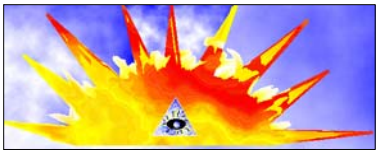

Virtual Reality and Standard Aptitude Test Preparation

1. Standardized Testing and Virtual Reality

About standardized testing, the Educational Research Service states simply, "educational accountability, as measured by standardized test scores, has become a fundamental part of the real world of schooling. Today, such testing is being used more and more to make 'high-stakes' decisions." Standardized testing is controversial to say the least- parents and educators throughout the nation have expressed great concern about the ubiquity and importance of standardized testing,

In Illinois, for example, the Chicago Tribune reported that 900 of almost 3,700 schools failed the new ISAT (Illinois Standard Aptitude Test) last year. Additional school failure on the ISAT will lead to the first steps in a complex series of sanctions that can lead to a state shutdown of consistently failing schools. Such pressure and consequences makes it difficult for schools to be "schools," and managing the learning process. Many at-risk schools are in dire need of assistance.

At-risk students have even a more pressing need of assistance. Imaginative test preparation can provide at-risk students with important lifelong skills-standardized tests are not merely a part of grade school, but a part of real life. The bad side of standardized testing for at-risk students is that chronic underachievement has an adverse effect on them. In the future these effects will include college admissions, career choices, and future earnings. Low scores on tests will severely limit opportunities.

Students without adequate test-taking skills will be disadvantaged in demonstrating what they know and can do as reflected in their test scores. To avoid these unfair and accurate results students should be prepared with higher-order test-taking skills. This can result in higher test scores that more accurately and fairly reflect what students have learned. When this is done in the context of content mastery, this approach can also improve student learning.

To combat these educational realities, our program was influenced by a school in South Carolina, that, against the odds, greatly raised their standardized test scores. The Harrison Elementary School found that with a few changes, student scores on the Iowa Tests of Basic Skills could substantially improve.

The Project Approach to Raise Standardized Test Scores

1) Teach subject matter and content the ISAT is designed to measure
2) Teach students basic test-taking skills and strategies that will enable them to demonstrate what they have learned
3) Embed test-taking skills into virtual reality subject-matter instruction

Emotional Approaches to Improve Test Scores

1. Negative Attitudes
   Persuasive negative attitudes towards standardized testing often affect test scores. VIRTUAL REALITY programs through high levels of engagement can do a great deal to improve student attitudes towards testing.

2. Motivating Students to Succeed on Standardized Testing
   Students must want to score well and do their best when taking the ISAT. Many students often seem nonchalant and indifferent during standardized testing. Apathy and lack of interest on the part of many students will drive down school test score averages. Finding ways to motivate all students to try hard when taking standardized tests is an important but overlooked strategy in the overall goal of raising test scores.

3. Recognizing Importance of Test-Taking Skills
   Competency in test-taking skills in very important to student students scoring well on standardized test. Students may have a thorough understanding of the content covered by a specific test, but may be unfamiliar with the structure of the test, be unskilled in responding in specific test question format, or be unfamiliar with the need to respond rapidly under time pressures

2. ISAT Test Structure

The following is a breakdown of a recent ISAT test. It is an ideal guide for determining what areas to highlight in ISAT test preparation activities.

Testing Areas 3rd Grade

Math		**Reading**	
Area	5	Word Sounds	3
Shapes	2	Vocabulary	3
Number Patterns	4	Roots	1
Math Word Solving	6	Reading Comprehension	18
Graphing	4		
Symmetry	2		

Testing Areas 4th Grade

Science		
Diagrams	5	Astronomy
Scientific Method	2	History of Inventions
Ecology	6	Chemical Change
Rocks/Fossils	2	Magnets
Variables	3	Machines

Social Studies		**Arts**
U.S. History	7	Dance
-Flag (1)		Drama
-Constitution (6)		Music
Civil Rights	3	Visual
Geography	4	Pattern Identification
Civil War	3	
Urban Life		**Health**
Rural Life		Health Prevention/Treatment
		Human Body Systems

3. Implementing a Strategy for Rapid ISAT Results

ISAT Mathematics Component (3rd Grade)

We are concentrating our efforts in curriculum areas where we are most likely to achieve substantial improvement in ISAT scores. An example of our focus is Math Computation, which is precise and structured, and improvement in learning can be clearly measured. Fundamental learning skills such as computation will also help students master basic number facts and arithmetic operations that provide the foundation for other testing, as well as lifelong learning.

