

A COMPARISON OF THE EFFECTIVENESS OF TRADITIONAL U.S. HISTORY
INSTRUCTION VERSUS U.S. HISTORY INSTRUCTION
INTEGRATED WITH DECISION TRAINING ON
CONTENT KNOWLEDGE AND DECISION-MAKING COMPETENCE

by

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DISSERTATION ABSTRACT

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Title: A Comparison of the Effectiveness of Traditional U.S. History Instruction Versus U.S. History Instruction Integrated with Decision Training on Content Knowledge and Decision-Making Competence

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The purpose of this study was to explore the effectiveness of training in decision-making on U.S. history content knowledge and on decision-making competence. All sophomores ($n = 387$) in one Pacific Northwest high school were randomly assigned for two trimesters to one of two groups: (a) U.S. history instruction integrated with decision training or (b) traditional U.S. history instruction. During the study, Experimental Group participants were trained to use a decision-making tool to sort, process, and analyze the facts, events, and concepts of history in the context of solving a historically relevant problem. By applying the decision-making tool to problems and decisions of the past, students utilized a schema for critical, analytical, and creative thinking about U.S. history content. Students also analyzed current problems and decisions they face. Dependent measures were (a) NAEP U.S. History questions, (b) Decision-Making Competence Index (DMC), (c) NAEP item analysis using knowledge forms and intellectual operations, and (d) Experimental Group follow-up interviews. Results indicated statistically significant differences between groups favoring the Experimental on both the

NAEP U.S. History test and on the DMC. Experimental Group participants scored higher on NAEP items requiring concept or principle knowledge forms and on items requiring summarization or illustration. Follow-up interview scores positively correlated with DMC posttest scores. Results are discussed in terms of (a) the application of NAEP and DMC scores to curricular interventions and (b) item analysis and interviews in relation to the environmental and physical constraints of the current high school structure.

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CHAPTER I

INTRODUCTION

Decision-making is a pervasive and important process in adolescent experience. Whether deliberate or implicit, adolescent behavior is generally the result of decision-making. Decision-making tendencies are established in adolescence (Jacobs & Klaczynski, 2002). Decision-making is also an essential aspect of critical-thinking and problem solving. Regardless of their perceived or actual utility, adolescent decision-making skills elicit important consequences for the individual and society. Personally, professionally, and socially, a democratic society depends on an educated citizenry capable of thinking critically and problem-solving effectively (Laskey & Campbell, 1991). Adolescents' personal, professional, and civic decisions impact economic and societal outcomes, if only because adolescents will eventually assume vital roles in society and the economy that will influence the direction of communities and the nation. Accordingly, adolescent decision-making garners a great deal of attention (Beyeth-Marom, Fischhoff, Quadrel, & Furby, 1991; Fischhoff, 2008; Jacobs & Klaczynski, 2002; National Center for Education Statistics, 2003; Reyna & Farley, 2006; Romer, 2003).

Personal Implications

Adolescents face particular challenges that place high demands on their decision-making skills. These include: (a) rapid physical, cognitive, affective and social development and (b) increased autonomy that allows adolescents increased decision-making about their lives that has ramifications for the individual and for society (Beyeth-Marom, et al., 1991). As often as not, adolescents make decisions that have serious

consequences, many of which appear inconsistent with an individual's long-term goals or well-being (Baron & Brown, 1991b). For instance, when identifying the leading causes of morbidity and mortality among adolescents in the United States, Keaton, et al. (2008) identified six interrelated health-risk factors that are established during childhood and adolescence and extend into adulthood: (a) behaviors that contribute to unintentional injury and violence, (b) tobacco use, (c) alcohol and other drug use, (d) sexual behaviors that contribute to unintended pregnancy and STDs, (e) unhealthy dietary behaviors, and (f) physical inactivity.

Unfortunately, Keaton, et al.'s (2008) risk factors play out in adolescents' decisions. For instance, adolescent smokers do not adequately understand or appreciate the risks of smoking (Slovic, 2003), and more than 80% of young smokers (14-22 years) would have chosen not to smoke if they could go back and choose again (Slovic, 2001). The Center for Disease Control estimated that approximately half of the 19 million new STD infections each year are among young people 15 to 24 years of age. The societal cost of STDs to the U.S. health care system is estimated to be as much as \$15.9 billion annually (Center for Disease Control and Prevention, 2008). Morbidity and social problems are associated with 757,000 pregnancies among women aged 15 to 19 years (Keaton, et al., 2008). Thirty-one percent of young drivers (15 to 20 years) who died in auto accidents had illegal blood alcohol concentrations, and 64 percent of young drivers in fatal crashes did not use seatbelts. Moreover, 75 percent of young drivers under the influence of alcohol died without seatbelt restraints (National Highway Traffic and Safety Administration, 2009).

The risks associated with adolescents' decisions around smoking, alcohol and drug use, gambling, seat belt use, drinking and driving, carrying weapons, suicide attempt, sexual activity, school dropout, and delinquency exact significant healthcare, property, and human costs (Reyna & Farley, 2006; Romer, 2003). Efforts to understand and protect adolescents from poor decisions abound (Baron & Brown, 1991a; Reyna & Farley, 2006; Romer, 2003; Steinberg, 2003). For example, advertising restrictions for the tobacco industry, abstinence education, and restricted driving privileges each aim at reducing the risk of unhealthy decisions and unnecessary damage (Reyna & Farley, 2006). Despite such efforts, adolescents are frequently characterized as poor decision makers and their decisions have economic, psychological, and health implications for the individual and society (Jacobs & Klawnski, 2002). Improvements in adolescent decision-making project improved health and life outcomes for adolescents; such improvements bode well for their economic prospects.

Economic Implications

Decision-making skills are an essential part of 21st century workplace skills. A historic shift from a production-driven economy to an information-driven economy has resulted in significant changes in workplace skills and the training needed to develop them. Increasingly, the premium on worker attributes has shifted from physical ability and durability to cognitive abilities that utilize critical, analytical and creative thinking strategies and improve information-driven decisions. For much of the twentieth century, Americans could work to achieve the American dream with limited formal education (Carnevale & Desrochers, 2003). Manufacturing industries have improved productivity by becoming increasingly technology-intensive and decreasing labor positions: those

positions that remain require workers to operate with specific technical and cognitive skills. (Carnevale & Desrochers, 2002). Individuals who develop higher cognitive abilities to meet demand appear to fare better in the labor market (Carnevale & Desrochers, 2002).

Changes in the complexion of workplace skills and knowledge have implications for education and training (Stasz, 2001). Education policymakers look to schools to prepare the nation for a global economy and to advance U.S. competitiveness by equipping students with college and career-ready cognitive skills. In an American economy that values an autonomous, adaptable workforce, post-secondary training is increasingly critical to individual and corporate success (Carnevale & Desrochers, 2003). Those who are not equipped with the knowledge and skills necessary to get, and keep, quality jobs are denied full social inclusion and tend to fall behind in mainstream culture and economy (Carnevale & Desrochers, 2003). Thus, the quality of adolescent decision-making skills is important, as it has value for the individual and society, socially and economically.

Although adolescent decisions influence the quality of individuals' lives and society, some reports indicate adolescents in the United States lack developed decision-making and problem-solving skills (National Center for Education Statistics, 2003). For example, the Programme for International Student Assessment (PISA) found that fewer than half of U.S. 15-year-olds demonstrated analytical problem-solving skills, and ranked 23rd among 29 industrialized nations in strong problem-solving ability (National Center for Education Statistics, 2003). These results reflect the importance placed on problem-solving skills in national policymaking and a global economy, and on a failure to foster

the problem-solving skill set in adolescents that the modern workplace requires (National Governors Association, 2008). Carnevale and Desrochers (2003) asserted that educational institutions needed to adapt to market demands for skill and knowledge in problem solving.

