



Learning Methods In Digital Simulation Training For Healthcare Professionals

LEQUEST WHITEPAPER



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FOR WHOM IS THIS DOCUMENT INTENDED?

The purpose of this document is to provide an overview of different learning methods to assist in the selection of the appropriate training solution for the lifelong education of healthcare professionals.

1. Medical device companies

Manufacturers of healthcare products have a responsibility to ensure the correct and safe use of their equipment or devices:

- Internally, for the onboarding of their staff (application specialist, support, distributor or salesperson). Keeping companies up to date with the proper use of the long list of new medical device features and innovations.
- Externally, to convince hospitals and health departments that using their equipment will help meet medical needs.
- Ensure safe use of equipment and avoid malfunctioning due to lack of training [\[1\]](#).

2. Managers & Hospital Admins

HCPs need to be trained (new users) and retrained (old users) during the life-cycle of the devices and technologies they use. Moreover, healthcare institutions have the responsibility and the obligation to train and educate their teams. Managers are all too often faced with staff shortages, lack of time to train and lack of equipment to practice on, making training solutions more and more demanding in terms of availability and accessibility.

3. For those who take on the challenge of HCPs training

The increasing amount of information that needs to be learned quickly and effectively by this large and diverse workforce is one of the biggest challenges in implementing the training strategy.

The list of limitations to a face-to-face training approach, such as staff shortages, lack of time and equipment availability, encourages the adoption of new options including digital simulation training solutions.

4. And in general...

For devices such as blood pressure cuffs, glucometers or activity trackers, the end user may be the patient. In this case, it's a real challenge to reach every single patient and train them in the safe use of medical devices..

More generally, to all those involved in educational planning for healthcare organizations who wish to learn more about learning methods for HCPs.

A CONTEXT DISRUPTED BY THE HEALTH CRISIS

It is impossible to talk about digital learning, medical device simulation training and online education without mentioning the crisis that has turned hospital organizations upside down over the last three years: **The COVID 19 pandemic.**

Thank you!

Well, of course nothing would have been possible without the unfailing mobilization of the healthcare professionals and the dedication of the medical device companies during this period of uncertainty. This white paper is also a way of saying thank you and to modestly trying to **help healthcare workforces in their daily work.**

We want to draw the lessons from this health crisis:

- We will never go back to full onsite training, but neither will we only use online training. Because training remotely highlighted the important differences between sharing information and practicing skills. **The blended learning is considered now as the new normal.**
- The **medical knowledge never stops growing** and the need to have a quick and efficient access to the information is still increasing. It also identifies an important need for scalability of training programs. In fact, a digital format is the quickest and easiest way to efficiently deploy for large numbers of learners.
- The gain in flexibility has meant that learners have integrated the **ability to access training materials from anywhere, at any time.** This makes it easier for trainers and learners to fit sessions into their busy schedules and has also helped to reduce the need to travel to for training.
- The **challenge now for digital learning is to be more engaging and interactive for learners.** This means focusing on content that motivates learners and empowers HCPs, ensuring retention of skills and, in the meantime, tackling screen fatigue.

HOW TO GET TRAINED TO USE MEDICAL EQUIPMENT?

Importance of providing the right information, in the right format, at the right time

The first step is to identify the learners' needs in order to define the training **objectives**, such as the requirement for HCP to be certified in the use of medical devices.

Depending on this, it's important to **choose the appropriate training method** based on the complexity of the medical device, but also the level of expertise of the end-users.

It is then the responsibility of the training manager to create a structured **training plan that includes knowledge transfer, hands-on practice and assessment** to achieve certification. However, lifelong learning also requires that HCPs are provided with **ongoing support and recurring opportunities for refresher training** to ensure that they are proficient in the use of the device.

Digital simulation training

Digital simulation allows the use of equipment to be practiced in a safe and controlled environment with no risk of harm to patients, HCPs or equipment. It also **allows for repeatable and standardized training experiences** that can be tailored to the needs of each individual learner. In addition, digital simulation training can **provide immediate feedback**, helping to identify areas for improvement and refine skills more quickly.

As new technologies increase the complexity of medical devices, it's crucial to ensure that HCPs can use them safely and effectively.