To adequately prepare for standardized tests, students need to learn both fundamental math skills and speed-in-response skills. It is essential that students have a solid foundation of competency in the basic math skills of addition, subtraction, multiplication, and division. Students must know these fundamental skills by rote memory and be able to apply them under severe time pressures. When students in the lower grades (5th and below) are still counting on fingers, they will not have time to complete all of the items on a test.

Custom Virtual Reality Program: Math Speed Drill

Virtual reality math speed drills are designed to teach fundamental math skills with practice in answering as many questions as possible in a one-minute period. Virtual reality math speed drills can be effective for students at all skill levels, helping students to prepare for higher-level math. According to the Educational Research Service, "research has shown that one of the reasons students have problems with advanced math is they are still struggling with basic math facts."

In virtual reality, students are weaned off of the debilitating habit of finger counting. This habit is very difficult for many students to overcome, but because students have a virtual reality headset on, students are not able to finger count.

Virtual Reality Programs Used: Geometry, Area, Circumference

ISAT Reading Component (3rd Grade)

The Reading Component of the ISAT focuses on vocabulary, reading comprehension and grammar. Like the math component, students will show the highest rate of gain by learning and practicing reading skills in a test-taking environment.

We are using virtual reality technology to improve student understanding and performance in four primary areas: vocabulary, comprehension, capitalization, and punctuation. Our approach is different- we are allowing students to focus on each area separately. For example, students practice looking only for punctuation errors in virtual reality. By taking this approach, in a virtual reality environment, we believe students will better build fundamental language skills.

Custom Virtual Reality Program: Vocabulary Speed Drill

Virtual Reality Programs Used: Vocabulary (Root Words)(Prefixes) (Suffixes), Capitalization, Punctuation, Grammar Treasure Island, Shakespeare's Globe Theater (Plot and Character Development).

ISAT Social Studies Component (4th Grade)

The primary obstacles to superior performance on the ISAT Social Studies component are the lack of context, understanding, and familiarity with important American and world events. To combat these problems, we plan to use virtual reality software to recreate key historical events, and let students participate in them as if they were actually at that event. For example, to prepare for the sizable American History section of the ISAT, students will be able go back in time and see life in 1787, watch Constitutional debates, and visit Washington D.C. to learn about the Constitution. We plan on providing students with similar experience to learn about the Civil War, Underground Railroad, and the 1963 Civil Rights march on Washington. Other historical scenarios will be added as the need arises.

Virtual Reality Programs Used: U.S. Constitution, World Geography, U.S. Geography, Underground Railroad, Virtual Chicago, 1963 Civil Rights March on Washington

ISAT Science Component (4th Grade)

Improving student performance on the science component of the ISAT is all about giving students opportunities for scientific exploration. As the Educational Research Service described in "Closing the Achievement Gap in Science," schools must focus on "providing experiences that build skills, increase interest, and expand opportunities for students." To build lifelong interest and score well on the ISAT Component, we plan to allow students virtual experience in many scientific fields, including Geology in the Grand Canyon, Astronomy throughout our Solar System, Biology trips inside of human cells, and Chemistry in a virtual period table complete with 3-D molecules.

Virtual Reality Programs Used: Human Cell, Chemistry, Solar System, Geology

ISAT Art Component (4th Grade)

To perform well on the ISAT Art Component, students must be able to classify art by time and place, examining different styles, movements, and periods. In a virtual world gallery, students view art in the context of culture and history. By classifying art this way students are able to see the similarities between different works within the same period and the same culture, the characteristics they share, and the cultural signposts they include.

