

INSTRUCTIONAL TECHNOLOGY

UNIT 5

EMERGING TRENDS IN INSTRUCTIONAL TECHNOLOGY

Recent Trends in Instructional Technology

1. Introduction

Instructional technology is the theory and practice of using technology for education. Encompassing the design, development, use, management, and evaluation of technology in education, instructional technology can take many forms. Anything from electronic whiteboards to online courses or even virtual reality classrooms can be considered instructional technology.

While the applications and benefits of instructional technology vary widely, all instructional technology shares one main purpose: to create engaging and effective learning experiences. Many applications of instructional technology have proved effective at achieving this goal. Experts widely agree that instructional technology provides many benefits to the education process, including better access to information, more opportunities for collaboration and better capabilities for meeting diverse learners' needs.

1.1 Instructional Technology

Technology is a fundamental part of the education process today. As the modern world becomes more digitized, tech literacy is becoming increasingly important. Teachers who use technology to support learning in meaningful ways can help prepare students for success in the digital era. Schools can use educational technology to support both teaching and learning by filling the classroom with valuable digital tools, expanding course offerings, increasing student engagement and accelerating learning. Instructional technology offers nearly endless applications, but experts have identified three key areas where integrating technology can have a significant impact. They are:

1. Flipped Classroom
2. Virtual Classrooms &
3. Virtual Laboratories.

1.1.1. Flipped Classroom

Flipped classroom is a “pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter” (The Flipped Learning Network, 2014).

A flipped classroom is a type of blended learning where students are introduced to content at home and practice working through it at school. This is the reverse of the more common practice of introducing new content at school, then assigning homework and projects to be completed by the students independently at home.

In this blended learning approach, face-to-face interaction is mixed with independent study—usually via technology. In a common Flipped Classroom scenario, students might watch pre-recorded videos at home, then come to school to do the homework armed with questions and at least some background knowledge.

The concept behind the flipped classroom is to rethink when students have access to the resources they need most. If the problem is that students need help doing the work rather than being introduced to the new thinking behind the work, then the solution the flipped classroom takes is to reverse that pattern.

The flipped classroom was invented in 2007 by Jonathan Bergman and Aaron Sams when they began recording their classroom lectures so that students could access them at home.

The principal goals of flipping are as follows:

- To make the classroom an active learning environment,
- To enable students to learn at their own pace, and
- To give the instructor more time to teach each student individually, rather than the class as a whole.

What do students do at home in a Flipped Classroom?

- Watch an online lecture.
- Review online course material.
- Read physical or digital texts.
- Participate in an online discussion.
- Perform research.

What do students do at school in a Flipped Classroom?

- Skill practice (guided or unguided by the teacher).
- In-person, face-to-face discussion with peers.
- Debate.
- Presentations.
- Station learning.
- Lab experiments.
- Peer assessment and review.

This doubles student access to teachers—once with the videos at home, and again in the classroom, increasing the opportunity for personalization and more precise guiding of learning. In the flipped classroom model, students practice under the guidance of the teacher, while accessing content on their own.

A side benefit is that teachers can record lectures that emphasize critical ideas, power standards and even the pace of a given curriculum map. It also has the side benefit of allowing students to pause, rewind, look-up the meanings (Google) of terms, re-watch, etc., as well as creating a ready-made library for student review, make-up work, etc.

Pros and cons of a flipped classroom:

As a learning model, criticisms include reduced opportunity for self-directed critical thinking, decentering the role of the student, encouraging a lecture-driven march through curriculum, and in general simply streamlining an already industrialized approach to learning.

And just like in a regular classroom, success depends greatly on the quality of the teacher, the clarity of communication, the quality of the given curriculum, assessment, and instruction. Further, equity is still a major issue, and it doesn't address the dated approach most educational systems take to curriculum.

By shifting passive lecture material to an at-home setting, students can review those materials in the time and place that works best for their needs. They can also access all the foundational information in advance. So, when they enter the classroom, they feel prepared and ready to participate in interactive learning activities.

During class, teacher-guided discussions and activities require students to put the lecture materials into practice. Classroom time may be used for group work, comprehension tests, in-depth application of the subject matter or open time for individual assignments—all with the added benefit of having a teacher and fellow students nearby for problem-solving and collaboration.

