- Understand the relationship between different technologies, privacy issues and the risks and dangers of the digital world.

This research report seeks to enhance the digital literacy of nurses and nursing students. It will inform nurses and nursing students on the different types of digital technologies available for learning and professional development. It will also highlight the most appropriate strategies required to effectively use these digital technologies. Lastly, it will enlighten and prepare nurses and nursing students on the risks and dangers of digital technology.



2. Benefits of Digital Learning Resources (DLRS)

Digital learning resources can be defined as information communication technology (ICT) based tools and materials that are used for teaching and learning purposes (Norwegian Centre, 2016). Nurses and nursing students can benefit in a number of ways from utilizing digital learning resources (Ark, 2015; LearnKit, 2018).

1. *Availability 24/7 anywhere.* Traditional learning resources are often available in specific places and at specific times particularly when one does not have complete ownership. Even when one does have complete ownership of a learning resource, it may not always be possible to take it everywhere. However, digital learning resources are electronic in nature with many of them being available on-demand and on the internet. Nurses can access them around the clock anywhere they may be. Additionally, nurses can access DLRs across multiple devices including mobile phones.
2. *Individualization – learn at own pace, time and location.* Digital learning resources provide an opportunity for nursing students to get a personalized learning experience. Personalized learning allows students to (Pandey, 2017):
 - Choose their own learning paths
 - Choose the devices they want to learn on
 - Learn at their own pace
 - Set their own goals and their own manageable milestones
 - Learn at their own convenience and with increased flexibility
3. *Feedback – immediate, individualized feedback.* One key characteristic of digital learning resources is that it offers high levels of two-way interactions between educators and students as well as among students. This in turn ensures access to prompt and personalized feedback. This can help students assess their progress better (Pandey, 2017).
4. *Engagement – learning can be more engaging and interesting.* According to the Merriam-Webster dictionary, something is said to be engaging if it stirs up positive attention or interest (Merriam-Webster, 2018). Digital learning resources include digital content in the form of audio, video and imagery among others. Further, students have hands-on control over the resources and the content. This ensures that students remain active and attentive throughout the session (March, 2012). Increased student participation in the learning process is important in boosting motivation levels.
5. *Increased freedom to make mistakes.* Nursing students often have the pressure not to fail since it may harm patients. However, through digital learning resources such as virtual worlds, interactive games and simulations, nurses and nursing students can practice various nursing activities in a safe environment where no patients are at risk of harm (McKenzie & Murray, 2010).

6. *Continuous and updated information.* Nursing students who use digital learning resources get access to material that is up-to-date and in line with the latest trends in nursing education and nursing practice. The tools used as digital learning resources are also becoming more advanced and more sophisticated. This means that DLRs are continuously improving in efficiency and effectiveness (European Heart Association, 2017).
7. *Cost-effective.* Many digital learning resources are freely accessible on the internet and through other sources such as university databases. When fees are paid, they are low and generally affordable. Additionally, the use of digital learning resources reduces costs associated with travelling, course materials, trainers and even facilities such as lecture rooms. This makes digital learning resources cost-effective and affordable.
8. *Enhances student employability.* Many healthcare providers are adopting the use of technology in their facilities and in the

provision of services. Many hospitals now have hospital information systems which cover clinical/medical, administrative and even financial operations among others (Bryant & Stratton, 2017). Nurses and nursing students who demonstrate skills in the use of digital technology will have a competitive edge over those who do not.

9. *Eco-friendly and sustainable.* The growing human population coupled with increased human activity has had a huge and negative effect on the natural environment and on natural resources (Dovers & Butler, 2015). Today, there is increased need for eco-friendliness. According to the International Council of Nurses, nurses can play an important role in implementing and driving environmentally friendly changes in healthcare (iSustainable Earth, 2012). One way to do this is through digital learning resources since they eliminate or minimize the use of paper. Additionally, fewer resources such as electricity and fuel (transport) are used (Gupta, 2017).



3. Challenges with Digital Learning

Nurses and nursing students who use digital learning resources should expect a few challenges.

1. *Best for knowledge – less effective for psychomotor and affective domains.* Many researchers recognize learning as a combination of three main domains: the cognitive domain (knowledge), the affective domain (attitude, feelings, and emotions) and the psychomotor (skills) domain (Cullinane, 2010). However, many digital learning resources focus on providing access to knowledge e.g. facts, concepts. These e-courses and e-materials focus less on the affective domain and even less on the psychomotor domain (Shyu & Chou, 2008).
2. *Less group interaction – although communications tools can overcome this to some extent.* Although e-learning often includes collaboration and interaction through social media and other interactive technologies, it takes away the authenticity of face-to-face interactions and real group activity (Mobbs, 2003).
3. *Requires self-discipline, dedication and motivation.* E-learning involves less supervision and more freedom. However, with freedom comes increased responsibility. Some individuals may not have the self-discipline, time management and self-motivation skills required to fully benefit from DLRs. Furthermore, some individuals may not thrive in learning experiences that are impersonal in nature (Mobbs, 2003).
4. *Diversity of browsers, operating systems and mobile devices.* Although digital learning material is often available across multiple devices, the user experience may differ on different devices. Users may experience unfriendly interfaces and other technical issues that may discourage them from using the DLR (Zaineb, 2016).
5. *Distractions – easy to be distracted.* Because of the freedom and independence given to learners, it is easy for students to lose attention or get distracted by other things in the background. In addition to that, the internet provides even more distractions such as social media and other online forms of entertainment. The ability of a student to benefit from DLRs is highly dependent on his/her ability to balance between learning and non-learning activities (Winter, Cotton, Gavin & Yorke, 2010).
6. *Over-reliance on technology skills.* The effectiveness of digital learning resources is also dependent on an individual's ability to use information technology. The association of e-learning and technical know-how may discourage students who are technology averse or less comfortable with technology from utilizing digital learning resources (Pappas, 2016).
7. *Lack of devices and internet issues.* Digital learning resources may not be of use to nurses and nursing students that do not own devices such as smartphones or laptops. Some individuals may also lack the necessary software required to