Virtual Reality Programs Used: Understanding Art

ISAT Health Component (4th Grade)

To do well on the ISAT Health Component, students need a detailed understanding of human body parts. Our approach to teaching Health knowledge in a virtual reality environment is a three-dimensional reference room consisting of 11 anatomical models and 27 physiological systems. When students have a question about a particular body part, organ, or system in virtual reality, they can come to the reference room where they find a gallery of 3-D organs, as well as "books" on body systems. The gallery of 3-D organs allows students to observe a simulated organ from any angle. They see first hand how organs differ from a picture in a book. "Touching" the organ brings more information about it. Similarly, touching one of 27 "books" provides an overview on specific body processes.

Virtual Reality Programs Used: The Human Body

ISAT Test Preparation (3rd and 4th Grade)

Test taking skills are critical to doing well on standardized tests, fundamental in raising scores. Perhaps most important, students must be familiar with the test and its structure, subjects, content, and time limitations. Basic ideas are conveyed such as teaching students to use test-taking strategies such as reminders for students to complete as many problems as possible. Students must practice the necessity of completing as many problems as necessary as opposed to taking an excessive amount of time making sure one particular problem is correct. Students must understand they only have about 30 seconds per problem and how to skip over problems they do not know how to do.

Custom Virtual Reality Program: ISAT Test Structure

Virtual reality 30 second drills are designed to create a mental clock in students' heads, allowing them to mentally estimate the time they have allotted for a each problem, and give them a sense of when they have spent enough time on any one problem and need to move on.

Test Preparation Matrix

Following directions closely
Discouraging guessing
Budgeting time
Eliminating wrong answers
Estimating on math tests
Answering easy questions first
Educated Guesses
Watch for testing tricks

Virtual Reality Programs Used: Test Preparation, Test Design

Student Attitudes and Motivation on Standardized Tests

A key to doing well on standardized testing is to expect good results and model positive attitudes. Motivational activities and incentives must be used. Students

must understand the purpose and relevance of testing and how scores are used in order to relieve anxiety surrounding the test.

Virtual Reality Programs Used: Motivation

ISAT Critical Thinking Skills (3rd and 4th Grade)

"While teaching test-taking skills may have its place, a far greater emphasis must be placed on teaching students critical thinking skills "

-Educational Research Service

Teaching critical thinking skills to students in preparation of the 3rd and 4th Grade tests will have a profound effect on the ability to learn, perform well on tests, and provide a framework for future learning and thinking skills.

Critical thinking skills must include:

Recall	Remembering of recognizing key facts
Analysis	Understanding relationships between the whole and its component parts
Comparison	Explaining how things are similar and how they are different
Inference	Reasoning inductively or deductively
Deduction	Students reason from the general to the specific, and recognize and explain the evidence
Induction	Students are given evidence and are required to relate and integrate information to come up with the generalization
Evaluation	Expressing and defending an opinion
Problem Solving	Identifying and breaking the problem into component parts

Virtual Reality Programs Used: Critical Thinking, Memory Development

4. Standardized Test Preparation: Proposed Virtual reality Programs

Virtual Reality Programs in bold represent custom-made programs specifically for the initiative.

