How Virtual Immersive Environments (VIEs) Address Learning Challenges in Life Sciences

By Brian Miller, Learning Strategy and Technology Consultant, Learning Mind

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EXECUTIVE SUMMARY

Constant Change Increases Demand on Learning

The life sciences industry is in a state of constant change. These changes include mergers and acquisitions (M&A), development of strategic partnerships, demand to bring products to market faster, new government regulations, and an increasingly diverse and globally distributed workforce.

These changes have all placed greater demand on internal training organizations to solve complex organizational learning problems and deliver more training programs in shorter periods of time to a larger global audience. To compound the problem, many life sciences companies are asking training organizations to operate with leaner budgets.

Online Learning is Missing the Human Factor of Socialization

One way in which life sciences organizations have responded to this increased demand for learning programs and the challenge of reduced training budgets is with self-paced, online e-learning.

Although self-paced e-learning has addressed the need for getting more learning content delivered to a global audience, life sciences organizations recognize that the humanistic factor of person-to-person collaboration is missing from the learning equation.

Sales representatives need to role play with real people, not just through scripted simulations. Marketing teams need to engage in dialogue with key opinion leaders, not simply read online content. Clinical site investigators need to engage with sponsor clinical trial teams when learning how to conduct a trial, rather than just watch a recorded presentation.

Clark and Gibb (2006), in a summary of studies related to virtual teaming, have indicated that the lack of human interaction in text-only communications, such as nonverbal gestures and voice exchange, can break down the process of knowledge exchange.

> *"The only constant is change."*
>
> *— Heraclitus of Ephesus*

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How 3-D VIEs Address the Challenges

3-D live virtual immersive environments address the financial challenges, global distribution of teams, and the human factor by providing learners with the ability to:

- Have a sense of presence and immediacy with other people in learning environments.
- Take part in dialogue using both voice and engaging nonverbal communications.
- Contextualize learning content within authentic real-world environments, augmented environments, and improbable environments, which go beyond the bounds of possibility.
- Save time away from the actual work environment.

In this paper we will briefly review some of the unique attributes provided by 3-D live VIEs. In addition, this paper will explore how VIEs have been used in the past, as well as the potential for how VIEs can be used in the future to support life sciences learning applications.

HOW 3-D LIVE VIES ENHANCE LEARNING ONLINE

Online, self-paced e-learning is a valuable tool for supporting the development of cognitive skills, including comprehension of facts, rules, and concepts; learning how to step through linear procedures; and even practicing how to branch through problems.

However, what online, self-paced e-learning does not provide is the ability to engage in discussion in a rich and engaging format. Some learning management systems do allow for online asynchronous discussion forums, which do aid in reflection and community learning.

But what 2-D online discussions do not offer is a combination of nonverbal communications, voice communications, and a perception of physical closeness with the people you are communicating with.

3-D live VIEs allow participants to review learning content that might come from multiple sources, similar to how they would with an online, self-paced course, with the added advantage of engaging in dialogue with other people studying the same content. These types of instructive discussions can be scheduled and facilitated, or can happen informally when two people unexpectedly meet while reviewing instructional content.

In addition, participants in 3-D VIEs have a sense of being in the same place together, combined with a sense of distance between one another. This type of learning is similar to several people walking up to a table at a professional

conference, reviewing the content at the table, and then engaging in a dialogue around the content.

These types of learning engagements are generally more memorable and transferrable to real-life tasks, as opposed to sitting passively in a conference lecture session.

This enhanced perception of being in a virtual environment with the other participants is referred to as "social presence." You also have the added perception of distance between you and people you are communicating with, typically referred to as "immediacy."

Edirisingha, Nie, Pluciennik, and Young (2009) explain that social presence and effective use of immediacy have an impact on improving learning. Swan (2003) suggests that researchers who have studied online asynchronous discussion groups have concluded that, "participants created social presence by projecting their identities online to build a discourse community among themselves."

2-D asynchronous forms of communications, such as text-based online discussion forums, are disembodied communications. In other words, you cannot physically move towards another person or group and use nonverbal gestures the way you would in person.