A viable economy requires a workforce that can think and make decisions with greater sophistication than past generations (Laskey & Campbell, 1991). A fundamental shift in the complexion of work and the workplace that emerged in a postindustrial economy has altered the knowledge, skills, and attitudes that promote successful employment (Stasz, 2001). The National Governors Association Report (2008) described changes in workplace tasks in a global economy and noted that routine manual and cognitive tasks are being increasingly automated by technology, while tasks “that require workers to bring facts and relationships to bear in problem-solving, [and] the ability to judge when one problem-solving strategy is not working and another should be tried” (p. 13) are increasingly in demand. Modern workplace skills – learning, reasoning, communicating, general problem-solving skills, and social skills—are broader and less measurable (Carnevale & Desrochers, 2003). In fact, problem solving is a recurrent theme in discussions of the new workplace skills. A report from the American Diploma Project, stated that “increasingly, the computer will do the computation ... [but] thinking about the problem, developing the problem, understanding the problem, looking at it from all sides, deciding what important information is relevant to the problem ... is the harder part” (Achieve, 2004, p. 2).

In addition, the American Diploma Project identified practical application of problem-solving as a benchmark skill in language arts, mathematics, and workplace tasks

(Achieve, 2004; Carnevale & Desrochers, 2002). Likewise, the Partnership for 21st Century Skills (2008), a consortium of business, education, and professional organizations, identified critical-thinking and problem-solving as essential student outcomes. Business, political, and cultural institutions are increasingly looking to partner with schools in developing real-world skills like problem-solving (Jacobs, 2010).

In the rapidly changing knowledge economy and its application of flexible technology and production systems, skilled and autonomous workers need broad, adaptable skills that enable them to access essential knowledge and apply it in a variety of contexts. Emerging job opportunities in manufacturing, technology, product development, and services require higher levels of problem-solving skills (Carnevale & Desrochers, 2002). Growing consumer demand for customization and variety has created a demand for workers with flexible problem-solving skills and reasoning abilities (Carnevale & Desrochers, 2002; Stasz, 2001). A company's capacity to ascertain and transcend barriers to improved productivity and competitiveness is largely determined by the problem-solving and creative thinking of its workers, and decisions (Carnevale & Desrochers, 2003). Decision-making skills inherent in problem solving are fundamental to achieving economic and social goals.

As American social, economic, and societal needs shift, the preparatory role of educational institutions (e.g. high schools) must shift as well. Schools play a role in developing the decision-making and problem-solving competence of adolescents. As part of the prescribed course of study, U.S. History content provides opportunities to focus adolescents' attention on the importance of quality decisions. In particular, U.S. History content provides a rich medium for applying tools and techniques that pertain to quality

decision-making skills. U.S. History content enables students to explore historic problems that demanded historic decisions, to analyze strategies applied to solve such problems, and evaluate the quality of outcomes rendered by big decisions. When students learn to sort, organize and analyze the elements of quality decisions and apply problem-solving strategies in the context of real-world concerns, students can learn to recognize and practice fundamental social and economic skills for the 21st century. My study proposed to integrate training in a decision-making model with U.S. History instruction in order to explore opportunities to expand adolescents' capacities to solve problems and contribute with adaptable cognitive skills. By using a decision-making schema to sort, process, and analyze the contextual details and concepts of history in order to solve historical problems, I hypothesized that students would improve both their decision-making competence and their content learning in U.S History.

CHAPTER II

LITERATURE REVIEW

The importance of adolescent decision-making in personal, societal, and economic terms is well recognized. The decisions adolescents make have important consequences for the individual and society, as adult behavior patterns often debut in adolescence (Jacobs & Klaczynski, 2002; Reyna & Farley, 2006). Adolescent decisions that lead to unhealthy and potentially detrimental behaviors exact a heavy toll on individuals and society. Decisions that culminate in teen violence, criminal deviance, drug use, alcoholism, smoking, reckless driving, and/or pregnancies are just a few of the potentially detrimental behaviors that render significant economic and social consequences. Improving the capacity of adolescents to make quality decisions can positively impact society by reducing the economic and human strain of unhealthy adolescent behaviors and reinforce positive life trajectories that relate to decision-making skills (Reyna & Farley, 2006).

Yet different types of decisions require different decision-making skills that Keelin, Schoemaker and Spetzler (2008) grouped into three categories based on importance or the amount of reflection involved: “(1) big life-shaping decisions; (2) significant decision to consider seriously; and (3) in-the-moment decisions that seem inconsequential or require an immediate response” (p. 4). For example, choosing a career, attending college, or quitting a drug habit constitutes *big* life-shaping decisions. Choices between summer job options, extracurricular activities, school courses, or cars represent *significant* decisions with foreseeable consequences. Choices about what to order in a restaurant, whether to skip class, to study for a test, or to get into a car with an intoxicated

driver illustrate a range of *in-the-moment* decisions that may not involve reflection, but may or may not portend a wide range of effects on the welfare or future of the decision-maker. Given the importance of adolescents' decisions, both for the individual and for society, decision-making skills have become an educational focal point (Achieve, 2004; Carnevale & Desrochers, 2003; Memory, Yoder, Bollinger, & Wilson, 2004; O.D.E., 2005). Those who study the educational processes and effects of adolescent choices (Beyeth-Marom, et al., 1991; Fischhoff, 2008; Jacobs & Klaczynski, 2002; Parker & Fischhoff, 2005; Reyna & Farley, 2006; Romer, 2003; Slovic, 2003; Steinberg, 2003) apply theories of decision-making (decision theories) to look at different elements and types of decisions adolescents face.

The classroom provides a positive environment for developing adolescent decision-making skills at all three levels: (a) *big*, (b) *significant*, and (c) *in-the-moment* (Keelin et al., 2008). Keelin and associates developed decision-making tools for teaching these skills. They believe students can learn, practice, and improve decision-making skills in the classroom without suffering the effects of real-world consequences. In addition, these decision-making skills may have a positive effect on academic thinking and performance. The unique nature of U.S. History classrooms, with their attention to actual big, significant, and in-the-moment decisions and the relevant, real-world consequences that followed, provides abundant opportunities to learn, apply, and improve quality decisions skills.

Therefore, the literature review for this dissertation builds upon Keelin et al.'s conceptualization of training in decision-making skills while combining it with U.S. History instruction. The introduction and literature review aims to build a

theoretical/conceptual framework for understanding the relationship between adolescent decision-making skills and the role of classroom-based training in improving both decision quality and student learning, specifically in U.S. History content knowledge. With regard to decision training, any classroom program designed to improve adolescent decision-making needs to be critically considered in terms of its relevance to decision theory, its potential impact on adolescent decision-making skills, and the quality of outcomes that can be attributed to the quality of adolescent decisions, whether in life or in the classroom. Classroom interventions designed to improve adolescent decision-making should incorporate insights from theory and research as they take into account the different factors that contribute to decision-making skills. In the context of U.S History instruction, classroom interventions that provide decision training should draw from the inherent complexity of historic decisions and the contextual details that surround them. Such U.S. History-based interventions provide students with tools and techniques that refine students' schema for sorting and processing history content and develop students' analytical thinking skills in the context of both understanding and making decisions. Before explicating current research on the effect of classroom-based training on adolescent decision-making skills and traditional and non-traditional U.S. History Instruction, it is important to (a) define what is meant by a decision and (b) understand how different theories address how individuals make decisions.

Defining a Decision

It is important to start this discussion with an operational definition of a decision. Howard (2007) defined a decision as “a choice among alternatives that will yield uncertain futures for which we have preferences” (p. 34). Put more simply, a decision has

three elements: “what you can do (your alternatives); what you know (the information you have); and what you want (your preferences)” (p. 37). Howard specified, “if any [element] is missing, there is no decision to be made” (p. 37). Similar to Howard, Hastie and Dawes (2001) viewed a decision as a response to a situation comprised of three parts: (a) “There is more than one possible course of action” (p. 25); (b) “the decision-maker can form expectations concerning future events and outcomes following from each course of action...that are described in terms of probabilities” (p. 26); and (c) there are “consequences, associated with possible outcomes, that can be assessed on...personal values and current goals” (p. 26).

Thus, for the purpose of this study a decision is defined as a choice among alternatives. Each alternative has an uncertain outcome. An optimal or quality decision identifies the alternative that is most likely to render the preferred outcome, based on the information available. In this review, the terms *alternatives*, *information*, and *preferences* will be used specifically to define elements of a decision and to develop the theoretical/conceptual framework for understanding adolescent decision-making and classroom training. The development of this framework of decision-making that applies to classroom learning of U.S. History also draws from *decision theory*.

