



**AGRIENT:**  
Enhancing Youth Entrepreneurship Skills,  
Careers Guidance and Competences in  
Agriculture Through a Game based Virtual  
Reality Platform physics education  
Agreement Number: 2018-3-HR01-KA205-060151



**Agrient- Enhancing Youth Entrepreneurship Skills,  
Careers Guidance and Competences in  
Agriculture Through a Game based Virtual Reality  
Platform**

**ERASMUS + 2018-3-HR01-KA205-060151**



**AGRIENT:**  
Enhancing Youth Entrepreneurship Skills,  
Careers Guidance and Competences in  
Agriculture Through a Game based Virtual  
Reality Platform physics education  
Agreement Number: 2018-3-HR01-KA205-060151

# **I02 - Game-based 3D Virtual Reality Educational Platform for Agro-Entrepreneurship Education**

**Report on Training with Virtual Worlds**

## Executive summary

---

This document has been prepared to present the main characteristic of the virtual worlds and present the main ways that they can be utilized in all levels of education. This deliverable summarizes the main educational methods and approaches that the virtual worlds scaffold and explains the pedagogical approaches. It consist of thee main chapters.

**Chapter 1, “Introduction”** presents the main characteristics of the virtual world environments and the motivations that can offer their integration in educational systems.

**Chapter 2, “Educational Capabilities of Virtual Worlds”** presents and analyses the capabilities and the educational possibilities of the virtual worlds.

**Chapter 3, “Main 3. Main Learning methods in Virtual Worlds”** presents the way that formal, informal and non-formal learning approaches can be utilizing integrated and offered to students in virtual world educational environments.

# 1. Introduction

---

Virtual reality (VR) means experiencing things through our computers that don't really exist. From that simple definition, the idea doesn't sound especially new. When you look at an amazing Canaletto painting, for example, you're experiencing the sites and sounds of Italy as it was about 250 years ago—so that's a kind of virtual reality. In the same way, if you listen to ambient instrumental or classical music with your eyes closed, and start dreaming about things, isn't that an example of virtual reality—an experience of a world that doesn't really exist? What about losing yourself in a book or a movie? Surely that's a kind of virtual reality?

If we're going to understand why books, movies, paintings, and pieces of music aren't the same thing as virtual reality, we need to define VR fairly clearly. For the purposes of this simple, introductory article, I'm going to define it as:

A believable, interactive 3D computer-created world that you can explore so you feel you really are there, both mentally and physically.

Putting it another way, virtual reality is essentially:

1. **Believable:** You really need to feel like you're in your virtual world (on Mars, or wherever) and to keep believing that, or the *illusion* of virtual reality will disappear.
2. **Interactive:** As you move around, the VR world needs to move with you. You can watch a 3D movie and be transported up to the Moon or down to the seabed—but it's not interactive in any sense.
3. **Computer-generated:** Why is that important? Because only powerful machines, with realistic 3D computer graphics, are fast enough to make believable, interactive, alternative worlds that change in real-time as we move around them.

4. **Explorable:** A VR world needs to be big and detailed enough for you to explore. However realistic a painting is, it shows only one scene, from one perspective. A book can describe a vast and complex "virtual world," but you can only really explore it in a linear way, exactly as the author describes it.
5. **Immersive:** To be both believable and interactive, VR needs to engage both your body and your mind. Paintings by war artists can give us glimpses of conflict, but they can never fully convey the sight, sound, smell, taste, and feel of battle. You can play a flight simulator game on your home PC and be lost in a very realistic, interactive experience for hours (the landscape will constantly change as your plane flies through it), but it's not like using a real flight simulator (where you sit in a hydraulically operated mockup of a real cockpit and feel actual forces as it tips and tilts), and even less like flying a plane.

A virtual world or massively multiplayer online world (MMOW) is a computer-based simulated environment in which many users create a personal avatar and simultaneously but independently explore the virtual environment and participate in various activities, as well as communicate with others.

A generally accepted definition of virtual world does not exist, but they do require that the world be persistent; in other words, the world must continue to exist even after a user exits the world, and user-made changes to the world should be preserved [2, 3]. While the interaction with other participants is done in real-time, time consistency is not always maintained in online virtual worlds.

Numerous 3D Virtual Worlds exist, aiming for various purposes, from socialization and leisure, to more formal approaches such as commercial and education oriented.

A virtual world is a digital environment (usually graphical, usually 3D) completely delivered over the Internet or Intranet, where users are represented by Avatars, interact with each other, interact with and effect their environment in a persistent manner, have no more restrictions placed on them than they can expect in the real world, can decide from a wide range of actions,



or even inaction, can build and create within the world, without having to master additional tools, can use the world for a wider variety of different purposes" [2].

Many definitions of VW exist in the literature, all of which have the following characteristics [3, 4]:

- Shared space between multiple users
- Graphical user interface – the virtual environment
- Real-time interaction between users
- Interaction with the virtual environment and with digital content within the virtual environment
- Persistence: it is guaranteed that the VW, its objects, as well as user interaction effects will exist even after the user has left the VW
- User communication through text and/or voice
- Networks of people formulate forming social groups
- User avatars: a digital representation controlled by a human in real time to interact within the VW
- Networked computers (servers) that manage all the data

A virtual world can be defined as a computer-based simulated environment that can be populated by many users who can create a personal avatar, and also independently explore what we call “virtual world”.

