WHAT MOTIVATES CHILDREN TO PLAY VIDEO GAMES?

A Thesis

Presented in Partial Fulfillment of the Requirements for
the Degree Master of Arts in the Graduate
School of The Ohio State University

By

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1985

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ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to my committee, Steve Acker and Don Cegala. Their guidance through the completion of this study was invaluable.

Thanks are also due to Mr. Myron Riegel and the fourth grade teachers at Sands Elementary School who allowed me access to the subjects used in this study.

A special thanks to my advisor, Steve Acker, for his encouragement and thoughtful suggestions throughout my graduate education.

Finally, I would like to thank Greg for his unwavering support from the beginning.
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CHAPTER 1
INTRODUCTION

Introduction

"A teenager stands transfixed before a video machine. His pockets bulge with quarters, and his dinner—a room-temperature slice of pizza—sits forgotten on a paper plate. Asked what he is doing, he responds, 'Nothing, just playing (Crawford, 1983).’"

The above quote represents the strong attraction of video games to children. The attraction is documented by the fact that at the peak of the video game phenomenon, in 1981, video games were the basis of a six billion dollar per year business (Nawrocki et al., 1983; Chaffin et al., 1982).

Although the video game industry is doing well, some parents and community leaders have placed restrictions on video game-playing and on the operation of video arcades. Even with these restrictions, children are still motivated to play video games and are finding time and money to do so.
Children are very captivated with video games. They spend hours at the arcade or in front of their home computer learning the games and the strategies necessary to do well at the games. Their minds are literally filled with knowledge about "Pac-Man" and invaders from space. Children are so motivated to play video games that they are learning the information that a video game provides. Instead of learning about invaders from space through video games, a better alternative would be to learn math, science, or reading through video games. In order to accomplish this, researchers must find out what motivates children to play video games.

**Purpose of Study**

The purpose of this study is to find out what motivates children to play video games. With this knowledge, programmers could incorporate these motivating features into educational software, thereby increasing the educational softwares' use and hopefully the softwares' instructional value.

**Literature Review**

Educators have long recognized that motivation is important in learning (Atkinson, 1958; Berlyne, 1960).
Piaget (1969) believes that "even behavior that may seem to be entirely intellectual, e.g. problem-solving or mathematical computing, must necessarily involve the motivating aspects of interest and cooperation. Without some motivation the effort requisite for that intellectual behavior would not be made (Furth, 1969: 15)." Bindra (1959) states that "human beings not only explore and find solutions to problems with which they are presented, but they also seek actively to seek problems (Bindra, 1959:34)."

Many researchers have discussed the importance of extrinsic motivation in learning (Atkinson, 1958; Bindra, 1959). However, it has been more recently suggested that extrinsic motivation may do more harm than good. The dissonance theory supports this idea. For many years, supporters of the dissonance theory have asserted that "the less the offered reward or the less the threatened punishment for belief-discrepant compliance, the greater the dissonance generated; hence, the greater the dissonance-reducing attitude change (Berger, 1971)."

In a dissonance theory study (1959) Festinger offered subjects either twenty dollars or one dollar to lie to another group of students and say that they had enjoyed an activity that they had just completed.
Festinger found that those subjects who had only been offered one dollar reported later that they had truly enjoyed the activity, more so than the subjects who were given twenty dollars. In other words, those subjects who were only given one dollar had little extrinsic reinforcement and, therefore, had to generate intrinsic reinforcement to justify lying (Loftus, 1983).

When children play video games, there is no extrinsic reinforcement. Players do not receive any prizes or money for playing; in fact, the players have to pay to play the games. Any reward that a player receives comes in the form of intrinsic reinforcement such as the feeling of accomplishment when a player achieves a goal. According to dissonance theory, the children must create positive attitudes towards playing to reduce any dissonance they might feel about paying a quarter each time they play.

The potential danger of relying solely on extrinsic factors for motivation is demonstrated by a study in which children were given the opportunity to engage in a drawing activity. The children were divided into three groups. The Expected Reward group were told that if they participated in the drawing activity they would receive a "Good Player" certificate. The Unexpected Reward group was not told about the award but were
given the award after they participated in the drawing activity. The No Reward group neither expected nor received the award. Two weeks later, the children were again offered the opportunity to participate in the drawing activity but no external reward was offered to the children. The children who were in the Expected Reward group in the previous part of the study spent significantly less time with the drawing activity than the children in either the Unexpected or the No Reward conditions. Lepper (1978) believes this is true because the children are associating the activity with the reward itself and when the reward is taken away, the interest in the activity is diminished. This study demonstrated that further interest in an activity that once only held intrinsic interest is diminished with the incorporation of an external reward (Lepper et al., 1978).

Further support for the idea that extrinsic rewards may do more harm than good can be found in a study in which children from a low socio-economic group were put into either a material or symbolic testing situation (Spence, 1971). The children in the material testing situation were rewarded with candy if they made correct choices between a series of sets of two drawings while the children in the symbolic testing situation received
nothing for engaging in the same activity. Both groups
were able to see a flashing light when they got an
answer correct. The flashing light represented a
symbolic reinforcer while the candy represented a
material reinforcer. Spence (1971) found that the
children in the symbolic group performed better than the
children in the material group. Specifically, the
children in the material group made a total of 112
correct responses while the children in the symbolic
group made a total of 146 correct responses. From these
results, Spence postulates that "a frequent effect of
using material reinforcers instead of or in addition to
symbolic ones is to interfere with the performance of
lower-class subjects (Spence, 1971)."

"An activity is generally said to be intrinsically
motivated if there is no apparent external reward
associated with the activity. In other words, the
reward is said to be in the activity itself (Lepper et
al., 1978)." With video games, it is, apparently,
intrinsic motivation that is so appealing to children.

By identifying the motivating factors in video
games, educators may acquire a very unique educational
tool—the video game. Although many may hesitate to put
video games in the classroom, the basis of any video
game is already becoming the norm in every classroom in
the United States--the microchip.

Computers are not very different from video games. The main difference is that computers are built to serve many functions while video games are built solely to function in a game capacity. This means that, while a video game can have much of its memory devoted to, for instance, graphics, a computer can only have a small portion of memory devoted to each function.

Many advancements have recently been made in the sophistication of home computers. The newer computers use the monitors to their fullest capacity and, therefore, the colors and graphics can be more sophisticated. Also, highly advanced synthesizers are being installed into home computers which means that music and sound effects can be more complex. The memory capacity of home computers has also grown which means that more complex programs can be stored into memory. Because of these advancements, computers can now perform in a similar fashion to video arcade games.

Computers are becoming a reality in the classroom that simply cannot be ignored. Because they are such an enormous investment, they must be used to their fullest capacity. One way in which this may be accomplished would be to harness the motivating factors in video games and then incorporate these factors into
educational software.


As a result of the three studies, Malone identifies three broad categories of motivating features of video games. These categories, challenge, fantasy, and curiosity, will be used to organize the remainder of the literature review.

Challenge

DeCharme (1968) discusses the importance of challenge and believes that "mastering an uncertain situation is valued for its own sake rather than merely for the relief that it produces (DeCharme, 1968: 327)."

Levine et al. (1983) agree by stating that if something is to be intrinsically motivating it must include challenge for the exercise of mastery. Piaget (1979) believes that if a child's competence is to be extended, the child must be exposed to things that are neither too old nor too new because the "former provide no challenge
because of surfeit, whereas the latter provide no challenge since they do not correspond to anything in her current structures and so cannot be assimilated (or accommodated to) by her (Boden, 1979: 33).

The incorporation of challenge in a video game is often cited as one of the most motivating features of a video game (Malone, 1980; Chaffin, 1982; Frederickson, 1982). Included in the area of challenge are goals, variable levels of challenge, fast pace, the opportunity of improvement, and uncertain outcomes. Each of these subfactors will be discussed in order.

Most of the past research emphasizes the idea that there must be clear-cut goals in a video game if it is to be motivating (Chaffin, 1982; Malone, 1980; Symposium, 1983; Bowman, 1982). For his first study in his dissertation, Malone interviewed a group of sixty-five elementary school children and asked them about twenty-five video games. The particular twenty-five games had come from a list provided by the teachers. For each of the twenty-five games the children were asked if they had ever played the game. If the children answered yes, they were asked if they liked the game. If the children answered that they liked the game, they were asked if they just liked it or if they liked it a lot. After all of the games were
ranked, the children were asked which game was their favorite and why they liked or did not like the games.

In order to find out what motivated the children in this study to play the games, Malone rated several games on their motivational features. He then correlated game features and game preference. The feature that had the highest correlation ($r = .65$) with game preference was the incorporation of a goal.

