A Real-Time Strategy Game Based on the Human Immune System

John Wong
Learning, Design, and Technology
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Abstract

A person’s actions and non-actions contribute to his or her overall health by having direct consequences to the person’s immune system. The immune system and the pathogens it defends against are complex organisms that use many different tactics to survive. To best show how they work, and what their strategies are, a real-time computer game will be developed for high school Biology students. The game will simulate both the function of the immune system and pathogen to teach learners how the two adapt, attack, and defend each other. A RTS game is appropriate for this project because the basic goals of a RTS game are also the same goals of the immune system and pathogens: to gain resources, land, and survive. The primary goal of the game is to teach how the immune system works by transforming the way the learner sees and interacts in the microorganisms’ world.

Learning Problem

The state of California outlines what high school biology students should understand about the immune system (California Science Content Standards, 1998):

Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:

a. Students know the role of the skin in providing nonspecific defenses against infection.
b. Students know the role of antibodies in the body’s response to infection.
c. Students know how vaccination protects an individual from infectious diseases.
d. Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body’s primary defenses against bacterial and viral infections, and effective treatments of these infections.
e. Students know why an individual with a compromised immune system may be unable to fight off and survive infections by microorganisms that are usually benign.
f. Students know the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.

Therefore, the primary goal of the RTS game is to teach high school biology students how the immune system works.

There are two secondary learning goals: an individual’s actions directly affects his or her health and there are misconceptions about bacteria/viruses. The immune system can combat disease effectively if the person takes care of his or her body. More importantly, students generally do not understand the many different factors that may strengthen or weaken the immune system to combat infection. To better demonstrate the effects of certain factors (e.g. sleep, exercise, food, medicine), a RTS game (described below) will be created to show how the immune system works and how it is affected by external factors. These factors will change in the background of the game, consequently the learner will not be able to control them. As a result, the learner will have to deal with the actions of the person and will understand the challenges and consequences of certain decisions. For example, if the person consumes orange juice then the immune system will have more resources to combat the invading pathogens. This does not necessarily mean that the immune system will have an easy path to defeat the pathogens, but have more resources at hand. However, if the person decides not to rest then the immune system will become overburdened and may take longer to get rid of the invading microbes. The intent here is to show the learner that a person’s actions directly affect the body’s immune system.
The other secondary learning goal involves misconceptions of bacteria/viruses. One such misconception is that most people think that the goal of most bacteria/viruses is to kill the host, on the contrary, the goal of bacteria/viruses is to live long enough to reproduce and infect other hosts. Another misconception is that all bacteria is bad. There are many “good” bacteria that help people digest food, and kill other bacteria by competing for resources. Because these are secondary goals, the game will include cut scenes to convey these misconceptions. For example, if playing on the bacteria/virus side and if the learner “wins” the battle then the game will go to a cut scene of a person sneezing, the microbes flying through the air and infecting another person.

A tertiary learning goal is to show the consequences of antibiotic use. The last few years have shown the amazing ability of bacteria to evolve and adapt to antibiotics because of human overuse and misuse. The game will include the use of antibiotics. In the beginning the antibiotics may kill all of the strains of bacteria. After many uses, however, a certain number of bacteria will become resistant to the antibiotics and the player of the immune system will have to overcome “super bugs”. Moreover, antibiotics do not seek out only “bad” bacteria but may also harm the “good” bacteria. This can lead to many health related consequences such as yeast infection.

Why is this important?

Knowing the functions of your body is important and is generally the necessary first step in understanding how to take care of yourself. Unfortunately, the learning that occurs may not transfer to understanding of how the immune system works and how it relates to a person’s health.

By grades 9-12, many students have a fairly sound understanding of the overall functioning of some human systems, such as the digestive, respiratory, and circulatory systems. They might not have a clear understanding of others, such as the human nervous, endocrine, and immune systems. Therefore, students may have difficulty with specific mechanisms and processes related to health issues. (NSE Standards, 1995)

As a result of how the immune system is taught currently, students may not make the connection between the medium they are using and translating it to how it relates in their lives. The game will accomplish this by showing how the different external factors change the complexion of the game. In other words, instead of receiving reinforcements from the immune system, they are diverted because the person receives a cut. And on top of that the body does not take care of itself then the player has even fewer resources to combat the pathogens. Usually, the player has control over these factors, but, because they are not they will realize the consequences even more.

Moreover, the immune system encompasses many different fields in biology, including, evolution, genetics, immunology, cell biology, and bio-chemistry. Understanding how the immune system works could lead to a better understanding of these fields and how they interrelate to one another.

What is a real-time strategy game?

There are two general categories of strategy games: turn-based and real-time. A turn-based game is when a person makes all of his or her moves, then the computer makes all of its moves, and this rotation continues until the game is won. Software board games like Risk,
Monopoly, Chess, and card games are good examples of turn-based strategy games. A real-time strategy game is when both the person and the computer are moving simultaneously until the battle is won. The real-time strategy genre has normally been about warring human and/or alien races battling for resources, land, and meeting predetermined objectives. The game is set within a storyline that keep people engaged. Each side has strengths and weaknesses and that plays into the strategy of how the game is played. Examples of real-time strategy games include: Starcraft, Warcraft, Red Alert, Command & Conquer, and Age of Empires II. To understand how this relates to this project, please see the section “Why a computer game?”.

Analysis of existing products

The game that I am proposing is unique because it has never been done before; however, there are similar products. Table 1 compares the existing products and the benefits of the immune system game. Below the table is a more detailed description of the existing products.

<table>
<thead>
<tr>
<th>Game</th>
<th>Immune System</th>
<th>Pathogens</th>
<th>Health Related</th>
<th>Guided by Curriculum</th>
<th>Cellular View</th>
<th>Accurate Information</th>
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<tbody>
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<td>X</td>
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<td>X</td>
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<tr>
<td>Participatory Simulations</td>
<td>X</td>
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<tr>
<td>Web Bacteria Games</td>
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<td>X</td>
<td>X</td>
<td>Some</td>
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<td>Age of Empires II</td>
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</table>

Table 1 – A comparison of existing products to the immune system game based on 7 criteria.

Bronkie the Bronchiasaurus

Bronkie is a video game that was originally released for the Super Nintendo system and will be released shortly for Windows-based machines. The game, supporting Bandura’s theories of self-efficacy and social cognitive theory, is designed to inform youth with asthma about their disease. The two main characters of the video game, Bronkie and Trakie, live in a polluted dinosaur world. The point of the game is to have children (or players) help save the dinosaur world from the clouds of dust formed from meteors crashing through the atmosphere. They help Bronkie and Trakie avoid the triggers that cause asthma (dust, animals, etc.) in a 2-D puzzle action game. Children learn not only to take on an active role in the game (their own lives) but
also to identify what may or may not cause their own asthma to flare up. Bronkie is the most similar of the products reviewed because the goals are relatively the same to the game I am proposing. The game genre and asthma are the main differences.