The user hits the button of the application that will launch the virtual world which presents perceptual stimuli to the user, who in turn can manipulate elements of the modeled and thus experience a degree of presence. Such modeled worlds and their rules may draw from the reality or fantasy worlds. Examples rules are gravity, topography, locomotion, real-time actions and communication.[1]

There is no generally accepted definition of virtual world, but they do require that the world be persistent; in other words, the world must continue to exist even after a user exits the world, and user-made changes to the world should be preserved. While the interaction with other participants is done in real-time, time consistency is not always maintained in online virtual worlds. For example, EverQuest time passes faster than



real-time despite using the same calendar and time units to present game time. As virtual world is a general term, the virtual environment supports varying degrees of play and gaming.[2]

We can see from this why reading a book, looking at a painting, listening to a classical symphony, or watching a movie don't qualify as virtual reality. All of them offer partial glimpses of another reality, but none are interactive, explorable, or fully believable. If you're sitting in a movie theater looking at a giant picture of Mars on the screen, and you suddenly turn your head too far, you'll see and remember that you're actually on Earth and the illusion will disappear. If you see something interesting on the screen, you can't reach out and touch it or walk towards it; again, the illusion will simply disappear. So these forms of entertainment are essentially passive: however plausible they might be, they don't actively engage you in any way.

VR is quite different. It makes you think you are actually living inside a completely believable virtual world (one in which, to use the technical jargon, you are partly or fully immersed). It is two-way interactive: as you respond to what you see, what you see responds to you: if you turn your head around, what you see or hear in VR changes to match your new perspective.

### ***1.1. Types of virtual reality***

"Virtual reality" has often been used as a marketing buzzword for compelling, interactive video games or even 3D movies and television programs, none of which really count as VR because they don't immerse you either fully or partially in a virtual world. Search for "virtual reality" in your cellphone app store and you'll find hundreds of hits, even though a tiny cellphone screen could never get anywhere near producing the convincing experience of VR. Nevertheless, things like interactive games and computer simulations would certainly meet *parts* of our definition up above, so there's clearly more than one approach to building virtual worlds—and more than one flavor of virtual reality. Here are a few of the bigger variations

#### ***1.1.1. Fully immersive***

For the complete VR experience, we need three things. First, a plausible, and richly detailed virtual world to explore; a computer model or simulation, in other words. Second, a powerful computer that can detect what we're going and adjust our experience accordingly, in real time (so what we see or hear changes as fast as we move—just like in real reality). Third, hardware linked to the computer that fully immerses us in the virtual world as we roam around. Usually, we'd need to put on what's called a head-mounted display (HMD) with two screens and stereo sound, and wear one or more sensory gloves. Alternatively, we could move around inside a room, fitted out with surround-sound loudspeakers, onto which changing images are projected from outside. We'll explore VR equipment in more detail in a moment.

### **1.1.2. Non-immersive**

A highly realistic flight simulator on a home PC might qualify as nonimmersive virtual reality, especially if it uses a very wide screen, with headphones or surround sound, and a realistic joystick and other controls. Not everyone wants or needs to be fully immersed in an alternative reality. An architect might build a detailed 3D model of a new building to show to clients that can be explored on a desktop computer by moving a mouse. Most people would classify that as a kind of virtual reality, even if it doesn't fully immerse you. In the same way, computer archaeologists often create engaging 3D reconstructions of long-lost settlements that you can move around and explore. They don't take you back hundreds or thousands of years or create the sounds, smells, and tastes of prehistory, but they give a much richer experience than a few pastel drawings or even an animated movie.

### **1.1.3. Collaborative**

What about "virtual world" games like Second Life and Minecraft? Do they count as virtual reality? Although they meet the first four of our criteria (believable, interactive, computer-created and explorable), they don't really meet the fifth: they don't fully immerse you. But one thing they do offer that cutting-edge VR typically doesn't is collaboration: the idea of sharing an *experience* in a virtual world with other people, often in real time or something very close to it. Collaboration and sharing are likely to become increasingly important features of VR in future.

### **1.1.4. Web-based**

Virtual reality was one of the hottest, fastest-growing technologies in the late 1980s and early 1990s, but the rapid rise of the World Wide Web largely killed off interest after that. Even though computer scientists developed a way of building virtual worlds on the Web (using a technology analogous to HTML called Virtual Reality Markup Language, VRML), ordinary people were much more interested in the way the Web gave them new ways to access *real* reality—new ways to find and publish information, shop, and share thoughts, ideas, and experiences with friends through social media. With Facebook's growing interest in the technology, the future of VR seems likely to be both Web-based and collaborative.

#### ***1.1.5. Augmented reality***

Difficult and dangerous jobs are hard to train for. How can you safely practice taking a trip to space, landing a jumbo jet, making a parachute jump, or carrying out brain surgery? All these things are obvious candidates for virtual reality applications. As we've seen already, flight cockpit simulators were among the earliest VR applications; they can trace their history back to mechanical simulators developed by Edwin Link in the 1920s. Just like pilots, surgeons are now routinely trained using VR. In a 2008 study of 735 surgical trainees from 28 different countries, 68 percent said the opportunity to train with VR was "good" or "excellent" for them and only 2 percent rated it useless or unsuitable.

#### ***1.1.6. Scientific visualization***

Anything that happens at the atomic or molecular scale is effectively invisible unless you're prepared to sit with your eyes glued to an electron microscope. But suppose you want to design new materials or drugs and you want to experiment with the molecular equivalent of LEGO. That's another obvious application for virtual reality. Instead of wrestling with numbers, equations, or two-dimensional drawings of molecular structures, you can snap complex molecules together right before your eyes. This kind of work began in the 1960s at the University of North Carolina at Chapel Hill, where Frederick Brooks launched GROPE, a project to develop a VR system for exploring the interactions between protein molecules and drugs.