Test Preparation (3rd and 4th Grade)

- -Test Preparation
- -**ISAT Test Structure**
- -Test Design
- -Student Motivation

Critical Thinking (3rd and 4th Grade)

- -Critical Thinking
- -Memory Development

Math (3rd Grade)

- -**Speed Drill**
- -Area
- -Circumference
- -Geometry

Reading (3rd Grade)

- -Vocabulary (Root Words)
- -**Vocabulary Speed Drill**
- -Grammar Treasure Island
- -Shakespeare's Globe Theater
- -Capitalization
- -Punctuation
- -Spelling

Social Studies (4th Grade)

- -U.S. Constitution
- -U.S. Geography
- -Virtual Chicago
- -World Geography
- -Underground Railroad
- -1963 March on Washington (Civil Rights)

Science (4th Grade)

- -Human Cell
- -Chemistry
- -Solar System
- -Geology

Art (4th Grade)

- -Understanding Art

Health (4th Grade)

- -The Human Body

5. Virtual reality and Standards Alignment

Illinois Learning Standards

Key components in raising test scores according to the Illinois State Board of Education is to "make ongoing improvements to curriculum and instructional practices that are aligned to the Illinois Learning Standards," and "varying teaching and materials to meet the need of all the students in a building."

Introduction

SUNRISE virtual reality programs are aligned to national and state standards. Aligning virtual reality learning to standards helps to determine whether or not students are meeting important state standards. Because virtual reality is used as a supplement to existing programs, teachers can check progress in many ways—by observing, questioning, reviewing work assignments, testing or judging projects and performances. Virtual reality learning goals are explicitly stated in supplementary material such as guides, maps, and lists of things to see and do.

The virtual reality learning alignments to standards can provide a "road map" for local and state measures of progress, and an important tool in evaluating the effectiveness of learning strategies, student performance, and virtual reality technology.

Alignment

Virtual reality learning outlines expectations for student learning. This provides a focal point for deciding how to use virtual reality to support education. Because virtual reality learning goals and objectives are stated, the efforts of educators and available funds for teaching and learning can be targeted more effectively to enhance learning. This helps take the guesswork out of decisions about programs, materials, equipment and staff assignments.

Virtual Reality and Learning Frameworks

As with standards frameworks, virtual reality based learning programs are divided into seven learning areas:

- English Language
- Mathematics
- Science
- Social Science
- Physical Development and Health
- Fine Arts
- Foreign Languages (advisory standards)

Applications of Learning

Virtual reality programs are not only aligned to standards, but also to "Applications of Learning. Learning applications are often specified by state and national standards as vital tools for students to possess, applying them to the

seven learning areas. Applications of learning are cross-disciplinary abilities important to student learning.

Applications of learning include:

1) Solving Problems
2) Communicating
3) Using Technology
4) Working on Teams
5) Making Connections

6. Using Virtual Reality Standards Alignment

Virtual reality alignments can be an important organizational influence for lesson plans, test items, scheduling methods, and technology plans. 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.

Teachers select virtual reality programs to complement existing curriculum plans. In selecting a particular virtual reality program, teachers understand and 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 alignments allow teachers to integrate virtual reality into their curricula while keeping existing assessment tools and administrative frameworks.

Virtual reality learning programs are organized by goals that inform one another and depend upon one another for meaning. Virtual reality learning goals are not as explicitly expressed and delineated- keeping in the spirit of self-motivated engaged learning, interaction with learning goals, and objectives with based on individual discovery. Unifying concepts are embedded in the virtual reality program. By allowing students to discover them through self-guided inquiry, the importance of this knowledge and its application is conveyed in an exciting new context.

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 learning goals and objectives can be used for a variety of purposes, including:

A guide to fit technology-based learning into assessment programs
A guide to assist schools and teachers with curriculum, instruction and assessments
A guide to organize and share curriculum, instructional methods and assessments across teachers, grade levels and schools;
A guide to target the use of funds to better support teaching and learning;

A means to gauge student progress through local assessments;
A guide to focus school improvement plans
A means to communicate the purpose and results of schooling to the local community.

Virtual Reality Programs and Alignment

Learning Goals are broad statements of knowledge and/or skills that organize the subject matter of the learning area.

Learning Objectives are specific statements of knowledge and/or skills within a goal. Taken together, the learning objectives clearly define the learning needed to reach that goal

Learning Goals and Objectives in virtual reality programs are broken down into concrete steps, and are numbered for easy reference. A basic tenet of virtual reality based learning instructional strategy is that learning can be broken down into small, observable, interactive, and sequential steps with immediate reinforcement, resulting in greater learning. Virtual reality emphasizes application performance because it requires the user to apply the program content to life-like situations in order to learn principles and solve problems.