**Participatory Simulations**
Collela from the MIT Media Laboratory has shown the value of using technology to transform student thinking. High school biology students wore infrared capable badges that were programmed to simulate the social life of a virus. Students were either infected, immune, or not infected and were told to socialize with other people. Depending on certain variables (time, immunity, etc.) the virus would infect other people. Students learned in a fun way how viruses spread in a community, that certain people are naturally immune, and that being infected is natural. In other words, they learned how viruses work. The game that I am proposing is different because the technology will allow students to see the immune system and pathogens at the cellular level versus the social level. Moreover, the game is different from the MIT experiment in that it is more individualized versus showing the social life of a virus. Thus, not only students will learn about the immune system, they will learn how it related to their health.

**Cells Alive CD-ROM**
Cells Alive is a CD-ROM that contains pictures, descriptions, and movies of the immune system and pathogens. This is one of the few products that use powerful magnification lenses to show the microorganisms at the cellular level. The main critique is that the images and movies can be confusing because they are out of context. In other words, showing an image of a white blood cell attacking a pathogen is interesting, but the before and after images are missing. Moreover, a person cannot easily tell between the white blood cell and the pathogen, whereas, with the game the immune system cells and pathogens will be clearly differentiated. The game also will give the learner context of how the whole system works.

**Magic School Bus CD-ROM**
The *Magic School Bus Explores the Human Body* CD-ROM attempts to show the body at the cellular level and be fun at the same time. Some of the benefits with this program is that it allows the user to see the body from a different viewpoint and to learn about the functions of the major organs. Some of the problems with this program are that the information given is sparse, it is mainly for entertainment, and it is difficult to use. The immune system game will also take advantage of allowing the player to see the cellular world, but, also will reflect accurately the complexity of the body.

**Bacteria Games (on the web)**
Most web-based games are quizzes in a television game show format (e.g. Jeopardy). Another type of web-based game can be found at [http://www.pbs.org/wgbh/nova/aids/immunewave.html](http://www.pbs.org/wgbh/nova/aids/immunewave.html) which attempts to be realistic, but at the same time is inaccurate in its display of information. The virus multiplying is realistic, but what is inaccurate is that the immune system’s defenses do not act alone. They work together to rid pathogens. The inaccuracies presented in this game are that the immune system is simplistic and that the organisms that make up the immune system work alone. These inaccuracies may be a result of limited resources and/or the focus of making the game fun. The intent of my design is to be both fun and accurate.

**Age of Empires II**
*Age of Empires II* is the only real-time strategy game that combines some learning with gameplay. As a player, a person can choose different war campaigns of great leaders (e.g. Joan of Arc) and will receive some information on the history of the era before beginning the battle. The
main intent is not to bore the player with needless information, but to give context to the importance of the situation and provide the storyline that keep people engaged. *Age of Empires II* is a successful RTS game. It won numerous gaming awards and it shows that the RTS genre is a good medium for the immune system game because there are many people who are familiar with this genre, it may provide motivation to use this product, and keep them engaged.

**Why a computer game?**

The immune system and the pathogens that it fights are complex organisms that use many different strategies to survive one another. This complexity can be shown most effectively in a RTS game because the basic goals of a RTS game are also the same goals of the immune system and pathogens: to gain resources, land, and survive.

Motivation is another reason why a computer game is appropriate. It has been well documented the power of computer games by the amount of time people play them. Creating a learning environment within a game would capitalize on a wonderful opportunity.

Engagement is another benefit of computer games. People can spend hours playing a game and not be aware of the time they have spent. Moreover, the things people learn from a game can be capitalized on. For example, a football game will demonstrate the many pass and run plays a person can choose from and enact. After playing the game for a short period of time, they will begin learning the name of the plays called and the strategy behind them.

The main objective of most games is to win. In order to win the player must use appropriate strategies, including learning the strengths and weaknesses of both the immune system and pathogens, to gain a better understanding of how things work. This is a good example of technology transforming thinking.

Finally, a RTS game will allow the learner to see the immune system and the pathogens in an interactive way at the cellular level. This has never been done before and is another good example of technology transforming thinking.

**Design Process**

Ethnography and interviews will be the main tool used to gain insight into the classroom, the teacher’s view, and the content. I will be observing at least two high school biology classes from Palo Alto High School: a freshman class and an Advanced Placement Biology class. This should give me information about the class set up, the material presented, misconceptions, prior knowledge that students bring, and interest in the material. Moreover, this will allow me to understand how the teacher presents the material and the corresponding assignments.

Interviews will inform my design of the content. I will interview high school biology teachers, doctors, and professors of immunology to better understand the immune system and bacteria. I will also reference high school and college biology textbooks. Moreover, I will consult with curriculum experts to ensure that my game follows and achieves California Science Curriculum Standards.

Participatory design will guide the design of the game because it better guarantees that the game will be designed for the right audience. Understanding the needs and desires of high school students will help the user interface and the story of the game. The content experts will
ensure that the material presented is accurate. Moreover, teachers will help me understand the learning problems that most students experience with the material.

I will design a storyboard from the ethnography data, interviews, and knowledge about the content and user test it for accuracy, motivation, engagement, user interface, and the learning. User testing will involve at least two students from the AP Biology class, two students from the freshman biology class, and two students from the intermediate biology class. Moreover, user testing will involve content experts to ensure the validity of the information. As a result of the user testing, a second story board will be created and user tested again using the same method described above. The results from the second story board will inform the prototype. Thus good design is an iterative process.

**The Game Structure**

There are two sides that a learner can play: the immune system or pathogen. This will help people understand how both systems work to attack, defend, and adapt to one another. Another dimension to this would be the external factors. In other words, what happens when you take penicillin or drink orange juice or don't get enough sleep? These are variables that change within the game and can be a result of the easy, medium, and hard skill levels. The immune system uses distinct strategies to defeat an invading microbe. A player must know what the strategy of the immune system is and the roles of the microorganisms with in it in order to successfully defeat the pathogen. Hints will be provided to the player if he or she does not know the immune system's microorganisms' roles. For example, if a player uses a B-Cell to attack a pathogen then the player does not understand or realize that B-Cells are used to replicate a pathogen so an antibody can be created. As a result, a hint will be provided to the player as to what B-Cells are and their role in the immune system.

Pathogens also have a distinct strategy and a player must use that strategy in order to successfully complete the battle. For example, viruses and bacteria have distinct strategies to survive. A virus must depend on invading other cells in order to survive. Bacteria are much bigger in size and can reproduce on their own. If a player does not know this, it will be apparent in the way the game is played. The player will also receive hints to help him or her better succeed.

Each sickness is an individual battle. For example, strep throat would be one battle. A player on the immune system who successfully defeats the streptococcus pyogenes bacteria will gain an antibody in the form of a merit badge. Similarly, the player who is on the pathogen side that successfully defeats the immune system will infect a person and that player will also receive a merit badge. The player repeats the battle if he or she does not successfully complete the objectives.