effectively use digital resources (Pappas, 2016). Aside from that, students are often required to have a working internet connection in order to use these digital resources. Individuals who do not have access to good internet connections and the required devices will find it difficult to benefit from e-learning (Pappas, 2016).

8. *Other challenges.* Other potential challenges of using digital learning resources include: availability of too much data, the evolving nature of e-learning technology, personal beliefs and attitudes as well as privacy and safety issues.



4. Finding Learning Resources

The internet has become a rich source of learning resources for nursing students. In truth however, the abundance of information and information sources can make it harder to conduct online searches for information.

4.1 Tips for effective online research

Nurses and nursing students must remember that although the internet is a rich source of information and material, it does not have everything. Online nursing and health databases may not have all the relevant information on some topics. Secondly, nurses and nursing students must keep in mind that it takes time and effort to conduct online research. Thirdly, information on the internet changes on a regular basis. This means information may be moved, changed/revised or even deleted.

1. *Planning the search.*

- Understand what you want to do/achieve.
- Determine what you know and what you do not know.
- From this, determine the gaps in knowledge and decide on the important information you need.
- Identify keywords or phrases that appropriately describe the information you are looking for. Additionally, identify synonyms or similar words/phrases.
- Understand the complexity or deepness of the information you require. For example, some students may require nursing statistics;

others may require peer reviewed nursing research.

- Lastly, decide on the most appropriate place to look for the information. Options may include Google scholar, university databases and government databases among others (Open University, 2018).

2. *Doing the actual search.*

- Start by searching for the pre-identified keywords or phrases.
- Alter the keyword and the search depending on the information that pops up.
- If results are too broad, narrow down the keyword or key phrase.
- Use “AND” between keywords to narrow down research.
- Use “OR” between keywords to broaden/expand search results (Mount Allison University, 2018).
- Use parenthesis to group similar nursing concepts together.
- Use the digital object identifier (DOI) to find and locate nursing articles.
- Differentiate between paid and organic search results.
- If the information is provided by an institution/program, check the accreditations. For example, nursing students may look for programs that have “nursing programmatic accreditation”.
- Consider using a meta-search engine. These conduct more

efficient and more relevant search results (Popkoff, 2018).

- Consider using the subject directories provided in search tools and data-bases.
- Use highly relevant and authoritative resources to identify and search for further resources.
- On Google and other search engines, use the advanced search settings.
- Use “NOT” in a cautious and infrequent manner.
- Use quotation marks for more specific results (including on Google).
- Consider limiting the search results to non-subject parameters. For example, one may limit search results based on whether they are: books, journal articles, clinical trials, review articles or even recent publication years (Open University, 2018).

3. *Specific strategies used in searching*

Generally, there are 3 commonly used strategies for conducting online search for learning materials (Creighton University, 2018).

The Building Blocks Approach

This strategy is one of the most basic approaches of conducting online searches. Success largely depends on nurses/student’s flexibility and willingness to learn from initial results. The strategy includes (Creighton University, 2018):

- Breaking down the search problem into smaller concepts/ideas
- Searching for each concept individually and separately
- Conducting a final search of the combined concepts
- Refining concepts by trial and error

Citation Pearl Growing

This strategy involves repetitions of the basic strategy. Using this strategy, the researcher uses a single source of information to identify other relevant sources of information.

Strategy is built on the assumption that articles covering the same topic/subject matter are assigned similar descriptors. It includes (Creighton University, 2018):

- Identifying the most relevant resources e.g. nursing research article (pearl)
- Searching the database for the article record
- Identifying and reviewing the descriptors used for the record (subject indexing)
- Using the descriptors identified from the pearl record to conduct a new search
- Evaluating the relevant records retrieved from the new search
- Conducting a new search using any additional relevant descriptors identified from the previous search
- Repeating the steps above until enough relevant learning materials have been identified

Successive Fractions Strategy

This strategy is ideal for nurses and students who are not familiar with the topic they are researching.

- Researcher starts by searching a broad topic
- Initial search results in retrieval of a large number of records
- Researcher identifies useful restrictions to apply to the search for more specificity
- Nurse/student repeats process until the most relevant results are achieved

4. Using Google Scholar

Nurses and nursing students are often required to use accurate and reliable scholarly sources/materials. Google Scholar is a search engine designed to search only that material which is considered scholarly.