In Malone's second study he used variations on the game Breakout. For example, he systematically left out feedback or scorekeeping in different versions of the game.

Malone asked ten Stanford undergraduates to rate different versions of the game Breakout on a scale from one to five. A rating of five was the highest possible score. Malone used multiple regression to predict game ratings from game features. The major finding in this study was that the incorporation of a goal was the most important feature of the video game ($r = .77$).

Malone suggests that Breakout offers a visually compelling goal because you can see the ball destroying the wall of bricks and it also offers the opportunity to see how close you are getting to the goal with the score-keeping. When any of these features were removed,
the rating of the game dropped. Malone believes that this is because there is no longer a clear goal and the player has no idea of how close they are to the goal. When the score-keeping device was omitted, the rating dropped to 4.1 and when the ability to see the brick wall being destroyed was omitted, the rating dropped to 3.3. When both of these features were omitted, the rating dropped to 2.0.

Malone (1980) suggests that the incorporation of a clear-cut goal is mandatory for an instructional computer game. In each of his studies, a clear-cut goal was found to be a necessary part of computer game. Synthesizing these findings with prior research, Malone suggests how goals should be incorporated into computer games. Specifically, Malone states that:

1. Simple games should provide an obvious goal.
2. A complex environment without built-in goals should be structured so that users will be able to easily generate goals of appropriate difficulty.
3. The best goals are often practical or fantasy goals instead of goals that simply require a skill.
4. The players must be able to tell whether they are getting closer to the goal (Malone, 1980).

Wold (1982) suggests that children must learn the importance of setting goals and planning ahead. When a child plays a game, the child is learning about goals.
The child learns what the goals are (winning the game) and how to go about reaching the goal (rules and procedures). "Playing a game demonstrates graphically that students will fare better if they have some understanding of what they are trying to accomplish and how they can reasonably expect to reach the goal (Wold, 1982)."

A second motivating factor of video games found in prior research is the incorporation of variable levels of challenge (Malone, 1980; Chaffin, 1982; Bowman, 1982). Children do not like games that are too easy for them (Kohl: Symposium, 1983). If a game is too easy, many children will abandon that game (Kohl: Symposium, 1983). On the other hand, games that are too difficult will also be abandoned by children (Kohl: Symposium, 1983). Kohl (1983) explains that, in his teaching, he has found more success starting students with more difficult ideas and then moving to the more simple. "I'd rather start with a complex, beautiful, visual program and show kids what they can do, and then give them LOGO or Pilot or Basic, and say, see, this is where you can go (Kohl: Symposium, 1983: 48)."

"Computer games, because they are so much fun to play, encourage students to 'stick to it until the end' (Wold, 1982)." Interestingly though, with variable
levels of challenge, a player will never "win" the video game because, as the player gets better, another level of challenge is added and, eventually, the game will always win. Yet, this still remains as one of the most motivating factors of a video game simply because it keeps the player challenged (Chaffin et al., 1982). Bruner et al. (1984) report evidence of the need for challenge among learning disabled children. The children played a learning game called "Space Eggs" that had variable levels of difficulty. At a certain point, however, one child mastered all of the levels. The game, therefore, just kept repeating the most difficult level over and over. The child simply quit playing the game and during subsequent days would choose different games to play (Bruner et al., 1984). Malone (1980) also agrees that there must be variable levels of difficulty. He believes that it should either be chosen automatically by the computer in accordance with the skill level of the player, chosen by the player himself, or determined by the opponent's skill (Malone, 1980).

A video game will also be challenging for the player if it is fast-paced because the player must direct all of their attention to the game. Also, "high response rates lead to automatic responses. When a task is learned automatically it is not readily forgotten
(Chaffin: Symposium, 1983: 54)." In other words, there
is no time to think about the responses because the game
is moving too quickly. As Chaffin (1982) notes, "During
the span of a game several hundred responses are not
only possible but are required for good performance.
Overt responses from thirty to more than one hundred per
minute are not uncommon. Covert responses (decisions)
probably occur at the rate of several hundred per minute
with the veteran arcade player. . . The task has the
player's undivided attention (Chaffin, 1982)."

The fast-paced game is very exciting to the player.
Author and teacher, Herbert Kohl (Symposium, 1983)
commends video games in this respect.

"Look at the kids in the arcades: they're
doing energy checks, firing missiles, looking at
how many moons they have, looking at how many
missiles the enemy still has left. You ask the
same kids in the classroom to calculate 10 minus
20 or 20 minus 10 and they say, huh? because
they don't want to do it, have no reason to do
it. They're using all those skills in video
game playing, including simultaneous functioning
and that's good for kids. We have to respect
the intelligence of children (Symposium, 1983)."

Although it is not often cited, the opportunity for
improvement is part of the challenge of video games
(Chaffin et al., 1982). Chaffin and his colleagues
developed the "Arcademic" games which apply video game
formats to educational software. The games were
developed after spending many hours observing video game players and drawing on past research. Chaffin believes that there must be a chance for improvement. As stated above, if games are too difficult for players, the game will be abandoned. However, if the players can see that they may improve their performance, the difficulty will be seen as a challenge and not an obstacle (Chaffin et al., 1982). As Chaffin also notes, "Experienced players attain much higher scores than the beginner, but the opportunity to improve performance is always available to both (Chaffin et al., 1982)." This feature of video games functions as reinforcement, and, therefore, encourages players to try again and again.

Although children want to know that they can improve their performance on a video game, they do not want to know for certain if they will reach particular goals during each and every play of the game. If players knew, they would stop playing the game because it was no longer challenging (Bruner et al., 1984; Malone, 1980; Symposium, 1983). Therefore, another factor in video games that aids in the challenge of the game is uncertain outcomes. Players are never sure exactly how they will do from play to play. Of course one of the ways in which a video game does this is by having varying levels of difficulty (Malone, 1980).
**Fantasy**

All of the above factors of video games that make up the *challenge* of a video game are important in the motivation to play video games. The second category of motivating factors, according to past research, is *fantasy* (Malone, 1980; Chaffin, 1982; Bowman, 1982; Wanner, 1982). According to Malone (1980), games that include fantasy are more interesting than games that do not include fantasy.

Malone makes a distinction between different types of fantasies in his dissertation. For study three in his dissertation, Malone used fifth grade students who were asked to rank different versions of the game *Darts* between one and five. There were a total of eight versions of *Darts*. One of the versions was the standard version of Darts in which students, using their knowledge of fractions, tell the computer where an arrow should go if it is to pop the balloon that is presented on the screen. Malone calls this an *intrinsic fantasy*. In other words, popping the balloons with the arrows is necessary to the skill being used. In another version of *Darts*, there are balloons and arrows, however, they only pop when a
player gets an answer correct, they are not part of the skill at all. A player does not aim at balloons in this game, the player simply aims at a line on the other end of the screen. The balloons are at the top of the screen and simply signal that a player made a correct response. Malone calls this an extrinsic fantasy because the fantasy is interchangeable and not related to the skill used in the game. In other words, in this version of Darte, rockets could have gone off or a flag could have gone up when the player made a correct response. In the previous version, the balloons and arrows were a necessary part of the calculations.

Malone measured preferences by time spent with the different versions as well as with the ratings. The girls played with the extrinsic version for 20.8 minutes and the intrinsic fantasy version for 19.8 minutes. The boys, on the other hand, played with the extrinsic version for 25.8 minutes and the intrinsic version for 34.5 minutes. Malone used multiple regression to further predict time spent on different versions of a game by the features present in each version. The Beta for the extrinsic fantasy was .67 for boys and -.10 for girls. In other words, boys would be more likely to play the extrinsic fantasy version of Darte than the girls. For intrinsic fantasy the Beta in multiple
regression was .27 for boys and -.49 for girls. Again, boys would be more likely to play this version than the girls. The girls were averse to this version of the game. Malone summarizes his major findings by stating, "There is an important difference in what boys and girls apparently like about the Darts game. Boys like the fantasy of arrows popping balloons and girls apparently dislike this fantasy. (Malone, 1980: 32)." Malone uses "fantasy" in this instance to refer to the players' ability to pretend that they are actually popping real balloons with real arrows. Malone believes that the reason that the girls preferred to play with the extrinsic fantasy version of the game as opposed to the intrinsic fantasy version of the game was because girls do not like the fantasy of popping balloons with arrows and the extrinsic fantasy version made the popping of balloons less salient. In other words, in the extrinsic fantasy version the arrows and balloons fantasy only served as a marker for correct answers, they were not necessary to the skill of using fractions. Because of this, the fantasy was of less importance. Also, the balloons only popped when the player responded correctly, therefore, the girls were exposed to this fantasy less often.
A game that has the feature of fantasy has the ability to evoke mental images such as destroying the enemy or winning the race. As Needham (1982-83) notes, "For young boys, escape can be very much like stepping into a frame of one of their favorite comic books. The extraterrestrial ZAPS, GRONKS, and WHOOSHES are all familiar. Now however, the boys are not excluded: They enter the macho space world as equals of the planetary adventurers of their imaginations (Needham, 1982-83)."