### ***1.2. Motivational factors***



User's motivation of using virtual world influences their behavioural, attitudes and the way they use the medium. Therefore it will be useful to establish the fundamental factors that motivate users.

In order to study the motivations behind Virtual users, Technology Acceptance Model (TAM) will be applied to investigate the intrinsic and extrinsic motivation behind the acceptance of virtual world. TAM is used to determine consumer's attitude towards Virtual World. They 'apply psychological factors of human into the adoption of Information Technology and Computers' (Shin, 2009) and are widely accepted by academics. The first form of TAM was formed by Fred D. Davis Jr. in 1985 which focused on perceived usefulness and Perceived ease of use as its basis of research. As technology progresses (in the context of Information Technology) through the three generations, it is no longer adequate to be used to evaluate the motivations. Therefore, the proposed model of TAM (Shin, 2009) is being analyzed.

The proposed model of TAM (Shin, 2009) would be intrinsic motivation (Perceived enjoyment and Perceived empathy), extrinsic motivation (Perceived usefulness and Perceived synchronicity) and flow (Immersive). Variables such as Perceived involvements, Perceived synchronicity and Flow are assigned on top of the original model to better relate to user behaviour in SL.

Perceived enjoyment is to determine if virtual world is enjoyable to be used by users in their own purpose of using. This will determine if virtual world presents itself as a hedonic system that is capable to bring enjoyment through the use of virtual world.[3]

Perceived empathy defines user's state of feelings and emotions when interacting with the medium. This will determine if positive empathy will enhance the relationship between users and virtual world.

Flow is the other term for 'immersiveness' in the medium. It is defined as the experiential factors when users are engaged and absorbed themselves into the virtual activity. This factor will determine if users find positivity in the flow of virtual medium to use them. This factor can also be classified under intrinsic motivation as immersive experience is part of hedonic effect.



Perceived usefulness is defined as 'the degree to which a person believes that using a particular system would enhance his or her performance' (F. Davis, 1985). This factor will determine if users find the whole concept of virtual world (Second Life) useful in their context.[3]

Perceived synchronicity refers to users doing things together at the same time with shared goals. They can be seen as a community concept, which is defined as 'aggregation of individuals or business partners who interacts around shared interest' (Porter, 2004). This can also be seen as a social presence state. This factor will determine if users are positively influenced by the social presence around them in the virtual world.

The result of the research done by Dong Hee Shin in 2009 on 274 Second Life users reveals that the motivational factors listed above showed reliability to predict and explain the behavior intent towards motivation to use SL. One of the major finding was that flow had a much greater impact on user motivation than previous studies. This factor aligns with the very nature of the characteristics of Virtual World; it's immersive environment. The study suggests that the immersive nature of virtual environment is one major driver in the use of SL. It has direct impact on the intrinsic and extrinsic motivations displayed by users. Therefore, 'virtual reality is about providers facilitating the presence of end-users as active, collaborative co-producers' (D. Shin, 2009) in an immersed environment.

In a virtual medium where there are no physical entities, users assign values to 3D objects in the virtual world they see and interact. Thus it is vital to assess the user's value in terms of how they see value in an 'imaginary' world. Second Life resembles the real world that we live in, but the elements of survival are 'not required to survive virtuality' (Jennifer 2008). There is no traditional concept of needs in virtual world. The following values when users assigned in Second Life: Use-Value and Exchange-Value (Jennifer, 2008) of virtuality are the 2 main factors of values to consider in virtual goods.[2]



**AGRIENT:**  
Enhancing Youth Entrepreneurship Skills,  
Careers Guidance and Competences in  
Agriculture Through a Game based Virtual  
Reality Platform physics education  
Agreement Number: 2018-3-HR01-KA205-060151

Use-Value refers to the inherent of physical object that give users value. This value, however, is not applicable in virtual set-up as there is nothing material in the medium. This factor will be omitted.[1]

Exchange-Value, as suggested by Jennifer Martin, is the value assigned by users in determining an object's worth. This is the dominant value in Second Life as use-value is completely absent from the system. Jennifer Martin suggested that Exchange-Value is related to how users linked virtual goods to: social belonging, status, individuality and social lubrication.[3]

The value of Social Belonging stems from the fact that virtual objects can be positioned to align with status, belongings and individuality. The major discussion was about 'Social Lubrication which indicates that virtual goods can be seen as a value that brings people together through common interests and share activities.' (Jennifer, 2008) It is evident that virtual communities echoed this value that users share when users come together in a community on a basis of an object; for instance, car or motorbike. Virtual world enables people with common interest to come together in a common platform. In this sense, it can be inferred that the value that users perceived is shifted intrinsically to fulfill their needs when using virtual medium.[4]

## 2. Educational Capabilities of Virtual Worlds

---

### *2.1. Virtual Worlds in Education*

The virtual reality is being more and more used in the education, allowing the student to find out, to explore and to build his own knowledge. The constant evolution of the technology is taking the education to new ways, much more attractive to the students, making possible the use of new tools, taking to an evolution on the teaching process. The Virtual Reality takes an important place in this evolution [1] .