**The Design Proposal**

The whole game will include the common ways of getting sick: common cold, flu, strep throat, etc. It will not include sexually transmitted diseases, allergies, and cancer causing cells because this will be part of version 2. This decision was informed by talking to a doctor who felt that a person must understand the basics of the immune system in order to understand the more “advanced” topics like HIV. The design will use strep throat as the primary example because a lot of people have had strep throat and is a good way for personalizing this game. Moreover, the doctor I interviewed said “streptococcus is a good bacteria to choose because it is concentrated in the throat, susceptible to penicillin, the most common antibiotic, the timeframe is consistent, and is generally not fatal.” The design will include how the immune system
combats the pathogens and also what they do to reproduce and infect others. Players will be able to set the skill level: easy = the host does everything possible to be healthy; medium = the host does some things necessary to be healthy; and hard = the host does nothing to be healthy. For example, an easy setting would mean that the host gets lots of rest, eats appropriately, and takes the appropriate kinds of medicine.

The game will include good bacteria. This set of organisms will compete with the bad organisms for resources. A consequence of using antibiotics will be the possible elimination of both good and bad bacteria causing harm to the host. A common result of antibiotic use is yeast infection.

A game manual will also be designed and will include how to play the game, what are the individual organisms roles and responsibilities, and their strengths and weaknesses. A general description of how things work will also be included.
Timeline

February – Proposal/Begin Research
20 – Began first interview with content expert
26 – Proposal finished

March – Research
1 – Gain entrée to school(s) setting
1 – Interview a teacher(s)
3 – Design review
15 – Literature review finished
26 – Begin storyboarding
31 – Finish storyboarding

April – User Testing/Design/Redesign
1 – Identify users/students
9 – Begin user testing
16 – First iteration
23 – Second round of user testing
27 – Second iteration
30 – Prototype finished

May – Assessment
1 – Work on design document
8 – Work on presentation
11 – Finishing touches
18 – Expo
25 – Final Project Due
Budget

Materials
Macromedia Director - $250
Macromedia Flash - $100
Miscellaneous - $250

Time/Fees
Ethnographer – 10 hours x $25/hr = $250
Curriculum Developer – 30 hours x $75/hr = $2,250
Assessment Specialist – 30 hours x $50/hr = $1,500
Content Experts – 30 hours x $75/hr = $2,250
Programmer – 60 hours x $75/hr = $4,500
Graphic Artist – 30 hours x $75/hr = $2,250

Total
Materials + Fees = $13,600

Consultants

Professors
Michael Kamil
Decker Walker
Brigid Barron
Denise Pope
Melissa Wong

Users
High school students

Content Experts
Dr. Enoch Choi
Dr. Chris Hirose
Teachers (TBD)

Programmers
Margaret Wong
Laura Wong
Peter Wong

LDT Class 2001
Special recognition to Heidi Chang, Tania Choi, Jee Park, Michael Thompson, Tacy Trowbridge.
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Health Education Games

**ImmunoScenarios: A Game for the Immune System.**
Taylor, Mark F., and others
*American Biology Teacher* v58 n5 p288-95 May 1996
Describes a board game, ImmunoScenarios, which was developed to reinforce the ideas about the immune system discussed in lecture classes. Emphasizes important characteristics of the body's specific defense system including specificity, cooperation among various cells, and memory. Includes directions for playing, student handouts, and scenarios.
EJ523659

**Health Education Video Games for Children and Adolescents: Theory, Design, and Research Findings.**
Lieberman, Debra A.
U.S.; California; 1998-07-00
This study examined whether video games could be effective health education and therapeutic interventions for children and adolescents with diabetes. KIDZ Health Software developed a game about diabetes self-management, and tested its effectiveness for children with diabetes. The Packy and Marlon Super Nintendo video game promotes fun, self-esteem, social support, increased knowledge, positive health behaviors, and positive health outcomes, and it teaches diabetes self-management skills. The characters are adolescent diabetic elephants going to a diabetes summer camp. Players help the characters monitor blood glucose, take appropriate amounts of insulin, review diabetes logbooks, and find foods according to the right number of food exchanges. Players learn about self-care and typical social situations related to diabetes. To win, players must engage in specific health-promoting behaviors. Children with diabetes and their parents from two clinics participated in a study that involved interviews before and after routine visits, testing of glycated hemoglobin, and receipt of either Packy and Marlon or a pinball video game to take home and play. After 6 months, participants rated the games.Interviewers examined time spent playing the game, self-efficacy, social support, knowledge, and self-care. Results indicated that children not only liked Packy and Marlon as well as the pinball game, but Packy and Marlon also significantly improved self-care behaviors, self-efficacy, and health outcomes.
ED422312

**The Body Game: Developed by Undergraduates for Key Stage 2 National Curriculum Science.**
Verran, J.; Brintnell, B.; Brownrigg, N.; Garcia, R.; Green, A.
*Journal of Biological Education* v31 n3 p181-84 Aut 1997
Describes a game developed for school children which addresses part of the Science National Curriculum. The board is a human body with organs on view. Questions relate to different organ systems, body parts, and processes. Topics include breathing, digestion and metabolism, blood and circulation, and the sensory organs and teeth.
EJ554595

**Game of Childhood Diseases. Technical Note No. 23.**
Bialosiewicz, Frank; Burns, Julie
U.S.; Massachussets; 1983-00-00
Designed to create an awareness of health problems among children in Third World settings, the board game uses simulation and role playing to help participants identify the symptoms and consequences of six childhood diseases preventable by vaccination: measles, whooping cough, tetanus, diphtheria, polio, and tuberculosis. The game also helps players understand the importance of vaccinations, malnutrition, and adequate diets for children, as well as the causes and effects of diarrhea and the treatment of dehydration. Consisting of a game board, drawing cards, markers, and a die or spinner, the game is a vehicle for nonformal education through discussion as players move their markers around the board. Although it was developed specifically for the rural women served by the government health center in Ciudad Vieja, Guatemala, educators can easily adapt the game to fit the needs and interests of different groups in different areas. A sample game board, reproducible board components and drawing cards, a
content outline, and guidelines for playing are included, along with suggestions for encouraging discussion and role playing.

ED238608

**Effectiveness of a Computer-Based AIDS Education Game: BlockAIDS.**

Johnson, Craig W.

U.S.; Texas; 1993-04-15

This paper reports on a study of the effectiveness of BlockAIDS, a computer-based AIDS (Acquired Immune Deficiency Syndrome) education game that communicates information from the U.S. Surgeon General's reports on AIDS to adolescents, preadolescents, and young adults. Game response protocols were obtained from 3,000 BlockAIDS players at the Houston Museum of Natural Science, Hall of Health Science. A random sample of 446 players responded to 4 questions about game impacts. The data showed that players gained significantly in knowledge about AIDS during game play. On average the games were played 5 to 6 minutes, during which time responses were made to about 15 questions on AIDS. As a result of playing BlockAIDS, about two-thirds of the players reported that they plan to avoid AIDS risks, know more about AIDS, and feel more comfortable talking about AIDS.