This points to an interesting problem with video games, however. The majority of games are directed towards boys' fantasies rather than girls' fantasies. Bruner (1984) states that "there is an urgent need for widely available video games that make as firm contact with the fantasy life of the typical girl as with that of the typical boy (Bruner, 1984)." Malone supports this idea in his research. One of the games that he used in his study involved aiming darts at balloons. Malone found that, overwhelmingly, boys enjoyed this game more than girls (Malone, 1980).

Fantasy may also be found in the form of wishes. Karnes (1981) asked a group of fourth and fifth grade gifted students what their favorite wish would be. Karnes found that the boys most often wished for
material things while the girls wished for things that
dealt with personal or family desires. These findings
seem to suggest one difference between the fantasies of
boys and girls. In another study, Lippa (1983) put
sixty-one females and sixty-two males in a quiz show
situation. They were able to choose the question
categories that were deliberately masculine or feminine.
Lippa found that the subjects’ gender did play a
significant role in question choice, especially for
women or low-masculine people (as determined by the Sex
Role Inventory). He suggests that the reason might be
due to the fact that women or low-masculine people
believe that the masculine questions will be too
difficult. Past research with video games suggests that
games incorporating male fantasies are not too difficult
for females, they are simply uninteresting for females
(Meadows, 1985). It may also be due to the fact that
women feel uncomfortable in the masculine situations.
This research supports the idea that there are
differences, if only in interests, between males and
females.

Past research supports the idea that there are
differences between male and female fantasies and that
it may affect interest in certain video games (Meadows,
1985). A video game that includes an engaging fantasy
can make video game-playing very exciting for the player. As one player put it, "You sense that you are responsible for the plight of each little dot, almost to the point of empathy (Bowman, 1982)."

**Curiosity**

The third major category of motivating factors is curiosity. Klausmeier (1975) defines curiosity as "a kind of intrinsic motivation that may be conceptualized as an intention to seek information about an object, event, or idea through exploratory behavior (Menis, 1984)." Piaget believes that curiosity starts very young in children. As early as eight to ten months old, a child will look for objects that are placed out of sight. When an object is placed out of sight behind a screen, the child will move the screen or walk around the screen. This behavior is described as exploratory. The child is curious about where the object is located (Berlyne, 1960). Skinner also addresses the importance of curiosity. Skinner believes that children have a natural curiosity that should be taken advantage of in the classroom. "A child sees things and talks about them accurately afterward. He listens to news and gossip and passes it along...He seems to have a
'natural curiosity,'...an 'inherent wish to learn.' Why not take advantage of these natural endowments and simply bring the student into contact with the world he is to learn about (Skinner, 1968:103)?" Skinner goes on to say that curiosity does not seem to be anything a child has learned. "By turning his eyes toward the source of a noise, for example, a child increases his chances of receiving possibly important visual stimulation. ...This response has obvious survival value and is evidently part of the child's genetic endowment (Skinner, 1968: 178)."

Malone identifies two types of curiosity. "Sensory curiosity involves the attention attracting value of changes or patterns in the light, sound, or other sensory stimuli of an environment (Malone, 1980)." The second type of curiosity is called cognitive curiosity and is accomplished by presenting "just enough information to make their [the player] existing knowledge seem incomplete, inconsistent, or unparsimonious. The learners are then motivated to learn more in order to make their cognitive structures better-formed (Malone, 1980)." In video games this function of curiosity is incorporated into the games in several ways.
First of all, a game should provide feedback. With video games, feedback is used to spark curiosity. It gives the players just enough information to make them want to go on to find out what is next in the game. Feedback also sparks curiosity in that it makes a game responsive to the player. According to Malone (1980), this makes the game "interestingly complex." Past research has often claimed the beneficial functions of feedback. Presssey (1926) was an early researcher of teaching machines and also one of the first to emphasize the importance of immediate feedback (Skinner, 1968). Clarke (1972) found that feedback promotes persistence in activities. When subjects were given feedback, they were more likely to persist in trying to solve even unsolvable problems. Feedback, however, should not give solutions but rather guidelines to help the player. In other words, students do not want to see the answers to problems before they have a chance to solve the problems themselves. Students who were given the answers to problems in the corner of a computer screen before they had a chance to solve the problems learned less than students who were given constructive feedback after they had a chance to solve the problems (Anderson, 1972). Comments such as "The answers should not be shown
immediately, as this causes cheating to be easier," were common in Clarke's study (Clarke, 1972). Peterson (1974) was not able to understand why subjects who were given 100% feedback (in the form of the correct answers on the back of the card with the questions) had significantly low drive (or motivation) scores. Again, since the subjects were able, easily, to peek at the answers there was no motivation to try to study and learn the questions and answers (Peterson, 1974). Anderson suggests that "a delay between the response and knowledge of the correct response (the correct answer) not only fails to impede learning but actually improves retention (Anderson, 1971)." Video games offer this type of feedback. For instance, in an educational video game called *Speed*, players test word retention. The screen shows a speedometer and a series of error lights. If they guess correct words, the speedometer goes up and words are presented faster and faster. If they guess a wrong word one of the error lights go on and the speedometer slows down. The goal of the game is to get to 126 words per minute and the screen clearly shows their progress (Loftus, 1983).

Malone believes that feedback should be surprising yet constructive. Feedback can be surprising by using randomness. The player often does not know how the game
will react to certain actions. He believes that constructive feedback should not simply tell the players what they are doing wrong, or what is incomplete, it should also tell them how to change what they are doing to make it right or complete (Malone, 1980). The game Darts, did this. The players have to aim darts at balloons. If the players miss feedback is provided that tells the player such things as "Way too high" or "A little low (Loftus, 1983)." Chaffin (1982) believes that feedback is one of the most important elements of video games. He believes that feedback should be immediate so that the players can instantly know if they did something right or wrong. (Chaffin, 1982).

Feedback is also given to the player by the use of a scoring feature. Malone (1980) found that the scoring feature was an important in a video game. The results of his first study in his dissertation showed a correlation between game preference and the inclusion of a scoring feature of .56. Nawrocki (1983) found that most of the people she studied were motivated by scores showing their own progress. Also very motivating, but only to a small number of the best players, is the chance to get to put your initials on a permanent record of the best players (Meadows, 1985). As with other forms of feedback, scoring lets players know exactly how they
are doing as they play the video game.

Finally, curiosity may be aroused in video games with sound, graphics, and color. As with feedback, these features are used to arouse curiosity. They spark what Malone refers to as sensory curiosity (Malone, 1980). Sound, graphics, and color may be used as decoration such as having music play at the beginning of a game. They may also be used as reward such as having lights flash when a certain goal has been met. Also, these features can communicate information more effectively than words or numbers (Malone, 1980). For example, when Pac-Man gets eaten, the player can see that his Pac-Man has shriveled up and the music supports this. Berlyne (1960) found that bright colors such as reds, yellow, or blues, are more arousing than dull colors such as grays, browns, or blacks. He attempts to explain this by stating that "grays, browns, and blacks are more likely to be found in relatively unimportant, unvarying background objects (Berlyne, 1960: 172)." Berlyne also finds that high-pitched sounds seem to be more exciting than low-pitched sounds (Berlyne, 1960). For use of sound in video games, Malone gives the example of using circus music at the beginning of a circus game to arouse curiosity (Malone, 1980). Using music in this way may attract players to
the game because it arouses their sensory curiosity. He also found that audio effects are important in game preference. For his first study in his dissertation, Malone correlated game preference with the inclusion of audio effects and found a correlation of .51.

Interestingly, however, prior research on video games seem to agree on the fact that sound, graphics, and color are of minor importance to players of video games (Chaffin, 1982; Malone, 1980; Nawrocki, 1983). Nawrocki believes that the use of color might only be a distraction from more important cues if the games are to be used for learning purposes (Nawrocki et al., 1983). Malone believes that using sound, graphics, and color to arouse curiosity might work at first, but soon these factors may simply bore the players (Malone, 1980).

As the literature review has pointed out, many factors may contribute to the motivational aspect of video games. However, further research must be done to insure the programmers of educational software that these, in fact, are the motivating elements of video games. Past research has relied heavily on just one study as a basis of answering the question, "What motivates children to play video games." This thesis will attempt to answer further that question. Malone, who is most often cited in the area of motivating
factors of video games, believes that the three most important motivating factors of video games are challenge, fantasy, and curiosity.