Google Scholar searches different databases and returns a variety of results including: conference papers, books, book chapters, government reports, scientific reports, journal articles, dissertations and theses among others (Kent, 2005). The search engine is ideal as a “first source” of information for nurses and nursing students (Kent, 2005).

Benefits of using Google Scholar

- More accurate and trustworthy search results
- Search results come with bibliometric data such as the number of researchers who have cited a nursing research article

- Wide range of inter-disciplinary results
- Searches use natural language

Tips on Searching using Google Scholar

To use Google Scholar effectively, nurses and nursing students should:

- Have access to a database e.g. a University database or services such as EBSCO Health, ProQuest Health and Medical collection, PubMed Central or Science Direct among others.
- Limit search results to specific domains/sites such as government websites and professional nursing organizations
- Link their Google Scholar accounts to their university/institution libraries
- Use phrase searching to reduce search results (MacEachern, 2016)
- Search for PDF files to locate full-text articles
- Use the “cited by” feature to find similar and newer studies
- Use the advanced search feature to refine search results by: name of author, publication date and even specific journals (Kent Library, 2017)
- Be familiar with the use of various tools meant to refine the search. These include (Otago, 2015):
 - Using the minus sign (-) immediately before a keyword to exclude it from search results

- Using the plus sign (+) before a search term to include it in results
- Using (intitle:) before a search term to find results that have the term in the title
- Using (author:) before a search term to only include results where the search term is the document author

4.2 Evaluating online information

The internet is an open source of information meaning that anyone can put up a website. The information that nurses and nursing students find on the internet is only as reliable as the source. It is important to use verifiable and authoritative sources.

1. *Evaluating the authority of the author.* Medical and healthcare information is highly sensitive. Authors of such material should be qualified to present the information.

Authoritative sources are:

- Available on professional/authoritative websites e.g. government websites, healthcare institution, professional organization, university websites
- Written by authors who are experts in subject matter e.g. nurses, advanced practice nurses

2. *Evaluating accuracy and validity.* After verifying the credibility of the author/source, nurses and nursing students must evaluate the material for accuracy/validity/truth. Highly accurate

articles are more reliable. To assess accuracy and validity:

- Determine purpose of information and the intended audience.
- Analyze the writing style, degree of research, detail and organization in the article. Scholarly articles often have citations from scholarly sources.
- Check for certification of the website. For example, websites offering medical information often have *The Health on the Net Foundation Code of Conduct* (HONcode) certification (Thompson, 2017).

3. *Evaluating currency of content/material.* Medical and nursing information is constantly changing and evolving as new discoveries and concepts are made. For any information to be reliable, it should represent knowledge that is current and up-to-date.

- Identify “date posted” or “publishing date”
- If applicable, check for a “Last updated” date
- Check for the dates of the cited material/sources in the article
- Check whether any links in the material are working. Broken links may indicate outdated or an unmaintained website (Thompson, 2017)

4. *Assessing the relevance of content to needs.* There is an abundance of learning material on the internet. However, this material is only useful if it is relevant to the informational and research needs of the nurse/nursing student. Things to look out for may include:

- New/unique perspectives/knowledge presented in the material.
- Breadth and depth of material. Some content provides in-depth analysis; others provide overviews.
- Compatibility with other articles on the subject matter (Thompson, 2017).

5. *Determining the objectivity of the website.* Accurate and reliable nursing research relies heavily on the factuality of information. Generally, information may be objective, subjective or a mixture of

both. To assess the objectivity of online learning material:

- Determine purpose of material e.g. educational, informational, scholarly, scientific, news, promotional, commercial, personal or even entertainment.
- Check for presence or lack of advertising on the website.
- Determine the intended target of information.
- Determine appropriate level of objectivity based on the purpose of information and intended target. For example a personal nursing blog would be subjective.
- Identify bias in the article e.g. presentation of opinion as fact or focusing on a single side of an argument (Thompson, 2017).



5. Technologies for Accessing and Using Learning Resources

Nurses and nursing students can access a wide array of digital learning resources. This section provides a brief description of some of the most common ones.

5.1 Nursing apps

The use of mobile health applications is on the rise among nurses and nursing students. Nursing apps provide access to valuable information and resources on the go.

How to find them

Nurses and nursing students can find nursing mobile applications by:

- Searching for them on the different app stores. These include:
 - *Apple's App Store*
 - *Google Play Store*
 - *Educational App Store*
 - *Amazon App Store*
- Searching the internet for nursing app catalogs and curated lists of nursing apps
- Looking for online reviews of nursing apps on the internet
- Consulting with instructors on the best available nursing apps
- Consulting with fellow nursing professionals and nursing students who already use the nursing apps.