“ Digital technologies can be employed to support on-demand training through the Internet and remote interprofessional collaboration among healthcare professionals in a national level.

— Konstantinidis et al. 2023 [2]

How this document is organized

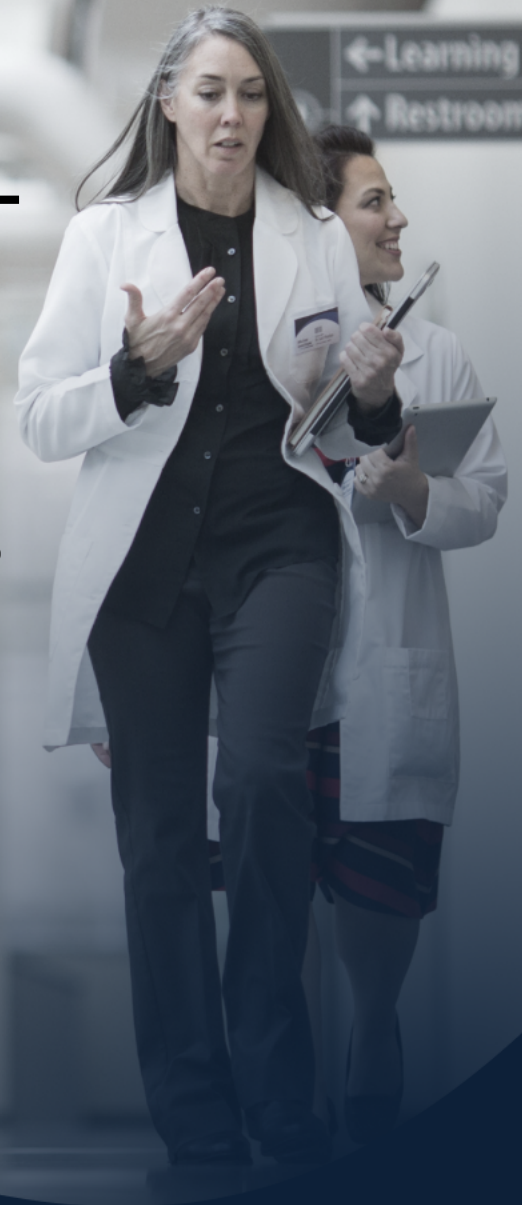
The following pages of the document provide an overview of **several learning methods commonly used in the context of lifelong education**. Each page follows the same pattern:

1. Defining a learning method or education concept;
2. Highlighting its relevance in a healthcare context;
3. Offering recommendations for implementation using digital learning solutions.

The purpose of this document is to **provide an overview of different learning methods to assist in the selection of the appropriate digital simulation training solution** for the lifelong education of healthcare professionals.