In terms of video games, challenge, fantasy, and curiosity have been broadly defined (Malone, 1980). The literature review identifies sub-categories of each of the terms that may or may not be important in motivating children to play them. For example, a challenging game would incorporate clear-cut goals and variable levels of challenge. The game would be fast-paced, the outcome of the game would be uncertain, and there would be the chance for improvement. A game that included fantasy might incorporate intrinsic or extrinsic fantasies. Also, the appeal of the fantasy would depend on the player's gender. Finally, a game that incorporated curiosity could include features that sparked both sensory and cognitive curiosity. Cognitive curiosity could be aroused with feedback and a scoring feature while sensory curiosity could be aroused with sound, graphics, and color. The terms, challenge, fantasy, and curiosity are very broad.

The following research will attempt to identify which components of challenge, fantasy, or curiosity are the most motivating factors of video games. The components of challenge to be considered are: goals;
variable levels of challenge; chance for improvement; fast-pace; and, uncertain outcomes. Fantasy is broken down into intrinsic and extrinsic fantasy, while curiosity is subdivided into sensory and cognitive curiosity.

Specifically, the following hypotheses will be examined:

H1: The preferences of elementary school children for video games will depend on the game's incorporation of

1. Goals
2. Variable levels of challenge
3. Chance for improvement
4. Fast-pacing
5. Uncertain outcomes.

H2: Elementary school children will prefer video games that incorporate intrinsic fantasies to games that incorporated extrinsic fantasies.

H3: Males and females will be attracted to different fantasies.
H4: Elementary school children will prefer video games that appeal to cognitive curiosity (i.e. feedback and scoring) more than games that appeal to sensory curiosity (i.e. sound, graphics, and color).
CHAPTER 2

METHODOLOGY

Subjects

Three sets of subjects participated in this study.

One group of thirty students served as a focus group from which information used in the construction of a questionnaire designed to measure game preference was gathered. There were thirteen males and seventeen females. All of the students, ages nine or ten, were attending the fourth grade at a Northeastern Ohio elementary school. The school draws from a high socioeconomic neighborhood.

A second set of subjects responded to prompts generated in the focus group to help identify what attributes of video games they liked. They were also asked to list their five favorite games. These subjects were also fourth graders, ages nine and ten, attending the same Northeastern Ohio elementary school. There were fifteen females and twenty males.

Both groups of children had been using computers in the classroom for approximately eight weeks during their third grade year. The children used Apple IIe's in the
classroom. In addition to using computers in the classroom, many of the students owned home computers. All of the children had experience playing video games.

The information gathered from both of these groups was used in the construction of a questionnaire that was administered to a third group of subjects (n=8). These subjects were trained as expert judges and used a questionnaire designed to rate video games on their motivational features.

There were five, eleven year old males who served as judges. Each of these males was familiar with, and was an expert player of all of the video games that were used in the study. In addition, three females (ages 11-12) served as judges. The females, although not expert players, were familiar with the games used in the study. The sample was drawn from volunteers at an arcade and at a park. Each judge evaluated eight games.

Materials

The instrument used for the study was developed initially using focus group interviews. Participants were asked to think about video games and what made them fun to play. The students were divided into four groups with seven or eight students in each group. A focus group leader directed and taped the discussion. The
children were asked to talk about their most and least favorite games, why they disliked or liked certain games, and how they feel when they play video games. The children were also asked about the things that they would rather be doing instead of playing video games. The focus group interview was designed so that the children would be able to identify through group discussion what motivates them to play video games. When the children were asked individually about why they like playing their favorite video game, the answer was often, "because it's fun." However, when the whole group of children began discussing the games, more specific reasons why the games were fun became apparent. At the conclusion of the group discussion, each child filled out a questionnaire with both multiple choice and open-ended questions about video game features they found enjoyable. This questionnaire also asked the students their feelings about the computers they use in school. For instance, they were asked if they liked using the computers at school and would they like more time using the computers at school (See Appendix 1 for complete questionnaire). After all of the students had completed the questionnaire, they were thanked and dismissed to their classroom. In total, each group spent approximately one half hour in the interview.
Questionnaire Design and Administration

From the information derived from the focus group interview a second questionnaire was developed. This questionnaire was administered to thirty-five fourth graders. Part one of the questionnaire was handed out to the students first. This part of the questionnaire simply asked the students to name their five favorite video games. The purpose of this open-ended questionnaire was to allow the students to recall their favorite video games. The students were told to list as many as five of their favorite video games, starting with their most favorite, then their second favorite, and so on. The students were told that they did not need to fill in all five spaces if they did not have five favorite games. After all of the students had returned part one of the questionnaire, the second part of the questionnaire was distributed. The second part of the questionnaire asked the students why they thought their favorite video game is fun. Because these young children have trouble verbalizing why they think their favorite games are fun, a list of motivational features of video games, compiled through prior research, and the focus group discussion, was provided. The students were told to first, write down the name of their all-time
favorite video game. Then they were told that we knew that a lot of people say video games are fun but what we really wanted to know was, why the video games are fun. After this part of the questionnaire was completed and handed in, the final part of the questionnaire was distributed. The final part of the questionnaire asked students to rank order a list of eight video games. The particular eight games were chosen from the games that were talked about as being the most favorite during the focus group interview. The list was randomly ordered so that each student would get a different order of games. The students were told to look at the list of games and circle any games that they had played before. Then, using only the circled games, they were to rank the games from most favorite to least favorite. As with each part of the questionnaire, the students were told that there were no wrong answers, but that their opinions were important.

The order in which the three parts of the questionnaire were distributed was deliberate. The first part of the questionnaire that asked students to list their five favorite games was given out first so that they would not be prompted by the names of the video games that were supplied in the later questionnaire. The second part of the questionnaire
that asked the students to state why they liked their favorite video game was given next so that the students would easily remember the game they listed as being favorite on the previous part of the questionnaire and write about that game. This was also a good test of consistency because it was possible to see if a student's favorite game choice remained the same. Finally, the third part of the questionnaire that supplied a list of video games was given last so that, again, the list would not tempt the students to pick a name off of that list as their favorite game simply because it was on the list. The purpose of the first two parts of the questionnaire was to get students to think on their own about the motivational factors of the games they enjoyed playing (See Appendix 2 for complete questionnaire).

Judges' Questionnaire Design and Administration

A list of eight games was created. Of the eight games, five were chosen to reflect the rank ordering of the earlier group of students. Three other games that, according to the researcher's judgement, did not incorporate highly motivating features rounded out the eight game list. The purpose for including the three additional games was to increase variance. By including
games that do not incorporate highly motivating features, it is possible to see how those games are ranked in comparison to how the favorite games are ranked (See Appendix 3 for complete list of games).

The judges' questionnaire was designed to tap into the motivating factors exhibited by the eight video games. The questionnaire was developed from prior research on video games and from the responses of the previous two groups of students. The thirty-three questions on the questionnaire represented the subfactors of challenge, fantasy, and curiosity. The items were randomly ordered.

The eight games to be evaluated by the judges were presented as videotaped segments showing each game being played. The videotape game-playing was shot such that both the action on the screen and the player's hand and finger movements could be seen. The camera was positioned over the shoulder of the player and a high-angle medium close-up shot was framed. The camera remained stationary throughout the play of each game. The method of videotaping the games was chosen to ensure a consistent display of the games since the male and female judges rated the games at separate times (See Appendix 5 for camera position and framing).

Before they actually rated the eight games used in
the study, the judges were trained on a different game. The researcher went through each question on the judges’ questionnaire, explaining and clarifying each question to the judges. The researcher also used the sample game to make sure that the judges were answering each question in the way it was intended. After the judges were trained, they viewed the eight taped games and used the questionnaire to rate each game. All of the judges had to complete their evaluation of one game before the next game was shown. Although all of the judges had experience with each of the games, they used the videotaped recording of the games from which to do their ratings. The male judges viewed the tape and evaluated each game in a video arcade. The female judges viewed the tape and evaluated each game at a city park.

Analysis

The original thirty-five subjects ranked a set of eight games by game preference. Of these eight games, the top five games were videotaped for the judges’ evaluation. To determine whether the judges were consistent with the larger group of subjects, the judges’ ranking of these five games was compared to the preference ranking of the original thirty-five subjects. This ranking was similar to the original subjects’
ranking (r = .55). The first and last ranked games are identical in both rankings and the mean scored for all five games are high, indicating that all of the games are enjoyed by the judges (See Tables 1 and 2 for rankings).

