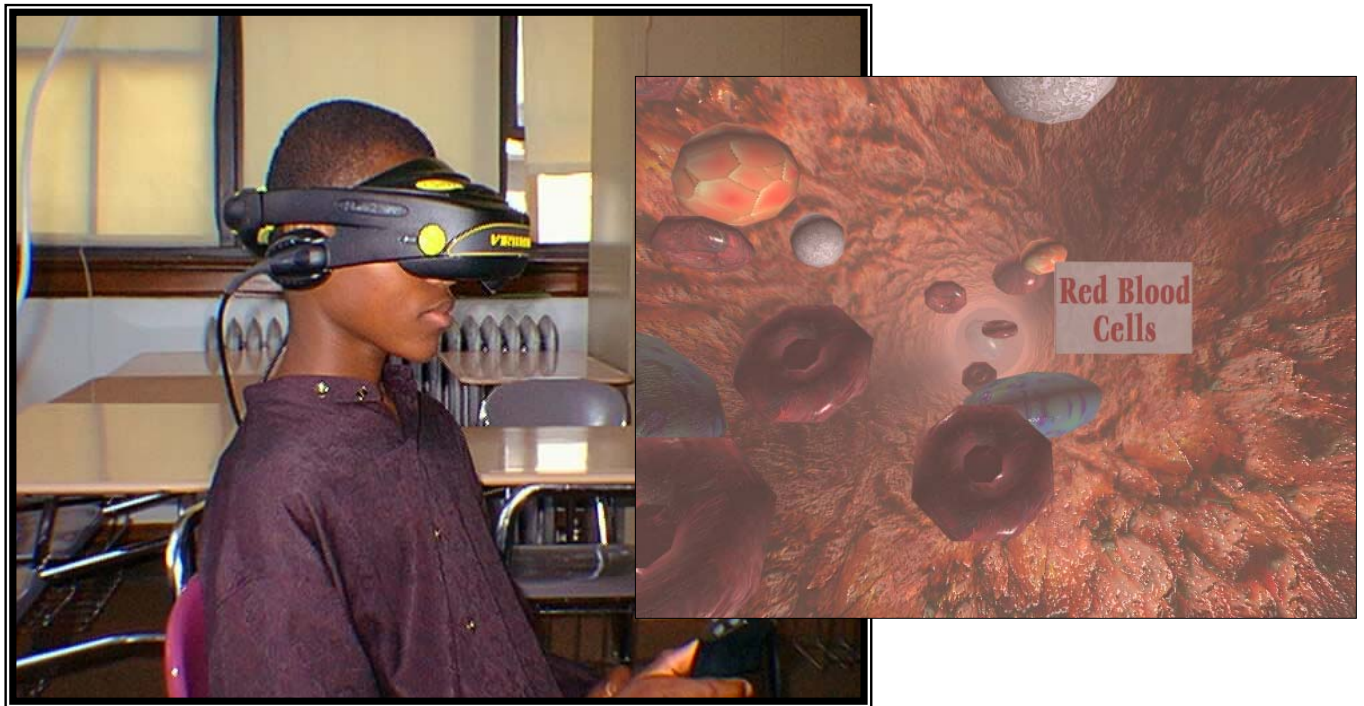


# The Educators' Guide to Learning in Virtual Reality



SUNRISE  
VIRTUAL REALITY © 2003

[www.sunrisevr.com](http://www.sunrisevr.com)

# Virtual Reality and Education

“By using VR in education material now considered too difficult for many students and taught even to advanced learners only at the college level could be mastered by most students in middle school and high school.”

-NASA Software Technology Branch

Virtual reality offers educators a truly new and innovative way to teach and engage students. Virtual reality can best be described as a cutting-edge technology that allows students to step through the computer screen into a three-dimensional, interactive environment. By putting on a special headset and glove, it places students inside of a simulated environment that looks and feels like the real world. Integrating virtual reality into everyday learning will revolutionize teaching and learning processes.



A helpful analogy to better understand the nature of the VE is that of a child exploring a forest for the first time. A child will best learn about the forest not from reading about it or listening to someone talk about it, but by walking into it- becoming a part of it. The child is free to explore the forest any way she likes. Discovery and experience become the best teacher.