Selecting the Apps

After finding a reliable source of mobile nursing applications, it is important to select the most appropriate application based on one's needs. In this case, the nurse/nursing student should consider factors such as:

1. *The platform of the application.* Different applications can be used on different platforms. Some mobile applications run entirely on mobile devices such as smartphones and tablets. Other applications are web-based but also optimized for use on mobile platforms (Calinici, 2017).
2. *Mobile Operating System.* Primarily, apps run on mobile devices such as phones and tablets. However, different devices use different mobile operating systems. Some common operating systems include iOS, Android and Blackberry OS. Some apps are tailored to run on specific operating systems. Other apps can run on multiple mobile operating systems as well as on the web portal. Nurses must select apps based on their compatibility with the operating systems of their mobile devices.
3. *Cost of the App.* It is also important to consider one's budget when selecting an educational app. Generally, apps can be divided into two categories – free apps and paid apps. Paid apps also vary in their costs; some are low cost while others are relatively more expensive. Some apps also have in-app purchases. This means that users must pay to access certain features of the app. However, a paid app is not necessarily of better quality than a free app.
4. *Purpose/use of the App.* Different apps are tailored for different uses and subsequently, different audiences. Nurses and nursing students should select apps based on how they intend to use them.

There are apps that are specifically tailored for nursing students preparing for their exams (Pfeffer, 2016). These include apps such as:

- *Nursing Essentials*
- *Davis Mobile NCLEX-RN Apps*
- *Med Mnemonics*
- *Mini Nurse*
- *Nursing in a Flash- Med Surg Volume I & II*

Other apps are designed for informational purposes and therefore have a general audience. They provide news on latest trends and developments in nursing (Pfeffer, 2016). These apps also provide access to nursing journals. They include:

- *MedPage Today*
- *Medscape WebMD*

Some apps can also be used for referencing purposes. These apps may contain information about assessment, medical diseases/disorders, diagnosis and medication (Pfeffer, 2016). Examples include:

- *Disease Dictionary*
- *Epocrates*
- *Black's Medical Dictionary*
- *Eponym*
- *Nursing Central*

Apps that are tailored for practicing nurses include (Pfeffer, 2016):

- *Davis Mobile: Nursing Procedure Checklists*
- *Nurses Aid*
- *ShiftPlanning*
- *Nurses Pocket Guide*
- *MediBabble Translator*

Evaluating Apps

Once one has identified an app, it is important to evaluate it and confirm its quality. Factors to consider when evaluating nursing apps include:

1. *Engagement.* The app should capture the attention of the user and motivate users to make use of the app.
2. *Relevance.* The app should stay true to its core purpose. More importantly, the app should cater to the needs of the student or nurse.
3. *Feedback.* Feedback is important for effective learning to take place (Hattie & Timperley, 2007). A quality app should feature prompt and specific feedback.
4. *Sharing.* A good app allows users to save their content in-app. It also allows them to share (export) this content to peers and instructors.
5. *Currency.* Quality apps are updated on a regular basis.
6. *Multimedia.* Good apps integrate the use of different media such as text, images and even audio.
7. *Customization.* Quality apps allow users to set content preferences as well as change settings to meet their needs.
8. *Other.* Other factors to consider when evaluating an app may include:
 - Ease of use
 - Reliability and accuracy of information
 - Presence of different difficulty levels
 - Integration with the cloud
 - Speed of loading
 - Availability of in-app help

5.2 Online courses

Technological development has also resulted in the growth of online nursing courses. Many offer non-clinical online education and experiential training in a healthcare facility.

Finding online courses

Like their name suggests, online courses are internet based. A simple internet search would therefore yield hundreds of different online nursing courses (Beachy, 2018).

Before registering for an online course, nurses/nursing students should consider the following factors (Campus Explorer, 2018):

1. *Accreditation.* The schools/organizations offering the course should have relevant accreditation as per country/state requirements. In the U.S for example, there are two main Department of Education recognized accreditors (Beachy, 2018):
 - National League for Nursing Accrediting Commission (NLNAC)
 - The Commission on Collegiate Nursing Education (CCNE)
2. *Cost.* Some online courses are free while others are paid. However, one should also look out for hidden expenses and fees.
3. *Faculty.* One should do a research on the quality of the program's faculty. Instructors should be certified, licensed and well-experienced individuals.
4. *Range of digital student resources.* The online course should also feature resources to help the student learn better. Examples of such resources include:

- Online library
- Online discussion board
- Student experience teams

5. *Feedback policies.* The online course should have strong policies on professor feedback. Additionally, it should have strong feedback policies on assignments and online discussions.
6. *Technical support.* Online courses involve the use of technology. It is not uncommon to experience problems and hitches while accessing the online course. A good program has 24/7 technical support for students.
7. *Student reviews.* Reviews allow one to judge a program based on the experiences of others.

Using online courses

To make the best use of online courses, nurses and nursing students should (Papps, 2015; Mock, 2015):

- Have a strong and reliable internet connection
- Understand the technical requirements of the program
- Be self-disciplined and self-motivated
- Have a dedicated study time and space
- Make a study plan and stick to it
- Have close working relationships with course instructors
- Participate in online discussions
- Seek help whenever the need arises
- Log-in on a regular basis
- Avoid procrastination

5.3 Online quizzes

Nurses and nursing students may also enhance their knowledge using online quizzes. These are internet based assessments designed to test students on different subjects. Most online quizzes are compatible with mobile devices and web-browsers. Online quizzes provide prompt results and feedback.