Decision Theory

Training in decision-making has a long history. In western civilization, formal efforts to define and guide decision-making can be traced to Aristotle’s writings on ethics, where he described training the soul to choose rationally according to axioms of virtue or rules for action (McKeon, 1941). Through the Renaissance, Enlightenment, and Scientific Revolution, philosophers and mathematicians refined theories of decision-

making that applied rational ideals to the realities of an uncertain world. The practice of gambling and playing games of chance further formalized decision theories. To that end, Cardano and Bernoulli devised rules based on probability and utility theory to identify an optimal decision under the conditions of uncertainty or risk inherent in gambling. These rules were developed into a structure that could be applied to decisions more generally with the intent of maximizing utility. Here, *utility* refers to the usefulness or preference of a decision's outcome (Keelin, et al., 2008; Yates, 1990), which is systematically defined in some decision-making models (see examples below). Von Neumann and Morganstern's (1947) *Theory of Games and Economic Behavior* represented a modern theory of decision-making that incorporated rules according to the principle of maximizing expected utility (Miles, 2007; Tallman & Gray, 1990). Multiple models of decision-making followed. Some theories expanded upon the application of rational, normative rules to maximize expected utility (the preferred outcomes of a deliberate choice), while other theories described patterns of irrational decision-making that run counter to the individual or group's preferred outcomes. In the past forty years, three separate perspectives in decision theory emerged.

Three Perspectives of Decision Theory

According to Howard (2007), "Decision theory is concerned primarily with making decisions in the face of uncertainty" (p. 34). Currently in decision theory, there are three perspectives of that direct or describe decision-making: (a) the normative, (b) the descriptive, and (c) the prescriptive. These three perspectives can be applied inclusively to capture a full range of the study of decision-making (Bell, Raiffa, & Tversky, 1988; Edwards, Miles, & von Winterfeldt, 2007; Reyna & Farley, 2006).

Bell, Raiffa, and Tversky (1988) contended that,

It was clear that mathematicians...are interested in proposing rational procedures for decision-making – how people should make decisions if they wish to obey certain fundamental laws of behavior [normative]. Psychologists are interested in how people do make decisions (whether or not rational) and in determining the extent to which their behavior is compatible with any rational model. They are also interested in learning the cognitive capacities and limitations of ordinary people to process the information required of them if they do not naturally behave rationally, but wish to [descriptive]. But there is a third group, the methodologists, the consultants...Some of us are concerned with the bottom line: how do you improve the quality of decisions in practice” [prescriptive] (p. ix).

Bell, Raiffa, and Tversky (1988) characterized the three perspectives, each focused on decision-making from different disciplinary backgrounds. According to Bell et al., mathematicians approach decision-making from the *normative* perspective, as it emphasizes statistical reasoning, probability and the laws of economic theory. Psychologists deal with decision-making more from the *descriptive* perspective, which draws from a base of behavioral and cognitive sciences. Finally, practitioners (e.g., educators) tend toward the *prescriptive* perspective, where methodologists attempt to apply normative theory and descriptive research to construct useful methods for improving the quality of decisions.

My study uses both the prescriptive perspective of decision theory and dual process theory (described later in this chapter) to provide the theoretical/conceptual framework for understanding adolescent decision-making and the role of education in

improving decision quality. In order to understand the prescriptive perspective, one needs to understand the normative and descriptive attributes inherent in a prescriptive decision-making model. What follows is a summary of the three perspectives, and a developed example of an adolescent decision within each perspective.

Normative perspective. Fishburn (1988) characterized normative decision theory as “the study of guidelines for right action” (p. 78). Reyna and Farley (2006) stated that “the normative analysis of a choice identifies the options in the decision makers’ best interests, given their goals and the information available to them, all integrated by the application of a rational decision rule” (p. 9). The normative perspective emphasizes rational choice and personal utility. Rational choice is based on consistent conformity to rules (also called axioms) that guide a person to their logical choice in the decision-making process. Personal utility (personal usefulness) is determined by accurately identifying preferences and likelihoods for each possible action.

To make the *right* choice, one must identify all possible courses of action, called alternatives, and evaluate these alternatives according to a set of rules intended to maximize personal utility. In a normative decision process, alternatives are identified and analyzed according to two key characteristics: (a) preference and (b) likelihood. Preferences are the desired outcome(s) that can be identified with each alternative. Preferences can be estimated and ranked according to how desirable each outcome is to the decision-maker. Likelihood refers to the probability of realizing the outcome associated with the alternative. Likelihood can also be ranked by estimating it in terms of probability. The preference and likelihood for each alternative is estimated and can then be quantified using probability and statistical reasoning. A sophisticated mathematical

rendering of each alternative quantifies the personal preference and likelihood of each alternative into a numeric value that is used to rationally determine the alternative with the greatest expected usefulness. Thus, from the normative perspective, people should follow logically consistent procedures to make decisions by applying rules to maximize the quality of their decision.

A decision about the utility of high school for college preparation offers an example of the normative perspective in the adolescent experience. For instance, upon entering high school, adolescents face a series of decisions that relate to their opportunities when they graduate. In general, many teachers, counselors, and parents endorse a normative perspective of college readiness. In the fall of ninth grade students meet with their school counselor, where they are presented with a logical four-year graduation plan that dictates coursework, co-curricular activity, community service, SAT or ACT college admissions exams, financial aid eligibility requests, college applications, scholarship options, and such. Then, students are encouraged to choose to excel in rigorous coursework, join student organizations like Key Club and Honor Society to accrue hours of community service, take and, if necessary, retake college admissions tests, and continue through the rational process of preparing for college. If college is presented as a course of action that connects *preferences* and the *likelihood* of realizing one's potential for earned income, quality of life and social status, a student will logically apply themselves to the process of preparing for college. In a reasoned decision with these preferences and perceived outcomes, college preparation in high school is the rational choice.

Descriptive perspective. The *descriptive* perspective of decision-making (also called behavioral decision theory) emphasizes how people make decisions. Rather than prescribe *what* rational procedures one should follow to maximize personal preferences, the descriptive perspective makes observations and predictions as to *how* individuals incorporate preferences and information into their decision-making (Fischhoff, 2008; Slovic, Fischhoff, & Lichtenstein, 1977). The descriptive perspective applies findings from empirical studies to develop predictive models of decision-making behavior based on patterns of divergence from rational decision-making (Howard, 2007).

Studies of decision-making behavior suggest that people do not naturally apply reasoning in the process of making decisions. As Fischhoff, Slovic and Lichtenstein (1979) stated, “When making inferences, people tend to ignore various kinds of normatively important information” (p. 339). Stanovich and West (2000) summarized descriptive research on the disparity between normative modeling and observed decision-making behavior by stating,

A substantial research literature—one comprising literally of hundreds of empirical studies conducted over nearly three decades—has firmly established that people’s responses often deviate from the performance considered normative on many reasoning tasks. For example, people assess probabilities incorrectly, they display confirmation bias, they test hypotheses inefficiently, they violate the axioms of utility theory, they do not properly calibrate degrees of belief, they over-project their own opinions on others, they allow prior knowledge to become implicated in deductive reasoning, and they display numerous other information processing biases (p. 645).

The descriptive perspective labels such patterns of illogical cognitive processing as *heuristics*. Heuristics describe the shortcuts people take in making decisions. Some shortcuts are logically sound, automatic and efficient; other shortcuts may circumvent rational processes and harbor biases in the choices people make. For instance, Tversky and Kahneman (1974) pointed out a common gambler's fallacy which is also a heuristic: in a series of coin tosses, an individual will estimate the probability of tails will increase with the number of consecutive heads in preceding tosses. Early descriptive decision research by Tversky and Kahneman (1974) and Kahneman and Tversky (1979) described decision-making patterns that fundamentally deviated from the normative perspective. Descriptive research literature has documented specific inconsistencies in a normative approach to decision-making around (a) perception of risk, (b) the effect of emotions, (c) heuristics and biases, and (d) peer pressure that caused individuals to ignore logical, rational decision rules or pertinent information that should be considered in identifying the best opportunity to satisfy utility (Finucane, Alhakami, Slovic, & Johnson, 2000; Jacobs & Klaczynski, 2002; Kahneman & Tversky, 1979; Reyna & Farley, 2006; Slovic, 2001, 2003; Tversky & Kahneman, 1974).