ED363277

**Other Biology Activities**

**Low Budget Biology 3: A Collection of Low Cost Labs and Activities.**

Wartski, Bert ; Wartski, Lynn Marie

U.S.; North Carolina; 1995-00-00

This document contains biology labs, demonstrations, and activities that use low budget materials. The goal is to get students involved in the learning process by experiencing biology. Each lab has a teacher preparation section which outlines the purpose of the lab, some basic information, a list of materials, and how to prepare the different solutions and chemicals. All the labs/activities/demonstrations were designed for 55 minute lab periods. Labs and activities include: Lactase Enzyme Lab, The Rate of Paperase Lab, Gelatin and Enzyme Activity, Protein Shape Activity, Protein Synthesis, Proteins, and Mutations Activity, Simple and Small Song, Amylase Regulation in Prokaryotes, Classification Activity, Guard Cell Observation Lab, Twig Anatomy Activity, Upper Arm Model, Hormone Match Game, and Population Estimation and Growth Simulation.

ED395759

**Cell Game.**

Riss, Pam Helfers

*Science Activities* v31 n2 p32-33 Sum 1994

Describes an activity that makes learning about cells and cell structures more fun. Students are asked to create a board game that teaches others about cells and their structures.

EJ491884

**Playing the Cell Game.**

Madrazo, Gerry M., Jr. ; Wood, Carol A.

*American Biology Teacher* v42 n9 p554-58 Dec 1980

Discusses the use of games to facilitate learning scientific concepts and principles. Describes the Cell Game, which simulates plant and animal cells; the Energy Quest, which requires players to buy property that generates largest amounts of electricity; the Blood Flow Game, which illustrates circulation of blood through the human body.

EJ237527

**Nucleogenesis! A Game with Natural Rules for Teaching Nuclear Synthesis and Decay.**

Olbris, Donald J. ; Herzfeld, Judith

*Journal of Chemical Education* v76 n3 p349-52 Mar 1999

Describes a game designed to familiarize students with nuclear reactions and the general geography of the table of nuclear isotopes by simulating the nucleogenic process.
Educational Card Games for Understanding Gastrointestinal Physiology.
Odenweller, Cynthia M.; Hsu, Christopher T.; DiCarlo, Stephen E.
*Advances in Physiology Education* v20 n1 pS78-S84 Dec 1998
Presents the rules for two educational card-games that provide an opportunity to integrate, analyze, and interpret basic concepts in gastrointestinal physiology. Enhances students' abilities to apply and synthesize.
EJ582691

Playing To Learn: Science Games in the Classroom.
Owens, Katharine D.; And Others
*Science Scope* v20 n5 p31-33 Feb 1997
Discusses the use of games in the science classroom as a productive, motivating tool. Presents games that require abstract thinking and that change potentially boring exercises into challenging competitions.
EJ538267

Some Software Naturals: Masking Education in a Video Game.
Texley, Juliana
*Natural History* v93 n12 p74-75,77-78 Dec 1984
Lists 12 science-oriented computer programs (indicating program name, source, RAM needed, compatible computers, and current cost). Also considers the use of these programs in educational and home settings.
EJ309062

Games for Learning

Simulations, Games, and Experience-Based Learning: The Quest for a New Paradigm for Teaching and Learning.
Ruben, Brent D.
*Simulation & Gaming* v30 n4 p498-505 Dec 1999
Presents an overview of the evolution of experiential instruction theory and practice from its popular emergence in the late 1960s through the present. Simulations, games, and other experience-based instructional methods have had a substantial impact on teaching concepts and applications during this period, and have influenced traditional classroom instruction. Seven limitations of the traditional teaching-and-learning paradigm are outlined.
EJ603658

Simulations and Games as Subversive Activities.
Christopher, Elizabeth M.
*Simulation & Gaming* v30 n4 p441-55 Dec 1999
Compares the advantages and disadvantages of using simulation games as a teaching tool. Describes some tactics to turn disadvantages into advantages, and concludes by describing the role of the game leader as crucial to learning outcomes.
EJ603657

In Search of a Fair Game.
Muckerheide, Paul; Mogill, A. Timothy; Mogill, Helen
*Mathematics and Computer Education* v33 n2 p142-50 Spr 1999
Describes a variation on Bingo that provides a non-routine probability investigation through which students develop concepts of chance.
EJ600106

The Use of Educational Simulation and Gaming To Improve Mathematics Teaching.
Seckinger, Don; Mitchell, Rick; Lemire, Dave
This paper advocates the deliberate and consistent use of educational simulations and games as one way of improving mathematics instruction. Dewey's philosophy to rationalize using simulations and games in mathematics classes is discussed. A drill and practice type of mathematical simulation game called Mathardy is illustrated. It is concluded that better teaching of mathematics through the use of educational simulations has serious potential to improve both students' attitudes toward mathematics and their actual achievement.

Playing Mathematical Games: When Is a Game Not a Game?
Gough, John
Australian Primary Mathematics Classroom v4 n2 p12-17 1999
Discusses the features of a good educational game. Describes mathematics that can be developed from playing games and introduces a strategy board game called Mancala.

Mathematical Games for Primary Students.
Badham, Val
Australian Primary Mathematics Classroom v2 n3 p19-23 1997
Outlines some ways in which games such as board games, card games, trading games, or match the rule may be used to improve students' mathematical skills while maintaining a positive classroom atmosphere.

A Computer Game To Teach Programming.
Kahn, Ken
U.S.; California; 1999-06-00
ToonTalk is an animated interactive world inside of which one can construct a very large range of computer programs. These programs are not constructed by typing text or arranging icons, but by taking actions in this world. Robots can be trained, birds can be given messages to deliver, and so on. This paper describes the design and preliminary testing of an interactive puzzle game that functions as a ToonTalk tutorial. Children are presented with a series of interactive puzzles in a game-like narrative context. The puzzles gradually introduce programming constructs and techniques. Each puzzle presents the player with a very limited selection of ToonTalk objects. Even some very young children are able to solve the puzzles because the search space is so strongly constrained, and yet players do not behave as if the puzzles are too easy--the children are clearly challenged. The sequence of puzzles is carefully designed to gradually introduce new concepts, one at a time. Testing has shown that both children and adults enjoy the puzzles and have learned some sophisticated programming skills.

Draze, Dianne
U.S.; California; 1997-00-00
This guide to a unit on a simulation game about the stock market contains an instructional text and two separate simulations. Through directed lessons and reproducible worksheets, the unit teaches students about business ownership, stock exchanges, benchmarks, commissions, why prices change, the logistics of buying and selling stocks, and how to select stocks. The guide presents a short simulation that gives students a 5-day taste of trading, along with a longer simulation which sets up the format for following prices on the actual stock market for several months. The unit gives students a varied venue for participation and application of knowledge, skills, and decision-making abilities, while teaching them about the economics and psychology of the stock market. The guide includes information for the instructor and a glossary of relevant terms.