Where to find online quizzes

- Search the internet for online nursing quizzes
- Referrals from other students as well as instructors
- Nursing oriented e-learning websites, for example Learning Nurse has more than 167 nursing quizzes with more than 12,000 questions.
- Online courses may also have quizzes

Using online quizzes

- Take the online tests on a frequent basis
- Always read the quiz instructions carefully
- Maintain honesty and integrity when taking the quizzes
- Have good time management skills
- Have a quiet test-taking spot with no distractions
- Have a strong internet connection and appropriate hardware and software.
- If possible, save and print feedback as a PDF
- Review feedback and incorporate it (Strang, 2014; UVaCollab, 2018)

5.4 Podcasts (Portable on Demand Broadcasting)

Podcasts are programs that are digitally recorded (audio or video). Users download them from the internet and play them on their devices (Gray, Smyth, Campbell, McLeod, & Strickland, 2010).

Finding Podcasts

Podcasts are available from a wide number of internet sources. Nurses and nursing students can find them through:

- Online University Libraries
- Podcast search engines and databases such as Listen Notes and Player FM
- Some nursing websites
- Curated lists from the internet
- Referrals from peers and instructors/professors

Using Podcasts

To benefit from podcasts, nurses and nursing students should:

- Have a reliable podcast app (podcatcher). Some are free, others come at a cost. Examples of podcatchers include:
 - Google Play Music
 - Apple Podcasts app
 - Stitcher Radio
 - Castbox
 - Pocket Casts
- Ensure the podcasts are relevant to their specific needs
- Start with a transcript if applicable
- Keep a notebook and take notes

- Pause, rewind and play at their convenience
- Critically analyze the information from the podcast and do further research (Lowry, 2017; Accidental Information, 2017)

5.5 Simulation and games

Simulation

Simulation refers to the imitation or reproduction of real-life experiences or systems. In nursing and healthcare in general, simulations are used for:

- Teaching
- Assessment of students
- Research
- Health system integration particularly in patient safety

A simulator is said to have high fidelity when it mimics/reproduces real-life experiences with great accuracy (Baumlein, 2014).

Game-based learning

Serious games are applications developed using computer gaming technologies and specifically designed for educational purposes. They include high fidelity simulations e.g. virtual worlds.

Gamification is the use of game-based mechanics, aesthetics and/or game thinking in activities not intrinsically game-based to (Baumlein, 2014):

- Engage students/participants
- Motivate action among participants
- Promote and enhance learning
- Enhance problem solving skills

Gamification is not a game. Gamification uses game elements to enhance the learning experience. Examples would include using:

- Achievement badges
- Leaderboards
- Point systems
- Level progressions
- Quests

Benefits of games and simulations

Some of the advantages of incorporating games and simulations in nursing education include:

- Learning takes place in safe environment i.e. no patients at risk
- Some games and simulations are highly realistic
- They are challenging and encourage creativity and problem solving
- They are rules based
- They provide immediate results and feedback
- Students/participants are free to fail
- They are interactive e.g.
 - Player vs. Player
 - Player vs. Content(System)
 - Multi-player modes
 - Massively multiplayer online games (MMOG)
- They are relatively cost-effective
- They compress time. Students/participants can learn potential long-term consequences of certain actions (Stokowski, 2013).

5.6 Videos

The use of videos in nursing and healthcare education is on the rise. Videos allow self-learning. Videos also help students understand concepts better because they use visual perception (Vieira, Lopes, & Soares, 2014).

Finding nursing videos

All sorts of nursing videos are available on the internet. Picking relevant and reliable videos that are of high quality may be difficult. However, it all depends on the source and the credibility of the source. Some potential sources of educational nursing videos include:

- Online university libraries
- Educational video hosting sites such as:
 - Amazon Education
 - EdX
 - iTunes U
 - YouTube #Education
- Accredited nursing education websites
- Scholarly databases
- Online nursing courses
- Instructors and professors

Video Searching Tips

Nurses and nursing students can enhance the search process by:

- Using curated lists
- Using student and professor reviews of videos/video channels
- If on YouTube, using #Education
- Subscribing to channels run by professional and accredited individuals/organizations
- Doing an initial search on Google or other search engine

5.7 Virtual and augmented reality

Virtual reality (VR) is a technology that fully immerses the participant into a virtual world. Users wear head-mounted displays and use haptic controllers to manipulate objects and move around in the imaginary world.

On the other hand, augmented reality (AR) uses digital details to enhance the real world. These digital details include graphic, sound, visual and even touch feedback. One can access AR from a modern smartphone and after downloading an AR app. One may also experience AR through special headsets e.g. *Google Glass* (Tokareva, 2018).

VR, AR and Learning

VR and AR are already in use in the healthcare industry both in practice and education. The use of VR and AR in nursing education will:

- Enhance the attention of students/nurses to task at hand
- Help to illustrate features, processes and concepts more accurately and with greater detail. For example, VR can allow students to go inside an organ and even walk around in it.
- Encourage interactive learning since they foster learning through active participation
- Immerse students into high fidelity simulations that provide realer experiences
- Help to enhance empathy towards patients and their families. Nurses can step into the shoes of patients and their family members. (Pantelidis, 2010; Craig & Georgieva, 2017)

5.8 Webinars

A webinar is a web-based seminar. Like normal seminars, webinars have themes, speakers, question and answer sessions and an audience. Everything takes place over the internet.