From the descriptive perspective, adolescent decision patterns frequently display tendencies that introduce bias and reduce long-term utility. For instance, upon entering high school, some adolescents identify college readiness as a viable focus and follow through with the recommended course of action without much deviation. For others, what seemed like a good idea at the beginning of ninth grade may not appear attainable at 11th grade because of a series of decisions that did not rationally align with the advised priority. Regardless of whether students reject or embrace the idea of college readiness,

students often find themselves unable to proceed on the prescribed course for a host of reasons: (a) students underestimate the importance of short-term decisions about how they approach homework that result in poor classroom performance; (b) students overestimate the importance of certain information, like a 4.0 grade point average (GPA) and assume a imperfect GPA disqualifies them for college; and, (c) students make habitual choices about classes or activities that maximize the social aspect or short-term gratifications of high school and minimize the academic rigor or cognitive development necessary for college readiness. Although they maintain that they would prefer to attend college, many adolescents appear to lack the decision-making skills to make adjustments in their approach to the competing interests of the high school experience and college readiness. In effect, high school students do not demonstrate the decision-making skills needed to pause and consider the impact of their immediate choices on their long-term goals or opportunities. As a result, they find themselves disenfranchised from the goals they aspired to when they entered high school.

Prescriptive perspective. The prescriptive perspective combines the practical application of normative procedures and the descriptive findings for decision-making. It combines logical rules for identifying the optimal choice and addresses the natural tendencies of human judgment that circumvent reasoned judgments in real-world situations (Edwards, et al., 2007; Howard, 2007). Bell, Raiffa and Tversky (1988) identified the prescriptive perspective with researchers who “are concerned with devising methods that incorporate the insights gained from normative theories, but in a way that recognizes the cognitive limitations of the decision maker” (p. ix). As stated previously, Bell et al. defined this perspective more directly: “Some of us are concerned with the

bottom line: how do you improve the quality of decisions in practice? It is one thing talk of axioms and proofs and paradoxes [normative] and cognitive limitations [descriptive]—but how can you really help?” (p. ix). In the prescriptive perspective, it is important to organize, analyze and simplify a complex decision in order to employ rational thinking under real-world conditions. The prescriptive perspective attempts to increase the individual’s decision-making competence by “closing critical gaps between the normative ideal and the descriptive reality” (Fischhoff, 2008, p. 14).

Decision Quality is an example of a prescriptive approach that closes the critical gap and improves the practice of decision-making. In his conception of Decision Quality, Howard (2007) observed that: (a) people who made decisions while relying on their intuition make multiple errors that could be recognized upon reflection, and (b) a formal procedure for making decisions could assist in identifying the heuristic “pitfalls that are characteristic of human thought” (p. 36). Prescriptive approaches designed to improve decision quality utilize tools, techniques, or schemas to represent and simplify decision tasks and to expose common biases and errors known from descriptive studies (Edwards, et al., 2007). As described previously, Howard (2007) defined a decision as a choice among alternatives that will yield varied outcomes each with varied preferences and likelihoods for the decision maker. Three essential elements constitute a decision: (a) what one can do (alternatives), (b) what one knows (information), and (c) what one wants (preferences). Howard claimed *quality* decisions incorporated three additional elements: (d) a proper frame, (e) normative logic, and (f) commitment to follow through. Taken together, these six elements form the Decision Quality model. Howard stated “a high quality decision has a proper frame, a selection of alternatives that respond to the frame,

and considered preferences on possible futures. The logic to arrive at a course of action must be sound, and the decision maker must be committed to both the process and to the significance of the decision” (p. 38). The Decision Quality model operates from the principal understanding that people can improve their decision-making skills. The six elements of decision quality collectively constitute a prescriptive model that incorporates normative, systematic reasoning with a broader understanding of bias and heuristic tendencies from the descriptive perspective of decision-making.

From a prescriptive perspective, school plays an active role in maximizing the quality of high school decisions related to college preparation. To assist students in making choices that instill and support college readiness, teachers, counselors, and parents incorporate specific skills and concepts designed to improve the quality of adolescent decisions. Students learn to recognize the difference between *big, significant*, and *in-the-moment* decisions. They identify how in-the-moment decisions impact big decisions and develop a working understanding of decision-making tools and traps that help or hinder the quality of their decisions. Specifically, students practice connecting the concepts of framing, values, creative alternatives, and useful information in a schema of reflective reasoning that supports their ability to make choices that maximize potential for desired outcomes. As a result, students follow through with a personal commitment to become college ready or not; either way, they have made a deliberate and active decision with an awareness of potential outcomes. Ideally, students who desire to attend college feel empowered and capable of executing a four-year plan for college readiness, learn to accommodate setbacks and adapt along the way, and receive support from adults who can lend expertise and perspective to improve the quality of student decisions.

Summary of the Three Perspectives

Within decision theory, three perspectives each contribute to a fuller understanding of decision-making. The *normative* perspective emphasize rational thinking in order to identify the choice that optimizes the decision-maker's preferred outcomes (Reyna & Farley, 2006). The *descriptive* perspective aims to predict decision-making patterns in terms of biases and heuristics that illustrate human tendencies to be irrational. These tendencies may reduce favorable outcomes or constitute errors in rational judgment under conditions of uncertainty. Finally, the *prescriptive* perspective attempts to focus the decision-maker's attention on optimal alternatives by simplifying decision tasks, applying decision rules, techniques and tools, and calling attention to biases and judgment errors known from descriptive decision research. Table 1 illustrates the three perspectives of Decision Theory by characteristic, typical application, and a key reference from the literature.

Table 1
Three Perspectives of Decision Theory

	Normative	Descriptive	Prescriptive
Characteristics	Rational and Reasoned Rule-based "Ideal"	Predictable patterns Bias and heuristics "Actual"	Practical Tools and training "Optimal"
Typical Application	Mathematicians	Psychologists	Consultants
Reference	Von Neumann & Morganstern (1947)	Tversky & Kahneman (1974)	Keelin, Schoemaker, & Spetzler (2008)

Reyna and Farley (2006) proposed that a program designed to improve adolescent decision quality "should be founded on a clear idea of what is normative (what behaviors, ideally should the program foster?), descriptive (how are adolescents making decisions in the absence of the program?), and prescriptive (which practices can realistically move

adolescent decisions closer to the normative ideal” (p. 10). Such a view presumes that the normative ideal serves the decision-maker in identifying a logically optimal choice. It also presumes that descriptive insights reveal natural tendencies that may, in Reyna and Farley’s analysis, increase adolescents’ risk or limit rational processing in making decisions.

In particular, the prescriptive perspective increases an understanding of decision theory by clarifying what ideally *should* (normative), actually *would* (descriptive), and optimally could (prescriptive) impact the quality of decisions that adolescents make. In effect, prescriptive decision-making processes provide tools and techniques to improve decision quality by facilitating procedural, deliberate reasoned decisions and minimizing the negative effects of common biases. Yet prescriptive decision-making requires training and practice. As Tversky and Kahneman (1974) noted, those who are highly trained are not impervious to the effect of consistent, illogical biases in their decision-making. The consistent disparity between normative and descriptive decision-making raises questions as to the source of the gap between the normative ideal and descriptive decision-making realities. To address this gap and further inform an understanding of prescriptive decision-making tools, it is necessary to incorporate dual process theory as part of the theoretical/conceptual framework. Dual process theory facilitates the explanation of when *would* deviates from *should* in the decision-making process of adolescents across the three perspectives.

Dual Process Theory

To understand how people make decisions, theorists have explored the cognitive processes that operate, cooperate, and sometimes contradict in decision-making (Baron,

1994; De Neys, 2006; S. Epstein, 1994; Evans, 2008; Kahneman, 2003; Sloman, 1996; Stanovich & West, 2000). Dual process theory describes how people sort information in making decisions. In theory, two cognitive processes coordinate in decision-making but operate according to different cues, construe decision tasks differently, and play roles that can contradict each other in the decision-making process. Ideally, the coordination of these two cognitive processes may enhance the quality of decisions.