However, through your avatar in a VIE, you can project your identity and emotions by making nonverbal gestures, such as clapping, pointing, waving, and even laughing. With the ability to speak with one another in a VIE, you can add the richness of tone of voice to project emotions, allowing you to engage in rich communications similar to the real world.

In a pilot study, conducted out of the University of Leicester in the United Kingdom, a small group of distance learning students were asked to participate in a learning experience in a virtual representation of a village in Pakistan.

The participants commented that they experienced a sense of closeness to other participants in the group. The authors of the study mention that this ability to create a sense of closeness reduces the "psychological distance," and as a result, improves learning. The authors commented that the

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"participants' feeling was of a totally immersive environment as if they were in a real physical world (Edirisingha, Nie, Pluciennik, and Young, 2009)."

One of the challenges in the life sciences industry, mentioned earlier, is providing globally distributed teams with the ability to learn together. There are several applications in the life sciences industry where the ability to enhance a sense of group unity through social presence and immediacy can enhance community learning.

Time Saver

Whether we are discussing the valuable time of a physician with a patient, a scientist in the lab, or a sales representative in the field, time is a valuable commodity not to be wasted. VIEs offer the ability for life sciences professionals to engage in highly interactive learning experiences while preserving time that would be lost by preparing for and traveling to a meeting, conference, or training event.

APPLICATIONS OF 3-D VIES IN LIFE SCIENCES

There are three classifications of environments for engaging people in group learning events within 3-D live VIEs. The three classifications are authentic environments, augmented environments, and improbable environments. Each class of environment offers different opportunities for the application of learning in the life sciences industry.

Authentic Environments

VIEs allow you to create an authentic representation of what we do in the real world as we work and learn. We meet in places such as offices, meeting rooms, auditoriums, classrooms, factory floors, and laboratories. We read, listen to, watch, and have live group discussions around the content.

We can also stand around a piece of laboratory equipment, medical device, or a 3-D molecule on a computer screen or poster. We take notes during meetings, either individually or as a group, on a flip chart or white board. All of these activities are being realized today in virtual immersive environments.

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We can step through the looking glass of our computer monitors and mimic the activities that could otherwise be done in a similar environment in the real world. The advantage of the virtual environment is that people in different physical locations around the globe can get the sense of standing in the same space together.

The problem of distance is eliminated. People can meet and have discussions as if they were in the same room together. Live discussions can occur through text-based chat or through voice.

Life Sciences Application of Authentic Environments

Any form of meeting, conference, or training event can be represented in a VIE. Meeting sizes can range from two to 50 people in a room. Large meeting rooms can allow people to break up into small discussion groups.

Two examples of meetings that could be facilitated by VIEs are key opinion leader (KOL) meetings and research poster sessions. In both examples, one or more facilitators lead group discussion around a topic using either a series of slides or an object such as a medical device. You could also leverage existing documents or multimedia content from disparate sources by bringing it into the VIE.

*KOL Engagements—*In sales and marketing, KOLs are tasked with helping those teams with product launches or making decisions about new markets. In clinical research, KOLs are tasked with supporting the development of clinical trial protocols.

The subject matter experts, normally physicians and research scientists, along with the attendees who take part in these KOLs, all lead very busy lives. Attending KOL conference sessions can be a challenge, especially when they are held at an off-site location in the evening.

In many cases, people scheduled to attend one of these meetings, even the speaker, could be pulled away to higher priorities, such as an emergency patient situation or meeting a project deadline. Having to cancel one of these events and reschedule it can be very costly. However, a meeting held in a live VIE event reduces the need for attendees to travel and provides for the flexibility, time, and cost savings associated with not having to leave their practice.

*Poster Sessions to Support Research—*Posters sessions are a crucial part of the research and development process. These sessions allow researchers to present their scientific findings on large posters, which they and attendees engage in dialogue around, fostering the knowledge transfer that is so crucial to the R&D process.

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These sessions are sometimes limited to the number of attendees because of cost. As a result, peers from around the world or junior scientists might not have the opportunity to join the conversation. This is a lost opportunity to advance the science when only a few are allowed or even have the time to participate in these educational sessions.