Evaluating a webinar

Many nursing education webinars are free to attend. The most important thing is therefore to allocate time for attendance (Olin, 2012).

To decide if a webinar is worth attending, consider the following factors:

- The topic of the webinar and its relevance to the student/nurse's needs.
- The sponsoring organization and the scheduled speakers.
- Level of allowed interaction in the webinar.
- Students who want to earn continuing education credits should check if the webinar offers them.
- Webinars take place on the internet and there may be time zone differences.

Where to find quality nursing webinars

Webinars are available from a wide range of sources including:

- Online schools and institutions
- Credible nursing websites such as:
 - American Nurses Association
 - American Association of Colleges of Nursing

- Nurse.com
- Medlineuniversity.com
- Educational databases such as Elsevier
- University library databases

How to maximize benefits

To get the most out of a webinar, nurses and nursing students should:

- Install webinar software on their computer. Examples of webinar software include:
 - Cisco WebEx
 - GoToWebinar
 - ezTalks
 - Skype
 - Adobe Connect
- Perform a technical check before the webinar to ensure all systems are working
- Designate a quiet and private location for the webinar
- Sign into the seminar early
- Avoid multi-tasking
- Actively participate in the webinar by responding to polls, commenting, asking questions and even making suggestions
- Be respectful to other participants including learning proper webinar etiquette
- Give feedback on the webinar to guide future improvements
- Download the webinar for future listening

6. Technologies for Communication and Interaction

Communication and interaction are important for effective e-learning. Nurses and nursing students have a wide range of communication and interaction technologies to choose from.

6.1 Technologies that allow for audio-visual communication

These technologies allow participants to use both audio and visual elements to communicate and interact. Examples include:

- FaceTime (iOS devices)
- Skype
- OoVoo
- Google Hangouts
- Zoom (Desktop)
- Talky

6.2 Discussion forums

Also known as discussion boards or online forums, these platforms allow users to read, leave and respond to messages (Rouse, 2011). These forums allow students and nursing professionals to network and even study together (OnlineLPNtoRN, 2011). There are different types of forums targeting different nursing specialties.

They are widely available on the internet. Examples include:

- Allnurses.com
- Nurse.com
- Nurse Connect
- The Student Nurse Forum

6.3 E-mail

Electronic mail is a message that is transmitted from one computer user to another through the internet. Aside from text, users can also attach different types of files including audio and images (Computer Hope, 2018).

Advantages of E-mail

- Messages are sent and delivered instantly over the internet.
- E-mails are stored electronically allowing long-term storage.
- E-mails can be sent to multiple people at the same time. This may facilitate group discussions.
- Communication via e-mail is relatively cheap.
- E-mails can be sent at any time.

E-mail Service Providers

To communicate via e-mail, one must have a valid e-mail account from an e-mail service provider. Some common service providers include:

- Gmail
- Yahoo! Mail
- Mail.com
- Outlook.com
- AOL Mail

6.4 Social media sites

These are internet-based communication tools that allow participants to create content, share content and consume content (Nations, 2018). Communication and collaboration via social media happens in real-time.

Common types of social media among nurses include:

- Facebook
- Twitter
- LinkedIn
- Google+
- YouTube

6.5 Texting and messaging apps

These are mobile-phone based software programs that allow users to send and receive text and multi-media via the internet (The Engine Room, 2017). Nurses can use these apps to exchange files, coordinate meetings and group discussions among others.

Common messaging apps include:

- Whatsapp
- Telegram
- Facebook Messenger
- Line
- Viber
- Google Allo

6.6 Net-etiquette

Internet communications must take place within certain rules and boundaries for them to remain effective. Net-etiquette is defined as

the code of good behavior on the internet (TechTerms, 2017). Net-etiquette depends a lot on the context of communications. In e-learning however, common rules to follow include (Marquette University, 2018; Duquesne University, 2018):

- Avoiding inflammatory/offensive comments in online communications.
- Respecting the privacy of others.
- Recognizing and respecting diversity.
- Acknowledging and responding to messages promptly.
- Sticking to the topic in discussion forums or on comment sections on other social media sites.
- Using clear and grammatical language and avoiding the use of slang.
- Respecting copyright laws and giving credit where credit is due.
- Avoiding the use of capital letters in text messages.
- Being patient with others.
- Allowing others to complete their thoughts before responding.
- Treating others as you would like to be treated.



7. Digital Tools to Manage and Assist Learning

Nurses and nursing students who choose to pursue e-learning have a number of tools to assist in the learning process.

7.1 Online highlighting and annotating tools

An online highlighter is used to focus on specific sections of text when reading documents on the internet (Basu, 2016).