S. Epstein (1994), Sloman (1996), Stanovich and West (2000), Kahneman (2003), and Evans (2008) each distinguished two cognitive processes in decision-making. S. Epstein referred to the dual cognitive processes as (a) experimental and (b) rational. Sloman referred to the processes as (a) associative and (b) rule-based. Kahneman labeled the processes as (a) intuitive mode and (b) reasoning mode. Evans distinguished two processes as heuristic and analytic. Finally, Stanovich and West labeled the first mode as System 1 and the second mode as System 2. Hereafter, the two systems will be referred to as System 1 (S1) and System 2 (S2). For purposes of this review, dual process theory will be applied to the theoretical/conceptual framework for understanding the relationship between adolescent decision-making skills and the role of education in improving decision quality at it relates to student performance in the classroom.

System 1 (S1) Processing

Kahneman (2003) described System 1 (S1) processing as “fast, automatic, effortless, associative, implicit, and often emotionally charged” (p. 698). S1 manages most decisions. Sloman (1996) theorized S1 processing matches present experience to stored (past) experiences or information in order to draw inferences and make in-the-moment judgments. S. Epstein (1994) linked the response to emotions, narratives,

irrational fears, and superstitious thinking in advertising schemes and other non-rational thinking as evidence of S1 at work. S. Epstein asserted that because of cognitive matching, this information is processed quickly and experientially. There is little time spent deliberating in S1-driven decisions. S1 processing encompasses properties of automaticity (Kahneman, Slovic, & Tversky, 1982; Tversky & Kahneman, 1974), affect (Slovic, Finucane, Peters, & MacGregor, 2002), prototypes (S. Epstein, 1994), heuristic processing (Tversky & Kahneman, 1974), and social-interactional intelligence (Levinson, 1995). S1 operations are governed by habit; they are difficult to reform or modify but can be monitored and overridden (Kahneman, 2003). In general, while most decisions are momentary and automatic, they are also unproblematic and successful (Kahneman, 2003; Klein, 1998).

In high school, quick, in-the-moment decisions range from choosing a lunch entrée in the cafeteria, disregarding the tardy bell and arriving late to class, passively participating in classroom routines like vocabulary worksheets or note taking, or selecting an answer on a multiple choice test without giving the other selections much thought. S1 processing may also play a noticeable role in making a big decision like choosing to utilize high school opportunities to prepare for college or career training. In-the-moment decisions to enroll in non-academic classes that maximize time with friends instead of rigorous preparatory courses, to jot down facts or dates related to a historical figure, or to participate in a study group because of a romantic (rather than academic) purpose may involve little reflective thought or deliberate consideration. Nonetheless, these S1-driven decisions may shape future decisions and prospects for high school students in the classroom and in life.

System 2 (S2) Processing

In contrast to System 1, System 2 (S2) cognitive processing is slower, serial, effortful, controlled, rule-governed, flexible, consciously monitored, and neutral (S. Epstein, 1994; Kahneman, 2003; Sloman, 1996). S2 processing conjoins analytic intelligence and computational capacity (Stanovich & West, 2000). It represents systematic conscious thought that requires or adheres to logic and reasoning (S. Epstein, 1994). S2 processing tends to de-contextualize and depersonalize decisions by representing dilemmas in terms of rules and principles that are actively considered (S. Epstein; Stanovich & West). These analytical operations result in explicit inferences or judgments because the individual is consciously aware and actively involved in the analysis of details related to the decision. Sloman asserted that S2 processing is sequential and rule-based in its application of logic, coding, and manipulation of information along lines of verbal and arithmetic thinking. S2 thinking is active thinking. It is controlled, procedural, and deliberate (Kahneman, 2003; Sloman, 1996). S2 is cued by an awareness of a potential error in initial S1 judgment (Evans, 2008; Kahneman, 2003; Kahneman & Frederick, 2002; Kahneman, et al., 1982).

In high school, examples of adolescent S2 processing are more difficult to distinguish, in part because S2 processing occurs less frequently and tends not to be applied systematically to *big* life decisions. Academic activities like developing proofs for Geometry problems, revisions in the writing process for a Language Arts essay, debating controversial events in a Social Studies forum, or completing formal write-ups of laboratory experiments in Science are cogent examples of S2 processing. In each academic exercise, students engage in a prescribed process based on principles, rules, or

procedures; students receive coaching on how to develop their thinking to form a logical, effective argument with reasons for why they hold a particular view or finding as important; and students engage in procedural, deliberate thinking that is intended to reach a conclusion or decision based on a body of information and a reasoning process. The academic development and demonstration of S2 processing in high school is rigorous, time-consuming, effortful, and results-oriented. It is also a product of training for most people: Kahneman (2003) stated that “people are not accustomed to thinking hard and are often content to trust a plausible judgment that quickly comes to mind” (p. 699). S2 processing requires conscious attention and focus, much like the active cognitive processing required for *big* and *significant* decisions and for critical-thinking in Geometry, persuasive writing, debate, or scientific method.

Dual-Processed Decisions

In dual process theory, System 1 (S1) and System 2 (S2) act in concert but operate differently in decision-making. S1 directs most decisions unless deliberate S2 processing modifies and overrides the initial choice. Most decisions are small in scope and in-the-moment. Given the myriad of decisions people face, it makes sense that S1 manages the cognitive processing of most decisions in a quick, efficient, effortless manner. In-the-moment decisions beg in-the moment processing. Thus, S1 is the primary determiner and driver in most decisions. De Neys (2006) referred to S1 as the default system that provides fast, automatic, computationally frugal conclusions; S2 operates as decision quality control. S2 monitoring is lax and used sparingly in decision-making (Kahneman & Frederick, 2002). This may be because most decisions simply do not need to be overridden. It may also be because people naturally often go with their first thought on a

decision without a second-thought, or because the monitoring system of S2 has not developed sufficient sensitivity to bias and fails to detect and override a dubious in-the-moment decision. Nonetheless, in dual processing, S1 functions effectively for decisions that do not require analysis or reflective thought. Most decisions do not. When a significant or big dilemma necessitates further consideration in order to reach a *quality decision*, whether processing shifts from thrifty automatic processing to a more expansive effortful analysis can be affected by psychological, environmental, and social factors that widen Fischhoff's (2008) gap between "the normative ideal and the descriptive reality" (p. 14).

Bridging the gap with coordinated, dual-processed decisions necessitates the proper functioning of the monitoring system and the development of analytical skills associated with S2 processing. In studies designed to detect corrective thoughts associated with active S2 processing, S2 processing was positively related to cognitive ability (Stanovich & West, 2000; West, Toplak, & Stanovich, 2008), need for cognition (Blais, Thompson, & Baranski, 2005; LeBoeuf & Shafir, 2003; West, et al., 2008), and training in statistical thinking (Agnoli, 1991; Agnoli & Krantz, 1989; Nisbett, Krantz, Jepson, & Kunda, 1983).

However, the corrective reasoning capacity of S2 processing has been shown to be impaired by such factors as time pressure (Finucane, et al., 2000), affect, (S. Epstein, 1994; Slovic, et al., 2002), time of day (Bodenhausen, 1990), mood (Bless, et al., 1996; Isen, 2001), and concurrent tasks (Gilbert, 1989, 2002). These limiting factors introduce bias and errors in reasoning. It is reasonable to conclude that demanding cognitive tasks like S2 monitoring may be disrupted when faced with such limiting factors. This makes it

less likely for the individual to process a decision task using System 2 and more likely that System 1 judgments will remain unmodified. In effect, S1 judgments are more accessible and more likely to be utilized in everyday decision-making. This serves a student well enough in judgments involving preferences like the color of shoes for the first day of school or to cooperate with daily instructional routines in the classroom. When preferences or likely outcomes of decisions are less immediate or clear, as in choosing not take a college entrance exam on a sunny Saturday or disregarding cognitively demanding questions in a lesson on the Bill of Rights, the absence of S2 thinking may negatively affect the quality of in-the moment decisions. When S2 fails to monitor automatic S1 processing, it can result in unreasoned and biased decision-making, which can also limit adolescent decision quality and classroom performance.

To process information quickly and with little statistical computational effort, S1-driven decisions may come by way of influential heuristics based on prior experience, knowledge, and beliefs. As stated previously, heuristics are like mental shortcuts. As simplified implicit principles or cognitive processes, they serve as sources or cues for judgment (Tversky & Kahneman, 1974) to speed processing and manage the high demand for daily decision-making. In most situations, these heuristics provide for efficient sorting of countless details that would otherwise overwhelm a deliberation-heavy processing system. Recall that heuristics are of great interest to the descriptive perspective of decision-making. Although most in-the-moment decisions are well served by heuristics, under certain circumstances, descriptive decision research has demonstrated that these heuristics may introduce bias and errors in judgment. Such cases

necessitate further reasoning or analytic processing in order to reach a quality decision that critically aligns preferences, likely outcomes, and relevant information.