Table 1

Aggregate Ranking of Game Preference by Original Thirty-Five Subjects
Data reported are means derived from eight point scale with eight as most preferred and one as least preferred

<table>
<thead>
<tr>
<th>Original Ranking of Game Preference</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole Position</td>
<td>7.3</td>
</tr>
<tr>
<td>Dig Dug</td>
<td>5.5</td>
</tr>
<tr>
<td>Donkey Kong</td>
<td>4.9</td>
</tr>
<tr>
<td>Centipede</td>
<td>4.7</td>
</tr>
<tr>
<td>Pac-Man</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Next, the judges ranked an expanded set of eight games. This set was comprised of the original five games plus three games which, according to the researcher’s judgement, did not incorporate strong motivational features. The judges’ aggregate ranking of
the eight games show that one of the three games included by the researcher, as containing weak motivational features, Track and Field, was actually ranked number one (most preferred) by the judges.

Track and Field is a male-oriented game. All of the track stars in the game are male. The high ranking of Track and Field suggests that the male-orientation of the game does not diminish the females’ attraction to the game.

The judges’ ranking of the games show a clear dividing line between the top six games and the bottom two games (See Table 1 for the original ranking of the games and Table 2 for the two rankings by the judges).

Once the games had been ranked, the judges completed a thirty-three item questionnaire to help identify the motivating factors of the game. Each item could be grouped under a subfactor of challenge, fantasy, or curiosity (See Table 3 for list of subfactors used in the study).

The mean score for each of the subfactors of challenge, fantasy, and curiosity was calculated for each game. Then, the eight games were ranked on each subfactor. These data were then correlated with the original ranking of the eight games.
Reliability was tested across the judges using Cronbach’s Alpha.
Table 2
Aggregate Ranking of Game Preference by Judges
Data reported are means derived from four point scale with one as most preferred and four as least preferred

<table>
<thead>
<tr>
<th>Judges Ranking of Five Games</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole Position</td>
<td>1.80</td>
<td>.27</td>
</tr>
<tr>
<td>Donkey Kong</td>
<td>1.88</td>
<td>.27</td>
</tr>
<tr>
<td>Centipede</td>
<td>1.93</td>
<td>.42</td>
</tr>
<tr>
<td>Dig Dug</td>
<td>2.00</td>
<td>.37</td>
</tr>
<tr>
<td>Pac-Man</td>
<td>2.10</td>
<td>.45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Judges Ranking of Eight Games</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track and Field</td>
<td>1.71</td>
<td>.38</td>
</tr>
<tr>
<td>Pole Position</td>
<td>1.80</td>
<td>.27</td>
</tr>
<tr>
<td>Donkey Kong</td>
<td>1.88</td>
<td>.27</td>
</tr>
<tr>
<td>Centipede</td>
<td>1.93</td>
<td>.42</td>
</tr>
<tr>
<td>Dig Dug</td>
<td>2.00</td>
<td>.37</td>
</tr>
<tr>
<td>Pac-Man</td>
<td>2.10</td>
<td>.45</td>
</tr>
<tr>
<td>Qix</td>
<td>2.56</td>
<td>.40</td>
</tr>
<tr>
<td>Sprint</td>
<td>2.96</td>
<td>.43</td>
</tr>
</tbody>
</table>
Table 3

**Subfactors of Challenge, Fantasy, and Curiosity Measured in this Study**

**CHALLENGE**

Uncertain Outcomes  
Fast-Pacing  
Variable Levels of Challenge  
Chance for Improvement

**FANTASY**

Appeal of the Theme

**CURIOSITY**

<table>
<thead>
<tr>
<th>Cognitive Curiosity</th>
<th>Sensory Curiosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback</td>
<td>Sound</td>
</tr>
<tr>
<td></td>
<td>Music</td>
</tr>
<tr>
<td></td>
<td>Graphics</td>
</tr>
<tr>
<td></td>
<td>Color</td>
</tr>
</tbody>
</table>
CHAPTER 3
RESULTS

Reliability

Reliability was tested across the judges over the thirty-three items in the questionnaire. Due to low reliability fifteen of the items were omitted. Intrinsic fantasy, extrinsic fantasy, and goals had to be omitted from the study since they were to be measured by the items removed because of low reliability. Reliability calculated on the remaining eighteen items was .69.

Challenge

The only subfactor of challenge that correlated with the original game preference ranking was chance for improvement (r=.63;p<.05). This suggests that in the higher ranked games there was chance for improvement (See Table 4).
Table 4

*Correlations of the Subfactors of Challenge and Game Preference
*Only correlations at p < .05 are reported

<table>
<thead>
<tr>
<th>Subfactors of Challenge</th>
<th>Original Game Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Levels of Challenge</td>
<td>.39</td>
</tr>
<tr>
<td>Uncertain Outcomes</td>
<td>-.03</td>
</tr>
<tr>
<td>Fast-Pacing</td>
<td>.23</td>
</tr>
<tr>
<td>Chance for Improvement</td>
<td>.63*</td>
</tr>
</tbody>
</table>

*correlation significant at p < .05
Fantasy

After the fifteen nonreliable items were removed from the analysis, only one item, appeal of the theme, remained as a subfactor of fantasy.

As represented by this one item, fantasy did not correlate at a statistically significant level with the original ranking of games. This suggests that the ranking of the games does not correspond to the appeal of the themes of the games (See Table 5).

Table 5

Correlations of the Subfactors of Fantasy and Game Preference
Only Correlations at p<.05 are reported

<table>
<thead>
<tr>
<th>Subfactors of Fantasy</th>
<th>Game Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appeal of the Theme</td>
<td>.50</td>
</tr>
</tbody>
</table>
**Curiosity**

When looking at the correlations between the original game preference ranking and the subfactors of curiosity, *sensory curiosity* seems to be more important than *cognitive curiosity*. *Sensory curiosity* correlated at a statistically significant level with game preference ($r = .67; p < .05$) but *cognitive curiosity* did not. In addition, several subfactors of *sensory curiosity* correlated at a statistically significant level with the original game preference ranking. *Graphics* ($r = .63$), *sound* ($r = .66$), and *music* ($r = .64$) all correlated with game preference ($p < .05$). No other factors of curiosity correlated with the original game preference ranking. (See Table 6).

**Subfactors Most Evident in the Top Six Games**

Some subfactors of curiosity were found in the top six games but were less apparent or nonexistent in the two least preferred games. For *color*, the top six games were rated from 1.2 to 1.6. This was out of a four-point scale, one being the highest. Games seven and eight were rated at a 4.0 and a 2.1.
Table 6

Correlations of the Subfactors of Curiosity and Game Preference
Only correlations at p<.05 are reported

<table>
<thead>
<tr>
<th>Subfactors of Curiosity</th>
<th>Game Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound</td>
<td>.66*</td>
</tr>
<tr>
<td>Music</td>
<td>.64*</td>
</tr>
<tr>
<td>Color</td>
<td>.31</td>
</tr>
<tr>
<td>Graphics</td>
<td>.63*</td>
</tr>
<tr>
<td>Sensory Curiosity</td>
<td>.67*</td>
</tr>
<tr>
<td>Cognitive Curiosity</td>
<td>.49</td>
</tr>
<tr>
<td>Feedback</td>
<td>.36</td>
</tr>
<tr>
<td>Curiosity</td>
<td>.59</td>
</tr>
</tbody>
</table>

*correlation significant at p<.05
This suggests that the top games all used color well, game seven did not use color at all (it was black and white), and game eight did not use color as well as the top games. This also suggests that those games that use color well, tend to motivate children to play (See Tables 7 and 8).

Similar results are shown with sound, graphics, and sensory curiosity. The top six games rated from 1.7 to 2.0 for sound, 1.1 to 1.7 for graphics, and 1.6 to 1.9 for sensory curiosity. Games seven and eight rated 4.0 and 2.6 respectively for sound, 3.6 and 3.0 respectively for graphics, and 3.6 for both games seven and eight for sensory curiosity (See Tables 7 and 8).

The other subfactors score fairly high across all of the games or, at least, across seven out of the eight games. Therefore, while those factors that score consistently high may be important, a line can be drawn between the games that use aspects of sensory curiosity well, and those who do not use them well or use them at all. The line that divides the six favorite games and the remaining two games is that line. These results suggest that the games that do not include aspects of sensory curiosity are not the favorite
Correlations Between Subfactors

Some interesting correlations were found between subfactors. Both color and graphics correlated at a statistically significant level with fast-pacing \((r=.68;p<.05)\) and \((r=.66;p<.05)\) respectively. This suggests that music and color may be used to create a fast-pace. Graphics and sensory curiosity correlate at a statistically significant level with the appeal of the theme \((r=.92;p<.05)\) and \((r=.60;p<.05)\) respectively. The appeal of the theme might be, in part, due to the graphics and sensory curiosity that help to create the fantasy.