Chapter 2

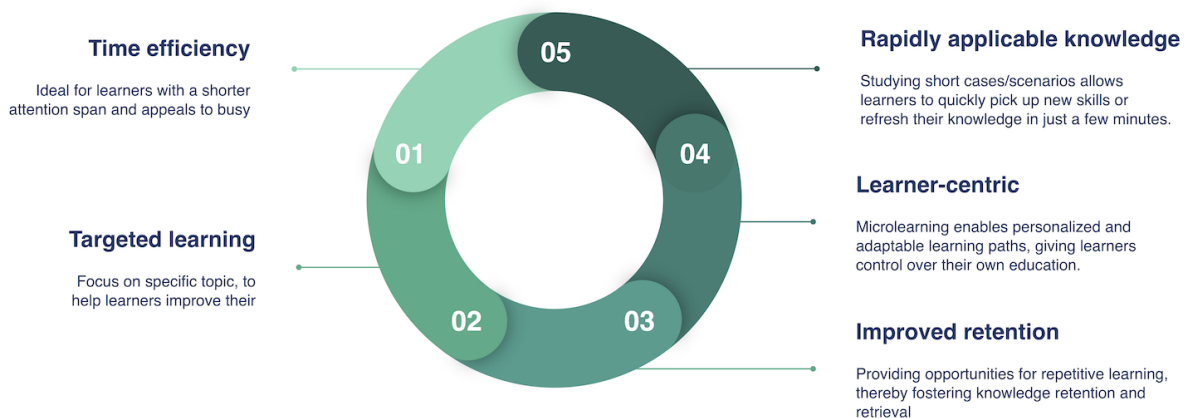
8 METHODS FOR EFFICIENT DIGITAL SIMULATION TRAININGS OF MEDICAL DEVICES



1. MICROLEARNING

Learning blocks which deliver knowledge in bite-sized chunks

As the name suggests, microlearning is an approach focuses on delivering content in small and independent units to meet very focused learning needs. It involves the use of different types of media, such as videos or simulations, that are adapted to the needs of on-demand content. Microlearning units are designed to be less than 5 minutes in length, giving learners very quick, concise and accurate access to knowledge that is easier to understand and apply. It encourages active learning by providing learners with practice and problem-solving opportunities that require a high level of engagement.



Microlearning benefits for the learners:

1. Time efficiency

HCPs are often busy and have limited time to devote to training.

Microlearning provides a way to deliver knowledge or skills in short bursts that can be completed quickly, ideal for fitting into a busy schedule.

2. Targeted learning

Microlearning can be used to deliver specific, targeted training on the use of particular medical devices or procedures. This allows HCPs to focus on the areas where they need the most help and improve their skills more quickly.

3. Improved retention

It allows learners to focus on small, digestible chunks of information, increasing the likelihood of remembering what they have learned by 20% [3].

4. Learner-centric

By providing flexible and adaptive training, it offers opportunities for repetitive learning, which promotes autonomy and self-directed access to the knowledge. This enhances learner engagement.

5. Rapidly applicable knowledge

Studying short cases/scenarios helps learners to make the link between theory and practice and to develop critical thinking and problem solving skills.

Recommendations

Part of a blended learning approach

Microlearning may not be sufficient on its own and may require detailed explanation to complete and deepen the topic.

Provide intuitive access

To be suitable for learners looking for specific information, it is important to provide modules as searchable components instead long e-learning blocs.

Variety of formats

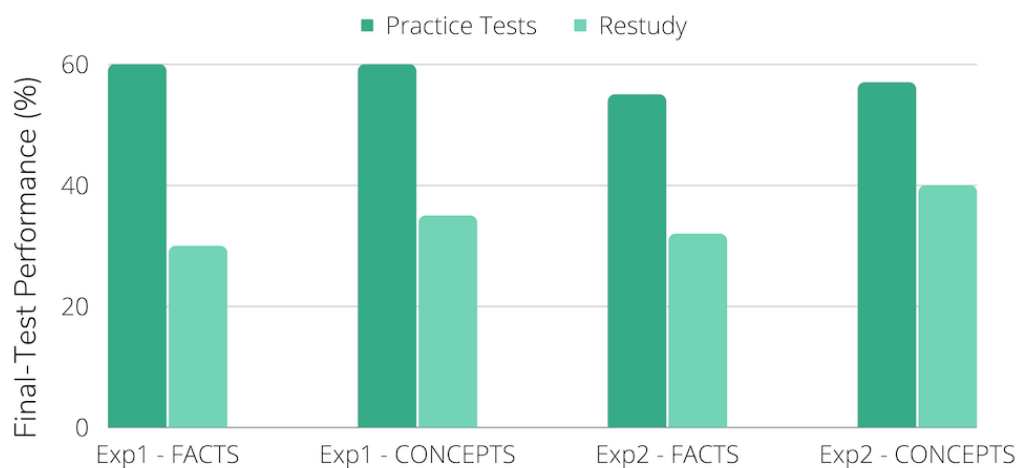
The choice of the microlearning asset or format, depends on the purpose that needs to be achieved.

2. TESTING EFFECT

Using retrieval practice to improve learning

The testing effect is a cognitive phenomenon that describes how testing one's knowledge on a topic can result in greater learning and retention of that information than just studying the same material. **The consequences of doing tests is to actively recall the acquired knowledge. This would help to strengthen the memory links.**

The exercise makes the content easier to recall in the future. A meta-analysis of previous research from Dunlosky et al. [4] **showed evidence that testing effects may be robust across a wide range of different types of material and learners' knowledge levels.** The gain is significant and has a positive impact on the long-term retention



Accuracy on final tests that consisted of inference-based transfer questions tapping key facts or concepts, administered 1 week after a learning session that involved either practice tests or restudy, results from [Butler et al. 2010 \[5\]](#) and figure from [Dunlosky et al. 2013 \[4\]](#).