Virtual reality is created by an impressive, exciting technology that engages the student. Because it expands the learning environment and conveys large amounts of information, its effectiveness as a learning tool is great. It draws its power from three principles: visual, experiential, and self-directed learning, the most effective ways to teach students. Virtual reality allows students to be fully involved in their education, instead of merely passive observers, focusing first and foremost on the learning needs of students.

The age-old problem educators face is how to better involve students in their studies. Traditional teaching methods have sometimes not been effective in the goal of seizing students' attention, relegating students to a passive role in the classroom. Learning is much more effective when it is an active discovery process.

Understanding virtual reality-based learning means understanding the shift from text-based education to multi-sensory, experiential learning. Virtual reality copies the way that people have always learned- by interacting with the world. Instead of teaching rules or reading about the Amazonian Rainforest, students “travel” to

a virtual recreation. They are “there.” It allows students to “see” the subject- especially benefiting students who learn best through experience instead of only reading or hearing about a subject.

Students learn best when they are immersed in their subject matter from a variety of different modes and viewpoints. Teacher lectures and textbooks only go so far, just as computers are similarly limited without valuable teacher guidance. The ideal situation is when students experience ideas in many different forms- virtual reality programs help complete this idea.



Virtual reality puts students *inside* of their subjects. From their own point-of-view, students have their own self-guided personal experience with their studies. They step inside (literally) of Independence Hall (in 1787) while studying the Constitution. They travel through a computer to learn how it operates. They become a part of what they’re learning, which can happen only in virtual reality.

Virtual reality is at the point where every school can use it to help students learn. The conventional wisdom about virtual reality is that it is an impressive learning tool, but only possible in the “future,” because it is too expensive. The truth today however, is that virtual reality systems are now run by the same personal computers already in schools and homes. Five years ago, a \$200,000 computer was needed to run a sophisticated virtual reality program. Today, these programs are run on PC’s, ushering in the age of virtual reality in schools.



#### **Learning in virtual reality:**

- Balances ideas with concrete information to facilitate sensory-intuitive learning
- Uses visual aids: 3-D objects, video, and pictures along with verbal information
- Provides demonstrations to accommodate different learning styles
- Allows hands-on activities to facilitate active learning
- Provides open-ended problems and exercises



# Student Learning in Virtual Reality

Virtual reality is exceptionally suited to take advantage of student learning preferences. They prosper when they can learn actively, through direct, hands-on engagement with readily apparent learning objectives.

1) Students start with high level of motivation to learn. Their high motivation is appropriate for the all-encompassing, engaging nature of virtual reality. Student attention is complete in virtual reality, as there are no distractions once the headset is put on. If students are not paying attention to the curriculum, they will not learn it. One evaluation of virtual reality learning in the classroom showed that 85% of students improved their grades (many over 20%). The Institute for Defense Analysis says, “these results are largely attributed to the increased motivation that virtual reality technology seemed to generate in the students.”

2) Students today are more self-directed and independent. Students learn best through self-guided exploration. They prefer an instructor that serves as a facilitator (to guide and assist) rather than an authoritarian leader. This not only improves the learning environment by giving students more control over it, but also by lessening the burden on teachers.

3) Students want to participate in decision-making. In virtual reality, students make most of the decisions concerning the resolution of a problem. Motivation to learn is increased when students perceive they have decision-making control. In virtual reality they are responsible for all the decisions made from choosing how to explore a virtual reality world to how they manipulate objects.

4) Students want to know how what is being taught them will benefit them. Students quickly grasp the practical use of the content when it is presented to them. Learning in virtual reality provides a highly sophisticated simulation of a real-life scenario with interactions with real ideas and principles.

5) Time is an important for students. Attention spans of today’s students are different- students quickly lose interest in learning. Virtual reality educational supplements are designed to maximize time by providing instruction in flexible capsules to supplement traditional classroom learning.