1.1.2. Virtual Classrooms

A virtual classroom is a video conferencing tool where instructors and participants engage with each other and with the learning material. The difference with other video conferencing tools is that virtual classrooms offer an added set of features that are essential to a learning environment.

A virtual classroom platform helps make the learning experience interactive and engaging while providing a controlled environment. But virtual classrooms also offer features that reach beyond the in-class experience. Instructors can access the classroom prior to the lesson to prepare the material. This material, as well as the session recording, is available after class, for reference of instructors and participants alike.

Virtual classroom software enables instructors to:

- Moderate student participation.
- Display learning materials in the form of documents, slide decks or multimedia files.

- Enrich the learning experience with screen-sharing and virtual whiteboard features.
- Divide the participants into breakout rooms which the instructor can join.
- Engage the participants with polls and quizzes.
- Record the sessions (and manage those recordings).

Participants can connect to virtual classroom platforms from any device that can connect to the Internet. This type of flexibility enables participants to consume content, regardless of their location across the globe.

Another major benefit of virtual classroom software is that it facilitates student progress tracking. Instructors can consult data such as class attendance and student activity. They can track a participant's progress via online polls and analytics, identify areas of difficulty, and help the participant learn challenging subject matter with visual tools.

Lastly, many virtual classroom platforms can be integrated within the school's established Learning Management System (LMS). Advanced platforms support Learning Tools Interoperability (LTI) so that the virtual classroom system and LMS can communicate with each other, making the whole greater than the sum of its parts.

What do you need for a Virtual Classroom?

Perhaps the most important requirement when moving from a physical classroom to a virtual classroom is the understanding that these are two different environments.

While a physical classroom environment is built using brick and mortar, a virtual classroom is composed of software and hardware. These materials have different uses and costs. What is needed when looking to create a virtual classroom is to find the most suitable virtual classroom platform that fits the needs. One consideration may also be how the virtual classroom platform fits with other systems that may already be in place, such as Learning Management System (LMS).

A virtual classroom platform can help education institutions provide a positive learning experience. Here are key features every virtual classroom software should provide:

- ***Easy access***—is key to help course participants learn course materials. When participants are required to install software or download plugins, they can experience difficulties. The result is a poor learning experience. Participants should be able to easily connect to digital tools, preferably using just a link and their credentials.
- ***A user-friendly interface***—is critical to help course participants use and navigate through digital learning tools. When the interface is simple and intuitive, participants can quickly enjoy classes and the relevant learning materials, communicate with instructors and collaborate with classmates.
- ***Efficient learning***—instructors and content creators should be able to add another layer of organization on top of the interface. Since each course is unique and provides different materials, the structure of the course should be similar to that of the entire hub, but flexible enough to provide unique features according to subject matter.
- ***Content security***—is a crucial element for content creators, curators, and consumers. A virtual classroom solution should help organizations and education institutions gain complete control over their content. The platform should also provide built-in security measures, such as authentication and access controls, which help prevent unauthorized access, usage, and download of educational and sensitive data.

Best Practices for a Virtual Classroom Setup

Typically, organizations and educational institutions create their own unique digital learning stack, which meets their individual needs and standards. However, there are certain practices that can help improve the process in most cases. Here are key best practices for a successful virtual classroom implementation:

- ***Simulate a physical learning environment***—instructors, teachers, and class participants need features that simulate a physical learning environment, regardless of their current location. Even if participants are viewing the class from their living room, the digital space should look familiar. A virtual classroom can help create a suitable learning environment, using quality streaming, presentation tools, and user-friendly collaboration features.

- ***Features for interactive teaching***—such as digital whiteboards, annotations, emojis, chats, and polls. All of these features help instructors engage participants and create a dynamic and interactive learning environment.
- ***Breakout groups***—are features that split a virtual classroom into mini virtual classrooms, where participants can work in small groups. Instructors can set a time limit for group work and bring all participants back to the main virtual classroom.
- ***Easy sharing capabilities***—instructors often share materials with participants. Instructors need to be able to share screens, video, audio, and other resources. Easy and quick sharing is critical to ensure a positive learning experience.

What a Virtual Classroom is and why it matters?

A virtual classroom environment ensures human connection, a vital element of classroom teaching that video-on-demand courses don't have and sorely miss. In a virtual classroom, teachers interact with students in real time; students can voice their questions and interact with peers similar to how they would in a regular classroom, albeit over the internet.