How to implement the testing effect approach into a digital learning solution

1. Involving the learners with interactive tasks

Tests demand an active participation of the learners. It means to implement interactive components that allow learners to assess their comprehension of the subject as they go. Examples: simulations, drag and drop tasks, multiple-choice or fill-in-the-blank questions.

2. Recalling knowledge from learners' memories

The flashcards exercises offer learners a stimulus and require them to recall the related material. It can be effective at imprinting information into short- and long-term memory.

3. Spaced learning

Use spaced practice, which is interrupting study periods and interspersing practice with various topics. This can aid in the reinforcement of learning and the improvement of retention over time.

The objective of the **Testing Effect** is to provide learners opportunity to **actively retrieve knowledge from memory and assess their comprehension of the content**. All types of testing could assist to strengthen their memory associations, as for example using self-assessment questions . The capacity to reproduce efforts from the learner, will make the content simpler to recall in the future.

Recommendations

Smart training design

The training structure should be built including phases dedicated to testing along the learning process.

Diversification of testing modalities

To keep learners interested, catering to different learning styles, and covering different types or formats of information.

Scheduling feature

Combined with learning content and testing system, it will set reminders to recall knowledge at regular intervals.

3. BLENDED LEARNING

Combining online and onsite trainings is the new normal

The multiple lockdowns during the pandemic accelerated the use of digital learning formats in healthcare education, leading to a need for online solutions to **create, distribute, and track digital training content**. The blended learning approach, which combines in-person and online components, is now often used for pre-work before a face-to-face training or for recertification of competencies. It is also a useful way of introducing healthcare professionals to the features and components of new medical devices. And when onboarding new employees or users, it provides a more flexible and interactive learning experience.

“ Blended learning is a powerful method to train HCPs that may be used at all level of education and fits to continuing professional development levels. It applies to all HCPs profiles, and it can range from brief, skill-specific modules to full-fledged degree programs.

— Leinster et al. [6]

Five considerations for the implementation of digital blended learning solutions

1. Choose the right tools

Software, hardware and internet connection must be operational from all parties. From a learner's perspective, it's important not to be limited by a technical aspect.

2. Introduce the rules

In any configuration (remotely, on site, synchrony or not) participants need to have a clear idea of how the knowledge will be shared, especially for the assignments to reach a certification.

3. Participation

Because it's when learners are engaged with interactive tasks that they become more motivated and engaged. The online or face-to-face approaches should allow for multiple interactions within the community of learners.

4. Cultural context

A huge diversity exist in HCP groups, languages and level of expertise, but also digital affinity or generation. A special attention of the learners' background is key.

5. Feedback

Essential part of the learning process, helping to motivate learners and spot where they need to improve.

Recommendations

All in one tool

A digital platform hosting the training content, following learners' progress, but also able to track and provide certifications.

Customizable solution

Able to fit with several profiles of learners: multilingual, easy to connect, an intuitive interface.

