DEBRIEFING IN SIMULATION GAMES: AN EXAMINATION OF REFLECTION ON COGNITIVE AND AFFECTIVE LEARNING OUTCOMES

by

JOSEPH R. FEINBERG

(Under the Direction of Ronald L. VanSickle)

ABSTRACT

This study investigated the role of debriefing as a form of reflection in promoting affective and cognitive learning in simulation games. Debriefing is central to the experiential learning process, yet simulation game research studies seldom have focused on it. A well-designed simulation game with debriefing potentially provides a means to engage students in thoughtful, engaging, and worthwhile learning that is consistent with the contemporary goals of social studies education. A small number of prior studies found debriefing had a positive effect on cognitive learning. However, the studies with positive results concerning debriefing are too few and too contradictory as a result of problematic designs to warrant generalizations from the findings. The participants for this study were 238 high school students in state mandated economics classes in Georgia public schools. A variety of immediate and retention posttest measures were utilized to assess the levels of cognitive learning and interest on four randomly assigned alternative treatments: oral debriefing, written debriefing, combined written and oral debriefing, or no debriefing. Data were analyzed by means of descriptive statistics, analysis of variance, and effect sizes. Findings from this sample supported previous research results that indicated debriefing has a positive immediate effect on cognitive learning. However, the results from this experiment showed small observed differences for the debriefing treatments relative to the control of no debriefing. Effect sizes were typically small and most differences were not statistically significant. The implications of the results and suggestions for future research were discussed in detail.

INDEX WORDS: Debriefing, Economics Education, Reflection, Simulations, Simulation Games, Social Studies.

DEBRIEFING IN SIMULATION GAMES: AN EXAMINATION OF REFLECTION ON COGNITIVE AND AFFECTIVE LEARNING OUTCOMES

by

JOSEPH R. FEINBERG

B.A., University of North Carolina at Chapel Hill, 1991

M.A., The University of Georgia, 1994

Ed.S., The University of Georgia, 1997

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2003

DEBRIEFING IN SIMULATION GAMES: AN EXAMINATION OF REFLECTION

ON COGNITIVE AND AFFECTIVE LEARNING OUTCOMES

by

JOSEPH R. FEINBERG

Major Professor: Ronald VanSickle

Committee: Shawn M. Glynn
John D. Hoge
Lloyd P. Rieber
Gregory A. Trandel

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
August 2003

DEDICATION

In memory of Rita K. Rubin, who inspired me to never quit.

ACKNOWLEDGEMENTS

First and foremost, I am fortunate and grateful to my committee. Thank you Dr. Ronald VanSickle, Dr. Shawn Glynn, Dr. John Hoge, Dr. Lloyd Rieber, and Dr. Gregory Trandel for your time, support, and scholarly guidance. Several school systems approved my study and I am thankful to Dr. Roger Crim and Dr. Colin Martin. In addition, I appreciate the teacher professionals who allowed their classes to participate in my study. I am also thankful for a wonderful cohort of colleagues who have been my inspiration and my friends. Thank you Lin Lin, Carolyn Lyon, Changwoo Jeong, Yali Zhao, and Pam Roach. Special gratitude to my dear friends Barbara Burak and Billie Bennett. Finally, thanks to my family and especially my parents for their financial support and appreciation of my professional pursuits and dreams.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Statement of the Problem

Well-designed simulation games potentially provide a means to promote thinking, motivation, and student engagement consistent with the purpose for social studies education articulated by the National Council for the Social Studies (NCSS). According to the NCSS definition, "The primary purpose of social studies is to help young people develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world" (NCSS, 1994, p. 3). Even though many educators agree that citizenship education should promote the development of informed and reflective citizens who are capable of making rational decisions, traditional pedagogy that stresses lower order thinking and ignores the constructive nature of knowledge remains dominant in social science classrooms. Consistent with the NCSS position, Newmann (1990, 1991) encouraged educators and researchers to move beyond the traditional pedagogy and embrace approaches that promote student learning in an engaging and thoughtful manner.

The purpose of this study was to investigate how alternative forms of reflection in simulation games affect cognitive and affective learning. Research on simulation games in the social sciences corresponded with the popularization of simulation techniques among social studies educators during the 1960s and 1970s. Research on instructional simulation games began in the 1960s, increased dramatically in the 1970s and dissipated in the 1980s (VanSickle, 1986a). The development of instructional computing has led to a resurgence of interest in simulation games and related research and development work (Rieber & Noah, 1997). The research reported here and similar research can increase understanding of the benefits and limitations of simulation games and lead to more effective simulation game designs.

Simulation Gaming

Instructional simulation games replicate elements of real-world events and objects in classroom learning environments (Berson, 1996; Grabe & Grabe, 2001; Lee, 1999). Simulations engage students in activities that would be impractical in a classroom environment because of time, expense, or hazard to students (Berson, 1996; Rieber, 1996). Imagine providing students real money to invest in the stock market or creating an environment for students to experience the realistic cruelty of child labor. It is neither responsible nor feasible to recreate some aspects of human interaction or history. Simulation games enable educators to model the world outside the classroom in a safe, practical, and cost-effective manner. According to Ruben (1999), “Traditional teaching-and-learning environments are often too predictable, static, unchallenging, and boring—particularly when compared with television or other ‘real-world’ environments that compete as sources of attention and learning” (p. 503). The engaging nature of many instructional simulation games addresses the motivational challenge Ruben described. Simulation games frequently are not clearly defined and explained in the literature; therefore, the following discussion clarifies the meaning of terms and concepts related to simulation-gaming.

Simulation Games

Games were integrated with simulations for military training purposes around the eighteenth century (Ellington, Gordon, & Fowlie, 1998). In contemporary society, countries often participate in realistic simulation war games. Games add to simulations a particular set of rules that define a competition to defeat or beat competitors (Gredler, 1994). In contrast, simulations model reality with participants assuming specific roles and solving a problem or issue in a particular manner (Gredler, 1994, p. 13). Combining simulation with games synthesizes elements of game-based rules and competition into a simulation model of reality. Thus, simulation game participants achieve objectives through making choices, implementing choices, and receiving feedback or consequences according to rules that are established to model a real world system (VanSickle, 1986b). Through the simulation game experience, students learn by working with concepts in a dynamic and interactive manner (Wighton, 1991).

Role-play

A role-play is a type of simulation that models human interaction (van Ments, 1999). For example, a stock market simulation game has students pretend to be investors or stock brokers. To varying degrees, role-play participants receive background information, such as objectives, goals, and constraints. A role-play provides participants a substantial measure of freedom to improvise events and reactions in a social situation (Gredler, 1994). For example, a mock trial role-play involves roles, such as judge, jurors, defendant, defense attorney, plaintiff, witnesses, and prosecuting attorney. Students are expected to participate in a serious and conscientious manner based on reality; however, the role-play structure allows students more autonomy than a simulation game structure.

Role-play elements are frequently embedded within simulation games that require participants to assume roles relevant to the game, but constrain participants' behavior more than role-plays not embedded in simulation games.

Instructional Simulation Game

The design and use of instructional simulation games will be outlined for two reasons: (a) to explain the value of the research questions addressed in this study, and (b) to promote a framework for the review of research. The essential characteristics of an instructional simulation game are based on the choices, moves, and rules that comprise the basic structure (Gillespie, 1972). According to Gillespie, the six facets of an instructional simulation game are the central problem, choices, moves, rules, organization, and conclusion. Each facet of the simulation game should be evaluated and analyzed to ensure it is contributing to student learning.

Gillespie (1972) emphasized the central problem of a game should be stated clearly to "ensure that the concepts and principles will serve a purpose, such as developing a skill or knowledge" (p. 35). She also recommended evaluating the choices, moves, and rules based on the criteria of soundness, consistency, and lack of distortion. For example, choices "must be carefully grounded in the problem statement" and moves need to exhibit consistent and meaningful sequences. "In addition, the rules of the game need to provide undistorted guidelines for behavior which lead players to make sound decisions to act consistently" (p. 35). Gillespie also maintained that an effectively organized simulation game provides "inclusiveness," or opportunities for all (not just a few) students to learn and make essential choices, and a sequence of activities that ensures sufficient opportunity to learn. The summary or debriefing session should relate to the problem statement and provide application activities that promote learning based on the simulation game (Gillespie, 1972). Debriefing embraces reflection as a form of higher order thinking. This study focused on the effects of variations of debriefing on student learning.

Three broad types of instructional simulation game approaches are found in the educational literature: (a) discovery approach, (b) application approach, and (c) modeling approach. Much of the research literature assumes most simulation games utilized for instruction implemented the discovery approach; consequently, researchers frequently failed to clarify the differences that exist between the three approaches. The application approach provides greater flexibility to incorporate instruction before and after a simulation game, whereas the discovery approach assumes students learn through exploration and connections to pre-existing knowledge and skills in a constructivist sense. The modeling approach provides a constructivist (or constructionist) atmosphere for participants or students to create their own simulation game based on a system or theory (see Papert, 1991). Researchers frequently have not clarified the approach studied and have neglected or avoided simulation game components, such as debriefing, that some consider extraneous to learning, but others consider essential. The conflict and confusion created from not understanding the simulation game approaches ultimately inhibits the best possible research and practice. This study focused on the application approach.

Reflection and Debriefing

According to John Dewey (1933), reflective thought is defined as: “Active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends" (p. 9). The importance of having the necessary skills, knowledge, and dispositions to participate as citizens highlights the significance of reflective thinking in the social studies classroom. Much of our daily activity is experienced unconsciously or without careful thought or reflection. According to Wade (1997), "Without reflection on our experience, we do not learn from it and we cannot glean lessons from our actions to inform our future efforts" (p. 96). What is the purpose of teaching if students do not learn from their experiences in the classroom?

Prior to the technologically propelled explosion of information, Dewey advocated evaluating knowledge and information in a thoughtful manner that utilizes scientific methods. Dewey identified dispositions necessary to be a reflective or "thoughtful" person. As quoted in Archambault (1964):

> When we say a person is *thoughtful*, we mean something more than that he merely indulges in thoughts. To be really thoughtful is to be logical. Thoughtful persons are heedful, not rash; they look about, are circumspect instead of going ahead blindly. They weigh, ponder, deliberate—terms that imply a careful comparing and balancing of evidence and suggestions, a process of evaluating what occurs to them in order to decide upon its force and weight for their problem. Moreover, the thoughtful person looks into matters; he scrutinizes, inspects, examines. He does not, in other words, take observations at their face value, but probes them to see whether they are what they seem to be (p. 247).

Massialis and Cox (1966) advocated Dewey's scientific version of reflective thinking that involves systematically identifying problems of fact or value, assessing the assumption embedded in the problems, and critically evaluating through specified criteria (p. 90). Dewey assumed that "facts" and knowledge are readily identifiable through scientific methods. However, Nash (1997) critiqued that "[an] 'objective truth' is knowledge consensually agreed upon through conversation--nothing more, nothing less" (p. 170). In the constructivist sense, "Truth—or knowledge—is always socially and culturally constructed, and influenced by time, context, situation, person, and position" (Gay, 1997, p. 101). Thus, the reflective approach promoted by Dewey did not adequately treat the constructive nature of knowledge.

Simulation games are frequently evaluated based upon traditional outcomes that assume knowledge is objective rather than socio-culturally constructed. Educators may be reluctant to utilize simulation games because higher levels of learning are not easily measured forms of knowledge. According to White (1985), "Orthodox evaluation methods are simply not appropriate for appraising the experiences drawn from simulation gaming" (p. 26). Yet, it is possible that student participants "will construct alternatives" that are different from those considered or created by simulation model designers. Therefore, according to White, many simulation games also fail to satisfy Dewey's ideals embodied in reflective inquiry because they do not allow students to evaluate the underlying model of the simulation game. However, White did not consider the role of simulation game debriefing. According to Raths (1987), "The product of the debriefing process is an articulated sense of 'meaning.' It is through this process of constructing personal meanings that students reveal their misunderstandings, oversimplifications, and personal theories" (p. 27). Thus, if students are given time to evaluate the underlying model and their learning through debriefing; they may gain a greater awareness of the system being studied through constructing their own meaning and understanding.

Simulation game experiences are not guaranteed to promote higher levels of learning. Thiagarajan (1998) echoed Wade (1997) in emphasizing that learning from experience is unlikely to occur without taking time to reflect on the experience. Simulation game experiences that are not carefully implemented can be “one blooming, buzzing confusion” (p. 40) for the participants. Thiagarajan further argued that participants “are not in a position to learn anything worthwhile unless they are required and encouraged to reflect upon the experience through a process of *debriefing*” (Thiagarajan, 1998, pp. 40-41). Similarly, Gillespie (1973) argued that most games do not provide students with the opportunity to reflect on their behavior and learning.

Debriefing ensures a simulation game stimulates reflective thinking and experiential learning (Crookall, 1992; Stewart, 1992). The process of debriefing assumes that students were affected in a meaningful way that needs “postexperiential” processing to provide insights (Lederman, 1992). In other words, debriefing facilitates additional educational benefits not received directly from the experience alone (Stewart, 1992). Stewart (1992) emphasized that debriefing is the ethical responsibility of teachers or facilitators of experiential learning, because failure to debrief or the absence of reflection after simulation games denies students an important source of learning. Thatcher defined debriefing as “the process of reflecting on and exploring what had occurred from the point of view of each of the participants” (Thatcher, 1990, p. 263). Similarly, Raths defined debriefing as “a process of helping students reflect on their learning experiences, attach personal meanings to them, and deepen their understandings” (Raths, 1987, p. 26).

Oral discussions engage students in a reflective process with their teacher about their learning and are the most common form of debriefing (Hankinson, 1987; Lederman, 1992; Petranek, Corey, & Black, 1992). The “debriefer” facilitates dialogue among participants and creates an open climate to encourage students to express their understanding and beliefs concerning their experience (Stewart, 1992). However, Gillespie (1972) noted that summary sessions of debriefing can take many forms. For example, students may work in groups, individually answer a series of questions, or analyze the data that they generated from participating in a simulation game experience. According to Gillespie, summarization, analysis and application of what is learned need to correlate with the objectives of a game and allow students to evaluate their experiences and apply their knowledge to a new situation. Inadequate debriefing focuses on elements of a simulation game, such as moves or choices, without providing substantive questions or analysis that enable participants to generalize beyond the situation modeled by the simulation game. Moreover, Gillespie (1973) argued that debriefing is often treated as separate from routine classroom instruction rather than as an essential and integrated part of subsequent learning experiences. Thus, she claimed that the success of simulation gaming as a learning tool is contingent upon the inclusion of well-designed debriefing procedures.

Petranek, Corey, and Black (1992) noted the importance of oral debriefing to the learning process, but cautioned that it is extremely difficult to ensure that all students participate, understand, and reflect on their experience. Consequently, they asserted that oral discussions provide teachers with an inadequate and limited ability to evaluate each student’s learning, insights, and ideas. Petranek (2000) recommended written debriefing as an avenue to expand learning from simulation game experiences. Student writing furnishes insights into each student's learning and perceptions and supplements oral debriefing (Petranek et al., 1992). For example, journals require all students to organize their thoughts and reflect about their personal choices and behavior. Written debriefing also permits a personal and private mode of communication with the teacher who guides students through the learning process with written comments. Quiet students gain a voice or means of communicating. Furthermore, each student documents his or her perspective in writing that permits assessment of the student's learning (Petranek et al., 1992). Finally, written debriefing promotes higher order thinking because it integrates student reflection and theories that analyze, explain and predict.