# Experiential Learning In Virtual Reality

“I hear and I forget. I see and I understand. I do and I remember.”  
- Confucius

One of the basic ways we learn during our lifetime is through experience. Educators have always sought to take advantage of this natural learning process by designing learning that focuses on concrete experiences. It has been assumed, correctly, that active rather than passive processes better encourage learning, especially for students. This idea is not new.

The role of virtual reality is basically that of a facilitator of a learning experience. The virtual reality program gives the student responsibility for and control over the learning process. It orchestrates an opportunity for the student to have a relevant experience of discovery and learning. Virtual reality learning guides the learning and discovery process as a collaborative effort between the program and the student. Students discover underlying principles and master necessary behaviors through active experimentation. Virtual reality learning programs allow for more interaction by the student resulting in more personalized learning.



Learning in virtual reality can also be understood as an every-day field trip where students are “taken” somewhere to better understand ideas and processes. This approach is highly engaging, allowing students to better connect academic concepts to real life.

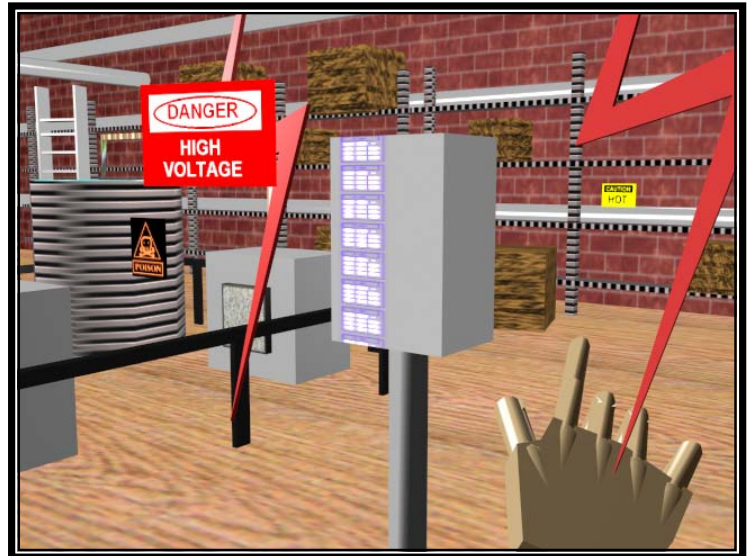
## **The Five Basic Assumptions of Experiential Learning**

- 1) Learning is most effective when it is an active discovery process
- 2) Students will learn more when they control the learning process
- 3) Learning is most effective when thought and action are integrated
- 4) Students need a safe environment to experiment with ideas
- 5) Realistic learning is more effective as a learning device

# Self-Directed Learning In Virtual Reality

The virtual reality learning program is a facilitator- it sets the stage for self-directed learning. Once the stage is set, the student may engage it as she chooses. A clear advantage of virtual reality as a learning delivery system is that it avoids the risk that the instructor's description of what is done is interpreted as the best, or only way to solve a problem.

Facilitating self-directed learning, virtual reality respects the student. People perform tasks differently in the exact same situation. It allows the student to adapt learning and discovery to their individual personalities, styles, and resources, emphasizes basic ideas which may be implemented in a variety of ways.

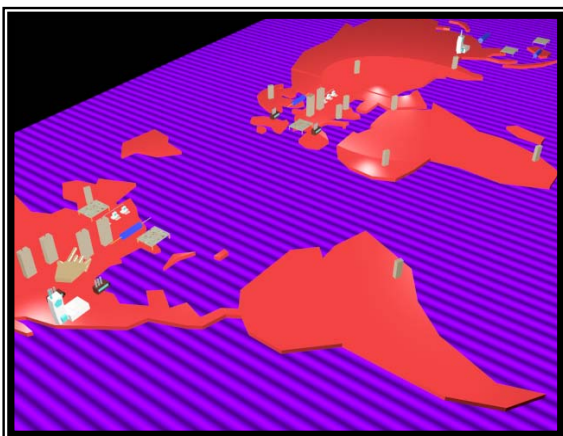


Optimal learning takes place when:

- 1) The student works at her own pace
- 2) Is actively involved in performing specific learning tasks
- 3) Experiences success in learning.