Using the Stock Market Game in the Social Studies Classroom.
Cox, Allen C.
Describes an educational game designed to help students (fourth grade through adult) understand how financial markets work within the free enterprise system and how the basic economic principles impact the stock market. Discusses the paper and Internet versions of the game and provides some teaching guidelines. EJ557566

Severe Weather Game. 
Owens, Katharine D.; Sanders, Richard L.  
Science Activities v35 n1 p9-12 Spr 1998  
Presents an unconventional assessment in the form of a card game for use in evaluating student understanding of severe weather-related concepts. Discusses the theory behind using educational games for instruction and assessment. EJ578423

A Probability Game.  
Melrose, Jean  
Teaching Statistics v20 n2 p53-54 Sum 1998  
Presents an educational game on probability that can be the starting point for an open-ended statistical project. EJ570867

Teaching and Learning with SimCity 2000.  
Adams, Paul C.  
Introduces "SimCity 2000," a computer simulation, as a tool for teaching urban geography. Argues that, combined with other activities, it can enhance computer literacy, geographical knowledge, and critical skills. Notes gender differences in students' previous exposure to the software; argues that instructors must consider this when designing a simulation. EJ569351

Computer Games: Increase Learning in an Interactive Multidisciplinary Environment.  
Betz, Joseph A.  
Discusses the educational uses of computer games and simulations and describes a study conducted at the State University of New York College at Farmingdale that used the computer game "Sim City 2000." Highlights include whole systems learning, problem solving, student performance, nonparametric statistics, and treatment of experimental and control groups. EJ520269

New Learning Strategies for Generation X. ERIC Digest No. 184.  
Brown, Bettina Lankard  
U.S.; Ohio; 1997-00-00  
The gap between Generation X and earlier generations represents much more than age and technological differences. It reflects the effects of a changing society on a generation. Social changes such as the increase in single-parent households and households with both parents working, corporate downsizing and layoffs, limited opportunities for career positions, and economic troubles at the society level have combined to create a generation characterized as follows: independent problem solvers and self-starters; technologically literate; responsive; focused; lifelong learners; ambitious; and fearless. Effective instruction requires that teachers target their teaching toward the unique characteristics of today's learners. The following are some suggestions for targeting instruction toward the characteristics identified with Generation X: focus on outcomes rather than techniques; engage students in role playing and cooperative learning experiences; give students control over their own learning; respect learner's ability to engage in parallel thinking; give attention to the format of instructional materials; and engage
students in creating their own learning environments and in completing projects that demand new skills and application of existing skills to new situations.
ED411414

The POVERTY GAME: A Computer-Based Learning Package for Exploring Poverty and Public Policy.
Gray, Susan H.
Teaching Sociology v17 n4 p489-92 Oct 1989
Describes a computer-based learning package designed to introduce students to concepts and controversies surrounding the social problem of poverty in the United States and to familiarize them with public policies concerning that problem. Use of the "Poverty Game" is discussed and information concerning cost and availability of software is provided.
EJ399665

Software Reviews.
McGrath, Diane, Ed.
School Science and Mathematics v89 n2 p169-71 Feb 1989
Provides reviews of courseware entitled: "Mystery Matter," which is a series that supplements the basic inquiry process; "Jumping Math Flash," which is an arcade-game program with arithmetic problems; and "Quest for Files: Science Rocks and Minerals The Upper Crust," which is a database program for earth science. Includes availability and costs.
EJ391162

Instructional Gaming: Implications for Instructional Technology.
Dempsey, John V. ; And Others
U.S.; Alabama; 1994-02-00
Instructional gaming, as distinguished from simulation, is defined as any overt instructional or learning format that involves competition and is rule-guided. The literature review identifies five categories of articles on instructional gaming: (1) research, (2) theory, (3) reviews, (4) discussion, and (5) development. Games have been found to serve many functions, such as tutoring, amusing, helping to explore new skills, promoting self-esteem, practicing skills, or seeking to change attitudes. Some assertions drawn from the literature that might be useful in using or designing a game or in researching its use or design are presented. A chart presents an annotated bibliography of 94 articles related to gaming.
ED368345

Benefits of Computer Game Learning

Din, Feng S. ; Caleo, Josephine
U.S.; New Jersey; 2000-02-00
This study investigated whether kindergarten students who played Sony Play Station (Lightspan) computer games learned better than peers who did not play such games. Participants were 47 African-American kindergartners from two classes of an urban school in the Northeast. A pretest and posttest with control group design was used in the study. The experimental group played the games for 40 minutes per day in school for 11 weeks. The Wide Range Achievement Test-R3 was used for measurement. Findings from data analysis via ANCOVA indicated that the experimental group made significantly more gains in the spelling and decoding areas. No difference was found in the math area.
ED438905

Cognition and Recreational Computer Games: Implications for Educational Technology.
Pillary, Hitendra ; Brownlee, Joanne ; Wilss, Lynn
Journal of Research on Computing in Education v32 n1 p203-16 Fall 1999
A qualitative approach was used to examine the cognitive processes students engaged in while playing recreational computer games. Participants were 21 high school students. Results indicated that players
practiced complex cognitive processes such as interpreting explicit and implicit information, inductive reasoning, metacognitive analysis, and problem solving.

EJ595428

**The Value of Serious Play.**
Rieber, Lloyd P.; Smith, Lola; Noah, David
*Educational Technology* v38 n6 p29-37 Nov-Dec 1998
Discussion of the affective domain, learning, and motivation focuses on serious play as a suitable goal for situations requiring learners, both children and adults, to engage in creative higher-order thinking coupled with intense personal commitment and involvement. Suggests that interactive computer games offer opportunities to support serious play for learning.

EJ575926

**The Games Our Students Play: A Review Activity for the Interpersonal Communication Classroom.**
Gesler, David M.; Tillson, Lou Davidson; Hanor-Dawes, Pamela
U.S.; Kentucky; 1998-11-00
This paper offers strategies for implementing student-generated games that focus on interpersonal communication skill development and suggestions for appropriate instructor and student evaluation measures. In today's classroom, games can be used to teach subject matter to adult students with the added advantage of making learning fun.

ED426420

**Considering Games as Cognitive Tools: In Search of Effective "Edutainment."**
Hogle, Jan G.
U.S.; Georgia; 1996-08-00
Use of educational games to supplement traditional classroom lectures is purported by some researchers to increase interest, motivation, and retention, as well as to improve higher order thinking and reasoning skills. This paper reviews proposed benefits of using games as cognitive tools, and discusses the complexities of assessing those benefits. The paper is divided into three main sections. The first section defines terminology, citing the most commonly used definitions found in the literature. The second section describes proposed benefits of educational games, reviewing issues of motivation, retention, higher order skills, and effects of practice and feedback. The last section discusses several factors which must be considered when attempting to measure these proposed benefits, including issues of learner differences, assessment methods, and implicit knowledge. Five figures present a possible model of the interrelationship between microworlds, simulations, and games, as well as Web screen copies of different games.