A virtual world is a computer-based world where many users are connected. In this environment they can create themselves an avatar and also to discover this world, participate in many activities and also to communicate with other users. Communication between the users of this world can be by text, graphical icons, visual gesture, sound, and by using voice command. This world allows many users to access this world simultaneously [2]

A very short time ago, we could consider that the great potential of Virtual Reality use was in small groups placed in large urban centers and in teaching and researching centers. However, nowadays the expansion is growing more and more and the potential of using it is huge.

No one has thought about learning inside a virtual environment. This is already possible thanks to work of many programmers who developed such a world. Now it's possible to attend a virtual lecture, discussion, exam, or lab in 3D. There are worlds for every young



children, teenagers or adults. The aim of these worlds is to encourage people to learn as many things as possible[3].

Formal learning, normally delivered by trained teachers who are following a specific list of subjects, is part of one of three forms of learning, the others being non-formal and informal learning. Formal learning should not be confused with 'formal learning theory', which, as the Stanford Encyclopedia of Philosophy reminds us, is: "the mathematical embodiment of a normative epistemology" [4].

Virtual worlds are playing an increasingly important role in education, especially in language learning. It was estimated that over 200 universities or academic institutions are using Virtual Reality as a support for their students. 3D virtual worlds are often used for constructivist learning because of the opportunities for learners to explore, collaborate and be immersed within an environment of their choice [5].

Virtual reality and games have the power to make the young people to focus more on a specific subject and to transform abstract notions in concrete examples. WolfQuest is a highly successful science game, downloadable and free of charge. The game is coordinated by a team of scientists. This game was created to bring the same experience as a normal video game. The purpose of this game is of teaching wolf behavior and ecology in an authentically way. „The game also successfully reached its target audience of 9-15 year olds with nearly 70% of players in that age range. This is significant because the game's science content was woven throughout the game and rarely made explicit" [6].

Informal learning can be defined as a particular way of learning which arises from the activities and interests of individuals and groups. After having identified and selected interests expressed by learners, informal-learning activities (discussion, talks or presentations, information, advice and guidance) are carried out in a flexible and



informal way, in informal community locations. One of the best examples of informal learning experience is the simplification of research through an online encyclopedia such as Wikipedia. Writers and bloggers find they can quickly research a topic of interest and amass factual information on a variety of celebrities, politicians and others in current news. [7]

Also, as an example, informal learning makes use of virtual reality in the example of virtual museums. Many people can be very interested into a specific subject such as technology. Now there are some museums that afford us to explore them without any costs.

“When asked about the advantage of the virtual classes over traditional classroom or lab settings, most students predictably answered that the main advantage was “not having to go to class.” However, upon deeper questioning, many students expressed that the environment made them feel like they were “at school” or “in school” or “actually there” embodied in the environment.”

Non-formal learning is purposive, but voluntary learning, that takes place in a diverse range of environments and situations for which teaching or training and learning is not necessarily their main activity. These environments and situations may be temporarily, and the activities or courses that take place may be held by youth trainers or by volunteers such as youth leaders. The activities and courses are planned, but are rarely structured by conventional curriculum subjects. They usually address specific target groups, but rarely document or assess learning outcomes or achievements in conventionally visible ways. [8]

The educational software for Virtual Worlds helped to take the formal, informal and non formal learning from classrooms to the computer labs, making the teaching and learning process more interesting and pleasant to the students, facilitating the teacher’s work during the evaluation performance too.



Virtual learning will open the doors for people to access the best kind of education by blending together the best of the real world, the best of the internet and online applications, and the best of the virtual world technology so that the most modern techniques are utilized to obtain that education.

A virtual world is one of the most effective tools that can help students nowadays study in a collaborative environment and to deepen the knowledge gained through traditional methods. The studies have shown that using a virtual environment as a method of teaching and learning is more effective in “maintaining the intrinsic motivation “ [1] than the traditional and direct way of teaching in which a teacher or professor communicates directly with the students.

It seems that those virtual worlds might provide technological features that can transform the concepts of communication, education and collaboration. One of the most important characteristics of a virtual environment is the fact that you do not have such constraints as a physical space.

Some opportunities that a virtual world can provide is that you can swap the roles between the teacher and the students and it can also give an objective and impartial feed-back when it comes to evaluating the skills of a student and his level of knowledge.

Virtual worlds provide many features, such as visualization, simulation and transposition that cannot be incorporated in the framework of reality and in the design of educational opportunities.

Those capabilities beget different experiences, as an example we can take the ability to discover and explore a virtual world can “generate opportunities that foster innovation”.

The real-time communication is also a good characteristic of the virtual environment, as it uses avatars that are able to move, change and “speak” to each other.

Therefore we can argue that many opportunities can arise and continue to develop in applying this virtual reality in education.



Virtual Worlds are very important due to the progress of technology as well, that is why they can provide so many opportunities, technology always improves and so are we, therefore it is very important to combine the traditional methods with the new and updated concepts in order to take education to another level.

The formal learning, on one hand, is the type of learning that has courses and curricula structured in a certain way. Virtual World formal learning can consist in webinars and screen-sharing technology that can also be used “so that remote learners can attend the required sessions”[2]. The capabilities that they can offer is that there are easy and very user-friendly ways of learning, interesting and flexible as location, you can attend them from whatever place you want. You have the opportunity to study from abroad for example, following the same curricula. It is usually used for companies that want to have more control over the learning and training of their employees.” They also create time and cost-saving simulation and allow for nuanced and personalized opportunities negating and perceived loss of quantity”[2].