Gender Differences in Appeal of the Theme

Past research has stated that there are differences in the fantasies that girls like and the fantasies that boys like (Malone, 1980; Bruner, 1984). This study does not support this hypothesis. Both the males and females chose the same fantasy as their favorite. The favorite theme was the driving theme found in Pole Position. Males and females both chose the track star theme found in Track and Field as their second favorite. The
theme that was chosen as being the least favorite was also the same for males and females (See Table 13).
Table 7

Mean Scores for Subfactors of Sensory Curiosity Reported by Game

<table>
<thead>
<tr>
<th>Original Game Ranking</th>
<th>Graphics M</th>
<th>Graphics SD</th>
<th>Sensory Curiosity M</th>
<th>Sensory Curiosity SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole Position</td>
<td>1.1</td>
<td>.35</td>
<td>1.6</td>
<td>.37</td>
</tr>
<tr>
<td>Dig Dug</td>
<td>1.7</td>
<td>1.16</td>
<td>1.7</td>
<td>.57</td>
</tr>
<tr>
<td>Donkey Kong</td>
<td>1.2</td>
<td>.46</td>
<td>1.6</td>
<td>.52</td>
</tr>
<tr>
<td>Centipede</td>
<td>1.5</td>
<td>.75</td>
<td>1.9</td>
<td>.55</td>
</tr>
<tr>
<td>Pac-Man</td>
<td>1.6</td>
<td>.51</td>
<td>1.6</td>
<td>.38</td>
</tr>
<tr>
<td>Track and Field</td>
<td>1.2</td>
<td>.46</td>
<td>1.7</td>
<td>.65</td>
</tr>
<tr>
<td>Sprint</td>
<td>3.6</td>
<td>1.06</td>
<td>3.5</td>
<td>.47</td>
</tr>
<tr>
<td>Qix</td>
<td>3.0</td>
<td>1.06</td>
<td>2.6</td>
<td>.83</td>
</tr>
</tbody>
</table>
Table 8

Mean Scores for Subfactors of Sensory Curiosity Reported by Game

<table>
<thead>
<tr>
<th>Original Game Ranking</th>
<th>Sound M</th>
<th>Sound SD</th>
<th>Music M</th>
<th>Music SD</th>
<th>Color M</th>
<th>Color SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole Position</td>
<td>1.7</td>
<td>.88</td>
<td>2.1</td>
<td>.99</td>
<td>1.6</td>
<td>1.06</td>
</tr>
<tr>
<td>Dig Dug</td>
<td>2.0</td>
<td>1.06</td>
<td>1.7</td>
<td>.70</td>
<td>1.5</td>
<td>.53</td>
</tr>
<tr>
<td>Donkey Kong</td>
<td>1.3</td>
<td>.94</td>
<td>2.2</td>
<td>1.28</td>
<td>1.6</td>
<td>.74</td>
</tr>
<tr>
<td>Centipede</td>
<td>1.7</td>
<td>1.16</td>
<td>3.0</td>
<td>1.19</td>
<td>1.6</td>
<td>1.06</td>
</tr>
<tr>
<td>Pac-Man</td>
<td>1.7</td>
<td>.88</td>
<td>2.0</td>
<td>.75</td>
<td>1.2</td>
<td>.46</td>
</tr>
<tr>
<td>Track and Field</td>
<td>2.0</td>
<td>1.06</td>
<td>2.5</td>
<td>1.19</td>
<td>1.2</td>
<td>.46</td>
</tr>
<tr>
<td>Sprint</td>
<td>4.0</td>
<td>1.20</td>
<td>3.5</td>
<td>.75</td>
<td>4.0</td>
<td>.00</td>
</tr>
<tr>
<td>Gix</td>
<td>2.6</td>
<td>1.06</td>
<td>2.7</td>
<td>1.03</td>
<td>2.1</td>
<td>1.12</td>
</tr>
</tbody>
</table>
Table 9

Mean Scores for Subfactors of Cognitive Curiosity Reported by Game

<table>
<thead>
<tr>
<th>Game Ranking</th>
<th>Feedback M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole Position</td>
<td>2.4</td>
<td>1.09</td>
</tr>
<tr>
<td>Dig Dug</td>
<td>2.4</td>
<td>.99</td>
</tr>
<tr>
<td>Donkey Kong</td>
<td>2.4</td>
<td>1.17</td>
</tr>
<tr>
<td>Centipede</td>
<td>2.1</td>
<td>1.27</td>
</tr>
<tr>
<td>Pac-Man</td>
<td>2.4</td>
<td>1.11</td>
</tr>
<tr>
<td>Track and Field</td>
<td>1.9</td>
<td>.77</td>
</tr>
<tr>
<td>Sprint</td>
<td>3.0</td>
<td>.92</td>
</tr>
<tr>
<td>Qix</td>
<td>2.4</td>
<td>.94</td>
</tr>
</tbody>
</table>
### Table 10

**Mean Scores for Subfactors of Fantasy Reported by Game**

<table>
<thead>
<tr>
<th>Original Game Ranking</th>
<th>Appeal of the Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td><strong>Pole Position</strong></td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Dig Dug</strong></td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Donkey Kong</strong></td>
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</tr>
<tr>
<td><strong>Centipede</strong></td>
<td>2.4</td>
</tr>
<tr>
<td><strong>Pac-Man</strong></td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Track and Field</strong></td>
<td>1.6</td>
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<tr>
<td><strong>Sprint</strong></td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Qix</strong></td>
<td>3.3</td>
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Table 11

Mean Scores for Subfactors of Challenge
Reported by Game

<table>
<thead>
<tr>
<th>Original Game Ranking</th>
<th>Fast-Pacing M</th>
<th>Fast-Pacing SD</th>
<th>Chance for Improvement M</th>
<th>Chance for Improvement SD</th>
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<tr>
<td>Pole Position</td>
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<td>.41</td>
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<td>.42</td>
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Table 12

Mean Scores for Subfactors of Challenge Reported by Game

<table>
<thead>
<tr>
<th>Original Game Ranking</th>
<th>Variable Levels of Challenge M  SD</th>
<th>Uncertain Outcomes M  SD</th>
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<tbody>
<tr>
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<tr>
<td>Qix</td>
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<td>2.3 1.06</td>
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Table 13

Ranking of Games by Preference for Theme by Male and Female Judges

<table>
<thead>
<tr>
<th>Male Ranking</th>
<th>M</th>
<th>SD</th>
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CHAPTER 4

DISCUSSION

The purpose of this study was to examine what motivates children to play video games. Much of the previous research on motivation derives from Malone’s seminal work (Malone, 1980). The major difference between Malone’s study and the present study is that Malone focused only on computer games in his study. Malone’s findings must be measured with this in mind. Although home computers are becoming more sophisticated, at the time of Malone’s study there were great differences between home computers and video games. One difference between video games and computer games is that screen resolution is better in video games. This will make colors and graphics appear much sharper. Second, the microchips in video games are designed with single functions in mind. For example, one chip may function only to provide part of the music. The microchips in home computers are designed to fulfill several functions and, therefore, a lot of processor
power cannot be put into sophisticated game functions or sound, graphics, and color. Because of this, some of Malone’s findings reflect the limits of the generation of computers available when he did his research perhaps more than motivational factors. For instance, Malone suggests that using sound, graphics, and color in games may enhance initial interest in a game, but that they will soon become boring, and even distracting. In his first study, the correlation between game preference and visual effects was r=.34 (p<.05). In his third study, music was important to the girls, but not to the boys. Color was never tested (Malone, 1980). This study emphasizes the motivating appeal of sensory curiosity when available at a sophisticated rather than crude level.

Until recently, the sound, graphics, and color in computer games have been of a lower quality than those of video arcade games. Chaffin (1982) notes that "the best of the games used in his [Malone’s] research were probably not as powerful, from a motivational point of view, as even the average video game (Chaffin, 1982: 174)." However, since Malone’s 1980 study the sophistication of home computers has increased, especially in the area of screen resolution and the ability of the processors to use the computer screens to
their full advantage. Therefore, home computers are now able to approximate the quality of sound, graphics, and color of arcade video games. The present study focused on video arcade games. The results of the study support the notion that, when the sound, graphics, and color in a game are sophisticated, as in a video arcade game, their motivational strength is also increased.

Not only are Malone’s findings dated, there also seems to be some methodological weaknesses in Malone’s study. Malone served as the only judge in determining the motivating features of a group of games. Also, Malone used completely different samples of subjects in each of his three studies from which to generalize. In study one he used students from kindergarten through eighth grade. In study two, Malone used college students, and in study three he used a sample of fifth graders. The features that motivate young children and college students may be very different and it may be inappropriate to generalize. The present study used a narrower range of ages for judges. Thus, the results are more precise although generalizable to a more limited age range.