Summary of Dual Processing

Where S2 functions as quality control for mental operations and overt behavior, the self-monitoring function is more likely to be susceptible to multi-task interference. Multi-task interference speaks to the tendency to become overwhelmed and distractible when performing multiple cognitive tasks. System 2 is even less likely to monitor and adjust a decision when people are engaged in demanding mental activity (Gilbert, 1989, 2002; Stanovich & West, 2000). Instead, S1 functions with heuristics that operate as shortcuts and may circumvent deliberate analysis in decision-making. Thus, S1 is practical, given the sheer volume of decisions and limitations of cognitive capacity, and so long as S2 is cued on those occasions that necessitate a deliberate, conscious, reasoned response. Findings from heuristics and biases research suggest that S2 is not always cued when needed. Identifying when biases and heuristics preclude rational analysis of decision tasks and what effect biases and heuristics have on the decision-making process can provide insight into the potential for evaluating the quality of decisions. Table 2 presents the distinguishing characteristics and roles of S1 and S2 processing in Dual Process Theory and their relation to the three perspectives of Decision Theory.

Table 2
Dual Process Theory

	System 1 (S1)	System 2 (S2)
Characteristics	Fast, automatic, associative, effortless, habit-based, affective, autopilot	Slow, deliberate, analytical, effortful, rule-governed, active, thinking
Role	Default system Manages most decisions	Quality control system Monitors and overrides if error detected
Relation to Decision Theory	Related to Descriptive perspective Patterns, bias, heuristics, shortcuts	Related to Normative perspective Procedural, reasoned, conscious

Applying Dual Process Theory to the Classroom

Sloman (1996) asserted that dual process theory is relevant to education in two ways: (a) to train students to use S1 and S2 processing together in learning content, and (b) to help teachers “predict which concepts learners find easy and which they find difficult” (p. 19). Recall that Sloman identified S1 with making implicit associations or inferences, and S2 with conscious rule-based reasoning. First, to train students to harness dual processing, Sloman stated

Teachers should be aware that students have two tasks: They must both master the rules of the [content] domain because rules provide productivity, systematicity, and a means to verify conclusions, and they must develop useful associations between elements of the domain to allow reasoning to become less effortful and more flexible. The necessity of learning both skills does not increase the burden placed on the learning; usually it decreases it. (p. 19)

When students actively engage in developing content area knowledge, they learn the vocabulary, facts, and concepts that serve as the rules for learning in that domain (Crawford, Carnine, Harniss, Hollenbeck, & Miller, 2007; Harniss, Caros, & Gersten,

2007; Ketterlin-Geller, McCoy, Twyman, & Tindal, 2006; Twyman, 2003; Twyman, McCleery, & Tindal, 2006). By applying the rules of a content area—be it the rules of arguing in debate, solving Geometry proofs, applying scientific method, or applying critical-thinking strategies to analyze the Cuban missile crisis – students develop an S2 schema for thinking that becomes less effortful, more implicit, and more accessible with use. In effect, this line of reasoning suggests S2 thinking can become accessible like or incorporated into S1 thinking in the classroom. S1-like implicit inferences could then be used to access increasingly complex content knowledge with quicker, more accurate associations or inferences. Thus, a student who develops S2 thinking can incorporate S2-generated schema into the more automatic S1 system and accelerate further in a content domain. S1 and S2 would then work together to enhance learning.

Sloman (1996) continued by saying that “useful associations guide the learner in the right direction; rule training also provides a means to check and correct performance. Both rules and associations play a role in reasoning, therefore in learning, and can be mutually supportive. Rule training also provides skills for the associative system to master inasmuch as rule application becomes associative with practice” (p. 19). With guided classroom practice in rule-governed analysis within a content domain, students can develop “mutually supportive” (p. 19) S1-S2 processing wherein both systems contribute to student learning.

Sloman’s (1996) second application of dual process theory to education is its role in determining student progress. Given that there are rules for thinking in each content domain, in Sloman’s understanding, content will be easier to learn when the domain rules that govern them are compatible with a student’s current level of implicit understanding.

Implicit understanding relates to S1 inferences that are accessible with little effort.

Concepts that conflict with a student's working knowledge in the domain may require greater attention to teaching strategies, to constraints of a student's cognitive capacity, and to the factors that limit access to S2 thinking.

Learning that incorporates and fosters coordinated efforts between deliberate reasoning (S2) and intuitive insight (S1) through practice may improve the capacity of the individual to make quality decisions and effectively access content knowledge. If these mutually supportive connections between S1 and S2 processing develop with increased exposure over time, it may prove useful to provide opportunities to practice the application of rule-based processing so that applications become increasingly second nature or *intuitive* in use. This supposition about S1-S2 connectedness aligns with the prescriptive perspective in decision-making and the decision quality model used in my study.

Decision Training and Learning in the Classroom

Although there appears to be a difference in performance between younger and older groups, Jacobs and Klaczynski (2002) provided evidence that adolescents show similar decision-making capacity and tendencies as adults. While adolescents can develop competence to reason effectively and apply logic, Jacobs and Klaczynski also showed that adolescents developed biased judgment strategies and applied ineffective heuristics that jeopardized optimal decisions. Teaching and practice in using decision-making schema that develops reasoning skills and heightens awareness of bias and heuristic shortcuts may aid in improving decision-making quality and reduce the likelihood of poor outcomes that result from poor decision making (Baron & Brown,

1991a; Beyeth-Marom, et al., 1991; Keelin, et al., 2008; Reyna & Farley, 2006).

Adolescent training in the application of a decision-making schema may improve S2 processing if it fosters analytical acuity or mitigates factors that contribute to poor decision-making. Jacobs and Klahr's (2002), Reyna and Farley's (2006), Romer's (2003), Slovic's (2003), and Steinberg's (2003) research on adolescent decision-making attended to reasoning capacity in the context of risk and uncertainty. These researchers agreed that although adolescents are cognitively capable of logical processing in decision-making, their research did not suggest adolescents make rational decisions under the strain of real-world circumstances.

Still, efforts to train adolescents have traditionally focused on formal, rational decision-making skills. In Baron and Brown's (1991a) review of six stand-alone school-based programs designed to teach decision-making skills to adolescents, they observed that most of the approaches attempt to teach, at least implicitly, a rational model of decision-making. Baron and Brown stated, "These are idealized methods of analysis. They are similar to methods of formal analysis used by professionals and taught in business schools and medical schools" (p. 9). The six programs are: (a) GOFER: Basic Principles of Decision Making (Mann, Harmoni, & Power, 1988), (b) Personal Decision Making (Ross, 1988), (c) Odyssey: A Curriculum for thinking (Adams, 1986), (d) Life Skills Counseling (Schinke & Gilchrist, 1984), (e) Life Skills Training: A Self-Improvement Approach to Substance Abuse Prevention (Botvin, 1983), and (f) Decision Skills Curriculum (Spitzhoff, Ramirez, & Wills, 1982).

The GOFER high school decision-making course on decision-making and the Personal Decision Making programs focused on developing decision-making skills. The

Odyssey program focused on developing general thinking skills, which included decision-making. Schinke and Gilchrist's (1984) Life Skill Counseling program, Botvin's (1983) Life Skills Training, and Spitzhoff, Ramirez, and Wills' (1982) Decision Skills Curriculum focused on developing life and social skills related mental health and risky adolescent decisions. The six programs ranged from eight to 75 hours of instruction delivered over a period ranging from two weeks to one year. All programs were designed for students between grades six and 12. All but one program (Life Skills Counseling) deliver decision training via prescribed curriculum. Each program used an experimental and control group; no program randomly assigned students to groups. Each group used different dependent measure to assess effects of training, and none of the programs reported validation of measures for internal or external validity. Results were mixed and any gains tended to be narrowly defined within the terminology of the dependent measure, be it a self-reporting survey or a terminology test. Table 3 describes the six stand-alone programs according to the characteristics of program goals, normative decision elements, length of training, evaluation method, and experimental group results.