ED425737

**Brain Food: Games That Make Kids Think.**
Fleisher, Paul
U.S.; Arizona; 1997-00-00
This guide offers more than 100 games from around the world designed to help students explore the fun of learning while developing their higher-order thinking skills. The guide is a compilation of new and traditional games, most of which can be completed with paper and pencil. Each game is classroom tested and tailored to enhance the intelligences and thinking skills of students. Games are provided in the following categories: (1) "Spatial Orientation and Strategy Games"; (2) "Alignment Games"; (3) "Blocking Games"; (4) "Chase Games"; (5) "Capture Games"; (6) "Checkers Variations"; (7) "Chess Variations"; (8) "Maze Games"; (9) "Other Spatial Orientation and Strategy Games"; (10) "Mathematical Games"; (11) "Mathematical Operations"; (12) "Factors and Multiples"; (13) "Deductive Logic Games"; (14) "Word Games"; (15) "Spelling Games"; (16) "Anagrams"; (17) "Long Words"; (18) "Other Vocabulary Builders"; (19) "Puns and Other Word Play"; (20) "Dramatic Word Games"; (21) "Rhymes and Homonyms"; (22) "Miscellaneous Word Games"; (23) "Memory Games"; and (24) "Visual Arts Games."

ED422065
Assessing the Efficacy of Gaming in Economic Education.
Gremmen, Hans; Potters, Jan
*Journal of Economic Education* v28 n4 p291-303 Fall 1997
Presents the results of a study that measured the efficacy of an international economics simulation among undergraduates. The simulation consisted of a macroeconomics game where students develop economic policies for four hypothetical countries. A multiple choice test and posttest questionnaire suggests that classroom games are more effective than lectures.
EJ553016

Beyond Entertainment: Using Interactive Games in Web-Based Instruction.
Stewart, Kelly Michael
*Journal of Instruction Delivery Systems* v11 n2 p18-20 Spr 1997
Explores elements of game design: entertainment, fantasy, nonthreatening reality, objectives, rules, opposition, hazards, outcomes; a rationale for using games in courseware; advantages of World Wide Web Instructional gaming: asynchronous learning opportunities, process data gathering, real-time interaction across geographically dispersed populations, dynamic scenarios; and potential problems in classroom use.
EJ549370

Computer Games Teach Problem-Solving.
Clayson, James
The difficulty many students have in solving complex problems stems not from a lack of mathematical skill but from an inability to visualize the problem. An appropriately-structured computer game may assist students in achieving this visualization and in solving problems better. A heuristic approach in programing one game is provided.
EJ275062

Children and the Nintendo.
Keller, Suzanne M.
U.S.; Illinois; 1992-00-00
The four reports contained in this document examine the effects of the Nintendo Entertainment System (NES), which entered the lives of many children in the United States in 1986. The first report discusses a study of children's interaction with the game hardware. The study of fourth- and fifth-grade students indicated that children's interaction with the NES did not predict eye-hand coordination scores, laterality scores, or directionality scores. The second report focuses on an NES study that explored the complex thinking skills required for successful interaction with the system. The high school students in the study who played Nintendo scored higher on critical thinking skills tests than those students who did not play. The study indicated that children believe NES helps them think, and that they are transferring these thinking skills to other areas of life. The third report discusses a study involving fourth-, fifth-, and sixth-graders, and high school students. This study found that children do not think violent thoughts while playing, but think of strategy to win the game. The study also indicated that Nintendo playing activity decreases around the age span of 12 to 14. The fourth report examines why Nintendo is so appealing to children, some of the possible emotional, social, and educational benefits of NES interaction by children, as well as some possible harmful effects.
ED405069

Star Software.
Kloza, Brad
*Instructor* v109 n6 p82-86 Mar 2000
Presents a collection of computer software programs designed to spark learning enthusiasm at every grade level and across the curriculum. They include Reader Rabbit's Learn to Read, Spelling Power, Mind Twister Math, Community Construction Kit, Breaking the Code, Encarta Africana 2000, Virtual Serengeti, Operation: Frog (Deluxe), and My First Amazing Science Explorer. The article includes teachers' favorite programs.
The Use of Computer Games as an Educational Tool: Identification of Appropriate Game Types and Game Elements.
Amory, Alan; Naicker, Kevin; Vincent, Jacky; Adams, Claudia
British Journal of Educational Technology v30 n4 p311-21 Oct 1999
Describes research with college students that investigated commercial game types and game elements to determine what would be suitable for education. Students rated logic, memory, visualization, and problem solving as important game elements that are used to develop a model that links pedagogical issues with game elements.

What Can We Learn from Computer Games: Strategies for Learner Involvement.
Jones, Marshall G.
U.S.; Tennessee; 1999-02-00
This paper reports the findings of an ongoing study of engagement in computer-based learning environments. The purpose of the study was to look at what engages people in computer games and to see how those patterns of engagement might be used within computer-based learning environments. The age of participants ranged from four to adulthood. Participants, engaged in both open systems and closed systems, were studied to ferret out strategies of learner engagement. Results are discussed in the following areas: problem definition; visual quality, including passive and active aesthetics; types of interactions; and point of view. Findings indicate that problem identification, physical representation, and interaction styles can be manipulated to help foster engagement of learners in computer-based learning environments.

Seriously Considering Play: Designing Interactive Learning Environments Based on the Blending of Microworlds, Simulations, and Games.
Rieber, Lloyd P.
Educational Technology Research and Development v44 n2 p43-58 1996
Provides a brief overview of the history, research, and theory related to play. Research from education, psychology, and anthropology suggests that play is a powerful mediator for lifelong learning, and the design of hybrid learning environments is suggested based on the constructivist concept of microworlds and supported with games and simulations.

Instructional Applications of Computer Games.
Dempsey, John V.; And Others
U.S.; Alabama; 1996-04-00
Games have long been used as instructional tools, but actual research examining that concept has been sparse. Increased sophistication and lower cost in hardware and software for personal computers has created a budding movement to incorporate computer games into learning environments. This paper discusses criteria for selecting an instructional game, which include simplicity, adaptability, potential for educational use, difference from other games in its category, and ability to be played by a single player. Games are grouped into eight categories: adventure games; arcade games; board games; card games; miscellaneous games; puzzles; simulations; and word games. The paper also describes some instructional applications of computer games, and describes a study in which 40 computer games were sampled by 40 adult participants; each game was played by two males and two females. An evaluator was present as the game was played. Researcher observation and follow-up interviews with the participants shed light on how differences in gender, learning style, and preferred problem-solving strategy affected the impact of the game on the individual learner. Results of the study showed that subjects felt that adventure, arcade, board, simulations, puzzles, and word games could be used for teaching problem solving and decision making. Most players felt that games containing violence had no place in education. Several players felt that the gambling scenarios depicted in card games were
inappropriate for children, and should be limited to an adult population. A list of games used in the study and a list of suggested instructional benefits of various classifications of computer games are appended.

**The Use of Computer-Based Videogames in Knowledge Acquisition and Retention.**
Ricci, Katrina E.
*Journal of Interactive Instruction Development* v7 n1 p17-22 Sum 1994
Research conducted at the Naval Training Systems Center in Orlando, Florida, investigated the acquisition and retention of basic knowledge with subject matter presented in the forms of text, test, and game. Results are discussed in terms of the effectiveness of computer-based games for military training.