Oral and written debriefing promote reflection through simulation game experiential learning. They reinforce and build upon curriculum concepts and reveal students' theories, misconceptions, and oversimplifications. By responding to questions in oral and written debriefing, students instantiate their misconceptions and misdirected theories. Then, teachers can correct and clarify them through written feedback and oral debriefing. Simulation game debriefing enables teachers to move beyond traditional pedagogy and embrace reflective teaching practices that engage students in higher levels of thinking.

Specific Research Questions

Insufficient attention to debriefing in systematic instructional simulation game research and practice may account for some of the minimal benefit findings for simulation gaming in research reviews examined in Chapter Two. The diversity of simulation games combined with the absence of a clear classification scheme (i.e., discovery, application, and modeling) has caused confusion concerning the most appropriate research approaches. As a result, debriefing has not been studied extensively as an aspect of simulation game research because many studies adopted an implicit discovery approach, which does not embrace debriefing as a necessary feature of instructional simulation gaming. Through a clearly specified application approach to simulation gaming, the following research questions will be examined in this study:

1. How does debriefing (i.e., oral, written, oral and written, and none) influence immediate recall?
2. How does debriefing (i.e., oral, written, oral and written, and none) influence retention?
3. How does debriefing (i.e., oral, written, oral and written, and none) influence level of reflection?
4. How does debriefing (i.e., oral, written, oral and written, and none) influence interest in monetary policy?
5. How does debriefing (i.e., oral, written, oral and written, and none) influence interest in instructional simulation game experience?

CHAPTER 2

RESEARCH REVIEW

This research review will address the following questions:

1. What do we know and need to learn about simulation gaming and debriefing?
2. What conditions influence the outcomes of cognitive learning and interest? How are the outcomes defined, operationalized, and measured?

The principal search mechanism for this review was the online version of the Educational Resources Information Center (ERIC) database. A primary descriptor *simulation gam** produced 949 writings. All were searched for relevant simulation games that related to education. Key descriptor *computer simulation* yielded 2,984 papers. However, the combined descriptors *computer simulation gam** produced only 27 writings.

Utilizing the primary descriptor *debriefing* yielded 499 writings. The addition of *simulation* as a descriptor with *debriefing* produced two, adding *gam** supplied only one, and *simulation* and *gam** or *computer simulation* and *gam** found no writings. The key descriptor *reflection* yielded an expected large number of writings (5,152). However, the number became manageable by adding relevant descriptors, such as *simulation* which provided 67, *gam** which produced 74, and *simulation gam** which supplied 17 papers.

The online version of *Dissertation Abstracts International* proved to be a useful database for systematic and relevant research studies. Descriptors such as *simulation* and *computer simulation* yielded impracticable numbers of dissertations or 40,786 and 9,862 respectively. The combination of *simulation* and *gam** yielded three studies. A more productive search used *debriefing* as a main descriptor and produced only 347 studies.

As a result of the limited numbers of published, peer-reviewed articles, all writings were considered at this point. Slavin (1986) recommended a "best evidence" principle that is applied through "consistent, well justified, and clearly stated a priori inclusion criteria…" (p. 6). The abstracts for over 500 articles were reviewed for relevance to this study. Most articles were theoretical in content or descriptive of a learning environment or simulation game, but lacked systematic and empirical research and were eliminated from inclusion. Original studies were targeted for inclusion and subsequent writings that repeated or recast the results of an original study were excluded. Citations in relevant articles were examined for research that was not retrieved through searches of ERIC and Dissertations Abstract databases. Finally, research on debriefing was summarized in a table that specifies the researcher(s) and year of each study, focus of the study, sample size, grade levels, duration of the study, treatments compared, and dependent measures.

Overview of Comparative Research on Simulation Gaming

Findings of the Reviews

Social science educators have implemented simulation games to promote thinking, motivation, and student engagement since the mid-1960s when simulation gaming was embraced as a "major instructional innovation" (VanSickle, 1986a). According to VanSickle, numerous articles were published to build a critical body of research, but the frequency of published experimental studies that compared simulation games with other instructional techniques peaked in 1975 and dwindled significantly after that time.

The earliest review of educational simulations by Cherryholmes (1966) contained only six studies. Cherryholmes cautioned that some of his conclusions were based on findings from only one or two studies with variations in research design that inhibited comparing results. The six investigations showed greater levels of student motivation and interest in simulations compared to conventional teaching methods, “but there are no consistent or significant differences in learning, retention, critical thinking or attitude change” (p. 6). However, Pierfy (1977) criticized Cherryholmes for generalizing about the effectiveness of simulations based on a “meager” sample.

In an overlapping review based on a similarly inadequate sample that included Cherryholmes’s findings and summaries of identical studies, Thorpe (1971) agreed that simulations are not superior and possibly are inferior to other teaching methods in their ability to teach short-term recall (“facts and principles”). In addition, Thorpe’s review of studies that compared traditional teaching methods to simulation games did not support assertions that simulations affect socialization, attitude change, “transferable decision making skills” (p. 466), and students with differing abilities. Similarly, Greenlaw and Wyman (1973) reviewed the effectiveness of simulation games in college business courses and reported “the effort and expenditures which have thus far been invested in developing business games have not been justified by the knowledge of specifically what games teach, if anything” (p. 292). Based on the negative results obtained from their review, Greenlaw and Wyman recommended developing more systematic research designs or "hard" measures of game learning in relationship to course objectives that are measurable with statistical tests of significance (p. 290).

The quality of reviews improved as more research was conducted and reported. Pierfy (1977) added 22 studies to update the comparative simulation game research approximately 11 years following Cherryholmes's (1966) review. Pierfy concluded that simulation games are similarly effective for short-term recall when compared to conventional classroom instruction. All but two of the 22 studies reviewed by Pierfy compared simulation games with conventional instruction, such as "lecture, discussion, textbook reading, recitation, and so on" (p. 257).

Contrary to previous reviews, Pierfy's findings indicated that simulation games have greater advantages in long-term retention, student interest and changes in attitudes. For example, eight out of 11 studies found significantly better retention for simulation games relative to conventional instruction through an administered second posttest. Also, eight out of 11 studies found simulation games were more effective in promoting attitude change. Moreover, seven out of eight studies reported greater levels of interest in simulation games than the controls of "more conventional classroom activities" (p. 260). Seven out of the eight studies that measured interest were at the high school level and the simulation games used were relevant to social studies courses with the game content ranging from government games to economics games. However, descriptions of the games and the school subjects in which they were implemented were not provided. Pierfy (1977) noted that inadequate instrumentation qualified the generalizations and conclusions of his review. Most of the assessments were constructed by investigators who reported little information about the "genesis of the tests" and instrument reliability (p. 261). In particular, the reliability of affective instruments was seldom examined.

In the same year of Pierfy's review, Rieser and Gerlach (1977) published an examination of fifteen simulation game studies about student interest, attitudes, feeling of efficacy, knowledge and intellectual skills. They reported higher levels of student interest in simulation game participation compared to conventional teaching methods, but participation did not conclusively produce greater interest in the subject matter represented in the game. Results concerning attitudes and feeling of efficacy had no obvious pattern and were inconclusive. Rieser and Gerlach defined knowledge similar to short-term recall. Findings indicated that recall relative to "traditional instruction" was not significantly affected by participation in a simulation game, which was consistent with the previously mentioned reviews. The "ability to apply knowledge to new problems" was labeled "intellectual skills" (p. 15). Rieser and Gerlach noted that the results concerning the application of knowledge were "ambiguous," which concurred with Cherryholmes's (1966) conclusions. In general, Rieser and Gerlach summarized research that was not very supportive of the cognitive and affective benefits of simulation games in education relative to conventional teaching methods.

Subsequent reviews were more comprehensive as a result of a surge in simulation game research. For example, Bredemeier and Greenblat (1981) synthesized over 70 studies in terms of three major categories of dependent variables identified as substantive learning, motivation, and the "atmosphere" of learning or student-teacher relations. Bredemeier and Greenblat concluded that simulation games produce greater retention and similar initial subject matter learning when compared to other teaching methods.

Furthermore, positive attitude change "toward the subject and its purposes" is more likely with simulation gaming than traditional methods of instruction "under certain circumstances and for some students" (p. 324) that varied with the simulation game used and the personality and nature of the students. The evidence reported by Bredemeier and Greenblat also suggested that simulation games produce significantly higher levels of interest in the subject matter. Nonetheless, Bredemeier and Greenblat cautioned that little was known about how and why simulation games influence student's motivation and interest. They also noted anecdotal reports that simulation games change classroom structure and interpersonal relations to promote a more open and relaxed atmosphere. They recommended research on the instructor's style and personality because they may affect simulation game outcomes.

Two reviews utilized quantitative techniques to summarize research findings (Dekkers & Donatti, 1981; VanSickle, 1986a). According to Dekkers and Donatti (1981), the evidence from effect size analysis "does not support the contention that simulation activities in the classroom result in increased cognitive development or retention when compared with other teaching strategies" (p. 425). However, the integration of findings did show that simulations are more effective than lecture in the development of attitudes. Dekkers and Donatti concluded from the effect size analysis of studies they reviewed that limited findings in favor of simulation games were inconclusive and unsubstantiated. A major problem in reviewing the research was the lack of "raw data" to utilize in a meta-analysis. Of the 120 documents examined by Dekkers and Donatti, 27 reported insufficient or unsuitable data.

In contrast, VanSickle (1986a) substantiated some benefits of simulation games. VanSickle conducted a systematic quantitative review of sixteen relevant studies and compared the instructional effects of simulation games with other instructional techniques. According to VanSickle, simulation gaming participants are more likely to remember what they learn longer than students who learn through other forms of instruction, such as lecture. Furthermore, student attitudes toward the subject matter, such as political self-confidence or political efficacy, showed simulation gaming had a small positive effect over traditional instruction. Similarly, White (1985) reported improved student attitudes or greater motivation to learn. Berson (1996) also cited research that showed improved attitudes toward the content area.

In a recent research review of scientific discovery learning with computer simulations, de Jong and van Joolingen (1998) concluded that various discovery learning studies produced contradictory findings and did not clearly favor simulations. They summarized research on instructional support measures that provide participants with direct access to domain information or knowledge and support methods that assist learners with the discovery learning process. Learners may lack sufficient prior knowledge and skills to state hypotheses, to interpret data, and to experiment in a systematic manner (de Jong & van Joolingen, 1998). De Jong and van Joolingen presented three studies that found “providing information at exactly the moment that it is needed by the learner” (p. 187) is more effective than providing all the relevant information prior to working with a simulation.

They also summarized research on support methods to assist with the discovery learning process. Varieties of methods were utilized with computer simulations, such as hypotheses menus, hypothesis scratchpads, and predefined spreadsheets, to provide additional support to generate hypotheses. The learning process and the performance of learners improved if learners were selecting from predefined hypotheses made available through menus. However, experimentation hints improved the students' experimentation ability, but did not effect learning. On the other hand, structuring the discovery learning environment by dividing the learning process into steps or stages of the experimental process that usually included other instructional methods, such as questioning, writing, or instruction prior to the simulation led to "more effective learning" (p. 193). In addition, learners who participated in simulations with questioning, assignments/exercises, and games performed better than those who worked with a pure discovery simulation.

Hypothesis to Explain Modest Results

The evidence in favor of simulation games compared to other instructional techniques, such as lectures, is limited and most positive conclusions are modest. One reason for the modest results is inadequate instrumentation. Low quality instruments would tend to reduce observed effects if there are true effects. As described previously, Pierfy (1977) noted that the reliability of measurement instruments was rarely provided by researchers. He emphasized that when reliability was reported it typically had low reliability coefficients that ultimately could have impacted the statistical significance of findings. VanSickle (1986a) noted the absence of "adequately designed instructional simulation games" (p. 257). He also found it difficult to locate studies with detailed descriptions of the alternate instructional treatments. In addition, reviewers of simulation game research highlighted concerns about insufficient and inadequately reported data that contributed to inconclusive research reviews (e.g., Brant, Hooper, & Sugrue, 1991; Dekkers & Donatti, 1981; VanSickle, 1986a).

Research results varied depending upon the instructional or course goals for using each simulation model and how the goals were evaluated (de Jong & van Joolingen, 1998; Greenlaw & Wyman, 1973). Some studies emphasized an instructional goal of “more intuitive and deeply rooted” learning (de Jong & van Joolingen, 1998, p. 193), whereas others emphasized the importance of learning associated with conceptual knowledge. Thus, the type of knowledge test must be relevant to the instructional goals. For example, de Jong and van Joolingen (1998) concluded that the advantages of discovery simulations “seem clear when the instructional goal is mastery of discovery skills” (p. 194) that are assessed with appropriate measures of discovery skills.

As noted previously, de Jong and van Joolingen (1998) also summarized research findings that indicated support measures and structuring the learning process enable learners to activate prior knowledge without overwhelming them with new information and without undermining the full complexity of a simulation. Thus, their research identified advantages for learning instruction prior to and during simulation games. Yet, few studies investigated the effects of instruction following a simulation game, also known as debriefing, because more researchers approached simulation gaming from a discovery perspective, and separated debriefing as a confounding variable (Rieser and Gerlach, 1977). An application model recognizes the complementary relationship of simulations games and debriefing in promoting learning.

Research on Debriefing in Simulation Gaming

The following literature review focuses on the few studies that systematically examined simulation game debriefing. See Table 2.1 for a summary of pertinent information from each study reviewed in this section. Findings from each study are summarized and critiqued below. Effect sizes are reported when sufficient data were available to compute them.

Chartier (1972)

Chartier (1972) assigned 133 undergraduate college students to four experimental conditions. There were no statistically significant differences between simulation with discussion, simulation without discussion, discussion without simulation, and the control of no discussion and no simulation with regard to five cognitive outcomes—knowledge, comprehension, analysis, synthesis, and evaluation. Chartier failed to report the statistical significance of the application measure, but mentioned data analyzed with descriptive statistics showed no differences. Based on his findings and those of other studies, Chartier concluded "that simulation games are not better than conventional classroom methods with regard to imparting content" (p. 215). Chartier recommended that further research examine the possible differences that may exist at "deeper levels" of learning; however, he did not explain the meaning of "deeper levels." Perhaps Chartier intended to suggest that traditional or standardized measurement instruments fail to measure higher levels of learning adequately.

Chartier (1972) reported statistically significant greater levels of learning satisfaction expressed by students who participated in the simulation with discussion. He noted that similar findings in other studies might have been caused by the Hawthorne or

Table 2.1: Debriefing Research Articles

Study & Simulation Game	**Research Focus**	**Sample Size/ Grade Level(s)**	**Duration**	**Treatments**	**Dependent Measures**
Chartier, M. R. (1972) *Generation Gap*	Instrumented Discussion	133 Under-graduate College Students	75 minutes	1) Simulation w/ Discussion 2) Simulation w/o Discussion 3) Discussion w/o simulation 4) No Discussion & No Simulation	1) Attitude toward games, discussion, & individual study 2) Cognitive Learning Achievement Test 3) Feelings of Satisfaction
Hankinson, H. (1987) *Commons Game*	Debriefing	66 High School Career Development Students	45 minutes (play) & 30 minutes debriefing	1) Film w/ No Debriefing 2) Simulation Game w/ No Debriefing 3) Simulation Game w/ Unstructured Debriefing 4) Simulation Game w/ Structured Debriefing	1) Free Recall of Principles 2) Application of Principles 3) Confidence in Answers 4) Attitudes Toward Conservation
Kidder, S. J., & Guthrie, J. T. (1972) *Modifying*	Discussion/ Training Effects	42 (Paid) Under-graduate College Students	Single play plus 10 minute discussion 25 minute discussion b/w two plays	1) No Treatment ("control") 2) Conventional Lecture 3) Game - Brief Discussion (10 minutes) 4) Game- Discussion (25 minutes)-Game	1) Condition 1: Written Test followed by Performance Test 2) Condition 2: Performance Test followed by Written Test
Livingston, S. A. (1973) *Ghetto*	Post Game Discussions	Four High School Classes	Two 60 minute periods for game w/ un-specified discussion	1) Simulation Game 2) Simulation Game w/ Discussion	1) Attitude Survey 2) Test of Student Understanding
Wighton, D. J. (1991) *O Emigratsii*	Debriefing	347 Grade 5 students from 16 classes	10 class periods + 1 to 3 days of additional debriefing	1) Computer-based Simulation w/ 3 debriefing groups: a) 1 day reflection, b) 2 days application, & c) 3 days analysis 2) Simulation Activity w/ no debriefing 3) No Exposure/ control	1) Achievement Test 2) Reading Test 3) Attitude Survey

"novelty" effect. Chartier believed the "novelty" effect for his study was controlled well because all participants in his study participated in novel instruction.