On the other hand, informal learning programs are based on the concept of flexibility in the way the content is delivered and consumed, this type of learning is taking into consideration the needs of the receiver. The capabilities are that it limits the responsibilities and it is more interactive and interesting for learners. This type of learning is very often created by people who understand the needs of a learner, based on feed-backs. The subjects are not so structured and they are not following a certain scheme.

This type of learning can consist in virtual messages, chatting and it makes it easier to share the information, which makes it more available. You have the opportunity to work in pairs, to exchange ideas, skills, concepts related to education. It is interactive, collaborative and it keeps you very interested. “Students need to acquire a broad range of knowledge and skills to integrate in society, and approximately 80% of these skills are acquired through informal learning”[3].



Another advantage of this type of learning is that it can eliminate conflicts between students which do not share the same culture and the same nationality, it makes them bound to each other and interacts in order to create something, and it makes them more open and communicative.

Non-formal learning is another concept that needs to be discussed further. It is very differently structured and has a large variety of subjects. It doesn't have the same curriculum, syllabus or assignments as formal learning, but it consists more in practicing.

As an example for the virtual environment, this type of learning can consist in video games, designed especially as a tool for learning easier.

“Although learning processes are usually neither intended nor reflected by the gamers, a major part of cognitive, motoric, and social development takes part within the context of games. The easiness of acquiring knowledge, skills, or cognition while playing arouses interest in using this kind of learning for different intentions“[4].

The opportunity is that the students can both learn and have fun while playing those games, it is a good way of relaxation, that has very productive results. The games can enhance his knowledge from various fields with just a click. It can be done in the spare time and it can be a multi-player game, therefore the user can connect in the same times with various other players from different countries or cities. In conclusion, every type of learning can enhance some qualities and has its role in gaining knowledge and used combined can lead to amazing results in our society.



The characteristics of the 3DVWs could potentially transform these environments to "educational virtual environments". An "educational virtual environment" is defined as an environment that is based on a certain pedagogical model, incorporates or implies one or more didactic and learning objectives, provides users with experiences they would otherwise not be able to experience in the physical world (or in a classroom) and redounds specific learning outcomes. Therefore, a growing interest in learning and teaching within 3DVWs is observed and a large number of schools and universities own such VWs for educational purposes, most of the times by projecting their campuses to the VW. 3D educational VWs are mostly used as safe simulation environments and virtual classrooms.

Compared to other e-learning technologies, 3DVWs use immersive 3D experiences, allowing the learner to freely wander through the learning environment, explore it, obtain sense of purpose, act, make mistakes, collaborate and communicate with other learners, and by that provide him/her with a full understanding of a situation. The most important and unique features that 3DVW technologies offer is the sense of immersion, i.e. the impression of "actually being in there" and the sense of presence, i.e. the feeling that the person is an entity of the virtual world that interacts with other entities in the same way as in a real physical environment. Moreover, the anthropomorphic avatars enhance the sense of presence. 3DVWs occupied by human-like avatars could enhance collaborative training activities such as games and simulations. In addition, immersion and interaction with virtual objects can enhance learners' interest and engagement to the learning tasks and help them to develop a stronger conceptual understanding, depending on the content. A very interesting statement however is that the simple use of highly immersive technologies alone could not be effective unless it is coupled to specific design strategies.

## ***2.2. Pedagogical Approaches in Virtual Worlds***



**AGRIENT:**  
Enhancing Youth Entrepreneurship Skills,  
Careers Guidance and Competences in  
Agriculture Thought a Game based Virtual  
Reality Platform physics education  
Agreement Number: 2018-3-HR01-KA205-060151

With the advent of technology and the ever growing demands young students are facing, the issue of learning in virtual worlds has become a desired reality. More and more efforts are being made in order to finance and implement new time-saving technologies that can help us learn efficiently and without being disconnected from the academic environment. The question remains whether these groundbreaking approaches can successfully improve the conventional face-to-face lesson or even replace it and if so, what are the steps one needs to follow in order to develop a “virtual curriculum”.

Why learning in virtual worlds.

As learning is a diverse process, each student should do it at his/her own pace and with individual strategies and without being afraid that their mistakes will be stigmatised, as it often happens in real life. Donaldson also reminds us that some of the best lessons are often learned from failure and reflection upon the failure. Taking risks and trying new things is crucial for the process of learning, and the virtual environment provides a clean and safe place for students to do so, which will result in students being more creative and willing to experiment. It is indeed true that there is a number of drawbacks to this new approach to education and perhaps the most evident of them is the loss of personal touch which may lead to addiction. These programmes should be implemented in such a way that students do not neglect other priorities and that they only represent a way of saving time by perhaps not physically going to some meetings and not become the opposite, i.e. a time-consuming addiction. The purpose of the virtual reality applications is to be included into the school curricula, whether they are used for individual or group study. Although there are some that are intended for teacher’s use inside the classroom only, others are meant to be used worldwide.

## 3. Main Learning methods in Virtual Worlds

---

When you think of higher education, chances are that virtual reality is not something that immediately comes to mind. In recent years, online learning has changed the face of education by becoming a supplement to traditional methods, allowing people to learn at a distance, on their own time and at their own pace. It has become a powerful tool for educators to expand their reach while providing students with a way to get an education without having to step foot into a classroom.

Despite these advantages, online education has proven to be a double-edged sword. At some point in their learning, every student needs personal help that interactive workbooks and textbooks alone cannot provide. Relying solely on asynchronous communication with a faceless professor stifles the kind of momentum that a classroom setting promotes.