**The Effectiveness of Games for Educational Purposes: A Review of Recent Research.**
Randel, Josephine M.; And Others
*Simulation & Gaming* v23 n3 p261-76 Sep 1992
Reviews empirical research from 1963 to 1991 that compared the instructional effectiveness of games to conventional classroom instruction. It is concluded that subject matter areas where very specific content can be targeted, especially mathematics, are more likely to show beneficial effects for gaming.

**Carmen Sandiego Is in Your Classroom. An Idea Packet.**
Mayland, Valen
U.S.; Florida; 1990-00-00
These materials are intended to be used with the computer program "Where in the U.S.A. is Carmen Sandiego?" to help students learn about U.S. geography and databases. The activities described involve students pursuing criminals throughout the United States, following clues about the location, and identifying the criminals. The activities include the use of problem-solving and critical thinking skills. These materials feature an overview, goals and objectives, course outline, resource materials, bibliography, sample worksheets, sample maps, and sample student work.

**Good Education and Good Entertainment.**
Peterson, George A.
U.S.; District of Columbia; 1990-10-00
The National Geographic Society is convinced that educational materials should be as lively, dynamic, and intriguing as the television, music videos, movies, and computer games that have so captured today's generation. To that end, a repertoire of pioneering feats in photography and innovative applications of computers, telecommunications, and multimedia educational tools have been developed for the classroom. For example, GTV, the product of a collaboration between the Society, California State Department of Education, Lucasfilm Ltd., and Apple Computer, is an interactive teaching tool combining videodisc and computer technologies in history and geography. The National Geographic Kids Network is an international telecommunications system designed to teach hands-on science with the help of computer-generated maps, modems, and telephone lines. And the newest addition to the electronic classroom is "Mammals: A Multimedia Encyclopedia," which is made up of clips from documentaries, pictures, and vocalizations, all coordinated by a computer. The National Geographic Society also recognizes that educational quality requires training for teachers, and has established a summer workshop institute for that purpose.

**The Video Game: A Model for Teacher-Student Collaboration.**
David, Austin; Ball, Michael P.
*Momentum* v17 n1 p24-26 Feb 1986
Describes a value-oriented computer game called "The Healer," which focuses on healing one's enemies and the environment, while maintaining sufficient life force to achieve these objectives. Stresses that
collaboration between students and teachers can result in computer programs that are value-driven, appealing to students, and useful learning tools.

**Home Video Games: Children and Parents Learn to Play and Play to Learn.**
Mitchell, Edna
U.S.; California; 1984-04-00
Twenty families in the San Francisco Bay area (California) with new Atari home video game sets were studied from February through June 1981 to obtain data on how the game-playing affected family interaction. Records of play were kept for one week each month and each family member was interviewed at the beginning and the end of the study. It was found that: (1) the majority of families spent less than an hour per day in average game-playing time for the total family; (2) time spent playing video games decreased 13 minutes from the first recordkeeping period to the last for the total sample; (3) family and sibling interaction increased in nearly all families as adults and children played with each other; (4) families with all girls had the highest percentage of recorded time spent playing with other family members; (5) mothers were reluctant to play the video games; (6) all but 1 of 17 fathers in the study played the games with the family at least occasionally; (7) two-thirds of the families reported watching less television; (8) families reported spending less money on coin-operated machines; (9) no families reported a detrimental effect on school work as a result of playing the home video games and some reported school work improvement; (10) none of the families saw a relationship between playing video games and developing aggressive, violent personalities; (11) girls tended overall to play less than boys; and (12) most of the families saw their video games as a bridge to personal computers. Quotations from family interviews are included in the report.

**ARC-ED Curriculum: The Application of Video Game Formats to Educational Software.**
Chaffin, Jerry D. ; And Others
Exceptional Children v49 n2 p173-78 Oct 1982
The article explores the applicability of video arcade game formats to educational microcomputer software for exceptional children. Guidelines for educational curriculum based on arcade game formats are proposed and the term "Arc-Ed Curriculum" is offered to describe such software.

**Children and Electronic Games in the United States.**
Funk, Jeanne B. ; Bermann, Julie N. ; Buchman, Debra D.
Trends in Communication n2 p111-26 1997
Reports video game playing demographics. Reviews the literature on video game health hazards and positive health applications; cutting-edge applications in education and controversies about learning; and effects on personality. Discusses laboratory and survey research on the effects of video games violence. Considers whether some children may be at high risk for negative effects from playing video games.

**Rethinking Video Games: A New Challenge.**
Long, Sandra M ; Long, Winston H.
Futurist v18 n6 p35-37 Dec 1984
New developments in video games give them enormous potential for application, particularly in the area of education. Studies indicate that the games are based on the same principles--challenge, fantasy, and curiosity--that motivate learning.

**Video Games: Instructional Potential and Classification.**
Nawrocki, Leon H. ; Winner, Janet L.
Journal of Computer-Based Instruction v10 n3-4 p80-82 Aut 1983
Intended to provide a framework and impetus for future investigations of video games, this paper summarizes activities investigating the instructional use of such games, observations by the authors, and
a proposed classification scheme and a paradigm to assist in the preliminary selection of instructional video games. Nine references are listed.

**Educational and Recreational Uses of Computer Technology: Computer Instruction and Video Games.**
Condry, John ; Keith, Douglas
*Youth and Society* v15 n1 p87-112 Sep 1983
Explores some of the issues raised by the introduction of computers into society and, in particular, questions concerning the impact, both direct and indirect, of the availability of computers on the young.

**The Problems with Computer Game Learning**

**Video Games: Research, Ratings, Recommendations. ERIC Digest.**
Cesarone, Bernard
U.S.; Illinois; 1998-11-00
This Digest reviews research on the demographics and effects of video game playing, discusses game rating systems, and offers recommendations for parents. The Digest begins by discussing research on the time children spend playing electronic games, which shows that younger children's game playing at home (90% of fourth-graders played at least one hour per week, according to one study) decreases in favor of game playing in arcades as they get older. Studies also consistently show that boys play more electronic games than girls, although girls perceive themselves to have peer approval for moderate amounts of game playing, and both boys and girls enjoy violent electronic games. The Digest then discusses research on the effects of playing violent games. Studies tend to show an increase in arousal and aggression in subjects who have played a violent versus a nonviolent game, although there may still be insufficient laboratory research to support strong causal statements about the effects of violent games on children's aggression. The Digest describes research on other effects of electronic game playing, such as the link between heavy game playing or playing of violent games and self-concept. Following a discussion of two electronic game rating systems, devised by the Recreational Software Advisory Council and the Entertainment Software Rating Board, the Digest offers parents recommendations for managing their children's game playing. Recommendations include knowing the content and procedures of the games, paying attention to game ratings, establishing explicit game-playing guidelines, and educating children about the difference between media and real-life violence.