The benefit of harnessing virtual reality-based self-directed learning is the self-reliance and personal responsibility learned and required in self-paced learning may carry over as habits to students' other responsibilities and personal

behavior. Furthermore, teachers' time is freed up, allowing more time to be spent in group sessions, individual consultation, and supervising the learning environment.



## **Important Features of Virtual Reality-Based Self-Directed Learning**

- 1) Individual responsibility
- 2) Individual discovery
- 3) Individual pacing
- 4) Successful learning based on specific learning objectives
- 5) Providing a variety of activities and accompanying resources
- 6) Organized learning in discrete steps
- 7) Immediate confirmation of mastery

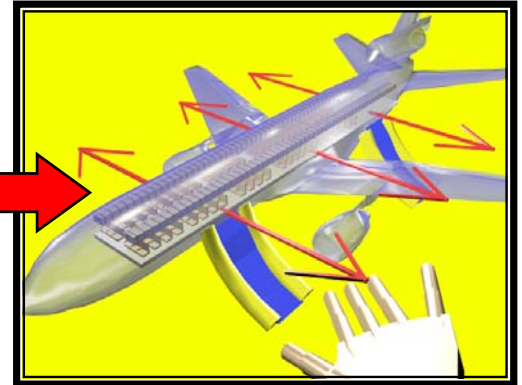
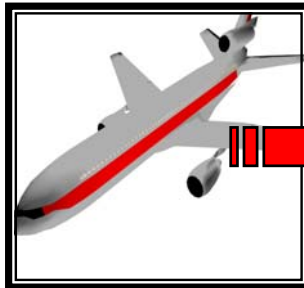


# Visual Learning in Virtual Reality

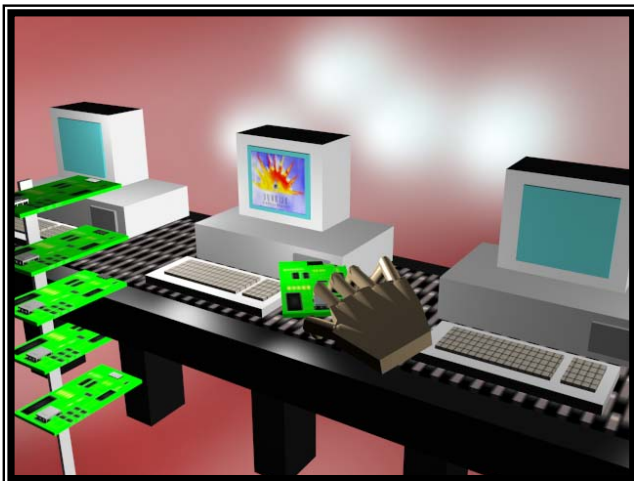
The human being is a very visual creature. Most of the information we receive come from visual images because it is simply the most effective and natural way for human being to process information. That is the way we are designed.

Unfortunately, most of the information we are asked to understand (like this document, for example) is not in such a natural form. The human mind can only read 100 bits/characters per second. However, visually it can absorb the equivalent of 1,000,000,000 bits per second. Half of the human brain is dedicated to visual processing. Using virtual reality is the most natural way for us to learn aside from actually seeing, hearing, and doing.

Because virtual reality presents information to us three-dimensionally (our brains think in three-dimensions), we are able to process the information naturally and efficiently. We also retain more of the information presented to us, which is very important for learning purposes.



We accept visual messages very quickly. This is increasingly true of students bombarded with images throughout their lives, from sources such as television, video games, and movies. Virtual reality is a student-friendly solution to the reams of text and figures that now pass before their eyes on computer or in textbooks. It is a true paradigm shift from other forms of learning because it allows all the human senses, especially the most communicative one, vision, to interact with information.