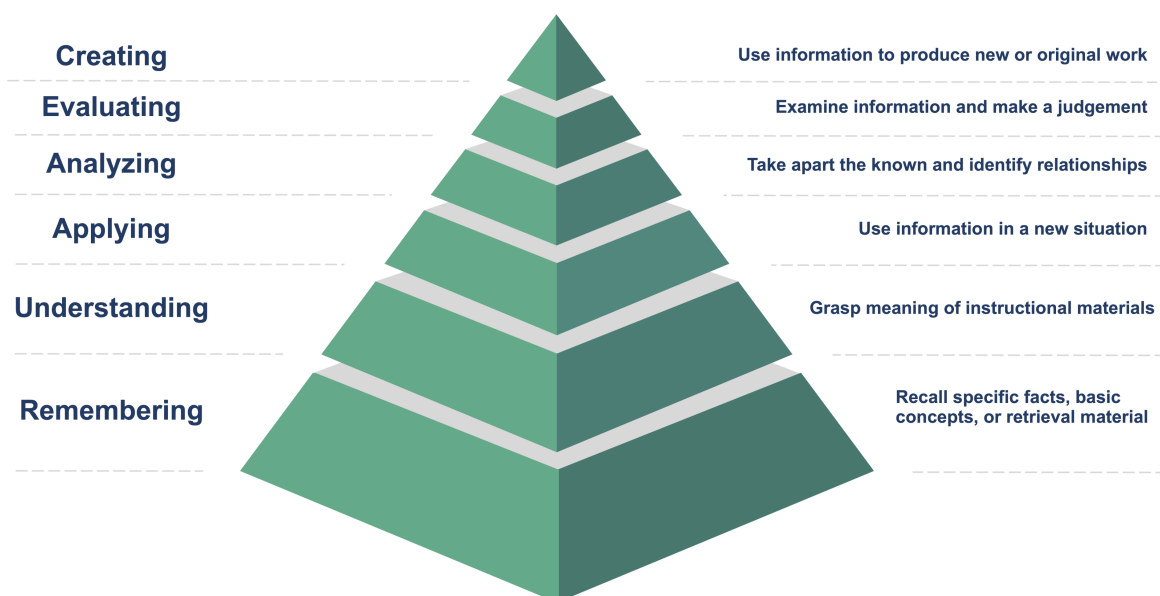
Full integration

The solution should be part of the education plan as a component of the curriculum.

4. BLOOM'S DIGITAL TAXONOMY

When technology supports the six levels of learning

Bloom's Taxonomy is a classification of learning objectives devised by educational psychologists Benjamin Bloom in the 1950s. It is frequently used to create, design and evaluate educational materials or learning activities. **The Bloom's Digital Taxonomy focuses on how new technology can be utilized to empower learning.** Developed by Andrew Churches in 2007 [\[7\]](#) this extension of the original classification is organized into six levels, which correlate with the six levels of Bloom's Taxonomy: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating. Each level has specific verbs that describe the sorts of activities that learners might engage in as they use technology to learn.



Digital components to support the six levels of Bloom's Digital Taxonomy:

1. Access to a wide range of digital resources

To support learning at all levels of the taxonomy, the learning platform should provide content in several formats, including movies, simulations, interactive exercises, and other multimedia content.

2. Organizing and synthesizing information

For the levels Analyzing, Evaluating, and Creating, it's important for the learner to have access to the list of training modules, those already certified and those still to be completed.

3. Collaboration and communication options

Learners must be able to interact and cooperate with their peers by sharing their work, giving and receiving comments, and working on projects together.

4. Individualized learning support

This might include personalized recommendations for learning resources, customized learning paths, assignments and assessments or feedback.

5. Assessments and evaluations

The platform should include a variety of assessments and evaluations to assist students in tracking their progress and understanding their strengths and areas for development.

6. Integration with systems

The learning content should be able to integrate with other systems that learners might use as other learning management systems.

Recommendations

Type of content

Propose interactive tasks, simulations and challenge-based learning experiences.

Personalized

Features that allow learners to set learning aims, track their progress, and receive personalized feedback and recommendations.

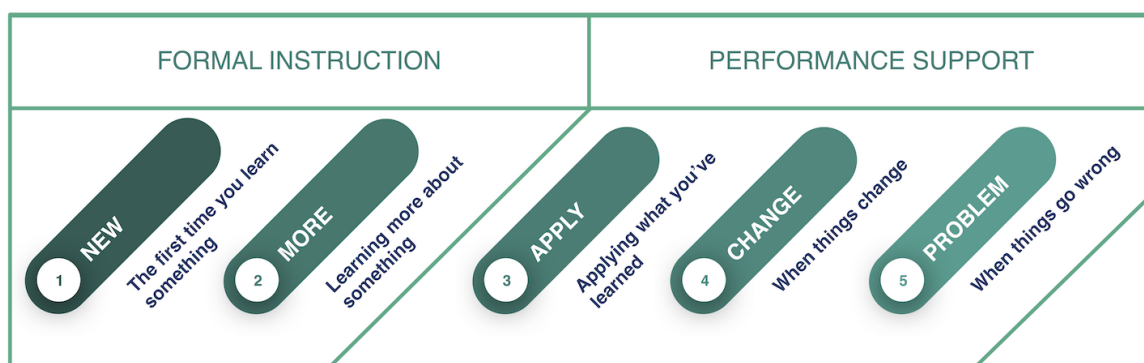
Compatibilities

With other education solutions such as Learning Management System. Also optimized for mobile devices, smartphones or tablets.