Classrooms and lectures allow students to engage with their professors, teaching assistants and with each other. Students have the ability to raise their hand to get clarification in the moment, when it is most useful, rather than having to send an email and await a reply. Students can be broken up into work-groups for projects; and potentially most important of all, students can turn to other students and ask them questions, make study-groups and form friendships and rivalries that provide emotional motivation for pushing themselves to learn more and succeed. The highest quality education must be social and interactive, and although online learning provides a degree of that via a website, the practicality of the real world instant feedback and social dynamics are missing.



Virtual worlds promise to deliver the best aspects of both real-world classrooms and online distance learning into a single platform. With tools that provide avatars that represent the educators and the students, voice and video capabilities, powerpoint and other collaborative whiteboard technologies and group and private messaging chat, educators are finding that the newest generation of virtual worlds can simplify the lecture and presentation process, allow students to ask/answers questions to their teacher or each other (without interrupting the lecture), socialize and learn in a very streamlined manner. All of this is done with the convenience and cost efficiency of distance learning.

### ***3.1. Formal Learning***

The terms formal and informal learning have nothing to do with the formality of the learning, but rather with the direction of who controls the learning objectives and goals. In a formal learning environment, the training or learning department sets the goal and objectives, while informal learning means the learner sets the goal and objectives.



One example of formal learning in virtual environments is archeology. This was one of the subjects attempted in the “Pedagogy” dimension of the virtual learning environment of Shome Park.

The initial archeology activity involved an in-world discussion of museums, focused on learning about their function and thinking about their future. This was followed by sessions in which students gathered information about artifacts and created a museum display about them. These activities involved ‘teacher’ led discussions in Shome Park, independent research by the students using information books and the Internet, and finally the creation of in-world museum displays.

While the students were in-world for the initial discussions about museums, and in that sense they were immersed in the environment, they could equally well have carried on these discussions using synchronous chat tools. The independent research took place outside Shome Park and thus was clearly not ‘immersive’. The creation of the displays was immersive in the sense that the students were in-world and were creating replicas of the artifacts, so they were in Shome Park, and one could argue they were learning by doing. However, this activity did not inform thinking/understanding about the historical artifacts, so the learning that was taking place was about how to build in Shome Park.

Another activity attempted in Shome Park was chess. Different groups of students engaged in creating chess sets and/or playing games of chess. Creating chess sets involved knowledge about chess, which was reinforced through the process of crafting the pieces, a non-trivial task if you are trying to create ‘traditional’ style pieces. Playing the game involved learning by doing. One of the groups created a giant chess board and then played games of chess in teams, with more experienced players working with less experienced ones in deciding what moves to make.

Aside from the “Pedagogy” dimension, Shome Park also experimented with a “Theoretical” dimension.

What this dimension highlights is that implicit in many aspects of activity in formal education is an individual view of the learner within which the focus of attention and



assessment is on individuals working 'on their own'. In contrast, the Shome Park model sees knowledge as being distributed, rather than being 'in the head of an individual'. Thus, the focus is on what individuals can do in collaboration with others. This was the goal of the "Theoretical" dimension.

From a socio-cultural perspective, learning is 'a process of becoming competent and belonging, ie, becoming a particular type of person' and that this makes knowledge and identity interdependent. Similarly, it is argued that identity is crucial to learning, in that 'all learning in all semiotic domains requires identity work. It requires taking on a new identity and forming bridges from one's old identities to the new one'. It is argued that games which involve the use of avatars (virtual characters controlled by the user) provide fertile ground for engaging in identity work.

The use of avatars engages people in an explicit process of projecting themselves, which inevitably involves a degree of reflection and self-analysis. More than other interactive online settings, Metaverses like Second Life may induce a rather deep dissociation between the invisible acting 'I' in the background and the visible performing 'me' on the screen. In SL, this is happening particularly in the case when one chooses the default 'observer' mode where they can see their own avatar acting. This implies that they take a decentered, objectivized stance toward their avatar: not unlike the observing position they take to all others. By observing themselves, they can take a self-reflective, critical attitude toward their nonverbal performances and their effects on others.

Thus, avatars provide a vehicle to support reflection on practice—directly addressing the need to make tacit knowledge explicit and enabling learners to reflect critically on their experiences and understandings.

All the technologies that facilitate education can happen in a virtual classroom, including the ability to record lectures, so that students can come back and listen to it later, replay the parts that they need to hear again and not have to rely on extensive notes. Students can attend classes from anywhere that there is Internet, and the costs of transportation and housing can be vastly mitigated.

Virtual learning will open the doors for people to access the best kind of education by blending together the best of the real world, the best of the internet and online applications, and the best of the virtual world technology so that the most modern techniques are utilized to obtain that education.

### ***3.2. Informal Learning***

Informal learning can be defined as a particular way of learning which arises from the activities and interests of individuals and groups. After having identified and selected interests expressed by learners, informal-learning activities (discussion, talks or presentations, information, advice and guidance ) are carried out in a flexible and informal way, in informal community locations.

The speed at which technology evolves today is increasing more than ever before and technology keeps offering new tools in order to simplify our lives. At the same time, teaching strategies are out of step with the times and students are not being taught how to adapt their learning to fit today's complex work environment.

Although formal forms of instruction such as classroom lessons and e-learning will still be used for many years to come, it is becoming more and more more important to pay attention to the more informal methodologies that students are using.