A number of methodological factors not addressed by Chartier may have contributed to the absence of statistically significant findings. First, the role and impact of facilitators were ambiguous. Facilitators were "carefully briefed" prior to the administration of each treatment, but no additional descriptions of their function as facilitators and their impacts on learning were provided. Differences in facilitator personality or approaches may have influenced learning. Second, "instrumented" discussion, the focus of the study, was not described in any detail. The only information provided by Chartier is that "[a]n instrumented format was used for the two discussion rounds" (p. 207). Readers must speculate about the mechanics of an "instrumented" discussion and the degree that participants were actively involved in discussion. Third, the participants' knowledge of the simulation game concepts and relationships was not tested prior to the experiment. Fourth, *Generation Gap* (Boocock & Schild, 1969), the simulation game utilized by Chartier, was criticized for being conceptually simplistic, which reduced the need for participants to generalize to other contexts and, therefore, limited the importance of discussion or debriefing (Hankinson, 1987; Livingston, 1973). For example, Chartier (1972) noted that the students in the control treatment who only read the instructions of the simulation game were finished in 22 minutes and scored similarly to students who participated in the full simulation game (75 minutes). Wighton (1991, pp. 24-25) questioned the value of the simulation activity utilized by Chartier and suggested the conceptual simplicity of the simulation game may have accounted for the lack of statistically significant differences.

Hankinson (1987)

Hankinson (1987) studied 66 high school career development students assigned to four experimental conditions. In the same classroom, all participants were randomly assigned to one of four treatment groups: (a) a structured debriefing, (b) an unstructured debriefing, (c) simulation game without debriefing, or (d) film with no simulation game and no debriefing. Hankinson described a structured debriefing as an organized debriefing grounded in published theory, whereas, an "unstructured" debriefing is not (p. 10). He derived the unstructured debriefing from six debriefing questions suggested by the game manual that progressed from questions relevant to the game's rules and symbols to application questions, such as "Which card gets you the most points in the short run?" and "Can you give some real life examples of this rule?" (p. 113). In contrast, the structured debriefing procedure was based on a directed discovery theory or a "'guided discovery approach'" designed by George Spelvin (1979—cited in Hankinson, 1987, p. 17), which is a type of inductive questioning that leads students as a group to discover and solve problems for predetermined principles. The structured debriefing appears to incorporate higher levels of thinking relative to the unstructured debriefing. Two examples of the structured debriefing questions are: (a) "How would you set up a reward system for those who did not conserve?" and (b) "How can an individual know what effect he/she is having on the problem?" (p. 109). The differences between structured and unstructured debriefing are not clarified beyond the preceding information. Both debriefings were led by facilitators who did not facilitate the game and were instructed to only ask questions contained in debriefing guides.

On a “Free Recall of Principles” test, participants who engaged in the structured debriefing had greater mean scores (*M* = 2.00) than those who engaged in the unstructured debriefing (*M* = 1.35) with a maximum possible score of seven. However, the difference was not statistically significant. Similarly, results were not statistically significant with the “Attitude Toward Conservation” measurement. The structured debriefing produced a higher mean score (*M* = 31.86) than the unstructured debriefing (*M* = 30.5) with a possible high score of 40. For the “Application of Principles” measure, respondents answered six short answer questions related to principles taught by the game. Each correct answer was worth two points for a total of 12 possible points. Participants had higher scores in the structured debriefing (*M* = 9.82) that were statistically significant relative to unstructured debriefing (*M* = 7.40). A “Cognitive Confidence” measure was asked with each question on the application of knowledge test, “How sure are you of your answer?” (Hankinson, 1987, p. 40). Participants demonstrated more confidence after a structured debriefing (*M* = 19.55) than they did after an unstructured debriefing (*M* = 18.95) with a maximum possible score of 24 being an expression of confidence (“very sure”) for each question, but the results were not statistically significant. However, unstructured and structured debriefing participants expressed greater confidence at a statistically significant level in their answers than participants in a simulation without debriefing (*M* = 15.36) or the control of film viewing with no debriefing (*M* = 14.57). As a result of the statistically significant findings from the “Application of Principles” measure with unstructured debriefing compared to a simulation game with no debriefing, Hankinson concluded that debriefing does have a positive effect on learning, which was contrary to his summary of previous findings (e.g., Chartier, 1972; Livingston, 1973) that stated debriefing made no difference when it is used after a simulation game.

The nonsignificant differences between structured and unstructured debriefing are potentially due to several methodological problems. First, questioning and assessment were sometimes poor. For example, the “Free Recall of Principles” instrument simply asked, “What did you learn from participating in this activity today?” (Hankinson, 1987, p. 92). The limited responses possibly were related to the single question lacking specificity and the limited amount of time to respond (five minutes). Hankinson recommended that future studies ask students to list “all” the things they learned during the game and provide numbered spaces to write responses to “prompt the number of correct responses” (p. 81). He also recommended that researchers focus on the “quality” of responses and allocate more time for the activity. However, he provided no advice about how to assess the quality of responses. Second, utilizing separate facilitators for the game and debriefing may have negatively impacted the results, so Hankinson recommended that future studies replicate or approximate the conditions where game facilitators “normally” control debriefings. Third, the reliability and validity of the measurement instruments were unknown. Hankinson’s dependent measures only referenced one author for the “Attitude Toward Conservation Measurement,” but instrument reliability and validity for the other measures were not discussed or provided. Fourth, the level of student participation in the oral debriefing treatments was not evaluated or measured, so readers do not know how active or involved students were during the debriefing sessions.

Livingston (1973)

Livingston (1973) investigated the impact of two treatments on four high school classes taught by two different teachers. Two of the four classes discussed the simulation game prior to assessment and the other two classes were assessed prior to discussion. The treatments and teachers were randomly assigned to the students. The simulation game lasted 60 minutes with two classes participating in discussions for an unspecified amount of time. Teachers facilitated discussion from a list of 16 questions, but teachers were not allowed to say anything beyond the lesson or rephrase student comments.

Livingston (1973) assessed student understanding of the game and student attitudes toward the people represented in the game. The test used to measure understanding of the game required short-answer responses to questions about game rules, strategies, and analogies to real life. Answers were given two points for being fully correct or one point for being partially correct. The results were not statistically significant for student understanding of the game and their attitudes toward the persons represented in the game. The attitude mean scores without discussion (M = 15.59 and M = 15.00) were comparable to discussion mean scores (M = 16.97 and M = 16.29) with a maximum possible score of 24. The cognitive test mean scores (M = 9.83 and M = 10.28) without discussion were similar to discussion mean scores (M = 8.21 and 10.50) with a high score of 14. Livingston concluded that the use of post-game discussion is “an article of faith” without findings or generalizations to support its use.

Livingston’s study (1973) is characterized by a number of limitations. Livingston did not provide data on the reliability or validity of the attitudinal and cognitive measurement instruments. Other than randomization of grading order, the procedures for scoring the short answers on the cognitive measurement, such as rater reliability, were not provided. The cognitive measurement instrument consisted of seven short-answer questions that related primarily to the participants' basic understanding of the rules and procedures of the game, for example, "What does each chip represent?" or "What does each round of the game represent?" (p. A4). The underlying system being modeled by the game was not explored or measured by the test. Similarly, application of knowledge to underprivileged inner city life was not measured. Furthermore, the level of student participation during the discussions was not evaluated or measured. Wighton (1991) criticized the experiment for not controlling the basic conditions, such as teacher instructional differences. Indeed, Livingston restricted teachers to say as little as possible during discussions, but he documented a significant teacher effect through analysis of variance. The significant difference between teachers indicates problematic or inadequate controls. However, more serious threats were probably a result of classroom effects and not teacher effects. Mortality or a discrepancy in the number of participants for each test was not discussed; however, the discussion treatment sample size for "Teacher 1" is 33 for the attitude measure and 29 for the cognitive measure. The above concerns cast serious doubt on the statistical findings of the study.

Kidder and Guthrie (1972)

Kidder and Guthrie (1972) utilized a sample of 42 undergraduate college students who were monetarily compensated for participating in a study with four experimental treatment conditions: (a) control of no game or discussion, (b) conventional lecture, (c) simulation game with a brief discussion (10 minutes) following the simulation game, and (d) simulation game with discussion (25 minutes) between two game rounds. Students were given brief instructions and facilitators returned only to answer questions. Statistically significant differences were found in favor of the longer discussion (25 minutes) between two plays of the simulation game compared to a simulation game followed by a ten-minute discussion. However, comparisons between the simulation game with a conventional lecture and a no game control were not statistically significant. According to VanSickle (1986a), the results confirmed an ability to apply behavioral modification techniques with a large observed effect of .89. The additional simulation game play has interesting ramifications for debriefing. Wighton (1991) noted that the positive finding may be interpreted as supporting the advantages of a complete debriefing (25 minutes) over a partial debriefing. However, Wighton cautioned that the results may have been the consequence of additional exposure to the simulation game through a second play.

A number of problematic features with this study related to the lack of information concerning the format and content of the discussion treatments. In addition, Kidder and Guthrie noted the possibility "that performance on either test when given second was affected by fatigue" (p. 23) or instrument decay, which negatively impacts the internal validity of a study. Furthermore, the centrality of discussion in this study is debatable since the treatment of the two groups differed by the amount of time allowed (25 minutes versus 10 minutes) and the sequencing of debriefing (after play versus between plays). Therefore, the complete discussion treatment group received over twice the amount of discussion time than that received by the partial debriefing treatment group.

Wighton (1991)

Wighton (1991) examined the impact of varying levels of debriefing on 347 fifth grade students from sixteen classes drawn from rural and urban schools. He started with ten experimental conditions that were randomly assigned to intact classes and schools, but he excluded one group and separated another from the standard analysis and, therefore, completed the study with eight treatments. If a school had more than one class involved in the study, the same treatment was assigned to the school. Three types of debriefing treatments were utilized to examine Kolb's Model of Experiential Learning and each debriefing was assigned to multiple groups of treatments: (a) 0 = control, (b) 1 = simulation, (c) 1 2 = simulation with reflection debriefing, (d) 1 3 = simulation with analysis debriefing, (e) 1 4 = simulation with application debriefing (separate analysis), (f) 1 2 3 = simulation with reflection and analysis, (g) 1 2 4 = simulation with reflection and application, (h) 1 3 4 = simulation with analysis and application (excluded from the study), (i) 1 2 3 4 = all three debriefings, and (j) 1 4 3 2 = reverse order of all debriefings. Thus, two groups of classes were selected randomly as controls that either experienced the simulation activity with no debriefing (1 = "non-debriefed") or had no exposure to the simulation game (0 = "Nil Exposure"). The simulation game took place over ten class periods. Qualitative data were also obtained from students and teachers.

Table 2.2 presents the means, standard deviations, and effect sizes for the achievement tests. Means and standard deviations were obtained from Wighton's dissertation. Effect sizes were calculated using the techniques described by Glass, McGaw, and Smith (1981). Therefore, the mean of a comparison or control group was subtracted from the mean of the experimental group and divided by the standard deviation of the control group to compute the effect size (*ES*) of a finding as thus, $ES = (M_E - M_C) / SD_C$. The interpretation of the magnitude of effect sizes is a conventional judgment. Effect sizes of .8 and greater are considered large, around .5 are medium, and near .2 are small (Cohen, 1988). The effect sizes calculations were based on the comparison or control of the simulation game with no debriefing.

The simulation game experimental groups scored significantly higher ($p < .001$) on immediate recall and retention sets (organized into three separate tests) of achievement and attitude measures than the "nil exposure" control group. The immediate achievement test mean for the no exposure group was $M = 6.97$, whereas the mean scores for exposure groups ranged from $M = 15.45$ to $M = 19.78$ out of a maximum score of 29. In addition, immediate achievement tests indicated that debriefing treatments scored significantly higher (majority at $p < .001$) than the non-debriefed control group with similar patterns for the retention achievement test. The no debriefing group mean score ($M = 17.51$) was lower than most groups ($M = 18.27$, 19.78, 18.59, 15.45, 18.54, and 19.46, respectively) for the immediate achievement test. The effect sizes for the debriefing treatments measured by immediate achievement indicated medium to small differences when compared to the simulation game with no debriefing. For example, the debriefing with analysis exhibited a medium effect size ($ES = .64$) that indicated 74% of the participants debriefed with analysis exceeded the mean score of the control participants who experienced the simulation game with no debriefing. Wighton noted that the "contradictory finding" of one debriefed group should be considered in the context of the "superior" results overall of the debriefed treatment to the non-debriefed control (p. 73), which were statistically significant.

There was no evidence that debriefing influenced students' attitudes towards the "Galician immigrants, the life they led, the obstacles they faced, and their treatment by others" (p. 56). Wighton suggested that the characteristics of the study, such as greater amounts of exposure to the materials, may have contributed to the statistically insignificant attitude outcome. He posed the possibility that student growth was achieved through the simulation play alone, and "no further growth was achievable because students had already clearly appreciated the implication of the events in the simulation" (Wighton, 1991, p. 131). However, the lower no exposure mean score (*M* = 30.29) suggested that attitude growth is "related primarily to the initial simulation activity" (p. 82).

Table 2.2

Effect Sizes for Achievement Tests (Wighton, 1991)

	Immediate				Retention			
Debriefing	*M*	*SD*	*ES*	%	*M*	*SD*	*ES*	%
0 (no game)	6.97	2.78			7.98	2.33		
1 (no debrief)	17.51	3.53			17.22	3.80		
1 2	18.27	2.97	.25	59%	17.97	2.93	.20	58%
1 3	19.78	3.62	.64	74%	19.65	3.20	.64	74%
1 4 separated								
1 2 3	18.59	3.22	.31	62%	17.45	3.71	.06	52%
1 2 4	15.45	4.17	-.58	28%	14.98	3.91	-.59	28%
1 3 4 excluded								
1 2 3 4	18.54	3.67	.29	61%	19.07	3.61	.49	69%
1 4 3 2	19.46	3.00	.55	71%	19.11	3.37	.50	69%

Note. 0 = control, 1 = simulation, 1 2 = simulation with reflection debriefing, 1 3 = simulation with analysis debriefing, 1 4 = simulation with application debriefing, 1 2 3 = simulation with reflection and analysis, 1 2 4 = simulation with reflection and application, 1 3 4 = simulation with analysis and application, 1 2 3 4 with all three debriefings, and 1 4 3 2 reversed the order of all debriefings

Wighton's experimental design has some deficiencies. First, differences in teaching ability were not sufficiently addressed by the study. Second, Wighton (1991) discovered that "the random assignment of classes to experimental groups was not fully effective in ensuring the absence of systematic differences between groups" (p. 67). A third possible concern is the reliability and validity of testing instruments. Although a pilot study was conducted, a reliability estimate was provided only for the reading progress assessment. The achievement test and attitude survey instruments were not tested for reliability. Yet, Wighton emphasized that the quantitative measures of students' achievement and attitudinal development were independently "confirmed" for validity. However, the validity was "confirmed" by an "expert" (p. 57) who was a member of the researcher's dissertation supervisory committee.