5. LEARNING MOMENTS

Five needs along the learner's journey

The concept of "five moment of needs" [8] provides a framework for understanding how learners grow through various phases of their learning journey. It's important to recognize and respond adequately to these stages by an appropriate content through efficient educational content.



When designing a digital training content, one of the challenges is to provide a solution personalized to the requirements and capacities of the trainees, depending on where they are in their learning journey process.

The "five moments of need" in the process of lifelong learning

1. New

This is the initial stage of learning in which learners are introduced to new concepts, ideas or features. They may be unfamiliar with the content at this point and require a great deal of assistance and guiding.

2. More

At this point, learners are ready to go further into the subject matter and understand more about it. They may feel more secure in their comprehension and be able to apply what they've learned in new situations.

3. Apply

During the apply stage, learners can use what they've learned to solve issues or accomplish assignments. They might be able to apply it in new settings or to solve new issues.

4. Change

At this level, learners have assimilated the content and are able to adapt their behavior or thinking in response to what they have understood. They may be able to use what they've learned in different settings and adjust their approach as required.

5. Problem

At that stage, learners can utilize their knowledge and abilities to identify and solve complicated challenges. They may be able to evaluate and synthesize information, as well as devise novel solutions to difficult issues.

Recommendations

Easy access solution

Educational content has an impact only if learners can have access to it where and when they want and need it.

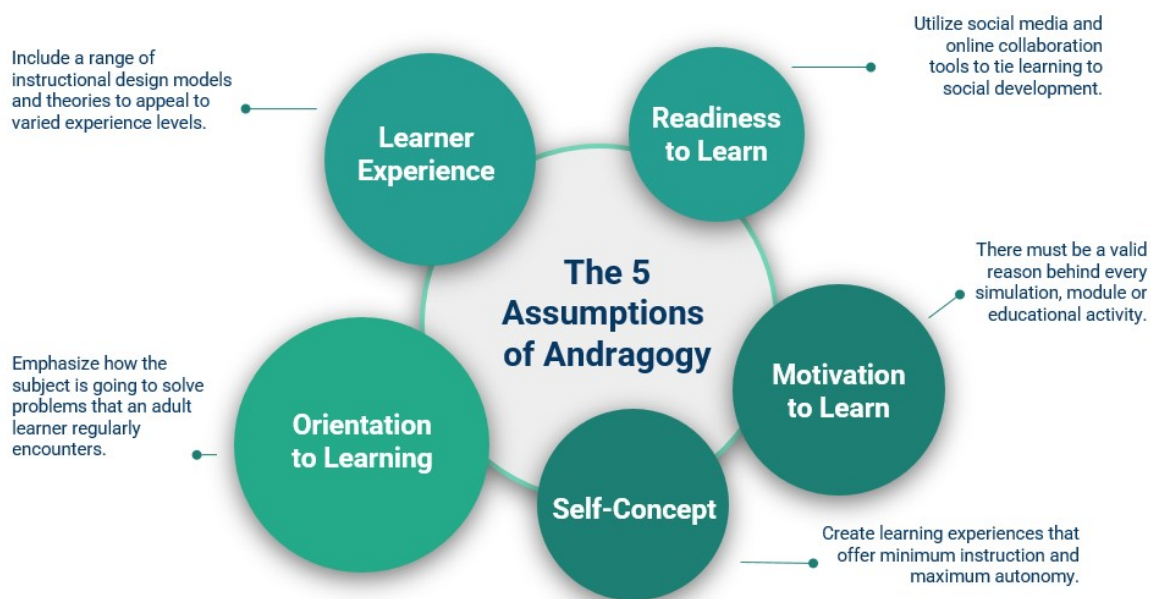
Control over learning

An open access to the learning content, allowing the learner to choose what, how, and when to study, as well as when to begin the assessment part of the training.