One pharmaceutical company piloted one of these poster sessions in ProtoSphere with very promising results. They summarized the following benefits by stating, "Clearly, virtual environments could hold the potential to offer vastly richer opportunities for scientific discourse and collaborative learning than those afforded by traditional static posters. (Welch, Ray, Melendez, Fare, and Leach, 2010)."

They also mention the advantage of offering a "more equitable engagement and participation from the global pool of scientific talent", cost and time savings and the fact that this is a "greener alternative."

Augmented Environment

An augmented environment refers to an environment that provides the ability to learn and collaborate in ways that are possible in the real world, but not without significant and possibly insurmountable challenges.

For example, a product development team, including scientists, marketing specialists, and external key opinion leaders might like to meet to discuss research for a market in a remote place in the world.

Getting everyone together in that location might be possible, but it would be very difficult, costly, and even dangerous. For example, if a member of your team has a physical handicap, it might not be possible for that person to meet in a remote village.

However, all global team members could meet in a virtual representation of the village. In 3-D VIEs, a virtual representation of that location and its attributes can be created, allowing participants on the product development team to gather in that place to hold weekly meetings, brainstorm, and get a sense of the challenges they would face if they were to conduct research there.

People who live local to the region could provide tours of the location to team members scattered around the world. As a result, a 3-D VIE can augment your capabilities as an organization to work as a team in ways that would otherwise not be possible. More informed marketing and research decisions can be made more rapidly.

Life Sciences Application of Augmented Environments

When a new clinical study is ready to be launched, site investigators need to be trained on how to properly conduct and manage the trial according to the protocol and sponsor polices. Larger clinical studies might require investigator sites located around the globe.

A series of investigator meetings to support the launch of a new clinical trial can cost a pharmaceutical company from $30,000 to $400,000 USD depending on the size of the trial. According to a recent study, the average cost is greater than $100,000 per study (Hess, J. (n.d.)).

The intent of investigator meetings is primarily for training the investigators how to run the trial. Once the trial has begun, the training does not end. Training needs will come up at investigator sites during the trial.

Minor changes in the protocol could also occur, triggering a need for updated training. Investigator sites can be added during the life of a trial, which could last for several years. The global coordination to monitor investigator sites and provide ongoing training is a complicated and costly endeavor.

Now imagine having one VIE dedicated to a clinical study. The VIE could include traditional office spaces and meeting rooms for the clinical trial team members, a space that looks like a clinical research site, and even a town where patients live.

You can reduce the spaces between the sites located around the globe, including the sponsor company, into one compressed campus. Investigators, clinical research associates, clinical trial team members, and even participants in the trial can all come to one single location to learn and socialize around the trial and any content related to it. As a company, you will augment your ability to learn as a single community involved in a single clinical study.

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Updates to a protocol could be made available on virtual bulletin boards. If protocol-related documents need to be made secure for a particular group, they could be secured in an external 21-CFR-Part-11-compliant document management repository.

You could also leverage existing e-learning content used by investigator sites. Clinical research associates (CRAs) could enter the VIE and meet with investigators from multiple sites simultaneously to discuss the content that they reviewed at a meeting or in a self-paced e-learning course.

In addition, a CRA could play the role of a patient and allow clinicians the ability to role play interactions with patients, such as an informed consent interview. VIEs also offer the unique opportunity to change roles. The clinician can take on the role of a patient, possibly an avatar as a child, and the CRA could demonstrate how to conduct an informed consent interview allowing the clinician to see the process from the perspective of the patient.

You can also use VIEs to provide for experiences that are very difficult to recreate in the real world in order for life sciences organizations to understand disease from the vantage point of the patient.

For example, a professor of psychiatry at the University of California used a VIE to simulate the sights and sounds experienced by someone with schizophrenia. The VIE allows you to walk into a space and hear and see what someone with that condition is sensing (Elliott, 2007).

You could create an avatar that has the physical characteristics and limitations of someone with a disease and place a research scientist or marketing specialist into that avatar. Then have them walk into a room of avatars representing healthy people or into a doctor's office, and allow them to see the world from the vantage point of the patient.