Wighton (1991) suggested that past research should be re-examined and future research should include debriefing.

> In light of the new evidence, much of the previous simulation research should be re-examined. Results from that body of research have generally been inconclusive and/or disappointing. However, since students in those studies generally only played the simulation and did not engage in any debriefing, the amount of student learning that was achieved likely was less than what was possible. The disappointing and inconclusive results from previous research, particularly comparisons of the simulation to some other mode of instruction, are understandable in the light of the possibility that researchers may not have utilized

> the full potential of the simulation mode. The simulation may be more powerful than suggested by previous research (p. 128).

In other words, past research may have been unproductive because most studies failed to consider the full potential of simulation games due to inattention to debriefing. Wighton referred to past research that includes many of the studies summarized and critiqued in the previous overview of simulation gaming research.

Summary

Simulation game models have diverse designs and uses which inhibit global conclusions and require cautious interpretation of research results. Within the confines of comparing simulation games to other instructional techniques, the majority of research reviews concluded that simulation games have similar levels of cognitive learning benefits for teaching recall, retention, and application. In addition, research reviews generally concluded that simulation games have positive effects on participants' attitudes. However, the studies that examined debriefing are insufficient and too contradictory to warrant generalizations from the findings, but they provide invaluable guidance for this study.

A number of factors may explain the limited findings. In particular, inadequate instrumentation that lacked validity and reliability affected the results. Measures should be linked to the instructional or simulation game objectives (de Jong & van Joolingen, 1998; Greenlaw & Wyman, 1973). In addition, simulation game reviews seldom discriminated between models of application or models of discovery, which has important implications for the role of debriefing. Application models embrace debriefing as a continuation of the simulation gaming experience. Reviewers as early as Thorpe

(1971) recommended that more research should focus on debriefing. Although Bredemeier and Greenblat (1981) emphasized that debriefing “is widely regarded as essential for maximum (or even correct) learning to occur” (p.310), few researchers and reviewers examined its significance. In fact, some reviewers questioned whether debriefing is a confounding factor and irrelevant to simulation game learning. Rieser and Gerlach (1977) recommended that “in order to prevent a confounding of effects, non-game activities should not be included as part of a treatment, unless such activities are being studied as independent variables” (p.16). Unfortunately, most researchers have not included reflection or debriefing as a treatment or independent variable. Pierfy (1977) noted that only some researchers “clearly indicate that postgame discussions were considered part of the treatment, and posttest data were not collected until after the debriefing exercises were completed” (p.263). The frequent exclusion of debriefing from research studies may explain the contradictory findings in simulation gaming research.

CHAPTER 3

METHODOLOGY

Research Hypotheses

The purpose of this study was to examine the learning impact of oral and written debriefing for students utilizing simulation games in secondary economics classes. In particular, this study focused on reflection and whether debriefing promotes reflection or higher order thinking. In addition, student interest in economics was evaluated through alternative treatments. The research hypotheses were as follows:

1. Participants in a simulation game with oral and written debriefing will exhibit greater levels of immediate recall, retention, and level of reflection on posttests than participants in the same simulation with only oral debriefing, with only written debriefing, or with no debriefing.
2. Participants in a simulation game with only written debriefing will exhibit greater levels of immediate recall, retention, and level of reflection on posttests and observations than participants in the same simulation with only oral debriefing or with no debriefing.
3. Participants in a simulation game with only oral debriefing will exhibit higher levels of interest in monetary policy and the instructional simulation game experience than participants in the same simulation with oral and written debriefing, with only written debriefing, or with no debriefing.

4. Participants in a simulation game with oral and written debriefing will exhibit higher levels of interest in monetary policy and the instructional simulation game experience than participants in the same simulation with only written debriefing or with no debriefing.

Participants and Sample Characteristics

Purposeful sampling of state mandated secondary economics classes in Georgia public schools was used to investigate the research questions. Four high schools with comparable level economics classes were selected based on their willingness to participate. The class sizes varied from 16 to 30 students and the initial sample size was 305 students from fourteen classes. All but six students returned parental permission forms and those six students were eliminated from the study. Demographics obtained from the teachers of the participants revealed more females (161 or 53%) than males (142 or 47%). A majority of participants were Caucasian (approximately 86%) with only 7% African American, 4% Latino/a, and 2.3% Asian.

Each class was randomly divided into four groups to receive the four treatments (oral debriefing, written debriefing, combined oral and written debriefing, or no debriefing). Participants were randomly assigned to the four treatments by rolling a die for each student. Each treatment group was represented by a number: (a) 1 = oral debriefing, (b) 2 = written debriefing, (c) 3 = oral and written debriefing, and (d) 4 = no debriefing. If the die landed on a five or six, it was re-rolled until it landed on a number one through four. A large number of students (45 or 14.8%) missed at least one of the first three days of the simulation game, debriefing, and immediate posttest and they were excluded. Seven students (2.3%) were removed from the study because their debriefing participation was considered inadequate or tainted. Another 22 students (7.2%) missed the retention posttest and were also excluded from the final study. The total lost from each treatment was 15 from oral debriefing, 20 from written debriefing, 20 from combined debriefing, and 19 from the control or no debriefing. Thus, as a result of truancy and other factors, the final sample size was 238 students. The final participant distribution in groups was relatively comparable with $n = 61$ for oral debriefing, $n = 57$ for written debriefing, $n = 62$ for combined debriefing, and $n = 58$ for the control or no debriefing.

The researcher administered the simulation game described below to reduce the confounding influence of differing teaching styles. Access to this sample was gained by securing permission from the school system, teachers, students, and parent(s) or guardian(s) of the student participants. Permission was also granted from The University of Georgia's Institutional Review Board (IRB) as project number H2003-10443-0.

Implementation

Simulation Game

The simulation game utilized for this study, *The Monetary Policy Game: Monetary Policy and the Federal Reserve System*, is a representation of how the central bank or the Federal Reserve System uses monetary policy to manage the money supply (stock of money) of the United States. *The Monetary Policy Game* was created by VanSickle, DeLorme, and Wygal (1990) who had expertise in simulation games, economics, and teaching. The instructional objectives incorporate students identifying and understanding the following concepts and their relationships: monetary policy, money supply/stock of money, fractional reserve requirement, open market operations, government securities, discount rate, money multiplier, and loanable reserves. *The Monetary Policy Game* is not designed to stand alone; students are introduced to the main concepts prior to play and apply their knowledge through making decisions during the simulation game and debriefing. Thus, the developers chose the application approach to simulation gaming over the discovery or modeling approaches.

The game is structured so that students assume the role of Federal Reserve System decision makers. The primary goal is to achieve money supply growth appropriate for economic conditions and within a specified range or target zone over approximately eight rounds of decision making, which represent two calendar years or eight business cycle quarters. The money supply target zone is depicted on a paper game board. Students adjust the money supply by increasing, maintaining, or decreasing three monetary policy tools: fractional reserve requirement, open market operations (sales or purchases of government securities), and the discount rate. During a brief (20 minutes) lecture or introduction, each student is provided concept diagrams that depict how to increase and how to decrease the supply of money.

The simulation game begins with the money supply at four billion dollars too high. The immediate goal is to reduce the supply of money to reach the target zone and maintain it within the zone. At the beginning of each round, students set a goal and decide how much they would like to increase or decrease the supply of money. Next, they choose the policy tools to change the supply of money. The game rules restrict the reserve requirement to one use and the discount rate to two uses. In addition, the rules prohibit the use of the discount rate in conjunction with the reserve requirement. After making a decision, students utilize a Choices and Consequences Book to look up the results of their decision/policy choice. At the end of each round or quarter, the teacher/game facilitator announces and displays an Unanticipated Event that may cause shifts in the money supply. Unanticipated Events represent various economic factors that influence the supply of money, such as business conditions, unemployment, and inflation. After the Unanticipated Event, students mark the game board and continue to the next round. The number of rounds or quarters that the stock of money is maintained in the acceptable game board target zone determines the winners. The amount of time to implement the initial instruction and play the simulation game for this study was approximately two 50 minute periods.

After carefully reviewing the simulation game features with Gillespie's (1972) criteria, it is reasonable to assert that the moves and rules of *The Monetary Policy Game* are consistent, meaningful, and delineated through choices that are grounded in the problem statement. According to Gillespie's standards, the game has a "sound knowledge base" and it is "workable in a classroom situation" (p. 34). In addition, the debriefing session relates to the problem statement and provides application activities to promote learning.

Treatments

The experiment focused on randomly assigning each class the following four alternative treatments: oral debriefing, written debriefing, oral and written debriefing, and no debriefing. The primary focus of this study was cognitive learning and interest/attitudes as a result of different debriefing treatments. The oral and written debriefing guides are found in the appendices. Descriptions of the treatments follow.

Oral Debriefing

The oral debriefing treatment group participated in a researcher-facilitated debriefing after the simulation game. The simulation game with the lecture lasted two 50 minute periods. Therefore, the oral debriefing took place during the third day of class. The "Oral Debriefing Guide" (see Appendix A) was the suggested debriefing from the *The Monetary Policy Game* and it was followed to ensure consistent application of the oral debriefing. The oral debriefing process surveyed students about their success, strategies, and the impact of Unanticipated Events. In addition, a number of questions determined student understanding of the concepts through application questions. The students who volunteered to answer questions were called upon. The time allowed for oral debriefing was approximately 20 minutes.

Written Debriefing

Written debriefing participants provided written responses to debriefing questions after the simulation game. The simulation game with the lecture lasted two 50 minute periods. Therefore, the written debriefing took place during the third day of class. The written debriefing questions (see Appendix B) were modified versions of the oral debriefing guide to ensure that all students participated in debriefing, which was a central reason for the implementation of written debriefing (Petranek, et al., 1992). The time allowed for the written debriefing was 20 minutes.

Combined Written and Oral Debriefing

The combined written and oral debriefing treatment group received a shorter written debriefing after the simulation game and then a researcher-facilitated oral debriefing (see Appendix C). The time allowed for the combined debriefing was 20 minutes.

Control Treatment

The control treatment group participants participated in the simulation game but received no form of debriefing. Instead, they read a recent article on the African ivory trade.

Data Collection Procedures

A variety of measures were integrated to reflect the cognitive learning and interest of each participant. The data collection procedures involved an immediate/recall posttest after debriefing (15 minutes) and a delayed posttest (20 minutes) approximately four weeks after the conclusion of debriefing. Each testing sequence included a Student Interest Survey to measure student interest in monetary policy and the instructional simulation game experience. On an index card, students were asked to write about their experiences at the conclusion of the delayed posttest. The written and combined debriefings that involved written responses were collected for documentation of student participation. The debriefing guides, measurement instruments, and assessment rubric are found in the appendices.

Measurement Quality

A pilot study was conducted during the same year in a separate school system. Three classes with an approximate total of 50 participants were utilized to examine the sequencing of the lecture, simulation game, debriefing and assessment. In addition, reliability was evaluated in the pilot study and the measurement instruments revealed strong levels of internal consistency. The 21-item multiple-choice posttest measure was internally consistent with a Cronbach's alpha of .70. In addition, the 16 item measure of student interest in monetary policy was internally consistent with a Cronbach's alpha of .89 and the 12-item survey of student interest in the instructional simulation game experience was internally consistent with a Cronbach's alpha of .90.

Immediate posttest. Cognitive learning was measured through an immediate posttest administered after a treatment and a retention posttest four weeks following the treatments. The immediate posttest (see Appendix D) was comprised of a 21-item assessment with half (questions 8-17) of the multiple-choice questions and answers designed by *The Monetary Policy Game* creators to test the recall and application of relevant concepts. The remaining items were examined and approved by one of the game authors. Therefore, the content validity was consistent with the design and goals of the simulation game. The 21-item multiple-choice posttest measure was internally consistent with a Cronbach's alpha of .71 for the immediate posttest.

Retention/reflection posttest. The retention/reflection posttest (see Appendix E) contained the same 21-item multiple-choice posttest assessment with the addition of a written reflection question. The retention posttest measure was internally consistent with a Cronbach's alpha of .70. The written reflection response required higher levels of thinking and was evaluated using an alternative assessment rubric (see Appendix F). Two raters evaluated each written reflection and inter-rater agreement was 94%. The rubric contained separate measures of knowledge and reasoning. The highest score for each measure was six and the lowest score was one. Scores of 6, 5, and 4 on the rubric indicated developed knowledge and reasoning, whereas scores of 3, 2, and 1 indicated developing knowledge and reasoning. The rubric contained two scales that were evaluated separately to avoid the ambiguity of a combined score equal to seven or the possibility that a student would score high on one measure and low on another. The largest gap is between scores of 3 and 4 that differentiated between developing and developed students respectively (Nelson & Drake, 1997).

Student interest survey. The student interest survey (see Appendices D & E) contained a series of questions that were scored on a six-point Likert scale (strongly disagree, disagree, somewhat disagree, somewhat agree, agree, and strongly agree). The first 16 items measured student interest in monetary policy and the final 12-items surveyed the participants' attitudes toward the instructional simulation game experience. Items nine through 16 and item 28 were adapted from VanSickle (1975), item eight was adapted from Crabb (2001), and items 17, 18, 19, and 24 were adapted from Hickey, Moore, and Pellegrino (2001). The 16 item measure of student interest in monetary policy was internally consistent with a Cronbach's alpha of .89 for the immediate posttest and .91 for the retention posttest. Similarly, the 12-item survey of student interest in the instructional simulation game experience was internally consistent with a Cronbach's alpha of .94 for the immediate posttest and .94 for the retention posttest.

Qualitative information. Qualitative information was collected to inform interpretation of the preceding dependent variables. After the retention/reflection posttest, students were asked to write on an index card about their experiences. On one side of an index card, students described what they learned from the simulation game and debriefing. On the other side, students described how they felt about the simulation game and debriefing.

Validity Threats

Internal Validity

Several threats to internal validity, such as historical, maturational, instrument decay, testing, participant selection, mortality and interactions (VanSickle, 1986c) were considered. However, the design of this study ensured that all four treatment groups were affected similarly by threats to internal validity. The researcher facilitated the simulation game and debriefings to control for possible changes and differences in teaching.

Historical threats to internal validity involve events that occur during the treatments that might change or cause the results instead of the treatments. A small number of historical events possibly influenced the results. For example, a classroom teacher failed to ensure that the students remained on-task while the researcher facilitated an oral debriefing in another classroom. Upon returning to the classroom, the researcher observed the students engaged in a discussion concerning their ongoing economics project and not completing their written debriefings. As a result, the posttest assessments for seven students were removed from the sample because they were considered tainted from lack of participation in the written debriefing. The remaining treatment groups in the class completed their debriefing assignments. In addition, two teachers reported some discussion of the Federal Reserve System during the four week period between the immediate posttest and the retention posttest. They shared the information discussed with their students and it is possible that one of the teachers impacted several knowledge level questions on the retention posttest. Fortunately, there were no fire drills and no overtly disruptive students.