6. ANDRAGOGY

Or the science of adult learning

Andragogy recognizes that adults have different learning needs than children or adolescents. It's due to more complex schedules, responsibilities, and goals. To meet those needs of adult learners, the digital learning solution must incorporate andragogy principles.



“ Andragogy is the science of adult learning. It involves understanding and supporting the teaching methods of lifelong learning for adult learners.

— Knowles, Holton & Swanson [9]

4 principles of Andragogy:

1. Engagement

As adult learners, HCPs want to be involved in how their training is planned, delivered, and implemented. They also want and need to control what, when, and how they learn. This means that for HCPs to be actively involved in their learning process, they must be in control. In other words, learners should be able to make decisions about their learning experience. To do this, they should be assisted by dedicated tools able to support them in managing and tracking their level of knowledges.

2. Experiential

Experience provides the basis for learning activities. This is the first stone of 'learning by doing'. In an online solution perspective, it demands various simulation-based practices and assignments within the training. Providing a safe practice environment is crucial because experience involves making mistakes, and it is essential to differentiate between formative assessment, which is part of the learning process, and summative assessment, which evaluates overall performance at the end.

3. Work relevant

Adult learners are most interested in learning subjects that have immediate relevance and impact to their job or personal life. In case of healthcare professionals interacting with medical devices, the learning goals should be constructed in the context of "How will these trainees use this device?". For that all learning tasks need to be meaningful, authentic, and representative of the tasks that a trainee must perform safely in their work environment.

4. Problem-centered

Focused on the learner and in contrast to the content-oriented learning method. The best approach for assignments is based on scenarios in which specific "problems/cases" need to be solved.

Recommendations

Self-paced learning

Allow the user to learn by reading, by trying and by going straight to assessment or a combination of all three.

Modularity

Assessments grouped per module; it helps to prevent cognitive overload.

Clear goals

Learners need to know the criteria of success of the tests. Completing the assessment is the how they can meet the learning goals and receiving a validation via a certificate.

7. LEVEL OF ABSTRACTION

Importance of the realism in screen-based simulation

The level of abstraction in digital representation refers to the amount of detail and the level of realism, with 3D capturing spatial depth while 2D is limited to a flat, two-dimensional plane. The latest technology innovations pushed Virtual Reality (VR) as a game changer in the world of simulation. Especially In the context of medical education, where VR enables users to interact and immerse themselves in a 3D, computer-generated world. Except for the haptic aspects, VR claims a high level of realism of external appearance, equipment usage, and exterior appearance. However, **it is important to consider whether a high level of realism is necessary to improve learning performance.**

Depending on the context or the tasks to teach, **2D simulations may be more appropriate and reach expectations in teaching specific skills.**

When equivalent outcomes can be accomplished in a 2D environment, it may not be essential to commit the time or resources to designing, maintaining, and deploying a simulation at a high fidelity of realism **[10-14].**

Impact of high-fidelity simulation on education efficiency:

1. VR vs 3D vs 2D

In term of education the use of virtual reality (VR) as a simulation tool may not offer significant advantages over a 2D simulations or a desktop computer-based learning [10]. There are no significant differences in learning accuracy between VR, 3D, and 2D [11].

2. Not all equal

VR may be more useful for experienced gamers, but both VR and desktop-based learning were found to be equally effective for less experienced gamers in a spatial task [12].

3. Cognitive load

However, in one study, the 3D virtual-physical fidelity group seemed to be at a disadvantage due to increased cognitive load and the potential for overconfidence in their ability to perform the task [13]. Then it's more important to choose the right scope and level of abstraction to avoid cognitive overload.

4. Focus on the skills

Ultimately, goal of educational simulations is to teach students the skills needed to make real-world decisions, rather than replicating the real world accurately [14].

Recommendations

Affordability

A solution able to offer a cost-effective technology, accessible without specific equipment, and easy to use and navigate for non-experimented users.