The reasons why informal learning is becoming so popular have to do with immediacy and relevancy. Informal methods of learning are often found in the work environment as they are seen as techniques that a learner can take advantage of right away and with immediate application to their job. Another reason consists in the fact that learners can drive their learning in a more meaningful and self-directed manner.

Joining an IT-intensive community such as Second Life immediately exposes one to a number of learning possibilities and, at the same time, to a number of learning needs:

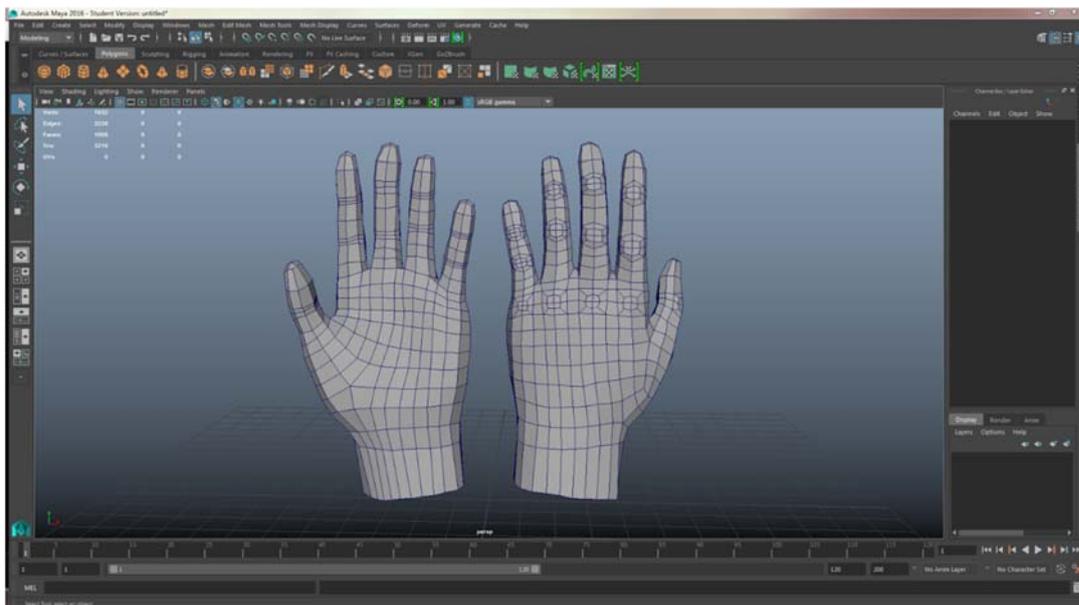
- In terms of language, since the most interesting events in the community seem to take place in English.
- In terms of IT skills, since one must master the Internet and PC skills for

meaningful involvement.

- In terms of social and communication skills (since the way in which people interact in Second Life definitely differs to the way they do so in the real world) and in terms of jargon, attitudes and behaviours.

Therefore, participating in such a community definitely has an indirect learning effect and raises a number of learning-related issues.

Active Worlds University is an organisation of volunteers who provide training and education for both novice and advanced users. The overall curriculum of AWU is divided into the four programme areas of graphic arts, 3D object modelling, advanced AW building, and AW technology.



A teacher chose to offer her class as a synchronous in-world learning environment in which all of the students met at the same time and location within the AWU once a week for approximately 2 hours. Her teaching style was discussion oriented, with much interaction with and between students. Because the chat tool relies solely on text, interaction was dependent upon typing speed and skills as well as bandwidth. However, the teacher's text always appeared boldfaced and was easily recognised and followed. During each class, typically, he presented a concept of 3D object modelling by way of the



**AGRIENT:**  
Enhancing Youth Entrepreneurship Skills,  
Careers Guidance and Competences in  
Agriculture Thought a Game based Virtual  
Reality Platform physics education  
Agreement Number: 2018-3-HR01-KA205-060151

chat tool. To illustrate each concept, she provided examples of how the concept was actualised by presenting a sample 3D object in the 3D environment. She provided further illustrations of how a technique or concept was constructed by supplying the underlying scripts of the object in the integrated web browser. This allowed learners the opportunity to follow the RWX script as well as see the resulting object in the 3D environment. For example, when she discussed the 3D coordinate system, she presented an axis in the 3D environment. Learners were able to move their avatars around the axis in order to understand how vertices on the axis define polygons.

### *3.3. Non-formal Learning*

Non-formal learning is purposive but voluntary learning that takes place in a diverse range of environments and situations for which teaching/training and learning is not necessarily their sole or main activity. These environments and situations may be temporarily, and the activities or courses that take place may be staffed by professional learning facilitators or by volunteers. The activities and courses are planned, but are seldomly structured by conventional rhythms or curriculum subjects. They usually address specific target groups, but rarely document or assess learning outcomes or achievements in conventionally visible ways.

From a didactic point of view, games are an interesting phenomenon. In general, games are very popular because they fulfill the needs for affection, attention and recognition, as well as the needs for prestige, strength, achievement, independence and freedom. Because of the high intrinsic motivation of the gamers to meet these needs, gaming becomes an end in itself with the single purpose of the playing activity.

Although learning processes are usually neither intended nor reflected by the gamers, a major part of cognitive, motoric and social development takes part within the context of games. The easiness of acquiring knowledge, skills or cognition while playing arouses interest in using this kind of learning for different intentions. In this case, games are designed or transformed in such a way that they pursue at least one further purpose other than the pure pleasure of the game. Games become more serious because they now take on functions which are perceived to be relevant beyond the borders of the game.