An additional perk of virtual classrooms is that they are scalable to accommodate a larger number of students. Physical classrooms often limit seating to a maximum number so that students can sit comfortably and have enough space to themselves. By contrast, virtual classrooms use virtual meeting solutions that have a higher cap on numbers, allowing more students to attend interesting classes at once. This enables better and higher participation rates and ensures knowledge is that much more accessible.

Like brick-and-mortar classrooms, virtual classrooms are also synchronous as learners and teachers appear online at the same time to facilitate immediate interactions. However, virtual classrooms also make use of pre-recorded components such as videos, presentations and lecture slides to facilitate learning, much like offline classrooms do.

A virtual classroom includes the following features:

Video conferencing: using the best web conferencing software to facilitate learner-teacher-learner communication.

Digital whiteboards: offering real-time demonstrations and diagrams.

Instant messaging: allowing typed conversations on lower bandwidths.

Participation controls: enabling students to participate in discussions, mute their surroundings or virtually “raise” their hands.

Sub-chats: breakout rooms to facilitate collaboration between learners.

Video recording: to save live lectures as video-on-demand for later reference.

End-to-end encryption: to ensure virtual classroom access is restricted to authorized learners.

Advantages of Virtual Classrooms over Brick-And-Mortar Setups:

1. *High interactivity* - An effective virtual classroom is one that makes use of multiple communication channels, such as online virtual meeting software, chat rooms, messaging, voice calls, and conferencing options. This is so that learners with varying preferences are all able to benefit equally.
2. *Collaborative education* - Digital whiteboards, file sharing, virtual meeting applications, and chats facilitate collaborative learning between students. This mimics the real-time atmosphere of classrooms without having to meet physically; it also reinforces materials learned so that knowledge retention is higher.
3. *Student-focused teaching* - Virtual classrooms focus on students and their real-time education, unlike pre-recorded videos which are highly teacher-centric. Students can ask questions, clarify concepts and discuss topics in real time.
4. *Range of content types* - Virtual classrooms make use of a range of media types to present knowledge such that a variety of student abilities and learning styles are catered to. These include videos, presentations, Slide Share, animations, digital whiteboards, and webinars.
5. *Comfortable learning space* - Virtual classrooms make learning online feel much less robotic. Human interaction is critical to the success of an education system; virtual

classrooms ensure learners are able to interact and chat with peers and teachers without compromise.

1.1.3. Virtual Laboratories

Virtual lab refers to a virtual teaching and learning environment aimed at developing students' laboratory skills. As one of the most important eLearning tools, they allow the student to conduct various experiments without any constraints to place or time, in contrast to the constraints of real labs.

Virtual labs incorporate various pedagogical techniques that help learners to better understand the theoretical information. These techniques include visual learning, active learning, recall-based learning, gamification & storytelling.

They also offer students access to a realistic lab experience that will allow them to perform experiments and practice their skills in a risk-free and interactive learning environment.

Categories of Virtual Laboratories:

Virtual laboratories are not homogenous and they largely differ in their purpose, composition and application. In general, a virtual lab in modern academia can be divided into the below categories-

Laboratories– These are the platforms that simulate physical labs on screens. The online experience offers the students the same facilities as in the physical lab, with the only difference of the interaction being limited to a 2D environment.

Simulations– Simulations offer students an opportunity to explore a different reality from a remote location.

VR spaces– VR or virtual reality classes offer a more immersive experience than simulators.

Top benefits of using Virtual Labs in Education:

1. Top-notch equipment

Virtual labs offer students with easy access to cutting-edge technology for experimentation. Tools such as Simulations and Virtual Microscopes provide futuristic solutions to science students.

Learners do not have to settle on outdated equipment with a virtual lab in place and can instead work with AI-powered laboratories and modern teaching techniques. They can easily compete with peers using advanced technological solutions.

Further, these labs can help the teacher cover various aspects of the course curriculum with practical applications. It allows students to understand the concepts better, which is otherwise difficult to offer with limited equipment and funding.

2. Serves as a visual aid to teach complex concepts

Using virtual labs, teachers can easily explain complex theoretical concepts to students through a visual, immersive experience that can make it simpler for students to understand.

Moreover, it provides the synchronization needed between explaining the theoretical ideas and practical application.

3. Ensures student safety

Students can try various kinds of experiments in a virtual laboratory without the risk of injuring themselves or damaging equipment. They can also test multiple scenarios, compare, and determine which one is the most effective without trying them in real life.