The most fundamental finding of this research is the importance of curiosity in motivation. Overall, this study found sensory curiosity to be the most
important factor in the motivation to play video games.

This generation of children live in a very visual world. They spend as many as seven hours per day in front of the television set. Just as children would rather watch a color television, they would also rather play a color video game. Because of fast-paced television advertising and because of programs such as *Sesame Street* and *Electric Company* offering children such an exciting learning environment, children are expecting their reality to be as exciting to their senses as the television world. Similarly, this generation of children are growing up in a world of *Raiders of the Lost Ark* and *Star Wars* special effects. Children seem to need more and better effects to stimulate them.

Children expect their world to be exciting, fast-paced, and appealing to all of their senses. This need is passed on to video games. Children want the sophisticated sound effects, music, and graphics offered in some video games. The less sophisticated games are becoming boring to children.

Sophistication in the sound, music, color, and graphics in video games also leads to a more realistic game. Children seem to enjoy games that are more realistic. For instance, *Pole Position* and
Sprint are both driving games but because Pole Position uses color, graphics, and sound well, and because the game is designed with a point of view such that it looks like the player is really in a race car, Pole Position is ranked as the favorite game. As one boy described it, "it looks like things are coming right at you."

Video disc games offer the sophistication that children desire. The video disc games can use cartoons or even recordings of real people in the stories. Video disc games do not seem as popular as regular video games because of the cost to the player. It usually costs at least twice as much as a regular video game to play a video disc game. However, if the price drops, the video disc game should become more and more popular.

Limitations

There were some methodological problems with the present research that should be addressed. First, part of the sample of judges was unreliable. It has always been difficult to do research with children and the sample of children in this study was no different. For the most part, the boys used in this study served as reliable judges. The boys participated in the videotaping of the video games by serving as the expert
players. It was easy to see that they were very familiar with all of the games in the study. The girls in the study, on the other hand, were not tested before they participated in the study. It was nearly impossible to find girls playing in the video arcades. The few that were in the arcades were either too old to participate in the study or were not given parental permission to participate. The girls that participated in the study were found at a city park. They were all asked if they were familiar with video games but, beyond that, there was no way of telling how familiar they were with video games. A problem with both the males and the females was their attention span. The data collection took approximately one and one half hours to complete and the participants' enthusiasm waned quickly. This may have had an effect on the reliability.

Because female judges were so hard to find, only three females served as judges in this study. The reliability of the judges could perhaps be improved with a larger number of well trained male and female judges.

The eight games used in the study were videotaped so that each group of judges would have a consistent display of games from which to rate. By videotaping the games instead of having each judge play the game, there was no personal involvement with the games. Therefore,
Challenge, which is a concept that can best be tested with personal involvement, was possibly a difficult concept for the judges to rate because of the lack of involvement with each game. On the other hand, by videotaping the games, the aspects of sensory curiosity became the easiest concepts to rate. While the importance of sensory curiosity would not be diminished if each judge rated the games by actually playing the games, perhaps, the importance of the subfactors of challenge would increase because of the increased personal involvement.

Fantasy could not be tested with this age group because the researcher was unable to make the distinction between intrinsic and extrinsic fantasy meaningful to subjects of this cognitive development. Indeed, this concept may need further clarifying in that even adults had considerable difficulty distinguishing between intrinsic and extrinsic fantasy.

Conclusions

It was hypothesized that there would be a difference in the importance of the subfactors of challenge (i.e. goals, variable levels of challenge,
chance for improvement, fast-pacing, and uncertain outcomes). The subfactor of goals was omitted from the study. The subfactor that seems to be the most important is chance for improvement. In other words, a game that used challenge well would be a game that allowed the players the opportunity to get better at the game.

The other subfactors of challenge are fairly equal in importance. Their ratings across the eight games are all fairly high. This suggests that, even in the lower ranked games, these subfactors are present. Because these factors may be found in all eight games, they are not making the difference between a favorite game and a game that is not liked. In other words, these factors do not discriminate between the games that are liked and the games that are not liked.

It was also hypothesized that intrinsic fantasy would be more important than extrinsic fantasy. This hypothesis could not be tested due to the low reliability of the judges across those items intended to reflect those variables. The concepts of intrinsic and extrinsic fantasy are difficult to grasp, especially for ten and eleven year old children. Even with training, the concepts were not understood by the
It was hypothesized that there would be a gender difference in the choice of favorite themes. The results do not support this hypothesis. Males and females both chose the driving theme as their favorite and the track star theme as their second favorite. Also, even though the sensory curiosity was low, the males chose the driving theme in *Sprint* as their third favorite. The females chose the fantasy of saving the damsel in distress from the gorilla found in *Donkey Kong*. With the exception of *Donkey Kong*, the favorite themes for both males and females are those that are most realistic.

Finally, it was hypothesized that games that appealed to cognitive curiosity would be preferred to games that appealed to sensory curiosity. *Sensory curiosity* (i.e. sound, graphics, music, and color) was found to be more important than cognitive curiosity. Past research has suggested that, while sensory curiosity may be important at first, players soon become bored with these elements (Malone, 1980). This study has found the opposite to be true. *Sensory curiosity* is very important. The games that were lower in the overall ranking tended, in fact, to be lacking in the four
aspects of sensory curiosity. *Sprint*, for example, has no music, it is black and white, and the graphics are very simplistic. *Qix*, too, is lacking in good graphics and bright colors. This study supports the notion that curiosity is the most important motivational element in a video game.

**Implications for the Classroom**

If video games are to be used as effective instructional tools, software designers must pay more attention to curiosity as a motivational factor. They must design games that use high-quality sound, graphics, color, and music. Schools must also make sure that they pay attention to screen resolution when they buy computers for the schools. Color monitors will also be necessary for instructional effectiveness.

Software designers must create games that are neither too easy nor too difficult. If the games are too difficult, the players will become frustrated and less apt to use the game to its full educational potential. If games are too easy, that means that they are not learning anything new. A chance to improve also means that as the players get better, they want to be able to continue to improve. This means that designers must continue to incorporate variable levels of
challenge in the games.

The video game format is also being used to train adults. Flight simulators for airplane pilots are almost identical to video games. Testing pilots with actual apparatus is no longer necessary. Because the video game format in itself is so powerfully motivational, many of the men being trained with them, take the games home to play with them during their off-duty hours (Kennedy, 1983). In addition, driving students use simulators as a teaching aid before they actually learn on the road. In both of these cases, software designers must incorporate motivational factors into these tools so that they will be used to their fullest capacity.

The disabled and elderly are using video games as therapy. Video games are helping to improve hand-eye coordination of the elderly and they are also sharpening the memories of the elderly (Weisman, 1983). Video games are also being used to retrain stroke and trauma victims (Ingber, 1983).

With all of these possible uses and benefits of video games, it becomes increasingly more important for researchers to study motivation within different segments of society and for software designers to incorporate these motivational factors into their
Implications for Future Research

Most of the previous research has supported the notion that the incorporation of clear goals in a video game is the most important motivational factor. Past research has also agreed on the idea that sensory curiosity is of little motivational importance. This study does not support these findings. Further research must be done that will further explore the question, "What motivates children to play video games?" In addition, future research must explore beyond motivation and children. Because of the growing use and increasing importance of the video game format in education, training, and therapy, researchers must explore what motivates other segments of society so that these factors can be incorporated into the appropriate tools. Further research must also reflect the state of the art tools available to instructional software designers to provide theory to guide software development.
APPENDIX A

FOCUS GROUP INTERVIEW

Thank you again for participating in the discussion that we just finished. Before you go back to your classroom, please answer the following questions as best as you can.

What is your age? ___

Are you male or female. Please circle one. Male ___ Female ___

During the discussion we talked about your favorite game. How long can you make one quarter last while playing your favorite game?

___ less than 10 minutes ___ 15 minutes ___ one half hour ___ one hour ___ more than one hour

Do you play video games at home? What is the name of your video game machine?

Do your parents play video games?

___ a lot ___ not very often ___ never

If you go to the arcade, where do you get the quarters to play?

How much money do you get for an allowance?

Do you spend more time playing video games at home or in the arcades?

How many quarters do you spend when you go to an arcade?

How close is the arcade to your house?

___ I can walk to the arcade ___ I can ride my bike to the arcade ___ Someone has to drive me to the arcade

Do your parents let you go to the arcade without them?

What are the names of some of the games you play on the computer at school?
How much time do you think you spend playing video games everyday?
   ____ less than 10 minutes
   ____ one half hour
   ____ one hour
   ____ more than one hour

Do you sometimes play video games with friends, or would you rather play alone?

Let’s go back to the computers you have at school. What is the name of the computer you use at school?