The player's motivating force, the pursuit of satisfaction, does not become less important but is in fact exploited in terms of the additional purpose because the motivated engagement in the game represents the prior condition for imparting transferable knowledge. On the other hand, it is this very exploitation which may adversely affect the motivation of the player because it is precisely the stepping out of "real" life which constitutes the game situation.

Each attempt to influence the gamer from outside the game causes a serious intervention into the game's world and runs the risk of reducing the gaming pleasure of the players. Nevertheless, gamers may accept non-game-related purposes under one of the following conditions: [2]

Ignorance – The gamer does not recognize the manipulation and appreciates just the game itself.

Tolerance – The gamer recognizes the manipulation but rates the satisfaction of the game higher than the possibility of being affected adversely.

Acceptance – The gamer recognizes the purposes of the game provider and endorses his intention in principle or trusts his reputation.

Agreement – The aims of the gamer correspond with the intention of the game provider.

Commitment – The game setting is integrated within an institutionalized context and, at least in part, is extrinsically motivated.



In case of behavioral patterns like ignorance, tolerance and acceptance, the gamer's interest is focused on the game itself, while learning processes occur, at best, incidentally.

This Incidental Learning can sometimes be linked to Non-Formal Learning. It is neither



goal-oriented nor reflected, but arises simultaneously to another performed activity. This means that Incidental Learning is always situational and linked to a certain problem.

Formal Learning can be defined qualitatively through characteristics such as external structure, curricular learning targets and independence from specific problems. Informal Learning is marked by its own problem-oriented construction of learning targets and a self-determined learning rhythm.

The differentiation between Formal and Informal Learning is not always clear-cut due to the relative reference, but it is always focused on the learner, which makes the approach discussed earlier most suitable for didactic considerations, especially in cases of Non-Formal-Learning. While games for Informal or Incidental Learning purposes can be easily integrated into Formal Learning contexts, they have to be adapted to suit the substantial requirements of a leisure-oriented Learning environment.

The notion of Non-Formal Education has been a significant feature of policy debates around education in southern countries for three decades. It has drawn attention to the importance and potential of education, learning and training that takes place outside recognized educational institutions. There are questions about usefulness of the notion when looking at the process of education. It has also gone in and out of fashion. Given the extent to which notions of lifelong learning and associated ideas have gained ground in recent years it will be interesting to see how the language of policy debates will change over the next few years.



## References

1. Bartle, Richard (2003). *Designing Virtual Worlds*. New Riders. ISBN 0-13-101816-7.
2. Daden Limited. (2010). *Virtual Worlds for Education and Training*. White Paper. Retrieved February 22, 2011 from <http://www.daden.co.uk/media/white-papers>.
3. de Freitas, S. (2008). *Serious Virtual Worlds: A scoping study*. Joint Information Systems Committee.
4. Bell, M.W. (2008). Toward a Definition of 'Virtual Worlds'. *Journal of Virtual Worlds Research*, 1(1), 2-5.
5. Mikropoulos, T. A. & Natsis, A. (2010). Educational Virtual Environments: A Ten Year Review of Empirical Research (1999 – 2009). *Computers & Education*, 56(3), 769-780.
6. Nowak, K., & Biocca, F. (2001). The influence of Virtual Bodies and Agency on Co-presence, Social Presence and Physical presence. In *Proceedings of 2001 of the 4th Annual International Workshop PRESENCE 2001*. Temple University, Philadelphia, PA, USA.
7. Richter, J., Anderson-Inman, L., & Frisbee, M. (2007). Critical engagement of teachers in Second Life: Progress in the SaLamander Project. In *Proceedings of 2007 Second Life Education Workshop* (pp. 19-26). Chicago, USA. Retrieved October 20, 2012 from <http://www.garito.it/prog/psico08/testi-def/slccedu07proceedings.pdf>.
8. Mantovani, F., & Castelnuovo, G. (2003). Sense of Presence in Virtual Training: Enhancing Skills Acquisition and Transfer of Knowledge through Learning Experience in Virtual Environments. In G. Riva, F. Davide, & W.A IJsselsteijn (Eds), *Being There: Concepts, effects and measurement of user presence in synthetic environments* (pp. 167-181). Amsterdam, The Netherlands: Ios Press.
9. Orel, M. (2019/forthcoming). The Potentials of Virtual Reality in Entrepreneurship Education. In L., Daniela (Ed.), *New Perspectives on Virtual and Augmented Reality: Finding New Ways to Teach in a Transformed Learning Environment*.
10. Krokos, E., Plaisant, C., & Varshney, A. (2019). Virtual memory palaces: immersion aids recall. *Virtual Reality*, 23(1), 1-15.
11. Gregory, S., Lee, M. J., Dalgarno, B., & Tynan, B. (Eds. ). (2016). *Learning in Virtual Worlds: Research and Applications*. Athabasca University Press.



**AGRIENT:**  
Enhancing Youth Entrepreneurship Skills,  
Careers Guidance and Competences in  
Agriculture Through a Game based Virtual  
Reality Platform physics education  
Agreement Number: 2018-3-HR01-KA205-060151

12. De Freitas, S., Rebolledo-Mendez, G., Liarokapis, F., Magoulas, G., & Poulouvasilis, A. (2010). Learning as immersive experiences: Using the four-dimensional framework for designing and evaluating immersive learning experiences in a virtual world. *British Journal of Educational Technology*, 41(1), 69-85.