Maturational or time-tied processes independent of the treatments might have had delayed effects that may have affected the results. For example, levels of enthusiasm may have diminished with each visit. Some students were vocally dissatisfied with having to write an essay answer for the retention posttest and a few students repeatedly asked if they were required to answer the question. The limited amount of time involved in this study (approximately four weeks) may have reduced maturational variation. In addition, instrument decay involves changes in the measurement instruments, procedures, and/or procedures after the initial observation. Some respondents may have been tired of answering the same questions. On the interest assessments, some respondents circled the same response, such as “agree,” for an entire page that had both positive and negative stems. In addition, most students recognized the identical nature of the questions on the retention posttest and the immediate posttest. Some participants asked if the assessment counted toward their class grade or appeared to desire external rewards for their participation. The effects of instrument decay are assumed to be random and not limited to any particular treatment group.

Testing may have caused internal validity problems because the observation or measurement may actually cause the results instead of the treatment. For example, the immediate posttest exposed participants to the purpose or goal of the research and might have biased the retention posttest. However, discussions with each class following the retention/reflection posttest revealed that no students discerned the focus of the experiment. Most students thought the experiment was measuring learning that occurred directly from participation in the simulation game and they failed to recognize that the different debriefings were the experimental focus.

Differential mortality threatens internal validity as a result of losing participants during a study. For example, student suspension from a classroom, absence, or attrition may damage a study's internal validity. Unfortunately, this study lost approximately 22% of the initial participants as a result of truancy. One class accounted for 18% of the truancy loss because 12 students failed to attend the early morning class on a rainy day. The teachers could not explain or think of any rational reason for the unusually high absenteeism. It is assumed that the loss of participants was random and not systematic, and the random assignment of students to the treatments provided some control for differential mortality.

Biased selection of participants can be a threat to internal validity. This study assumed student participants were randomly placed in classes and they were not systematically selected by race, gender, SES, or other factors. Federal anti-discrimination laws are generally followed in public schools and economics is a required participant for graduation in Georgia, so student schedules were assumed to be the primary determinant of class placement. Furthermore, the treatments were randomly assigned to treatments by rolling a die for each student. The interactions of various threats to internal validity overlap and are difficult to control; however, none are apparent.

External Validity

The external validity of this research study is extremely restrained. The limited number of participants and the absence of a random selection process for participant classes inhibit generalizations from this study to a target population. The participants in this convenience sample were assumed to be randomly placed in each classroom without consideration of personal factors, such as race, gender, and SES. However, this study included schools that track students and attempted to include only college preparatory/ general level and honors students because they represent the majority of students in the school system studied. Advanced Placement (A.P.) and gifted level students were excluded. The findings from this non-random sample only represent the participants of the study. Only further replication will increase the possibility of generalizing to a particular target population. Independent variables were explicitly described to promote replication.

CHAPTER 4

RESULTS

This study investigated the effect of alternative forms of reflection on cognitive and affective learning from simulation games. The posttests were used to quantify and compare student learning related to economic concepts embodied in the simulation game. The quantitative data derived from immediate and retention posttests were analyzed with descriptive statistics, effect sizes, and analysis of variance (ANOVA). The effect sizes calculated and reported are based on Cohen's d (Cohen, 1988) and η^2 (Green, Salkind, & Akey, 1997). Data were examined to ensure that the assumptions of ANOVA were met.

The qualitative data collected on the index cards was problematic and not discussed below for several reasons. First, participant writing lacked the detail and information that would have been useful to this study. Second, the index card questions did not elicit responses that were distinguishable from one another. Third, approximately 30% of the participants did not provide written feedback on the index cards.

Descriptive Statistics

Table 4.1 summarizes the means and standard deviations for the immediate posttest and the retention posttest scores by debriefing treatment. The results indicated limited differences between the treatments with a maximum test score of 21. The combined debriefing mean (M = 12.68) was the most noticeably different result and showed that combined debriefing facilitated higher levels of learning than the oral (M = 11.87), written (M = 11.39), and the control treatment (M = 10.74). The retention posttest treatment revealed that all treatments had lower test score means that moved toward the control mean (*M* = 10.17), which remained relatively constant. This limited finding concerning retention contradicted the predicted cognitive learning benefits of debriefing.

Table 4.1

Means and Standard Deviations for Cognitive Learning

Debriefing Treatment	*n*	Immediate Posttest Mean	Immediate Posttest *SD*	Retention Posttest Mean	Retention Posttest *SD*
Oral	61	11.87	3.08	10.98	3.73
Written	57	11.39	3.98	10.72	4.01
Combined	62	12.68	3.60	10.65	3.97
Control	58	10.74	3.82	10.17	3.64

As recommended and utilized by previous simulation game research reviews (Dekkers & Donatti, 1981; VanSickle, 1986a), effects sizes were calculated and reported in Table 4.2. Based on the conventional interpretation of effect sizes (Cohen, 1988), the combined debriefing for the immediate posttest had a medium effect size (*ES* = .51). Therefore, 70% of the combined debriefing participants exceeded the control mean score. Oral debriefing exhibited a modest effect size (*ES* = .30) that indicated 62% of the oral debriefing participants exceeded the control mean score. The written debriefing effect size was small (*ES* = .17) and only 57% of the written debriefing participants surpassed the control mean score. Regarding the retention posttest the effect sizes for oral, combined, and written debriefings were small (*ES* = .22, .15, and .13, respectively).

Table 4.2

Effect Sizes for Cognitive Learning

Debriefing Treatment	Immediate Posttest		Retention Posttest	
	ES	%	*ES*	%
Oral	.30	62%	.22	59%
Written	.17	57%	.15	56%
Combined	.51	70%	.13	55%

Findings reported in Table 4.3 show the means for interest in monetary policy with a maximum score of 96 were larger than the control for the immediate posttest and reduced in size for the retention posttest. Written debriefing (M = 62.44) exhibited a mean comparable to the control (M = 62.22) for the immediate posttest score, but lower than the control for the retention posttest. Effect sizes exhibited in Table 4.4 revealed small observed differences between means of the treatment groups when compared to the control of no debriefing. The oral debriefing means for both posttests were larger than the other treatments, but the effect sizes were only small.

Table 4.3

Means and Standard Deviations for Interest in Monetary Policy

Debriefing Treatment	*n*	Immediate Posttest		Retention Posttest	
		Mean	*SD*	Mean	*SD*
Oral	61	65.56	10.85	60.26	13.45
Written	57	62.44	9.38	57.86	9.89
Combined	62	64.58	10.92	59.19	13.05
Control	58	62.22	11.45	58.88	11.04

Table 4.4

Effect Sizes for Interest in Monetary Policy

Debriefing Treatment	Immediate Posttest		Retention Posttest	
	ES	%	*ES*	%
Oral	.29	61%	.13	55%
Written	.02	51%	-.09	46%
Combined	.21	58%	.03	51%

Findings reported in Table 4.5 show mixed results for interest in the instructional simulation game experience with a maximum score of 66. The means for written debriefing (M = 47.86 and M = 43.23) were smaller than the control of no debriefing for the immediate posttest and retention posttest. In addition, the combined debriefing mean (M = 47.88) decreased to a mean smaller than the no debriefing control (M = 45.86) for the retention posttest. Effect sizes exhibited in Table 4.6 revealed very small positive and negative observed differences between means of the treatment groups when compared to the control of no debriefing.

Table 4.5

Means and Standard Deviations for Interest in the Instructional Simulation Game Experience

Debriefing Treatment	*n*	Immediate Posttest		Retention Posttest	
		Mean	*SD*	Mean	*SD*
Oral	61	50.84	10.98	46.67	12.32
Written	57	47.86	9.91	43.23	10.89
Combined	62	49.39	10.56	45.76	11.29
Control	58	48.69	12.81	45.86	11.77

Table 4.6

Effect Sizes for Interest in the Instructional Simulation Game Experience

Debriefing Treatment	Immediate Posttest		Retention Posttest	
	ES	%	*ES*	%
Oral	.17	57%	.07	53%
Written	-.06	47%	-.22	41%
Combined	.06	52%	-.01	50%

The means and standard deviations for levels of reasoning and knowledge with maximum scores of six are exhibited in Table 4.7. The oral debriefing means for reasoning (*M* = 1.48) and knowledge (*M* = 1.61) were lower than the control (*M* = 1.66, and *M* = 1.59). Therefore, the effect sizes were negative for oral debriefing and small for written and combined debriefings (see Table 4.8).

Table 4.7

Means and Standard Deviations for Reasoning and Knowledge

Debriefing Treatment	*n*	Reasoning		Knowledge	
		Mean	*SD*	Mean	*SD*
Oral	61	1.48	1.10	1.61	1.20
Written	57	1.72	1.22	1.79	1.25
Combined	62	1.73	1.09	1.79	1.20
Control	58	1.66	1.22	1.59	1.24

Table 4.8

Effect Sizes for Reasoning and Knowledge

Debriefing Treatment	Reasoning		Knowledge	
	ES	%	*ES*	%
Oral	-.15	44%	-.09	49%
Written	.05	52%	.10	54%
Combined	.06	52%	.11	54%

ANOVA

One-way analyses of variance (ANOVA) were conducted to evaluate the relationship between debriefing with cognitive and affective outcome measures. The independent variable, debriefing, included four types of treatments: oral, written, combined, and no debriefing. The dependent variables were immediate score, retention score, reasoning, knowledge, interest in the subject, and interest in the instructional simulation game experience. The *F*-statistic was significant, $F\ (3, 234) = 3.03$ with $p = .03$, for the immediate posttest (see Table 4.9). The strength of the relationship between debriefing and immediate posttest score, as assessed by η^2, was small, with debriefing accounting for 3% of the variance in the immediate posttest score. The reported η^2 represents an effect size index of the proportion of variance in the dependent variable accounted for by the treatment factor (Green, Salkind, & Akey, 1997; Shannon & Davenport, 2003). No other comparisons were statistically significant as reported in Tables 4.10 – 4.16.

The assumptions of homogeneity of variance, normality, and randomly selected sample were met for the one-way ANOVA procedure. Levene's statistic ($p = .03$) for the immediate score variable revealed the possibility of unequal variances. Thus, the validity of the results were questionable (Kendrick, 2000), but the F_{max} test statistic revealed the assumption of homogeneity was not rejected (Kirk, 1968). In either case, the ANOVA was robust given the nearly equal sample sizes and the proportion of the observed variances (Glass & Stanley, 1970). The sample size was large enough to assume normality. However, histograms were examined and the dependent variables were normally distributed. In addition, the treatment groups were randomly selected to meet the random sample assumption.

Table 4.9

Analysis of Variance for Immediate Score

	SS	*df*	*MS*	*F*	η^2	*p*
Between Groups	119.86	3	39.95	3.03	.037	.030
Within Groups	3081.13	234	13.17			
Total	3200.99	237				

Table 4.10

Analysis of Variance for Retention Score

	SS	*df*	*MS*	*F*	η^2	*p*
Between Groups	20.24	3	6.75	.457	.006	.712
Within Groups	3450.96	234	14.75			
Total	3471.20	237				

Table 4.11

Analysis of Variance for Immediate Interest in the Subject

	SS	*df*	*MS*	*F*	η^2	*p*
Between Groups	475.098	3	158.37	1.39	.017	.248
Within Groups	26750.27	234	114.32			
Total	27225.37	237				

Table 4.12

Analysis of Variance for Immediate Interest in the Instructional Simulation Game Experience

	SS	*df*	*MS*	*F*	η^2	*p*
Between Groups	282.84	3	94.28	.764	.010	.515
Within Groups	2878.36	234	123.41			
Total	29161.20	237				

Table 4.13

Analysis of Variance for Retention Interest in the Subject

	SS	*df*	*MS*	*F*	η^2	*p*
Between Groups	173.27	3	57.76	.401	.005	.752
Within Groups	33668.51	234	143.88			
Total	33841.79	237				

Table 4.14

Analysis of Variance for Retention Interest in the Instructional Simulation Game Experience

	SS	*df*	*MS*	*F*	η^2	*p*
Between Groups	387.90	3	129.30	.963	.012	.411
Within Groups	31425.75	234	134.30			
Total	31813.65	237				

Table 4.15

Analysis of Variance for Reasoning

	SS	*Df*	*MS*	*F*	η^2	*p*
Between Groups	2.48	3	0.83	.615	.008	.606
Within Groups	314.16	234	1.34			
Total	316.64	237				

Table 4.16

Analysis of Variance for Knowledge

	SS	*df*	*MS*	*F*	η^2	*p*
Between Groups	2.45	3	0.82	.547	.007	.651
Within Groups	349.42	234	1.49			
Total	351.87	237				

Post-hoc tests were conducted to evaluate pairwise differences among the means. Because the treatment sample sizes had small differences, the Scheffé test was utilized as a conservative and flexible application (Keppel, 1991). The only statistically significant differences were between the means of the combined debriefing and the control of no debriefing ($p = .038$).

Summary

The findings can be summarized as follows. First, the combined written and oral debriefing produced higher achievement than the control of no debriefing on the immediate posttest at a statistically significant level. Post-hoc tests showed statistically significant differences between the combined debriefing and the control of no debriefing ($p = .038$). Second, the retention posttest treatment revealed that the benefits of debriefing dissipated with time; there were no statistically significant differences on the cognitive retention test. All debriefing treatments indicated that the learning benefits of debriefing for this study were temporary. In other words, the oral, written and combined debriefing treatment means on the retention posttest were smaller than the immediate posttest and were not statistically significantly different from the control mean.

With regards to interest in monetary policy and interest in the instructional simulation game experience, there were no statistically significant differences between the debriefing treatments. However, the mean differences and effect sizes for the immediate posttest revealed that written debriefing and the control participants were somewhat not interested, whereas, oral and combined debriefing participants were somewhat interested. Observed effect sizes suggested that debriefing had very limited impact on interest in the instructional simulation game experience.

The retention posttest indicated that the affective outcomes of debriefing on interest in the subject shrank over time. The retention posttest also showed that interest expressed by written debriefing participants was less than participants in the control of no debriefing. Overall, the oral and combined treatments' observed differences favored the instructional simulation game experience for both posttests. On the immediate and retention posttests, the results also showed the observed means for oral debriefing on interest outcomes were larger than the other treatments, but the effect sizes were only small.

Finally, the small observed differences in means and effect sizes for reasoning and knowledge on the written reflections were not expected. In contrast to the small negative effect sizes for oral debriefing, the small positive effect sizes for written and combined debriefings indicated possible benefits from writing. The written reflections appeared to benefit four weeks later from debriefings that required writing, such as the combined and written debriefing. Note, however, that these effects were not statistically significant.

CHAPTER 5

DISCUSSION AND RECOMMENDATIONS

The beginning of this chapter provides a summative introduction preceding a discussion of the research findings. A discussion of the findings in relationship to the purpose and research questions of the study follows the introduction. Relationships between the findings and the prior research on debriefing and possible explanations for the unexpected results are presented next. The chapter concludes with the limitations of this research and provides recommendations for future research.

As a form of reflection, some consider debriefing an essential component of instructional simulation games (Lederman, 1992; Stewart, 1992). The application approach incorporates debriefing as a complementary aspect of simulation games that facilitates additional learning benefits not directly received from the experience alone. A well-designed simulation game with debriefing potentially provides a means to engage students in thoughtful, engaging, and worthwhile learning that is consistent with the contemporary goals of social studies education. Although some early simulation game reviewers recommended that more research should focus on debriefing (Thorpe, 1971), the majority of researchers studied simulation games from a discovery approach and ignored debriefing or separated it as a confounding factor. A small portion of previous simulation game research investigated debriefing as a form of "postgame discussions" (Pierfy, 1977, p. 263), but most research omitted debriefing and compared simulation games to other instructional methods. A small number of previous studies found debriefing had a positive effect on cognitive learning (Hankinson, 1987; Wighton, 1991). However, the studies with positive results concerning debriefing are too few and too contradictory as a result of problematic designs to warrant generalizations from the findings.