The ordering of content in virtual reality is efficient as possible to help students achieve learning objectives. Sequencing can take place on many levels, including learning, world, and concept-related sequencing. The type of sequencing used is based on both the content being taught and the audience. To the student, sequencing in virtual reality seems obvious as she enters different virtual environments, has different experiences, and manipulates different objects.

Goals	Indicators	Benchmarks	Measures
Goal 1 ISAT Test Scores	• Students will display increasingly higher performance on standardized tests.	• Within two years, 3rd and 4th student scores on the ISAT standardized test will increase by 10 percent	• Student ISAT standardized test scores for the 3rd and 4th Grades
Goal 2 Student Motivation	• Students will view the ISAT and core subjects with greater relevance and will display an increased motivation to learn.	• Within two years, student attitudes towards the ISAT and core subjects will improve 10%.	• Student attitude surveys and observation
Goal 3 Curriculum Integration	• Virtual reality-based engaged learning methodologies will increasingly be incorporated into the curriculum in testing and core subject areas.	• In two years, math, English, science, and social studies curricula will have at least 25 percent of lessons incorporating virtual reality-based engaged learning methodologies.	• By subject area, the percentage and frequency of lessons included in the curriculum that incorporate virtual reality-based engaged learning methodologies
	• An increasing percentage of teacher lessons will incorporate virtual reality-based engaged learning methodologies.	• All trained teachers will have at least 25 percent of lessons incorporating virtual reality-based engaged learning methodologies.	• From classroom observations, %of teacher lessons that incorporate virtual reality-based engaged learning methodologies

Goal 4 Professional Development	• Increasing numbers of teachers will be trained to integrate virtual reality-based engaged learning methodologies into their teaching.	• By the end of the school year, 50 percent of teachers will have had training in virtual reality-based engaged learning methodologies.	• Number and percent of teachers requesting and receiving training by type of training
	• Teachers will learn how to integrate virtual reality-based engaged learning methodologies into their teaching	• After training, teachers will be able to devise at least three examples of how virtual reality-based engaged learning methodologies can be integrated into their lessons.	• Lesson plans produced at professional development activities • Teacher responses from professional development survey
Goal 5 School-wide Implementation of Virtual Reality Learning	3rd-8th Grade students will use virtual reality-based engaged learning methodologies to prepare for the ISAT, as a supplement to classroom learning, and for individual exploration and clarity.	By the end of the school year, 50% of students will have used virtual reality-based engaged learning methodologies to prepare for the ISAT, as a supplement to classroom learning, and for individual exploration and clarity.	Number and percentage of students in the virtual reality lab, uses, and times used.
Goal 6 Availability Virtual Reality Lab	• Each class is able to explore schoolwork in virtual reality environments together.	• By next year the virtual reality lab will enable each student in a class to have their own virtual reality system.	• Teacher: virtual reality system ratios • Student: virtual reality system ratios
	• Students will actively use virtual reality systems for projects and assignments.	• All students will use virtual reality systems at school at least 4 hours per week.	• Percent of students who use virtual reality systems at least four hours per week at school

Goal 7 Partnership Model	• The school and SUNRISE will collaborate to create VR programs and lesson plans.	• Within two years, the school and SUNRISE will meet 20 times and create three virtual reality programs.	• Meeting minutes, interviews, participant surveys, software
Goal 8 Dissemination Plan	• The school and SUNRISE will jointly disseminate program components and results.	• Within two years, SUNRISE will create a cutting edge, three-dimensional website based on the program, demonstrate the school virtual reality programs at at least three conferences, and write at least two articles about the partnership. • Within two years, school faculty will coordinate 25 on-site visits, write two progress reports, and host local media.	• Number of other schools and media outlets exposed to the program