Researchers in the field of social and behavioral genomics research are looking to VIEs to support their research, education, and even treatment.

"Immersive virtual environment systems may hold great advantages for advancing social and behavioral research related to genomics, as users can be immersed in a variety of situations that can aid understanding, help predict emotions and behavior, and promote practice and learning in ways that were not previously possible with traditional technologies and methods (Persky and McBride, 2009)."

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Persky and McBride explain that VIEs have unique attributes for supporting research by creating realistic and controlled environments with an ability to track behaviors.

Improbable Environments

VIEs can be used to place content and dialogue in an environment not possible to duplicate in the real world. In real life, you cannot shrink yourself and your work team down to the size of a molecule or a cell. In the real world, you cannot transport a group of people from a meeting to a research center in seconds. These scenarios are possible in a 3-D live VIE.

### Life Sciences Application of Improbable Environments

For example, let's say a global team is working on a product in a cardiovascular therapeutic area. They are exploring areas of research that require discussion around heart disease. This can be done with slides and documents in a traditional lecture. However, what if the team could meet inside a diseased heart, and walk through the diseased heart while discussing scientific data recently gathered?

You could place slides or even 3-D representations of scientific data inside the heart. You could place a whiteboard inside the heart and take notes while there. You could animate the heart so that it mimics actual heart activity. Your team will have the ability to reflect, brainstorm, and innovate in ways otherwise not possible in a real world setting.

In our Key Opinion Leader meeting example, we considered a KOL standing in the front of a meeting room, giving a presentation while participants sit in chairs at tables. What if the KOL told the room that we are all going to shrink ourselves down now and go into a diseased human body to discuss this topic in context?

With a click of the mouse, the entire audience and KOL enter a human body or even get smaller and go into a cell, and continue the dialogue there. Now, that's a memorable learning experience! The KOL could also walk everyone over to a life-size rotating molecule and have a discussion while walking the group around the molecule.
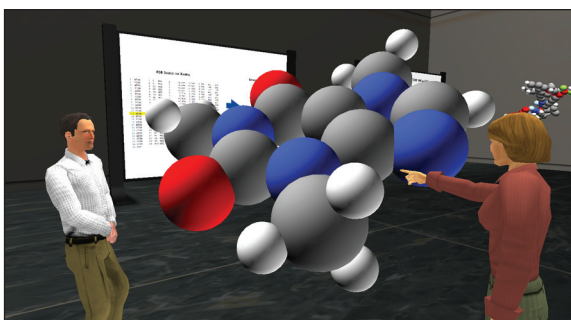
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Virtual immersive environments provide the promise of merging existing online learning content with rich interactive dialogue, while helping life sciences professionals dedicate their time to bringing new and innovative products to market.

CONCLUSION

In the ever changing world of life sciences, learning how to learn as an organization is increasingly important. To have an impact on learning, organizations need to offer the ability to access quality learning content on demand, while providing for opportunities to engage in rich dialogue around that content.

In addition, life sciences organizations need to find ways to increase the time that employees are conducting science at the lab bench, conducting marketing research, and selling products in the field. Virtual immersive environments provide the promise of merging existing online learning content with rich interactive dialogue, while helping life sciences professionals dedicate their time to bringing new and innovative products to market.

ABOUT THE AUTHOR

Brian Miller has worked in the corporate learning and development industry since 1993 as a trainer, instructional designer, e-learning developer, project manager, senior level learning manager and strategic consultant. Brian has worked in the pharmaceutical industry for nine years. He also worked in the industrial process control and semiconductor industries. Brian has a master's degree in instructional systems technology and is currently working on his Ph.D. in learning and knowledge management. Brian is the President of the Learning Mind consulting firm, dedicated to helping organizations move learning online through strategic consulting, program design, and training. If you would like to contact Brian, his e-mail address is Brian@LearningMind.com. You can also check out his LinkedIn profile at http://www.linkedin.com/in/briangeorgemiller.
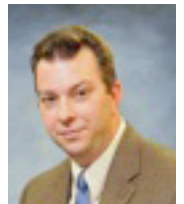
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