This study attempted to build upon the body of knowledge created by previous research and contribute to an understanding of the role of debriefing in promoting affective and cognitive learning in simulation games. A variety of measures were utilized to assess the levels of cognitive learning and interest on four alternative treatments: oral debriefing, written debriefing, combined written and oral debriefing, or no debriefing. Analyses of the variables were conducted utilizing descriptive statistics, effect sizes, and ANOVA. The descriptive statistics and effect sizes were implemented to identify any observed differences between the treatments on cognitive learning and interest outcomes. In addition, ANOVA was used to examine the statistical significance of observed differences between means on the measured outcomes.

Discussion of Findings

The first research hypothesis was as follows: participants in a simulation game with oral and written debriefing will exhibit greater levels of immediate recall, retention, and level of reflection on posttests than participants in the same simulation with only oral debriefing, with only written debriefing, or with no debriefing. This study obtained a statistically significant finding ($p = .03$) that indicated the combined debriefing resulted in greater levels of immediate recall than the control. Thus, findings from this sample supported previous research results that indicated debriefing has a positive effect on cognitive learning (Hankinson, 1987; Wighton, 1991). However, the null hypothesis was not rejected for the other comparisons and measurements. Therefore, the predicted long-term cognitive learning benefits of the combined debriefing were not observed. Thus, the benefits of combining a written debriefing with an oral debriefing were only partially substantiated.

The second hypothesis was as follows: participants in a simulation game with only written debriefing will exhibit greater levels of immediate recall, retention, and level of reflection on posttests and observations than participants in the same simulation with only oral debriefing or with no debriefing. Results from this study failed to support this hypothesis. The experimental design of this study inhibited standard teaching practices that may have reinforced the benefits achieved from debriefing. For example, the debriefing treatments that incorporated writing (written and combined) were quite possibly not sufficient to promote retention without subsequent reviews and written feedback that are provided through teacher comments (Petranek, 2000; Petranek et al., 1992). In addition, preceding most assessments students are given the opportunity to review and ask questions. The design of this study prohibited students from reviewing and asking questions prior to the retention test and, therefore, they missed opportunities that could have reinforced learning and clarified misunderstandings. Thus, if students were systematically provided feedback that represented realistic pedagogy, would the retention measure show statistically significant differences between the treatments?

A substantial proportion of the written reflections provided no response (13%) and a larger number (40%) had inadequate responses that were rated a one out of a possible six. Thus, 53% of the participants provided responses that exhibited no critical thinking skills, reasoning, or reflection. The second educator who coded the written reflections currently teaches English at a large university in the South and she taught high school English for two years. Her experience with secondary and post-secondary writers is that most are unable to reason in writing. She noted that many of the written reflections from this study were missing key variables, and many of the writers appeared unable to reason through the question and, therefore, could not understand what to write. Also, student motivation was possibly limited as a result of few external rewards. Repeatedly, students sought external rewards and asked about receiving grades on the posttests.

The third hypothesis was as follows: participants in a simulation game with only oral debriefing will exhibit higher levels of interest in monetary policy and the instructional simulation game experience than participants in the same simulation with oral and written debriefing, with only written debriefing, or with no debriefing. Oral debriefing participants reported slightly higher levels of interest in the subject of monetary policy and with the instructional simulation game experience. The results from this study showed the oral debriefing means for all interest outcomes were larger than the other treatments, but the effect sizes were only small and the differences were not statistically significant. Randomization of the treatments among participants required an artificial teaching environment for this study's experimental design. The oral debriefing might have been undermined because the experimental design required moving students to a new environment or different classroom. On the other hand, the groups ranged in size from three to eight students and greater than typical levels of attention to each student were possible with such small groups. This would be virtually impossible in real, non-experimental classrooms.

The fourth hypothesis was as follows: participants in a simulation game with oral and written debriefing will exhibit higher levels of interest in monetary policy and the instructional simulation game experience than participants in the same simulation with only written debriefing or with no debriefing. The results were not statistically significant and the effect sizes were small. However, participants in the combined debriefing treatment scored higher on the retention measure of interest in the instructional simulation game experience than those in the written debriefing, but they scored slightly lower than the control group on the same measure. The written part of the combined debriefing may have reduced the levels of interest because some students find writing to be less enjoyable or even tedious (Petranek et al., 1992).

Simulations games depart from traditional pedagogy and provide students with greater control over the learning environment. However, the simulation game implemented for this study relied heavily on teacher facilitation and students were not allowed to work in groups, which was contrary to the design of the *Monetary Policy Game*. Group dynamics and interactions were controlled to examine individual cognitive learning, which was possibly to the detriment of student interest in the instructional simulation game experience and cognitive learning. Furthermore, student interest was lower on the retention posttest than the immediate posttest possibly because they were required to write essay answers for the reflection question prior to completing the interest survey.

Relationships to the Prior Research on Debriefing

Chartier (1972) found no statistically significant cognitive differences between simulation with discussion, simulation without discussion, discussion without simulation, and the control of no discussion and no simulation. Chartier's cognitive results combined with the results of this experiment suggest the cognitive advantages of oral debriefing and discussion with an instructional simulation game are limited. However, Chartier's participants who participated in the simulation with discussion expressed greater levels of learning satisfaction that were statistically significant. Although this study found that students who participated in oral debriefing had higher observed scores on both measures of interest, the differences were not statistically significant. Although the simulation game utilized by Chartier was criticized for being conceptually simplistic, the monetary policy concepts utilized in the simulation game for this study were relatively complex.

Hankinson (1987) concluded that debriefing had a positive effect on cognitive learning as a result of statistically significant differences between unstructured debriefing and a simulation game with no debriefing. In this experiment, the statistically significant results from combined debriefing compared to no debriefing further supports Hankinson's assertion on a limited scale. However, Hankinson's study had a number of design flaws that were previously discussed and may have contributed to his limited findings. For example, his sample size contained only 66 participants. The benefits of combining Hankinson's versions of structured and unstructured debriefings with other forms of debriefing, such as written or combined debriefings, would be potentially useful research.

Livingston (1973) also utilized an inadequately designed experiment, but he determined that the merits of post-game discussion were unsubstantiated by his findings for cognitive and affective measures. Livingston's findings are somewhat contradicted by this experiment since combined debriefing had an immediate positive effect on cognitive learning. Furthermore, this study measured cognitive learning beyond Livingston's measure of the basic rules and procedures of an instructional simulation game. Therefore, the cognitive assessment for this study was most likely a better indicator of students' cognitive learning and application of concepts.

Kidder and Guthrie (1972) utilized the smallest sample relative to the other debriefing studies ($N = 42$). They found statistically significant differences in favor of a longer discussion between two plays of the simulation game compared to the simulation game followed by a ten-minute discussion. Kidder and Guthrie (1972) were criticized for their experimental design, which incorporated treatments that varied in length of time to participate. In this experiment, the duration of the combined debriefing was carefully designed to ensure a consistent and systematic application of all treatments and prevent similar time-tied effects. However, unmeasured variations in the separate activities may have given students an opportunity to refocus from the written aspect of the debriefing when they were asked to participate in the oral portion of the debriefing. In other words, the separate tasks may have effectively kept the attention of students by breaking up the tasks. The varied simulation game activities (simulation game-discussion-simulation game) for Kidder and Guthrie and the varied combined (written and oral) debriefing in this study may have maintained the attention of the participants and may help explain the statistically significant cognitive differences.

Wighton (1991) found that most debriefing treatments scored significantly higher than the non-debriefed control groups on immediate and retention achievement tests. In this study, similar results were observed but were not statistically significant; all debriefing treatment groups scored higher than the control of no debriefing on the immediate and retention cognitive learning measures. Wighton concluded that debriefing promoted student cognitive learning, whereas the results from this experiment were less convincing and forced reconsideration of the dubious cognitive benefits of debriefing. In contrast to the cognitive findings, Wighton found no evidence that debriefing influenced students' attitudes towards the immigrants portrayed in the simulation game. However, the longer duration (ten class periods) of the instructional simulation game employed in Wighton's study may have contributed to changed attitudes prior to the debriefing treatments. This study also found limited increases in interest outcomes, but the duration of this study (three class periods) was relatively short. Wighton postulated that a simulation game with more difficult character roles that were not easily understood by students not playing them would have different implications for student attitude outcomes for debriefing. The concepts in *The Monetary Policy Game* for this study were sufficiently complex, but results indicated no statically significant differences between treatments for interest in monetary policy and interest in the instructional simulation game experience.

Suggestions for Future Research

Contrary to the viewpoint that debriefing is essential to learning and that students would not learn anything worthwhile without it (Thiagarajan, 1998), debriefing had a limited positive effect on cognitive learning in this experiment. Although participation in a simulation game experience does not guarantee higher levels of learning (Thiagarajan; 1998), participation in debriefing does not ensure reflection will occur. Thus, more research on debriefing is necessary to clarify the contradictions of this study.

The results and conclusions of this study are not generalizable beyond the sample population studied. However, the independent variables and all measures were explicitly described to promote replication. Future replication of this study on a larger scale that includes random samples of various populations will facilitate external validity. Additional systematic research results that are based on random samples may contribute to solving the unanswered questions and problems of this study. It would also be helpful to have data on the lost participants. The literature would benefit from more studies conducted at the secondary and primary levels of education that include participants with varying abilities and learning stages. VanSickle (1986a) noted that 68% of the participants in his research review were college age or older.

Reflection as a form of debriefing is exceedingly difficult to measure and frequently evaluated based upon traditional outcomes that assume knowledge is objective. Researchers and educators should work together to create alternative assessments similar to the rubrics utilized in this study. Future studies would also benefit by examining the immediate impact of reflection in simulation games. Qualitative analysis combined with quantitative approaches would provide greater depth and understanding of the participants' comfort, interest, motivation, and competence with reflection or reasoning (oral and written). Thus, a mixed design study would enhance the potential to triangulate the data and potentially provide a deeper understanding of the participants' affective and cognitive learning.

This study controlled group dynamics and interactions to examine individual cognitive learning by requiring students to participate individually, which was possibly to the detriment of student interest in the instructional simulation game experience and cognitive learning. Therefore, future studies may desire to replicate this study and create a comparison treatment that allows for group interaction and participation during the simulation game. In addition, a variety of independent variables were not examined in this study, such as age, race, gender, intelligence, and socioeconomic status. Future studies would benefit the literature and practice by systematically examining the impact of other variables on simulation game learning and reflection.

Further research should consider utilizing long-term instructional simulation games (Pierfy, 1977; Thorpe, 1971) with longer debriefing treatments to ensure greater amounts of student exposure to the content, treatments, and opportunity for reflection. Some students may need more time to comprehend the theories and concepts presented in the debriefing. The student written responses for this study were quite limited in depth and content. For example, many responses to reflective questions on the written debriefing were one sentence in length, which highlights the difficulty some students had in reasoning and the limited motivation of others. Students may need strategies and examples of how to justify their opinions with logic or reasoning. Examples of how to answer and respond to a thoughtful question or scenario may strengthen debriefing treatments. As discussed previously, students may not have known how to reason and their limited writing skills also inhibited reflective responses to questions. Debriefing questions and scenarios could be designed to provide greater levels of relevance to the students' lives to make it more interesting. For example, rather than general questions about oil prices, scenarios might be related to increased gas prices in the city or state of the participants.

In an altered experiment, scenarios for written debriefing treatments could be reduced in quantity and students could be required to share their written responses with a partner. The scenarios could be different for each partner, and they could be required to reflect on a separate scenario and critique each other in writing. Directions for the written critiques should require students to explain why they would respond similarly or differently to their partner's scenario. This serves a dual purpose of motivating students to write and justify their reasoning to someone other than the impersonal researcher.

As argued by Gillespie (1972), the six facets of an instructional simulation game are the central problem, choices, moves, rules, organization, and conclusion. The central problem may have the greatest impact on the relevance of debriefing. If an instructional simulation game does not have a complex or sophisticated central problem, it may be too simplistic to necessitate a debriefing. For example, the simulation game utilized by Chartier (1972), *Generation Gap*, was criticized for being conceptually simplistic, which limited the relevance of debriefing (Hankinson, 1987; Livingston, 1973). Furthermore, the organization of a simulation game may reduce the need for debriefing. Wighton (1991) suggested that greater amounts of exposure to a simulation game may have contributed to student attitude growth that was relatively thorough and did not need debriefing. Yet, the complexity of the simulation game may have factored into the results. Thus, instructional simulation games should be evaluated prior to research for complexity of the central problem and how the simulation game is organized to promote or facilitate reflective learning.

According to Wighton (1991), a simulation game with more difficult character roles would have different implications for the relevance of debriefing and student learning outcomes. In *The Monetary Policy Game* all students assume exactly the same role. In contrast, other simulation games incorporate multiple roles with different interests, resources, and complex interactions. In addition, simulation games with multiple participant roles frequently require more complex rules that vary based on the underlying theories of the simulation game. For example, in an international relations simulation game, participants might assume different leadership roles for a fictitious country, such as ambassadors, prime ministers, or heads of state. A variety of rules govern how each participant's leadership role can interact with leaders of the same country and other countries. For example, prime ministers must communicate to other prime ministers through ambassadors. Thus, debriefing is likely to be essential in such complex instructional simulation games to promote understanding of the relationships, theories, and interactions between roles. Future studies should attempt to examine the impact of debriefing on learning outcomes for instructional simulation games that incorporate multiple, complex roles with varying interests and resources.

The time between moves in *The Monetary Policy Game* was restricted by the progress of other students and the efficiency of the facilitator. All students were required to wait for an "Unanticipated Event," so quick decision-makers were forced to wait until everyone made a decision and plotted their results. Thus, the quicker students had more time to reflect between rounds of each play, whereas the students who had difficulty or took longer to make decisions had less time to reflect. On the other hand, the quicker students may have been simply bored and thinking about other things, which would have a negative impact on their interest toward the simulation game. It would be useful to investigate the differences in outcome measures based on such participation differences.

In a relevant computer simulation game review, de Jong and van Joolingen (1998) summarized that providing all the relevant information prior to working with a simulation was less effective than incorporating technology to present it when it is needed by the students. The simulation game implemented for this experiment relied heavily on information presented during a lecture that preceded playing the game. Some of the information from the lecture may be more effective if it was presented during the simulation game. In addition, a computer based version of the game may provide menus or instantaneous information to inform learners at the point that they may need the information. A computer version of the simulation game could integrate debriefing throughout the simulation game with questions through menus or hypertext that could promote reflection about decisions and consequences. Furthermore, students should be given additional time to evaluate the underlying model of a simulation game through debriefing; they may gain a greater awareness of the system being studied through constructing their own meaning and understanding. For example, a simulation of fiscal policy with the monetary policy simulation game would assist in understanding different approaches to altering the economy.

REFERENCES

Archambault, R. D. (Ed.). (1964). *John Dewey on education*. Chicago: The University of Chicago Press.

Berson, M. J. (1996). Effectiveness of computer technology in the social studies: A review of the literature. *Journal of Research on Computing in Education*, *28*, 486-499.

Boocock, S. S. & Schild, E. O. (1969). *Generation gap*. New York: Western.

Brant, G., Hooper, E. & Sugrue, B. (1991). Which comes first the simulation or the lecture? *Journal of Educational Computing Research*, *7*, 469-481.