Baron and Brown noted that of most the instructional approaches described "have been subjected to some degree of evaluation, but almost none have got very far toward testing for, much less demonstrating, beneficial impact on the quality of real-world decision-making...given the difficulty of establishing decision quality and attributing any of it to one among many determinants—in this case an introductory decision skills course" (p. 12). Each of the efforts surveyed attempted to teach decision-making skills within the context of students' personal lives. None of these efforts to provide *real-world* decision-making instruction attempted to integrate decision training within the context of

content area instruction. However, curricular researchers attempted to incorporate aspects of decision-making such as problem-solving instruction into content area instruction.

Table 3
Stand-Alone School-Based Decision Training Programs

<i>Program</i>	<i>Goal</i>	<i>Normative Elements *(A,I,P,L)</i>	<i>Grade Level</i>	<i>Length of Training Hrs (months)</i>	<i>Evaluation</i>	<i>Results</i>
GOFER	Decision skills development	A, P, L	10	50 (12)	Survey	Increased decision confidence
Personal Decision-Making	Decision skills development	A, I, P, L	7-8	10	Terminology test	Improved normative skills (A, I)
Odyssey	Thinking skills development	A, I, P, L	7	75 (5)	Ability test	Gains on all ability tests
Life Skills Counseling	Personal problem-solving	A, P	6-12	8 (2)	Survey	Inconclusive
Life Skills Training	Tobacco and drug abuse prevention	A,P, L	6-9	20 (2)	Survey	Inconclusive
Decision Skills Training	Coping skills development	A, P, L	7	8	Survey	Inconclusive

**A = alternatives, I = information, P = preferences, L = likelihood of achieving preferences*

Decision Training and Content Learning

Harniss, Hollenbeck and Dickson (2004) characterized secondary content knowledge (e.g., science, history, geography, biology, physics) as complex and comprising “a diverse and multifaceted collection of factual, conceptual, and rule-based knowledge...Curricula tend to focus on disconnected facts rather than principles or rule-

relationships” (p. 247). Ketterlin-Geller et al. (2006) observed that “curriculum at the secondary level may reflect an array of disconnected ideas and be laden with facts” (p. 43).

In no content area is this more apparent than in social studies. According to Bain (2005), “History students encounter thousands of unfamiliar and distant names, dates, people, places, events and stories. Working with such content is a complex enterprise not easily reduced to choices between learning facts and mastering historical thinking processes” (p. 180). An index of high school content standards presents facts, events, dates, documents, and details that can overwhelm even the most interested learner. Even when students can access the information with sufficient reading skills and can communicate their understanding proficiently, the convoluted, fact-heavy nature of secondary history curriculum can obstruct students’ learning experiences and inhibit the incorporation of facts into a deeper, lasting understanding of concepts (Harniss, Dickson, Kinder, & Hollenbeck, 2001). Without tools or techniques to anchor student understanding, history content knowledge may remain only a collection of facts that are sometimes regurgitated but rarely analyzed, synthesized or applied to form a deeper understanding.

Critics of the complexity of high school content area curricula like history commonly point to the heavy emphasis on textbook-driven instruction and the absence of big ideas or themes that anchor facts and details in a deeper student understanding (Harniss, et al., 2004). With regard to history textbooks, McKeown and Beck (1994) stated that textbooks are “not oriented toward developing a coherent chain of events” and they “lack the coherence needed to enable students to draw connections between events

and ideas” (p. 5). Some researchers (Crismore, 1984; McKeown & Beck, 1994; Wineberg, 2001) noted that the majority of information found in textbooks is not structured to make connections between discrete facts that foster complex knowledge. For instance, in McKeown and Beck’s (1990) analysis, history textbooks assumed unrealistic levels of students’ prior knowledge. These unrealistic levels obstructed student understanding (Harniss, et al., 2004). McKeown and Beck’s results suggested that students’ content knowledge before and after traditional history instruction is characterized by “simple associations and a lack of connected structures” (p. 688) – far from the ideal of deep understanding or critical-thinking described by Conley (2010). Instead, students struggle to make associations between the details and important concepts or principles within the text and get swept away with “seductive details” (Garner, Gillingham, & White, 1989, p. 41) that are not instructionally important (Garner, et al., 1989; Harniss, et al., 2004).

Learning History Content

The social sciences encompass multiple disciplines (history, economics, political science, geography), each discipline has a distinct knowledge base and way of thinking (Conley, 2005). In the discipline of U.S. History, besides a fundamental knowledge of important events and documents such as the Civil War or the U.S. Constitution, students need to develop certain cognitive skills that relate to historical thinking (Bain, 2005; Conley, 2005). According to Bain (2005), “Learning history entails teaching students to think quite differently than their natural inclinations” (p. 180). Along with possessing factual knowledge and a sense of chronological sequence and causation over time, students need to master tools and ways of thinking that foster a deeper understanding of

history. Given the parade of details and the prevalence of textbook-driven instruction, U.S. History students may get the impression that social sciences are primarily a collection of facts to be memorized and reiterated (T. L. Epstein, 1994; Harniss, et al., 2001; Ketterlin-Geller, McCoy, Twyman, & Tindal, 2003). Regardless of the quality of history textbooks or the traditional history classroom content delivery models, if students are to master complex content, they must move from memorizing facts to making connections that anchor a deeper understanding. When students develop strategies for sorting, processing, and analyzing content, they can develop a working knowledge that makes deeper understanding and historical thinking possible.

History knowledge and history instruction. Historians (Levesque, 2008; Wineberg, 2001), educators (Bain, 2005; Brooks, Aris, & Perry, 1993; Timmins, Vernon, & Kinealy, 2005), and researchers (Conley, 2005, 2010; McKeown & Beck, 1994; Nokes, Dole, & Hacker, 2007) acknowledged that high school students need training to develop foundational factual, chronological, and causal content knowledge and history-specific ways of thinking. Instructional tools and techniques designed to assist students in acquiring key content knowledge and developing historical thinking skills abound. Cognitive organizers (Boon, Burke, Fore, & Spencer, 2006; Crank & Bulgren, 1993; Hudson, Lingnugaris-Kraft, & Miller, 1993; Kim, Vaughn, Wansek, & Wei, 2004), problem-based learning (Bain, 2005; Harniss, et al., 2004; Hmelo-Silver, 2004; Osana, Tucker, & Bennett, 2003), problem-solving (Jonassen, 1997; Sewell, Fuller, Rosemary, & Funnell, 2002), critical-thinking (Hynd, 1999; Paul, 1984; Wright, 2002), case method (Guyer, Dillon, Anderson, & Szobota, 2000; Wasserman, 1992), issue centered instruction (Evans, 1998; Rossi, 1995, 1996; Shaver, 1992), and concept-based

instruction (Harniss, et al., 2004; Twyman, et al., 2006) each provide schema-related methods for sorting, processing, and analyzing information for the expressed purpose of learning history. In each approach, students are taught to (a) employ a learning strategy to sort and process content and (b) develop analytical thinking that connects discrete fact-heavy details to larger concepts and ideas in order to facilitate content learning.

Discussions of more effective history instruction consistently address critical-thinking and problem-inquiry approaches that reflect real-world concerns and interests. Osana, Tucker, and Bennett (2003) alluded to the argument that history and decision making are naturally interconnected. Students in all content areas are required to be actively involved in the construction of knowledge and the evaluation of choices they make. In fact, a central theme of reform in social studies education for the past few years has focused on higher-order thinking within contexts that would foster civic responsibility in all students in the K-12 educational system (p. 358).

Osana et al. further suggested that, “decision making is arguably becoming the centerpiece of most reform efforts in social studies education; several researchers have expounded on the critical importance of centering curricular activities around decision-making tasks” (p. 358). As Memory, Yoder, Bollinger, and Warren (2004) stated, “At least since John Dewey published his classic works, teachers have been urged to engage students by using problem-based thinking and inquiry tasks that reflect real-world concerns and interests” (p. 147). Memory et al. cited *The Problems Approach and the Social Studies* (National Council for the Social Studies, 1955) and *Problem-Centered Social Studies Instruction* (Gross & Meussig, 1971), both early works in Social Studies reform, as evidence of the connection between real-world problems and learning history

content. Thus, advocates of instructional efforts based on problem solving and higher-order thinking under real-world constraints has both a precedent and more current support.