Examples of online highlighters include:

- Liner (web and mobile devices)
- Highly highlighter (Web, iPhone and iPad)
- Yellow Highlighter Pen for Web i.e. Marker
- Bamboo for Web
- Qwote for Web

Annotating tools on the other hand are used to add notes to text or diagrams. Examples of annotating tools to assist in digital reading include:

- Annotate
- Mendeley
- Scribble
- Qiqqa
- Gaiho Reader

7.2 Task organizing tools

Keeping notes, tasks and ideas well organized is important for effective learning to take place. Nurses and nursing students can use note organizing tools such as:

- Workflowy
- Asana
- Trello
- Wunderlist

- Dynalist

7.3 Note taking tools

Nurses and nursing students are often required to take notes. Note taking apps speed up the process of note taking and also enhance note organization (Guiness, 2017). Examples of digital note taking tools include

- EverNote
- OneNote
- Bear Notes
- SimpleNote
- Zoho Notebook

7.4 Time management tools

One of the biggest advantages of e-learning is the increased flexibility and independence that students get. Digital time management tools can help nurses and students use their time more effectively and wisely (O'Donovan, 2018). They include:

- Rescue Time
- Remember the Milk
- Toggl
- Timely
- Focus Booster- Get in the Zone

7.5 To do lists

Keeping to-do-lists can help to enhance task management (Duffy, 2018). Digital to-do-list apps include:

- Google Keep
- Clear
- Todoist
- Google Tasks
- Apple Reminders

8. Hardware Considerations

8.1 Desktops

This is a personal computer that is designed to be conveniently placed on top of a surface such as a desk. They comprise of a computer monitor, a central processing unit (CPU), keyboard and mouse. Desktop computers facilitate:

- Gaming
- Creating, editing and saving documents and other files
- Browsing the internet
- Communication via the internet

Advantages of desktop computers

- Compared to laptops, desktops are relatively cheap
- More ideal for gaming applications
- May have bigger and more powerful processors
- Desktops have no charging/overheating issues
- Easy to assemble and therefore, easy to customize
- Have larger monitors and more comfortable keyboards
- Are relatively immobile. This may reduce the risk of theft (England.edu, 2018).

Disadvantages of desktop computers

- They are bulky and therefore less portable than laptops
- Often come without any wireless connections
- Relatively noisy
- Require a dedicated space

- Most lack aesthetic appeal
- More prone to blackouts and data loss due to interrupted power supply
- Have a bigger carbon-footprint since they use more electricity (Computer Hope, 2018)

8.2 Laptops

This is a portable computer capable of all/most of the functions a desktop computer can perform. They are small single units that can run off AC power or battery power (Computer Hope, 2017).

Advantages

- Are highly portable and allow computer use on the go
- Take up less room and easier to put away when not in use
- Less prone to data loss through interrupted power supply since they use batteries
- Easy to use and require no assembly of parts unlike a desktop
- Can be easily connected to an external display such as a monitor, screen or projector (Computer Hope, 2018).

Disadvantages

- Powerful laptops with higher speed, better graphics and more storage space are relatively more expensive
- Processors are relatively limited when compared to desktops
- They have smaller keyboards and smaller screens
- Only the memory and hard drive are easily upgradable. Most other components are built-in.

- Unlike desktops, they are more challenging to repair
- Power and physical space is limited
- Less ergonomic than desktop computers
- More prone to theft or loss (Computer Hope, 2018).
- Taking online quizzes and tests
- Reading and following news
- Translating units of measurement and language
- Reading eBooks
- Listening to music
- Storing files

8.3 Smart phones

These are mobile phones with highly advanced features. They typically combine phone technology with computer technology. They can do everything a computer can and much more. Different smartphones have different features which may include (Techopedia, 2018):

- Touchscreen interface
- Internet access
- Music players
- Video and movie players
- Camera
- Camcorder
- GPS Navigation
- Alarm clock
- Games

Common uses of smartphones

Smartphones are highly versatile and can be used for a wide range of entertainment, educational and even industrial purposes. These include but are not limited to (Leyden, 2015):

- Communicating via call/texts/internet based technologies
- Participating in social media
- Taking photos and videos
- Browsing the internet

Advantages

- Facilitate different forms of instant communication including e-mail, texting apps, video calls, etc.
- More convenient internet browsing
- High functionality due to a wide array of features
- Provide more privacy than laptops and desktop computers
- Highly portable and can be used from anywhere there is a network connection
- Wide array of applications to make daily processes easier

Disadvantages

- Heavy and uncontrolled use may lead to health issues such as sleep issues or even eye problems
- Are highly addictive particularly due to the ease of gaming, communication and accessing entertainment
- Can easily distract students/nurses
- More prone to loss and other security risks such as privacy breaches
- May negatively affect real social connections (Munoz, 2017)
- Relatively more expensive compared to standard phones

8.4 Tablet PC

These are portable personal computers that are smaller than a laptop/desktop but bigger than a smartphone. Tablets use touchscreen interfaces and some may come with fold-out keyboards (TechTerms, 2018). Tablets can perform most of the functions that a smartphone or computer can perform.

Advantages

- Can be used on the go
- Lighter and smaller than a laptop
- Aesthetically pleasing
- Ideal for e-conferences and e-seminars
- Ideal for interactive learning
- Ideal for project presentations
- Gesture recognition
- Take a short time to start-up relative to laptops and desktops
- Typically longer battery life than laptops (Ramsey, 2014; Tablets-PC-Specs, n.d.)

Disadvantages

- Few or no ports
- Poor ergonomics due to lack of wrist rest
- Higher risk of screen damage
- Many lack keyboards
- Screens are relatively small as compared to laptops and desktops
- Input process is slower than on a laptop/desktop

8.5 Electronic readers

These are handheld devices (Kindle, Nook, Kobo, Cybook, etc.) used to read electronic versions of books, newspapers, magazines and other documents (Techopedia, 2018). eReaders use electronic ink to mimic the experience of reading the actual document on paper.