Bredemeier, M. E., & Greenblat, C. S. (1981). The educational effectiveness of simulation games. *Simulation and Games*, *12*, 307-332.

Chartier, M. R. (1972). Learning effect: An experimental study of a simulation game and instrumented discussion. *Simulation and Games*, *3*, 203-218.

Cherryholmes, C. H. (1966). Some current research on effectiveness of educational simulations: Implications for alternative strategies. *American Behavioral Scientist*, *10*(2), 4-7.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Crabb, K. D. (2001). Case study of geographic information system integration in a high school world geography classroom. (Doctoral Dissertation: University of Georgia, 2001). *Dissertation Abstracts International*, *62* (09), 3009A.

Crookall, D. (1992). Editorial: Debriefing. *Simulation & Gaming*, *23*, 141-142.

Dekkers, J., & Donatti, S. (1981). The integration of research on the use of simulation as an instructional strategy. *Journal of Educational Research*, *74*, 424-427.

Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. Boston: D. C. Heath and Company.

Ellington, H., Gordon, M., & Fowlie, J. (1998). *Using games & simulations in the classroom*. London, England: Kogan Page Limited.

Gay, G. (1997). Connections between character education and multicultural education. In A. Molnar (Ed.), *The construction of children's character* (pp. 97-109). Chicago: The University of Chicago Press.

Gillespie, J. A. (1972). Analyzing and evaluating classroom games. *Social Education*, *36*, 33-42, 94.

Gillespie, J. A. (1973). Designing simulation/games in social studies: The game doesn't end with winning. *Viewpoints: Bulletin of the School of Education, Indiana University*, *49*(6), 21-27.

Glass, G. V., McGaw, B., & Smith, M. L. (1981). *Meta-analysis in social research*. Beverly Hills, CA: Sage Publications.

Glass, G. V. & Stanley, J. C. (1970). *Statistical methods in education and psychology*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Grabe, M., & Grabe, C. (2001). *Integrating technology for meaningful learning* (3rd ed.). New York: Houghton-Mifflin.

Gredler, M. E. (1994). *Designing and evaluating games and simulations: A process approach*. Houston, Texas: Gulf Publishing Company.

Green, S. B., Salkind, N. J., & Akey, T. M. (1997). *Using SPSS for windows: Analyzing and understanding data*. New Jersey: Prentice Hall.

Greenlaw, P. S. & Wyman, F. P. (1973). Teaching effectiveness of games in collegiate business courses. *Simulation and Games*, *4*, 259-294.

Hankinson, H. (1987). The cognitive and affective learning effects of debriefing after a simulation game. (Doctoral Dissertation: Indiana University). *Dissertation Abstracts International*, *49* (04), 712A.

Hickey, D. T., Moore, A. L., & Pellegrino, J. W. (2001). The motivational and academic consequences of elementary mathematics environments: Do constructivist innovations and reforms make a differences? *American Educational Research Journal*, *38*, 611-652.

de Jong, T. & van Joolingen, W. R. (1998). Scientific discovery learning with computer simulations of conceptual domains. *Review of Educational Research, 68*, 179-201.

Kendrick, J. R. (2000). *Social statistics: An introduction using SPSS for Windows*. Mountain View, CA: Mayfield Publishing Co.

Keppel, G. (1991). *Design and analysis: A researcher's handbook,* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Kidder, S. J., & Guthrie, J. T. (1972). Training effects of a behavior modification game. *Simulation and Games*, *3*, 17-28.

Kirk, R. E. (1968). *Experimental design: Procedures for the behavioral sciences*. Belmont, CA: Brooks/Cole Publishing Co.

Lederman, L. C. (1992). Debriefing: Toward a more systematic assessment of theory and practice. *Simulation & Gaming*, *23*, 145-160.

Lee, J. (1999). Effectiveness of computer-based instructional simulation: A meta analysis. *International Journal of Instructional Media*, *26*, 71-85.

Livingston, S. A. (1973). *Simulation games in the classroom: How important is the post-game discussion?* Center for Social Organization of Schools, No. 150. Baltimore: Johns Hopkins University.

Massialas, B. G., & Cox, B. C. (1966). *Inquiry in social studies*. New York: McGraw-Hill.

Nash, R. J. (1997). *Answering the "virtuecrats:" A moral conversation on character education*. New York: Teachers College Press.

National Council for the Social Studies. (1994). *Expectations of excellence: Curriculum standards for social studies.* Washington, DC: National Council for the Social Studies.

Nelson, L. R. & Drake, F. D. (1997). Enhancing reflective practice through alternative assessment. *Journal of Research in Rural Education*, *13*, 47-56.

Newmann, F. M. (1990). Higher order thinking in teaching social studies: A rationale for the assessment of classroom thoughtfulness. *Journal of Curriculum Studies*, *22*, 41-56.

Newmann, F. M. (1991). Promoting higher order thinking in social studies: Overviews of a study of 16 high school departments. *Theory and Research in Social Education*, *19*, 324-340.

Papert, S. (1991). Situating constructionism. In I. Harel & S. Papert (Eds.), *Constructionism* (pp. 1-11). Norwood, NJ: Ablex.

Petranek, C. F. (2000). Written debriefing: The next vital step in learning with simulations. *Simulation & Gaming*, *31*, 108-119.

Petranek, C. F., Corey, S. & Black, R. (1992). Three levels of learning in simulations: Participating, debriefing, and journal writing. *Simulation & Gaming*, *23*, 174-185.

Pierfy, D. A. (1977). Comparative simulation game research—stumbling blocks and stepping stones. *Simulation and Games, 8*(2), 255-268.

Raths, J. (1987). Enhancing understanding through debriefing. *Educational Leadership*, *45*(2), 24-27.

Rieber, L. P. (1996). Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. *Educational Technology Research & Development*, *44*(2), 43-58.

Rieber, L. P. & Noah, D. (1997). Effect of gaming and visual metaphors on reflective cognition within computer-based simulations. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Rieser, R. A., & Gerlach, V. S. (1977). Research on simulation games in education: A critical analysis. *Educational Technology*, *17*(12), 13-18.

Ruben, B. D. (1999). Simulations, games, and experience-based learning: The quest for a new paradigm for teaching and learning. *Simulation & Gaming*, *30*, 498-505.

Shannon, D. M. & Davenport, M. A. (2003). *Using SPSS to solve statistical problems: A self-instruction guide*. Upper Saddle River, NJ: Merrill Prentice Hall.

Slavin, R. E. (1986). Best evidence synthesis: An alternative to meta-analytic and traditional reviews. *Educational Researcher*, *15*(9), 5-11.

Stewart, L. P. (1992). Ethical issues in postexperimental and postexperiential debriefing. *Simulation & Gaming*, *23*, 196-211.

Thatcher, D. (1990). Promoting learning through games and simulations. *Simulation & Gaming*, *21*, 262-273.

Thiagarajan, S. (1998). The myths and realities of simulations in performance technology. *Educational Technology*, *38*(5), 35-41.

Thorpe, G. R. (1971). A brief survey of research in learning through the use of simulation games. *High School Journal*, *54*, 454-469.

van Ments, M. (1999). The effective use of role-play: Practical techniques for improving learning (2nd ed.). London: Kogan Page.

VanSickle, R. L. (1975). The effects on participant outcomes of resource independence and decision-making procedure specificity in simulation games. Unpublished doctoral dissertation, Indiana University.

VanSickle, R. L. (1986a). A quantitative review of research on instructional simulation gaming: A twenty-year perspective. *Theory and Research in Social Education*. *14*, 245-264.

VanSickle, R. L. (1986b, April). Research implications for the design of social and *computer simulation games in economic education.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.

VanSickle, R. L. (1986c). Toward more adequate quantitative instructional research. *Theory and Research in Social Education*. *14*, 171-184.

VanSickle, R. L., DeLorme, C. D., and Wygal, S. S. (1990). *The monetary policy game: Monetary policy and the Federal Reserve System.* Athens, GA: The University of Georgia.

Wade, R. (1997). Reflection. In R. C. Wade (Ed.), *Community service-learning: A guide to including service learning in the public school curriculum* (pp. 95-112). Albany, NY: State University of New York Press.

Wighton, D. J. (1991). Simulation debriefing: Applying Kolb's model of experiential learning to improve classroom practices. (Doctoral Dissertation: University of Victoria, Canada). *Dissertation Abstracts International*, *53*(10), 3483A.

White, C. S. (1985). Citizen decision making, reflective thinking and simulation gaming: A marriage of purpose, method and strategy [Monograph]. *Journal of Social Studies Research*, *2*.

APPENDIX A

ORAL DEBRIEFING GUIDE

Oral Debriefing Guide

1. Survey the class regarding the number of rounds they were on target or within the acceptable range.

2. Ask successful students to explain his/her strategies and to identify good and bad choices they made. Compare and contrast.

3. Ask less successful teams to explain the problems they encountered that did not involve Unanticipated Events. Ask what they might have done differently.

4. Ask about the impact of particular Unanticipated Events and how students responded to them.
   - What was the impact of the Unanticipated Event that had business conditions improve? How did you respond to it?

   - What was the impact of the Unanticipated Event that had an increase in the unemployment rate? How did you respond to it?

   - What was the impact of the Unanticipated Event that had an increase in inflation? How did you respond to it?

5. Ask comprehension questions to assess students' understanding of the monetary policy concepts and their relationships.
   - What are the three Monetary Policy tools available to the Federal Reserve System?

   - If you decrease the reserve requirement, how does that affect the money supply? Why does it have that effect?

   - If you increase the discount rate, how does that affect the money supply? Why does it have that effect?

   - How do open market operations affect the money supply?

6. Pose some alternate scenarios and discuss good policy choices.
   - What should be done if the money supply is too small at Time Zero?

   - What should be done if the nation's oil supply is sharply reduced because of international problems?

   - What should be done if a major financial scandal or disaster makes people uncertain about the safety of their money in the banks and they begin to withdraw it (i.e., currency drain)?

   - What should be done if the inflation rate increases unexpectedly during the simulation game?

APPENDIX B

WRITTEN DEBRIEFING QUESTIONS

Name_________________________________ Period:________________ Date:
Written Debriefing Questions

1. How many rounds were you on target or within the acceptable range?

2. Explain your strategies and identify good and bad choices you made.

3. Explain any problems you encountered that did not involve Unanticipated Events. What would you do differently?

4. What are the three Monetary Policy tools available to the Federal Reserve System?

5. What was the impact of the Unanticipated Event that had business conditions improve? How did you respond to it? Why does it have that effect?

6. What was the impact of the Unanticipated Event that had an increase in the unemployment rate? How did you respond to it? Why does it have that effect?

7. What was the impact of the Unanticipated Event that had an increase in inflation? How did you respond to it? Why does it have that effect?

8. What was the impact of the Holiday Shopping Event? How did you respond to it? Why does it have that effect?

9. If you decrease the reserve requirement, how does that affect the money supply? Why does it have that effect?

10. If you increase the discount rate, how does that affect the money supply? Why does it have that effect?

11. How do open market operations affect the money supply?

12. What should be done if the money supply is too small at Time Zero?

13. What should be done if the nation's oil supply is sharply reduced because of international problems?

14. What should be done if a major financial scandal or disaster makes people uncertain about the safety of their money in the banks and they begin to withdraw it (i.e., currency drain)?

15. What should be done if the inflation rate increases unexpectedly during the simulation game?

APPENDIX C

COMBINED DEBRIEFING WRITTEN QUESTIONS AND COMBINED ORAL DEBRIEFING GUIDE

Name____________________________________ Period:_________________ Date:

Written Debriefing Questions for Combined*

1. How many rounds were you on target or within the acceptable range?

2. Explain your strategies and identify good and bad choices you made.

3. Explain any problems you encountered that did not involve Unanticipated Events. What would you do differently?

4. What are the three Monetary Policy tools available to the Federal Reserve System?

5. What was the impact of the Unanticipated Event that had business conditions improve? How did you respond to it? Why does it have that effect?

6. What was the impact of the Holiday Shopping Event? How did you respond to it? Why does it have that effect?

7. If you decrease the reserve requirement, how does that affect the money supply? Why does it have that effect?

8. If you increase the discount rate, how does that affect the money supply? Why does it have that effect?

9. What should be done if the nation's oil supply is sharply reduced because of international problems?

Oral Debriefing Guide for Combined Debriefing

1. Survey the class regarding the number of rounds they were on target or within the acceptable range.

2. Ask successful students to explain his/her strategies and to identify good and bad choices they made. Compare and contrast.

3. Ask what they might have done differently.

4. Ask about the impact of particular Unanticipated Events and how students responded to them.

   - What was the impact of the Unanticipated Event that had an increase in the unemployment rate? How did you respond to it?

   - What was the impact of the Unanticipated Event that had an increase in inflation? How did you respond to it?

5. Ask comprehension questions to assess students' understanding of the monetary policy concepts and their relationships.

   - What are the three Monetary Policy tools available to the Federal Reserve System?

   - If you decrease the reserve requirement, how does that affect the money supply? Why does it have that effect?

   - If you increase the discount rate, how does that affect the money supply? Why does it have that effect?

6. Pose some alternate scenarios and discuss good policy choices.
   - What should be done if the money supply is too small at Time Zero?

   - What should be done if a major financial scandal or disaster makes people uncertain about the safety of their money in the banks and they begin to withdraw it (i.e., currency drain)?

APPENDIX D

IMMEDIATE POSTTEST AND INTEREST SURVEY

Name___________________________________ Period:________________ Date:

Monetary Policy Assessment: Please circle the letter beside the correct answer.

1. The Federal Reserve System (the Fed) uses Monetary Policy to
   A. regulate federal banks.
   B. manage the level of taxation.
   C. manage the money supply.
   D. regulate government spending.

2. The amount of money in circulation is known as
   A. open market operations.
   B. consumer reserves.
   C. government securities.
   D. money supply.

3. The amount of money commercial banks have available for loans is known as
   A. open market operations.
   B. the fractional reserve requirement.
   C. loanable reserves.
   D. the discount rate.

4. The percentage of deposits that commercial banks are required by law to set aside as reserves with their district or Federal Reserve Bank is known as
   A. open market operations.
   B. fractional reserve requirement.
   C. government securities.
   D. the discount rate.

5. The buying and selling of government securities is known as
   A. open market operations.
   B. the fractional reserve requirement.
   C. loanable reserves.
   D. the discount rate.

6. The interest rate commercial banks must pay for loans from the Federal Reserve Bank is known as
   A. simple interest rate.
   B. the fractional reserve requirement.
   C. compound interest rate.
   D. the discount rate.

7. If commercial banks are permitted to maintain a smaller percentage of their deposits as reserves (i.e., lower fractional reserve requirement), then
   A. more reserve dollars are required, commercial banks' loanable reserves decrease, and fewer dollars are available for bank loans.
   B. fewer reserve dollars are required, commercial banks' loanable reserves increase, and more dollars are available for bank loans.
   C. more reserve dollars are required, commercial banks' loanable reserves increase, and more dollars are available for bank loans.
   D. fewer reserve dollars are required, commercial banks' loanable reserves increase, and fewer dollars are available for bank loans.

8. In order to increase the money supply, what should be done?
   A. Sell government securities.
   B. Decrease the discount rate.
   C. Increase the fractional reserve requirement.
   D. None of the above.

9. If the discount rate is decreased, what will be the effect on commercial banks' loanable reserves?
   A. It will increase the loanable reserves.
   B. It will decrease the loanable reserves.
   C. It will have no effect on the loanable reserves.
   D. It will eliminate the loanable reserves completely.