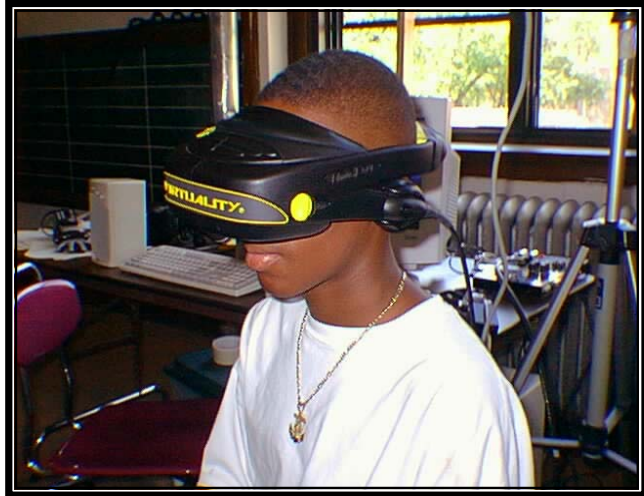
## **The Medium of Virtual Reality**

In VR information is presented to students in three-dimensions. Because the human brain thinks three-dimensionally as well, our brains no longer have to translate 2-D data (text, T.V.) into three-dimensions. A

STAGE OF CEREBRAL PROCESSING IS SKIPPED, allowing the student to accept information in a much more efficient manner. This results in a great increase in the depth of processing.

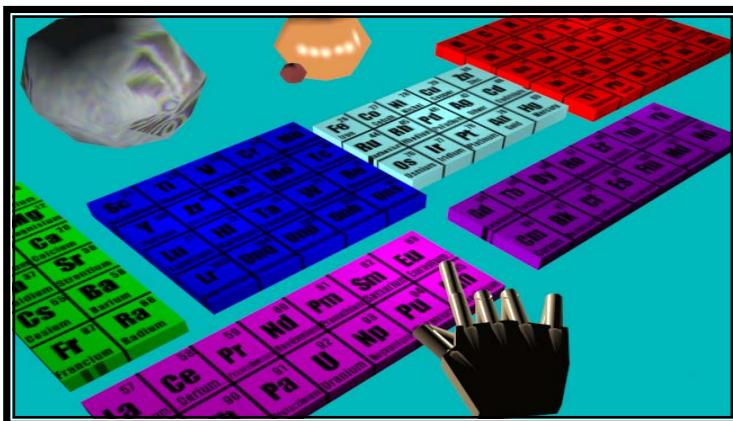
# The Virtual Reality Lab

Part of the challenge is integrating virtual reality into existing school culture. The seamless integration of virtual reality learning into the curriculum, teacher lesson plans, and school culture is an important goal. New technology, no matter how impressive, does little good if not an integral part of the every-day learning process. Virtual reality learning is flexible, designed in a modular format. It may be used many ways- as a primary resource, supplement to classroom learning, or as a student study aid.



A virtual reality lab is similar to the ways existing computer and language labs are used. Different classes, at selected points during the week use the virtual reality lab to supplement to traditional classroom work. A rapidly growing library of courseware allows virtual reality learning materials to be used by most classes in the school. As a study resource, similar to using the library, students would have access to the virtual reality lab before and after classes, as well as throughout the day. A typical virtual reality workstation consists of a personal computer, virtual reality headset, and glove.

In an initial stage of integration, virtual reality is best used as a supplement to existing coursework, allowing instructors to integrate the virtual reality lab programs into learning objectives. For example, the biology class where students are learning cell structure is supplemented by a trip to the virtual reality lab where students enter and explore a human cell.



The scheduling board in the virtual reality lab identifies which virtual reality stations are available and where they are located. This ensures that space is available during the times and days when it is needed. Simple logistical planning will ensure that all classes and programs are able to use the virtual reality lab. As most schools have limited computer resources for virtual reality labs, good planning is an important component to making the most of resources.



## Virtual Reality and Teachers

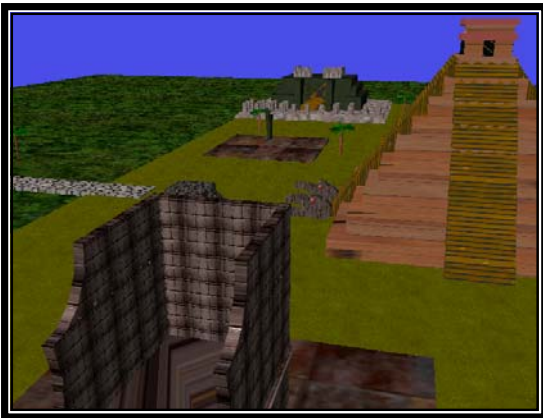
Using virtual reality in schools greatly eases the burden of teachers. Teachers become learning facilitators as students explore and learn in virtual reality. As opposed to merely supplying answers, teachers guide students' self-discovery and assist in building ideas. Virtual reality is a giant step towards "perfect learning—" a learning environment that focuses on the student rather than placing burdens on teachers. It creates a learning environment where students explore, discover, and make decisions, while teachers assist and guide.