**Video Game Controversies.**
Funk, Jeanne B. ; Buchman, Debra D.
*Pediatric Annals* v24 n2 p91-94 Feb 1995
Reviews the literature on: (1) health-related effects of video games (VGs), including seizures, physiologic responses, and musculoskeletal injuries; (2) eye-hand coordination in VGs; (3) psychological adjustment related to VGs, including possible psychopathologies and violence-related effects; and (4) the educational impact of VGs. Also examines some prosocial applications of VGs, identifies trends, and offers recommendations for parents.

**Developing a Scientific Knowledge of Simulation/Gaming.**
Wolfe, Joseph ; Crookall, David
*Simulation & Gaming* v29 n1 p7-19 Mar 1998
Speculates on why such little progress has been made regarding the effective application of educational simulation/games and suggests that the field's eclectic foundation has been good for its development but bad for its rigorous assessment. Antecedents for meaningful research and generating a body of literature are outlined.
A Computer Adventure as a Worthwhile Educational Experience.
Grundy, Shirley
Interchange v22 n4 p41-55 1991
Australian researchers examined a computer adventure game's potential to provide worthwhile learning experiences by videotaping elementary students at play. Results indicated students learned about computers, read, had fun, and solved problems, but the game did not meet specified criteria for a worthwhile educational experience.
EJ442239

Video Games and Children. ERIC Digest.
Cesarone, Bernard
U.S.; Illinois; 1994-01-00
This digest examines data on video game use by children, explains ratings of video game violence, and reviews research on the effects of video games on children and adolescents. A recent study of seventh and eighth graders found that 65% of males and 57% of females played 1 to 6 hours of video games at home per week, and 38% of males and 16% of females played 1 to 2 hours of games per week at arcades. This study also found that, among five categories of video games, games that involved fantasy violence and sports games (many with violent themes) were most preferred by the students surveyed. Systems for rating the violent content of video games have been developed by the Sega and Nintendo companies, and by the National Coalition on Television Violence (NCTV). A 1989 survey of video games conducted by NCTV found that 71% of the games received 1 of 3 violent ratings. Contrary to early research, recent studies on the effects of video games on children have found connections between children's playing violent games and later aggressive behavior. A research review done by NCTV in 1990 found that 9 of 12 studies on the impact of violent games on children reported harmful effects. Some professionals speculate that performing violent acts in video games may be more conducive to children's aggression than passively watching violent acts on television. Another problem cited by critics of video games is that these games stress autonomous rather than cooperative action. Furthermore, children's attitudes toward gender roles may be influenced by video games, in which women are usually cast as persons who are acted upon, rather than as initiators of, action. Given the inconclusive nature of research, recommendations concerning video games must be conservative.
ED365477

Simulations and Games as Subversive Activities.
Christopher, Elizabeth M.
Simulation & Gaming v30 n4 p441-55 Dec 1999
Compares the advantages and disadvantages of using simulation games as a teaching tool. Describes some tactics to turn disadvantages into advantages, and concludes by describing the role of the game leader as crucial to learning outcomes.
EJ603657

Failure To Connect: How Computers Affect Our Children's Minds--for Better and Worse.
Healy, Jane M.
U.S.; New York; 1998-00-00
As the federal government provides funding to wire classrooms to the Internet, software companies market educational programs even for preschoolers, and school administrators cut funding in other areas to make room for new computers, it is time to examine the impact of computer use on children. Presented in three parts, this book examines the advantages and drawbacks of computer use for children at home and at school, exploring its effects on children's health, creativity, brain development, and social and emotional growth. Part 1 of the book discusses the current situation in schools, homes, and home schools; reviews the basics of educational computing; and offers guidelines for technology choices. Part 2 examines personal issues in technology use, including physical health, intellectual and brain development, and the social, emotional, and other personal aspects of children and teens using computers. Part 3 describes practical applications that illustrate appropriate and inappropriate ways to use new learning technologies with different age groups. The book concludes by noting that with thought, planning, and good sense, adults should be able to help children to develop minds that are able to deal
with the challenges of the future. Also, the real-life values in the lives parents structure for their children will determine the kind of world they will inhabit.

ED438041

**Video and Computer Games in the '90s: Children's Time Commitment and Game Preference.**
Buchman, Debra D.; Funk, Jeanne B.
*Children Today* v24 n1 p12-15,31 1996
Examined electronic game-playing habits of 900 children. Found that time commitment to game-playing decreased from fourth to eighth grade. Boys played more than girls. Preference for general entertainment games increased across grades while educational games preference decreased. Violent game popularity remained consistent; fantasy violence was more preferred by girls than by boys, who preferred human and sports violence games.

EJ544891

**Reevaluating the Impact of Video Games.**
Funk, Jeanne B.
*Clinical Pediatrics* v32 n2 p86-90 Feb 1993
Surveyed 357 seventh and eighth graders about video game play and preference. Found that approximately 64% of boys and 56% of girls played one to two hours of video games per week at home; and that, among five categories of video games, those most preferred by the students were games that involved fantasy violence and sports games.

EJ476434
OBJECTIVE
Obtaining a position that capitalizes on my usability skills along with my knowledge of how people learn by designing learning environments that use technology.

EDUCATION
Stanford University. M.A. Education; Learning, Design, & Technology; June 2001
University of Colorado at Boulder. B.A. Sociology; Magna Cum Laude; May 1997

COMPUTER
• Windows 95/98
• Windows NT
• UNIX
• Macintosh
• MS Office
• NT List/Mail
• Evolution
• e-education
• Acrobat
• Photoshop
• Illustrator
• RealProducer
• Dreamweaver
• Fireworks
• Director
• HomeSite

SKILLS
• Windows NT
• NT List/Mail
• UNIX
• e-education
• Director
• HomeSite

EXPERIENCE
Cisco Systems, Inc. San Jose, CA January 2001 – Present
• IT Learning Group Intern
• Designing a web-based training course using Reusable Learning Objects

• Instructional Coordinator
• JIU is the first regionally accredited online university
• Maintained JIU web pages - http://www.jonesinternational.edu/
• Developed and maintained JIU online courses
• Organized, designed, and maintained the e-Global Library
• Provided technical support to students, faculty, and administration

• Computer Lab Supervisor
• Supervised 12 lab advisors including hiring, scheduling, and payroll
• Facilitated and resolved computer software and hardware problems for students
• Supported operations of two LANs that overlooked 150 PCs

• BCOR 1000 Teacher’s Assistant
• BCOR 1000 teaches students basic and intermediate computer skills
• Taught one recitation in the Fall 1996 semester with 37 students
• Taught the Advanced Section in the Spring 1997 semester with 15 students

• Research Assistant
• Worked on a national assessment funded by the National Science Foundation
• Provided hardware and software support at the Center

Quark, Inc. Denver, CO June 1996 - August 1996
• Quality Assurance Intern
• Tested QuarkXPress 4.0 and QuarkImmedia 1.0 software products

HONORS
Completed Sociology Honors Program.
• Magna Cum Laude
• Examined how Internet Privacy can be established, violated, and protected
• Funded by the Undergraduate Research Opportunity Program Grant