10. The term money multiplier is used because
    A. the government can print more money if it is needed.
    B. people can earn interest on their savings accounts in banks.
    C. banks can multiply the amount of money in circulation by lending more money.
    D. people can multiply their money by buying government securities.

11. If commercial banks' loanable reserves increase and demand for loans remains constant, how will the price of borrowing money (that is, the interest rate) be affected?
    A. It will go down.
    B. It will stay the same.
    C. It will go up.
    D. It is impossible to predict the effect.

12. What will happen to the money supply if the Fed buys more government securities through open market operations?
    A. Banks will have more loanable reserves and the money supply will increase.
    B. Banks will have less loanable reserves and the money supply will increase.
    C. Banks will have less loanable reserves and the money supply will decrease.
    D. Banks will have more loanable reserves and the money supply will decrease.

13. What two things could be done to decrease the money supply?
    A. Increase the fractional reserve requirement and buy government securities.
    B. Increase the discount rate and buy government securities.
    C. Decrease the fractional reserve requirement and sell government securities.
    D. Increase the discount rate and sell government securities.

14. What might the Fed do to the money supply in order to reduce the inflation rate?
    A. Leave the money supply at its current level.
    B. Increase the level of taxation.
    C. Increase the money supply.
    D. Decrease the money supply.

15. When the Fed buys government securities, it is
    A. taking money out of circulation and helping reduce inflation.
    B. taking money out of circulation and working against recession.
    C. putting money in circulation and working against recession.
    D. putting money in circulation and helping reduce inflation.

16. Which actions will increase the money supply?
    A. Decrease the fractional reserve requirement, decrease the discount rate, and buy government securities.
    B. Increase the fractional reserve requirement, increase the discount rate, and buy government securities.
    C. Increase the fractional reserve requirement, decrease the discount rate, and buy government securities.
    D. Decrease the fractional reserve requirement, increase the discount rate, and buy government securities.

17. If the fractional reserve requirement is increased and the discount rate is decreased, what effect will this have?
    A. The two changes will work together to increase the money supply.
    B. The two changes will work against each other, and the money supply will stay approximately the same.
    C. The two changes will work together to decrease the money supply.
    D. None of the above.

18. What might the Fed do to the money supply in order to stimulate the economy during a recession?
    A. Leave the money supply at its current level.
    B. Change the level of taxation.
    C. Increase the money supply.
    D. Decrease the money supply.

19. If the economy is strong and businesses are investing in new production, what might the Fed do to the money supply to encourage continued economic growth?
    A. Buy government securities.
    B. Increase the discount rate and increase the fractional reserve requirement.
    C. Sell government securities.
    D. Increase the fractional reserve requirement.

20. What might the Fed do to the money supply if unemployment is high?
    A. Leave the money supply at its current level.
    B. Decrease the level of taxation.
    C. Increase the money supply.
    D. Decrease the money supply.

21. What might the Fed do to the money supply if the U.S. goes to war and consumer confidence declines?
    A. Decrease the fractional reserve requirement, decrease the discount rate, or buy government securities.
    B. Increase the fractional reserve requirement, increase the discount rate, or buy government securities.
    C. Increase the fractional reserve requirement, decrease the discount rate, or buy government securities.
    D. Decrease the fractional reserve requirement, increase the discount rate, or buy government securities.

For each question circle one of the following: strongly disagree, disagree, disagree somewhat, agree somewhat, agree, and strongly agree.

1. I think monetary policy is interesting to study.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

2. I think monetary policy is valuable to understand.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

3. I think monetary policy is worthwhile to learn.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

4. I think monetary policy is understandable.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

5. I think monetary policy is important for the welfare of our country.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

6. I think monetary policy is logical.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

7. I think understanding monetary policy will help me make better decisions.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

8. I think the Monetary Policy Game should be included in future economics courses.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

9. I think monetary policy should be discussed frequently in my classes at school.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

10. It is important for people like me to know how monetary policy decisions are made.

    strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

11. Most people like me do not need to understand how monetary policy decisions are made.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

12. I would like to learn more about how monetary policy decisions have been made by United States leaders.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

13. I have no strong feelings about monetary policy.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

14. I like to watch or hear news reports about monetary policy.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

15. I don't find newspaper and magazine articles about monetary policy very worthwhile reading.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

16. I avoid watching the television news reports about monetary policy.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

17. Playing the Monetary Policy Game was enjoyable.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

18. Playing the Monetary Policy Game was fun.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

19. Playing the Monetary Policy Game was boring.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

20. Playing the Monetary Policy Game was confusing.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

21. Playing the Monetary Policy Game helped me learn.

strongly disagree   disagree   disagree somewhat   agree somewhat   agree   strongly agree

22. Playing the Monetary Policy Game was a waste of time.

strongly disagree   disagree   disagree somewhat   agree somewhat   agree   strongly agree

23. Playing the Monetary Policy Game was useful.

strongly disagree   disagree   disagree somewhat   agree somewhat   agree   strongly agree

24. Playing the Monetary Policy Game was interesting.

strongly disagree   disagree   disagree somewhat   agree somewhat   agree   strongly agree

25. Playing the Monetary Policy Game was not interesting.

strongly disagree   disagree   disagree somewhat   agree somewhat   agree   strongly agree

26. Playing the monetary policy game was exciting.

strongly disagree   disagree   disagree somewhat   agree somewhat   agree   strongly agree

27. Other economics lessons are more interesting than the Monetary Policy Game.

strongly disagree   disagree   disagree somewhat   agree somewhat   agree   strongly agree

28. If I had my choice, I would not have played the Monetary Policy Game.

strongly disagree   disagree   disagree somewhat   agree somewhat   agree   strongly agree

APPENDIX E

RETENTION/REFLECTION POSTTEST AND INTEREST SURVEY

Name_________________________________ Period:_______________ Date:

Monetary Policy Assessment: Please circle the letter beside the correct answer.

1. The Federal Reserve System (the Fed) uses Monetary Policy to
   A. regulate federal banks.
   B. manage the level of taxation.
   C. manage the money supply.
   D. regulate government spending.

2. The amount of money in circulation is known as
   A. open market operations.
   B. consumer reserves.
   C. government securities.
   D. money supply.

3. The amount of money commercial banks have available for loans is known as
   A. open market operations.
   B. the fractional reserve requirement.
   C. loanable reserves.
   D. the discount rate.

4. The percentage of deposits that commercial banks are required by law to set aside as reserves with their district or Federal Reserve Bank is known as
   A. open market operations.
   B. fractional reserve requirement.
   C. government securities.
   D. the discount rate.

5. The buying and selling of government securities is known as
   A. open market operations.
   B. the fractional reserve requirement.
   C. loanable reserves.
   D. the discount rate.

6. The interest rate commercial banks must pay for loans from the Federal Reserve Bank is known as
   A. simple interest rate.
   B. the fractional reserve requirement.
   C. compound interest rate.
   D. the discount rate.

7. If commercial banks are permitted to maintain a smaller percentage of their deposits as reserves (i.e., lower fractional reserve requirement), then
   A. more reserve dollars are required, commercial banks' loanable reserves decrease, and fewer dollars are available for bank loans.
   B. fewer reserve dollars are required, commercial banks' loanable reserves increase, and more dollars are available for bank loans.
   C. more reserve dollars are required, commercial banks' loanable reserves increase, and more dollars are available for bank loans.
   D. fewer reserve dollars are required, commercial banks' loanable reserves increase, and fewer dollars are available for bank loans.

8. In order to increase the money supply, what should be done?
   A. Sell government securities.
   B. Decrease the discount rate.
   C. Increase the fractional reserve requirement.
   D. None of the above.

9. If the discount rate is decreased, what will be the effect on commercial banks' loanable reserves?
   A. It will increase the loanable reserves.
   B. It will decrease the loanable reserves.
   C. It will have no effect on the loanable reserves.
   D. It will eliminate the loanable reserves completely.

10. The term money multiplier is used because
    A. the government can print more money if it is needed.
    B. people can earn interest on their savings accounts in banks.
    C. banks can multiply the amount of money in circulation by lending more money.
    D. people can multiply their money by buying government securities.

11. If commercial banks' loanable reserves increase and demand for loans remains constant, how will the price of borrowing money (that is, the interest rate) be affected?
    A. It will go down.
    B. It will stay the same.
    C. It will go up.
    D. It is impossible to predict the effect.

12. What will happen to the money supply if the Fed buys more government securities through open market operations?
    A. Banks will have more loanable reserves and the money supply will increase.
    B. Banks will have less loanable reserves and the money supply will increase.
    C. Banks will have less loanable reserves and the money supply will decrease.
    D. Banks will have more loanable reserves and the money supply will decrease.

13. What two things could be done to decrease the money supply?
    A. Increase the fractional reserve requirement and buy government securities.
    B. Increase the discount rate and buy government securities.
    C. Decrease the fractional reserve requirement and sell government securities.
    D. Increase the discount rate and sell government securities.

14. What might the Fed do to the money supply in order to reduce the inflation rate?
    A. Leave the money supply at its current level.
    B. Increase the level of taxation.
    C. Increase the money supply.
    D. Decrease the money supply.

15. When the Fed buys government securities, it is
    A. taking money out of circulation and helping reduce inflation.
    B. taking money out of circulation and working against recession.
    C. putting money in circulation and working against recession.
    D. putting money in circulation and helping reduce inflation.

16. Which actions will increase the money supply?
    A. Decrease the fractional reserve requirement, decrease the discount rate, and buy government securities.
    B. Increase the fractional reserve requirement, increase the discount rate, and buy government securities.
    C. Increase the fractional reserve requirement, decrease the discount rate, and buy government securities.
    D. Decrease the fractional reserve requirement, increase the discount rate, and buy government securities.

17. If the fractional reserve requirement is increased and the discount rate is decreased, what effect will this have?
    A. The two changes will work together to increase the money supply.
    B. The two changes will work against each other, and the money supply will stay approximately the same.
    C. The two changes will work together to decrease the money supply.
    D. None of the above.

18. What might the Fed do to the money supply in order to stimulate the economy during a recession?
    A. Leave the money supply at its current level.
    B. Change the level of taxation.
    C. Increase the money supply.
    D. Decrease the money supply.

19. If the economy is strong and businesses are investing in new production, what might the Fed do to the money supply to encourage continued economic growth?
    A. Buy government securities.
    B. Increase the discount rate and increase the fractional reserve requirement.
    C. Sell government securities.
    D. Increase the fractional reserve requirement.

20. What might the Fed do to the money supply if unemployment is high?
    A. Leave the money supply at its current level.
    B. Decrease the level of taxation.
    C. Increase the money supply.
    D. Decrease the money supply.

21. What might the Fed do to the money supply if the U.S. goes to war and consumer confidence declines?
    A. Decrease the fractional reserve requirement, decrease the discount rate, or buy government securities.
    B. Increase the fractional reserve requirement, increase the discount rate, or buy government securities.
    C. Increase the fractional reserve requirement, decrease the discount rate, or buy government securities.
    D. Decrease the fractional reserve requirement, increase the discount rate, or buy government securities.

22. Consider what you recently learned from the monetary policy simulation game and in economics. Now assume you are an economic advisor to the Federal Reserve Board. You have conducted research on the economy and found the following:

- the economy is weak,
- business investment is down,
- unemployment is at ten year highs,
- consumer confidence is modest,
- and inflation is stable.

Prepare a report (at least eight sentences) for the Federal Reserve Board explaining your recommendations. (1) Using the information above, what is your recommended money supply goal? Why? (Describe how the information above affects your recommendation.) (2) Using the fractional reserve requirement, discount rate, and buying and selling of government securities as monetary policy tools, how would you change the money supply? Why?

For each question circle one of the following: strongly disagree, disagree, disagree somewhat, agree somewhat, agree, and strongly agree.

1. I think monetary policy is interesting to study.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

2. I think monetary policy is valuable to understand.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

3. I think monetary policy is worthwhile to learn.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

4. I think monetary policy is understandable.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

5. I think monetary policy is important for the welfare of our country.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

6. I think monetary policy is logical.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

7. I think understanding monetary policy will help me make better decisions.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

8. I think the Monetary Policy Game should be included in future economics courses.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

9. I think monetary policy should be discussed frequently in my classes at school.

   strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

10. It is important for people like me to know how monetary policy decisions are made.

    strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

11. Most people like me do not need to understand how monetary policy decisions are made.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

12. I would like to learn more about how monetary policy decisions have been made by United States leaders.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

13. I have no strong feelings about monetary policy.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

14. I like to watch or hear news reports about monetary policy.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

15. I don't find newspaper and magazine articles about monetary policy very worthwhile reading.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

16. I avoid watching the television news reports about monetary policy.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

17. Playing the Monetary Policy Game was enjoyable.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

18. Playing the Monetary Policy Game was fun.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

19. Playing the Monetary Policy Game was boring.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

20. Playing the Monetary Policy Game was confusing.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

21. Playing the Monetary Policy Game helped me learn.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

22. Playing the Monetary Policy Game was a waste of time.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

23. Playing the Monetary Policy Game was useful.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

24. Playing the Monetary Policy Game was interesting.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

25. Playing the Monetary Policy Game was not interesting.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

26. Playing the monetary policy game was exciting.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

27. Other economics lessons are more interesting than the Monetary Policy Game.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

28. If I had my choice, I would not have played the Monetary Policy Game.

strongly disagree disagree disagree somewhat agree somewhat agree strongly agree

APPENDIX F

WRITTEN REFLECTION ASSESSMENT RUBRICS

KNOWLEDGE
Knowledge of evidence from social sciences: facts/supporting details; themes/issues; and concepts/ideas

6
- Key concepts/themes/issues/ideas are thoroughly identified, defined, and described
- Significant facts/supporting details are included and accurately described
- Has no factual inaccuracies

5
- Key concepts/themes/issues/ideas are considerably identified, defined, and described
- Facts/supporting details are included
- Has only minor factual inaccuracies

4
- Key concepts/themes/issues/ideas are partially identified, defined, and described
- Some facts/supporting details are included
- May have major factual inaccuracy, but most information is correct

---

3
- Some key concepts/themes/issues/ideas are identified, defined, and described
- Few facts/supporting details are included
- Has some correct and some incorrect information

2
- Few key concepts/themes/issues/ideas are identified, defined, and described
- Facts/supporting details are not included
- Information is largely inaccurate or irrelevant

1
- Key concepts/themes/issues/ideas are not identified, defined, and described
- Facts/supporting details are not included
- Information is inaccurate or irrelevant

REASONING
Analysis, evaluation, and synthesis of evidence

6

- Identifies and logically organizes all relevant evidence
- Uses appropriate and comprehensive critical thinking skills to analyze, evaluate, and synthesize evidence
- Reaches informed conclusions based on the evidence

5

- Identifies and logically organizes most of the relevant evidence
- Uses appropriate and critical thinking skills to analyze, evaluate, and synthesize evidence
- Reaches informed conclusions based on the evidence

4

- Identifies and organizes some of the relevant evidence
- Uses partial critical thinking skills to analyze, evaluate, and synthesize evidence
- Reaches informed conclusions based on the evidence

3

- Identifies some of the relevant evidence but omits other evidence
- Uses incomplete critical thinking skills to analyze, evaluate, and synthesize evidence
- Reaches incomplete conclusions based on the evidence

2

- Identifies little relevant evidence and omits most of the evidence
- Uses unclear or inappropriate critical thinking skills to analyze, evaluate, and synthesize evidence
- Reaches inaccurate conclusions based on the evidence

1

- Important evidence relevant to the problem is not identified
- Critical thinking skills are absent
- Conclusions are lacking or unclear