Designed with the latest technology, virtual labs protect students from the dangers they face while conducting some dangerous laboratory experiments. Further, it also eliminates the need to deal with toxic/radioactive chemicals and other similar hazards and offers an effective way to avoid laboratory accidents.

4. Engages learners

Listening to lectures and watching presentations about experiments can eventually become disinteresting for students. Virtual labs allow the instructors to capture learners' attention by allowing them to test all those procedures in an online setup easily.

Students can conduct the same experiment multiple times to ensure they completely understand the concept.

5. Offers instant feedback

Another advantage of virtual labs is that it allows students to redo the experiments. Unlike the traditional lab setup, in virtual labs, experiments no longer have a single chance option. Students can go over their mistakes, analyze what went wrong and give it another shot immediately.

Since all the experiment results are recorded, maintaining communication between teachers and students becomes more efficient.

6. Allows learning flexibility

One of the most common benefits of online learning is that students can learn at their own time and pace. The same applies to virtual laboratories also. It helps students study, prepare and perform laboratory experiments at any time and place as per their convenience.

Since all virtual labs are cloud-based or accessible via the web, they offer students unhindered access to the platform whenever they want. Students can also access the laboratory on any device from any location, making them indispensable for contactless learning.

7. Affordable alternative to physical labs

Online or virtual labs are far less expensive as compared to the real ones. One single lab platform can serve an entire school or institution without spending a massive amount of resources on its development. Besides, schools also don't need to worry much about maintenance costs and other similar expenses.

With the changing educational landscape, educators are constantly exploring innovative ways to fine-tune their online learning processes. Virtual labs are excellent digital resources that help save costs and enhance student productivity manifolds. Moreover, they allow students to take part in school work from any location and seamlessly combine the convenience and ease of use offered by contemporary technology. While virtual labs still need some improvements to replicate the physical laboratories, it won't be wrong to say that they are here to stay.

Advantages and disadvantages of Virtual Laboratory:

Advantages of Virtual Laboratory in education:

- 1- Virtual labs enable students to perform many experiments that are difficult to perform in real laboratories because of the risks.
- 2- Virtual labs help teachers and students save time and effort because they don't need to adhere to certain times to enter the lab, or to move from one place to another.
- 3- Virtual labs enable students and teachers to use the latest technologies.
- 4- Virtual Labs help users keep up with the technological development of the digital age.
- 5- Virtual labs allow students to perform the practical experiments related to the theoretical courses, which helps them absorb the courses.
- 6- The virtual lab provides enjoyment during experiments.
- 7- Virtual labs help students perform the experiment more than once.
- 8- Online Virtual labs protect students and teachers from hazards, given there is no direct contact with toxic or radioactive chemicals and there is no handling of explosive devices or electricity.
- 9- Virtual labs provide the convenience of changing the inputs and transactions used in the experiment without worrying about any dangerous effects of these changes.
- 10- Virtual labs allow students to stay in touch with the Internet, which helps them search and gather information during the experiment.

11- Virtual Labs enable students to record results electronically and share them with others to exchange experiences.

12- Virtual Labs provide teachers with the opportunity to follow up and evaluate students electronically.

13- Virtual labs provide flexibility in performing experiments.

14- Virtual labs provide a complete Learning Management System (LMS) around the virtual labs where students can avail the various tools for learning including additional web-resources, videos, animated demonstrations and self-evaluation.

15- Virtual labs help students learn basic technology techniques and practice methods used by lab technicians and researchers with keeping the advantages of biology and chemistry laboratories.

Disadvantages of Virtual Laboratory:

1- They require computer devices with high specifications in order to simulate the exact phenomena with full details and create a three-dimensional virtual lab.

2- They require professional programmers with strong skills in different programming languages. They also require a team of experts in the scientific material, teachers, and experts in psychology.

3- One of the negative effects of Virtual Labs is that it reduces the direct interaction between students and each other, and between students and teachers, given that the communication between them is electronic most of the time.

4- Due to the experiment in virtual lab can repeat as many times as necessary, student will get insensitive to failure and danger in a real situation.

5- Students can learn something useful from a full sensory experience in a real lab like weird noise and smell, random error, faulty machinery, etc.

Virtual laboratories are a great method that facilitate the teaching of science, as it contains 3D simulations of chemistry, physics and biology experiments.

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