Performance

Avoiding as much as possible cognitive load, a better control of the training environment to stay relevant to the learning objectives.

Scalability

The portability and flexibility of the simulations should allow them to be adapted to different contexts.

8. A.G.E.S MODEL

The four active ingredients for long-term learning

Learning is not only based on the capacity to reproduce new concepts or skills once, but it also implies to be easily recalled. Neuroscience research described that the level of activation of the hippocampus has a real impact on the retaining and recalling learning. In order to be considered effective, training must produce a strong activation of the hippocampus, not in terms of the number of repetitions, but rather in terms of a state of mindfulness.

The A.G.E.S model is a framework for understanding how adults learn [15] and needs to be implemented for an efficient digital learning solution.

The A.G.E.S model can be used as a guide when designing learning materials or programs for adult learners. This approach is based on neuroscience and has shown to be a reliable framework for boosting knowledge retention. Digital learning solutions should be centered on the outcomes for the learners, **information retention is part of the top priorities**, and the A.G.E.S model can contribute to reach those goals for long-term learning.

Four stages to learn quickly and retain the information

1. Attention

Is a key part of the state of mindfulness. The learners are more likely to pay attention to learning materials that are relevant to their needs and goals, especially in a professional environment to stay efficient.

2. Generation

Adults learn more effectively when they are actively involved in the learning process, such as through problem-solving or hands-on activities as the simulations.

3. Emotion

To increase retention, it's important to create an emotional connection between the trainees and the material. An emotional connection exists when the content is personally relevant to the learner, when it uses storytelling and real-life examples, when it encourages active participation, and when it provides a supportive learning environment.

4. Spacing

Adults tend to learn more effectively when they spread out their learning over time, rather than trying to absorb all the information at once.

Recommendations

Customizable learning paths

A technology that can allow learners to choose the learning path that best meets their needs and goals.

Realistic scenarios

Using storytelling based on examples that are emotionally resonant to let learners connect with the material.

Review activities

Such as quizzes or simulations, into the learning process to help learners reinforce their understanding of the topic.

CONCLUSION

Enabling Active Learning through digital solutions

The greatest impact of digital learning methods for HCPs is that they can **learn whenever and wherever they want**. But to be effective, it's also important to use a digital solution that has the **ability to promote active learning, where the learner is engaged rather than passive**. To achieve this kind of engagement, it is important to choose the right digital learning platform.

This white paper presents a number of suggestions based on learning methodologies. The combination of these suggestions would amount to a **customizable digital learning platform that can host training content, track progress and provide assessments all in one**.

The ideal solution need to be easily accessible, provide valuable feedback to the learner and allow the creation of personalized learning paths. Other key features should be included as self-paced learning, modularity, clear definition of learning objectives, realistic scenarios and a variety of testing modalities. Not to be forgotten is the **importance of intelligent training design**. This also has an impact on the effectiveness of long-term knowledge retention.

Overall, the main goal for an ideal digital solution is to create a learning environment that is adapted to the constraints of HCPs and empowers learners to take an active role in their own education.

Chapter 3

TO GO FURTHER

WHAT WE DO AT LEQUEST

At LeQuest, we make digital learning simulations of medical technologies and provide device-specific training for healthcare professionals using virtual, hands-on experiences. Our goal is to advance the knowledge and skills of all HCPs.

Our team has been involved in helping healthcare professionals learn and practice their skills on medical devices for over a decade, with more than hundred digital simulation trainings.

Since 2011, we have deployed over 200,000 hours of technical engineering experience to develop our active learning platform in 60 countries and 11 different languages.

This achievement is the result of strong partnerships with hospitals and medical device companies. In this document, we would like to share our know-how with the healthcare community as a way of extending our experience and sharing it with all the education and training managers, application specialists, and medical device experts who have supported and trusted us over the years.

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MEET THE MAKERS

- Makers of digital simulation trainings for healthcare professionals.
- The only company in the world that provides medical machine-based training that is device specific with a virtual, hands-on experience.
- Cater to advancing the knowledge and skills of all healthcare professionals.

LEQUEST

MAKERS OF SIMULATION TECHNOLOGY