Advantages

- They are highly portable
- They provide high storage capacity. One can carry more than 200 documents on it.
- Access to thousands of books and documents on the internet
- Cost effective as it eliminates the need to buy hard copy books/documents
- Use little power and can stay charged for up to 2 weeks
- E-readers support multiple document formats
- Have built-in dictionaries in different languages
- Better reading experiences in the dark and in the sun (Kozlowski, 2018)

Disadvantages

- eReaders are relatively expensive
- Provide limited access to books and other documents since not all are available in this format
- Difficult to lend books to others
- Lack the authenticity of reading a real book/document (Baron, 2015)

9. Risks and Dangers

Despite the advantages of e-learning, it comes with a host of privacy and security issues and other disadvantages.

9.1 Identify theft

Identity theft is simply the act of illegally obtaining an individual's online "personal" information and using it for criminal activities. Information that is at risk includes (Computer Hope, 2017):

- Full name
- Home address
- Social Security numbers
- School/Institution address
- E-mail
- Phone number
- Credit card numbers
- Date of birth
- Personal photos

Protecting against identity theft

- Limit the sharing of personal information online
- Learn how to identify and avoid scam e-mails and fake websites
- Manage privacy settings on social media and other websites better
- Have strong and secure passwords and change them regularly
- Have up-to-date antivirus and spyware protection programs
- Using two-factor authentication (Bouquet, 2014)

9.2 Infection prevention & control

Smartphones and other mobile devices may also act as carriers of pathogenic and nonpathogenic bacteria (Zakai, et al., 2016). This is because they can be used from anywhere including the toilet. Despite this, there are few protocols available for cleaning and disinfecting these devices.

Possible infection prevention and control measures

- Avoid the use of mobile devices in clinical areas and particularly when handling patients
- Use medical gloves
- Clean and disinfect hands after handling mobile device
- Clean mobile devices using disinfectant solutions or wipes

9.3 Personal safety

Criminals on the internet are not always after financial/material gain. In some cases, they have more malicious motives which may cause psychological and even physical harm. For example, internet users are at risk of being stalked, harassed or physically assaulted by people they have met online.

Measures to enhance personal safety

- Avoid giving out contact information to strangers on the internet
- Avoid meeting people you connect online unless you can verify their true identity
- Be careful about what you post
- Be careful about what you download from the internet (Kaspersky, 2018)

9.4 Privacy and confidentiality

Privacy refers to the internet user's right to safeguard his/her personal information from other internet users. Confidentiality refers to the responsibility of the service provider to protect consumer data from third party access (Techopedia, 2018).

Protecting personal privacy online

- Set your browser to automatically delete cookies after every session
- Make use of cloud storage encryption
- Encrypt internet communications such as chat and email
- Surf the internet anonymously either using private windows or a VPN (Schmitz, 2013)

9.5 Unethical conduct

The use of the internet and other technologies in e-learning has also resulted in the surge of unethical behavior. Ethics are moral principles that define acceptable behavior (ISE, 2016).

Examples of unethical behavior include:

- Inappropriate access, use and sharing of patients' health information
- Digital plagiarism
- Software theft and breaking copyright laws
- Improper use of e-learning resources such as computers e.g. watching pornography or spreading viruses
- The internet may encourage cheating and fabrication of data

9.6 Violation of professional boundaries

Social media and other internet technologies may also encourage the violation of professional boundaries. Colleagues get an often unwarranted open window into one's personal life. The use of social media in clinical settings may also blur professional boundaries between nurses and patients (Cronquist & Spector, 2011).

Avoiding violation of personal boundaries

- Avoid transmitting patient-related information/images that degrade, humiliate or violate a patient's right to privacy.
- Do not taking photos/videos of patients on personal devices.
- Maintain professional boundaries online. This includes limiting social contact with patients.
- Stay within organizational guidelines for work-related postings.
- Do not use the internet to make negative remarks or other offensive comments about employers, co-workers, co-students or even instructors (Cronquist & Spector, 2011).

9.7 Malware

Malware refers to any software that seeks to illegally access, infect and harm a host system (Woods, 2017). There are different types of malware (Comodo, 2018):

- *Viruses*. Contagious codes that infect software on host system and spreads when software is shared between computers.
- *Adware*. Though it may not have malicious intent, constant advertisements on the screen make reading and navigation difficult.
- *Spyware*. This type of malware spies on a computer user and tracks the user's internet activities. They are often difficult to detect.
- *Worms*. This software replicates itself and destroys all information and files stored in the host system.
- *Trojans*. This type of malware deceives the user that it is safe. However, the software is

programmed to access personal information and take over the host system's resources.

- *Ransomware*. This type of malware restricts access to a host system's files and information unless the user pays a certain fee.

Protecting yourself against malware

Here are some suggestions and recommendations to protect yourself from becoming a victim of malware.

- Install and activate a firewall
- Install and keep current antivirus software
- Install and keep current anti-spyware software
- Use strong passwords and change them regularly
- Keep Windows / operating system software up-to-date
- Use the latest versions of browsers



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