From a teacher's perspective, virtual reality creates a structured environment that focuses students on specific learning objectives, similar to good teaching. Because the students are immersed in virtual reality with a headset, there are no distractions to learning. Students are totally focused with no unruly behavior.

Attention is a very important facet of classroom learning. If students are not involved in their education and are not paying attention, they will not learn. Virtual reality can be a powerful tool for teachers to keep the attention of

students. Students respond positively when information is presented throughout the semester in varied formats. Including an active, visual-based approach to learning greatly heightens the relevance of traditional teaching.



Teachers select virtual reality programs to complement existing curriculum plans. In selecting a virtual reality program, teachers identify the learning goals and sub-goals of the program to integrate it into their curriculum plan where they have similar or identical goals specified. Virtual reality programs are aligned to national and state

standards. The alignments allow teachers to integrate virtual reality into their curricula while keeping existing assessment tools and administrative frameworks.

Integrating virtual reality into a teacher's curriculum plan is a means of improving the learning environment by using a new, powerful tool to present information. Students are able to have experiences that they could not ordinarily have in the classroom.

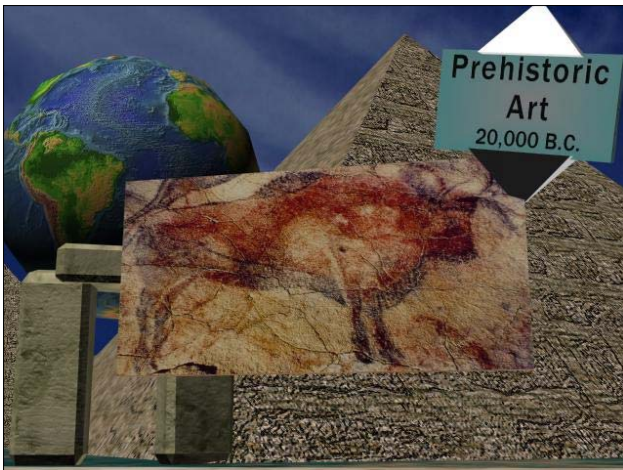
Finally, virtual reality can help ensure that all students have similar experiences to facilitate learning and discussion. All learning experiences are social, and it is an ideal way for teachers to use virtual reality to enrich the larger classroom and learning process.

# Virtual Reality Programs

Virtual reality programs are designed to meet specific state curriculum objectives and standards, and be easily integrated into any curriculum. When a subject is being studied, virtual reality is used as a supplement. It educates, clarifies, and reinforces because subject matter now makes immediate sense to students. Programs and tutorials are chosen from a mix of the library of existing virtual reality programs and custom-designed programs made especially for certain subject areas and occupational programs. A complete library of virtual reality learning programs are available to use in each classroom in the school.



Supplementary materials are also used to integrate virtual reality into the curriculum, providing a bridge between virtual reality and the traditional classroom. Students can be guided in developing their own skills and attitudes by following and answering supplementary questions provided with virtual reality programs. Supplementary materials such as guides, questions, and lists of things to “see and do” help prepare and focus the student on the content. These materials can also be used to set up “post-virtual reality” discussions in the classroom between students and teachers.



## **Virtual Reality Program Areas**

Math	Social Studies/History
English	Language/Travel
Science	Cognitive Skills
Technology	Black History
Vocational	Business

### **Mnemonics**

Learning in virtual reality also makes great use of mnemonics; devices to help learners recall facts to further facilitate deeper processing. Ideas are turned into mental images to assist students. The entire “setting” of a VR learning program can be a mnemonic.