How much time do you get to spend on the computers?
   ____ one day a week
   ____ two days a week
   ____ three to four days a week
   ____ five days a week

Is this enough time or would you rather have more time?

What is your favorite subject to study on the computer?

Are there any games you play on the school computer that you don’t like? What are they?

Do you have a computer at home? If yes, do you use it a lot, a little bit, or do you never use it?

If you don’t have a computer at home, do you want one? Why?

Thank you very much for your help!
APPENDIX B

SUBJECTS’ QUESTIONNAIRE

Male_____ Female_____

In the space below, please list your favorite video games.

1. My favorite video game is ______________
2. My second favorite video game is _____________
3. My third favorite video game is ______________
4. My fourth favorite video game is ______________
5. My fifth favorite video game is ______________
There are a lot of people who say that video games are fun. What I want to know is, why are video games fun? Below, I have listed some of the things that some people say make video games fun. Think of your favorite video game. Write the name of it in the space below. Then, think about why you think your favorite video game is fun for you. Write a little story about your favorite video game that will tell me why you think it is fun to play.

Here are some things that some people say make video games fun.

Some people like to see their score on the screen while they are playing a video game.
Some people like to see they’re high scores on a permanent screen for everyone to see.
Some people say they like music.
Some people like the game to get harder as they get better at playing it.
Some people don’t like games that they think are too easy.
Some people like the pictures on the video game screen to look real.
Some people like to always have their hands working with the buttons, dials or joysticks while they’re playing a video game.
Some people like the color on the screen.
Some people like to understand the rules so that they know what they have to do to win the video game.
Some people like to pretend they are doing something they couldn’t ordinarily do in real life while playing a video game.
Some people like the video game to tell them when they are doing something right.
Some people say they like a lot of noises.
Some people like to see a lot of action going on on the screen while they’re playing.

Now tell me about your favorite game. Make sure you first tell me the name of your favorite game.
Below is a list of video games. Draw a circle around each game you have played. Now, make a list of these games starting with your favorite game and ending with your least favorite game. List only the games that you have circled.

Asteroids 1. My favorite game is ______
Centipede 2. My second favorite game is ___
Donkey Kong 3. My third favorite game is ___
Pole Position 4. My fourth favorite game is ___
Frogger 5. My fifth favorite game is ___
Pac-Man 6. My sixth favorite game is ___
Space Invaders 7. My seventh favorite game is ___
Dig Dug 8. My eighth favorite game is ___
APPENDIX C

JUDGES' QUESTIONNAIRE

Please rate each game on the following criteria on a scale from 1 to 5. A score of 1 means that the statement is very true and a score of 5 means that the statement is very untrue. Please circle your scores.

1. The skills in this game have real life application.
   1----------2----------3----------4
   very       somewhat  somewhat  very
   true       untrue    untrue    untrue

2. You get a chance to get better at this game.
   1----------2----------3----------4
   very       somewhat  somewhat  very
   true       untrue    untrue    untrue

3. The game gets more difficult as each player completes a screen.
   1----------2----------3----------4
   very       somewhat  somewhat  very
   true       untrue    untrue    untrue

4. Overall, the game is easy.
   1----------2----------3----------4
   very       somewhat  somewhat  very
   true       untrue    untrue    untrue

5. I like the music in this game.
   1----------2----------3----------4
   very       somewhat  somewhat  very
   true       untrue    untrue    untrue

6. The rules of the video game are clear.
   1----------2----------3----------4
   very       somewhat  somewhat  very
   true       untrue    untrue    untrue

7. The game stays at the same level of difficulty screen after screen.
   1----------2----------3----------4
   very       somewhat  somewhat  very
   true       untrue    untrue    untrue
8. As the player gets better the game gets more difficult.
  1--------2--------3---------4
  very somewhat somewhat very true true untrue untrue

9. I like the sound effects in this game.
  1--------2--------3---------4
  very somewhat somewhat very true true untrue untrue

10. I like the story that this game is about.
    1--------2--------3---------4
    very somewhat somewhat very true true untrue untrue

11. If it wasn't for the story being told in the game, the game would be boring.
    1--------2--------3---------4
    very somewhat somewhat very true true untrue untrue

12. The game makes me want to go on and on just to find out what's next.
    1--------2--------3---------4
    very somewhat somewhat very true true untrue untrue

13. I like the graphics in this game.
    1--------2--------3---------4
    very somewhat somewhat very true true untrue untrue

14. I can always tell what this game will do next.
    1--------2--------3---------4
    very somewhat somewhat very true true untrue untrue

15. There is action on the screen.
    1--------2--------3---------4
    very somewhat somewhat very true true untrue untrue

16. There is time to think before acting.
    1--------2--------3---------4
    very somewhat somewhat very true true untrue untrue
17. The game makes me feel like I'm part of the action.
   1---2---3---4
   very somewhat somewhat very
   true true untrue untrue

18. The object of the game is clear.
   1---2---3---4
   very somewhat somewhat very
   true true untrue untrue

19. There is more than one goal in the game.
   1---2---3---4
   very somewhat somewhat very
   true true untrue untrue

20. There is time during the game to set strategy or make decisions.
   1---2---3---4
   very somewhat somewhat very
   true true untrue untrue

21. The game repeats itself screen after screen.
   1---2---3---4
   very somewhat somewhat very
   true true untrue untrue

22. The player has control over how hard the game is.
   1---2---3---4
   very somewhat somewhat very
   true true untrue untrue

23. The game tells the player how he is doing.
   1---2---3---4
   very somewhat somewhat very
   true true untrue untrue

24. The game tells me when I do the right things.
   1---2---3---4
   very somewhat somewhat very
   true true untrue untrue

25. The action in this game imitates real life.
   1---2---3---4
   very somewhat somewhat very
   true true untrue untrue
26. The game always surprises me with something new.
   1-------2--------3--------4
   very somewhat somewhat very
   true true untrue untrue

27. The game keeps presenting new challenges.
   1-------2--------3--------4
   very somewhat somewhat very
   true true untrue untrue

28. The fantasy is part of the game.
   1-------2--------3--------4
   very somewhat somewhat very
   true true untrue untrue

29. The game tells me when I do the wrong things.
   1-------2--------3--------4
   very somewhat somewhat very
   true true untrue untrue

30. The player must work very hard when he plays this game.
   1-------2--------3--------4
   very somewhat somewhat very
   true true untrue untrue

31. The game holds my attention.
   1-------2--------3--------4
   very somewhat somewhat very
   true true untrue untrue

32. I like the color in this game.
   1-------2--------3--------4
   very somewhat somewhat very
   true true untrue untrue

33. I have played games that look different than this one, but I do the same thing in both.
   1-------2--------3--------4
   very somewhat somewhat very
   true true untrue untrue
APPENDIX D

Description and Ranking of Games Used in the Study

Game 1: Pole Position

This is a driving game in which the player controls an accelerator pedal with his foot, a steering wheel, and a two-speed gear shift. On the screen is a race track with other cars and obstacles that must be avoided. Players try to beat specified times to continue on from race to race.

Game 2: Dig Dug

This game is similar to "Pac-Man" in that the object is to eat all of the dots on the screen without getting eaten yourself. The difference is that, with "Dig Dug," the player creates the maze that the objects on the screen travel through.

Game 3: Donkey Kong

The object of this game is to climb a tall skyscraper, overcoming obstacles, such as swooping airplanes, to save the beautiful woman on the top who is being held captive by the ape.

Game 4: Centipede

The object of the game is to kill all of the centipedes that break apart and fall from the top of the screen, without getting hit yourself. When you hit part of a centipede, it becomes a mushroom that the next centipedes have to fall around. This speeds up the descent of the centipede.

Game 5: Pac-Man

The object of this game is to send your Pac-Man around a maze to eat a path of dots. Once it has eaten all of the dots in the maze, you go to a new maze. Little creatures serve as obstacles that try to eat you.
Game 6: Track and Field

This game challenges the player to compete in different track events such as running and jumping. If the player wins, the crowd roars, but if the player loses, your man stamps his feet and there are no sounds from the crowd.

Game 7: Sprint

This is a black and white driving game. The player gets a bird’s-eye-view of the racing track. The object of the game is to get around the track as many times as possible without running into walls or other cars.

Game 8: Qix

The object of this game is to use your man to draw the perimeters of squares and rectangles. Once you have closed in a box, the box fills in with a solid color. Your adversary is something called a Qix that will try to destroy you before you get your boxes completed. Once seventy-five percent of the screen is filled with boxes, you go on to the next screen.
APPENDIX E

POSITIONING AND FRAMING OF CAMERA USED TO VIDEOTAPE
THE PLAYING OF EIGHT VIDEO GAMES
LIST OF REFERENCES