To engage students in learning history with a critical-thinking and problem-solving approach, Wright (2002) asserted that, “students need specific information and certain tools. No matter the gravity of the problem, students need to have background information about it, criteria for judging the matter, knowledge of critical-thinking vocabulary, thinking strategies, and certain habits of mind” (p. 258). Yet, the barriers that hinder student access and retention of history knowledge in traditional approaches apply here, as well. Investigators of instructional approaches that emphasized critical-thinking and problem-inquiry approaches in social studies classes identified challenges, such as pressure to cover a broad scope and sequence of content, lack of students’ prior knowledge necessary for higher order thinking, student motivation or interest, and the necessity of expert guidance for students during the process (Ehman, Glen, Johnson, & White, 1990; Memory, et al., 2004; Saye & Brush, 1999).

Non-traditional instructional approaches. Despite the challenges and limitations of fact-heavy traditional textbook-driven instruction, students’ limited prior knowledge, or student motivation, examples from instructional research literature explored strategies intended to improve history content learning at the secondary level. In one example of non-traditional U.S. History instruction aimed at improving the connections between historical events and ideas or concepts, Harniss, Caros, and Gersten (2007) investigated the impact of a experimental middle school U.S. History textbook on content knowledge development. Using a selection of relevant items from the National

Assessment of Education Progress (NAEP) American history tests, Harniss et al. compared the performance of students who received instruction through a traditional U.S. History text with the performance of students who received instruction through a non-traditional textbook designed “to teach history as a series of related events and actions and to make the relationships explicit” (p. 41). Harniss et al. found no effect for time of test (pre- vs. posttest) or condition (experimental vs. control). Thus, no interaction was observed. However, Harniss et al. found that students in the Experimental Group performed significantly higher on the content-specific tests than did the comparison group. Results also showed that students in the Experimental Group were significantly more actively engaged and significantly less off-task than the comparison group. In addition, they answered significantly more questions correctly and significantly fewer questions incorrectly.

Using a quasi-experimental design, Twyman, McCleery, and Tindal (2006) studied the effect of explicitly teaching concepts and problem-solving strategies on middle school students’ content knowledge, content-based vocabulary development, and problem-solving skills when compared to traditional history instruction using lectures and textbook-driven reading. To address documented limitations of textbooks in the areas of prior content knowledge and to foster historical thinking and problem solving, Twyman et al. designed a concept-based instruction module to build a knowledge base and develop student-centered strategies for applying the knowledge. Using concepts and attributes as a framework for introducing, delivering, and discussing U.S. History, students could practice organizing content with a structure that explicitly identified connections between larger domain ideas and detailed information from the textbook. Although performance

was not statistically different between groups (experimental and control) in a measure of content knowledge, Twyman et al. found significant differences on vocabulary and problem-solving measures.

Nokes, Dole, and Hacker (2007) also used a pretest-posttest, quasi-experimental design to investigate the impact of teaching high school students to use historical-thinking heuristics on U.S. History content knowledge. They randomly assigned eight history classrooms to one of four three-week interventions: (a) traditional textbooks and content instruction, (b) traditional textbooks and heuristic instruction, (c) multiple texts and content instruction, and (d) multiple texts and heuristic instruction. Heuristic instruction taught sourcing, corroboration, and contextualization: three definitive sense-making strategies used by historians to construct meaning from historical documents. Results of the intervention were mixed. Nokes et al. found that students who read multiple texts scored higher on a content test with questions collected from published NAEP and Advanced Placement tests, and students who used heuristics in a document analysis exercise scored better on the content test.

Decision Quality and Learning History

Using the Decision Quality model, training in decision-making skills provides both a schema for sorting and processing history content and practice in developing analytical thinking skills foster a deeper understanding of U.S. History. Based on literature that emphasized the higher order thinking skills originally described in Bloom's taxonomy (1956), The Learning Research and Development Center (1991) listed the following higher order thinking skills [seriation mine]: (a) "size up and define a problem that isn't neatly packaged, (b) determine which facts and formulas stored in memory

might be helpful for solving a problem, (c) recognize when more information is needed, and where and how to look for it, (d) deal with uncertainty by ‘brainstorming’ possible ideas or solutions when the way to proceed isn’t apparent, (e) carry out complex analyses or tasks that require planning, management, monitoring, and adjustment, (f) exercise judgment in situations where there aren’t clear-cut ‘right’ and ‘wrong’ answers, but more and less useful ways of doing things, (g) step outside the routine to deal with an unexpected breakdown or opportunity” (pp. 3-4). In this hierarchy of cognitive processing from knowledge-level thinking to evaluation, such skills facilitate students’ deeper understanding of history content than a fundamental grasp of facts and dates. Decision-making skills, particularly deliberate analyses of the elements of big or significant decisions in the Decision Quality model, embody the higher order analytical skills necessary for deep understanding of history.

The elements of a quality decision provide both a schema for sorting and processing content, and an analytical framework for actively thinking about problems in history that is also relevant to students’ daily lives. The schema guides the student in a deliberate, conscious analysis of details according to applicable associations and concepts in history and in decision-making. By applying the Decision Quality model to problems in U.S. History, students build upon a personally relevant skill – decision-making – that fosters analytical thinking in service of learning. In theory, analytical, System 2 thinking becomes progressively more accessible, fluid and effortless with use (Kahneman, 2003; Klein, 1998; Sloman, 1996).

U.S. History Instruction Integrated With Decision Training

In my study, U.S. History students were trained to use the Decision Quality model as a schema to sort, process, and analyze content information according to the six elements of a decision. In learning to sort, process and analyze, student practiced thinking skills that enabled them to access to increasingly complex historical concepts that contributed to a deeper, more connected understanding of U.S. History. In theory, learning to think through and sort information with the Decision Quality model connects making decisions (a universal experience) with the facts, dates, events, people, and concepts of U.S. History. Students construct historical content knowledge by sorting, processing, and analyzing specific details in history with the Decision Quality tool. What makes this unique, though, is that students take a familiar experience, like making personal decisions about resisting authority or using force to compel another person to submit to authority, and apply it to similar but less familiar concepts in U.S. History like civil disobedience during the Vietnam conflict or using the atomic bomb to end fighting in the Pacific theater of WWII. However, there is limited evidence in the research literature that validates a relationship between developing decision skills and U.S. History content knowledge.

In relation to daily life and school, both decision-making and the study of history are universal adolescent experiences. As discussed earlier, the prescriptive perspective of decision theory contributes tools, techniques, and training to address “the bottom line: how do you improve the quality of decisions in practice” (Bell, et al., 1988, p. ix). The Decision Quality model provides a tool and training to improve decision competence. High school students need training to develop both a foundation of factual, chronological

and causal content knowledge, and schema-based tools to engage in critical, analytical, and creative thinking about U.S. History and other content areas. Similarly, students need training to develop fundamental procedural knowledge that can improve decision competence, in general. My study explored the possibility that high school students learn both U.S. History and decision-making more effectively when they learn both domains simultaneously and symbiotically.

Purpose of This Study

My premise is that decision-making skills will improve because students are practicing decision-making skills with historical content, which will in turn lead to improved U.S. History content knowledge as students practice decision-making skills. In theory, the cognitive act of deliberately sorting historical information with Decision Quality concepts engages students' critical, analytical, creative (S2) processing capacities and promotes learning in both the domains of U.S. History and decision-making competence. In my study, students in the intervention were trained to access essential U.S. History content knowledge and apply it in the context of making a decision. The training aligns with the sort of "thinking about the problem, developing the problem, understanding the problem, looking at it from all sides, deciding what important information is relevant to the problem" (Achieve, 2004, p. 2) that prepares students with the skills to be successful in the modern workplace. Because of the lack of empirical studies around high school decision-making, the importance of adolescent decision-making skills, and students' need for cognitive strategies for sorting, organizing, and analyzing complex content knowledge in the context of problem-solving, the effect of

integrating decision-training in U.S. History content instruction is worthy of empirical study.

Thus, the emphasis of my study was on the effect of training in decision-making as it related to (a) increased U.S. History content knowledge and (b) increased decision-making competence. In exploring the effect of training in decision-making, I addressed four research questions:

1. Do 10th grade students in a U.S. History-integrated-with-decision-training course score significantly higher on a U.S. History NAEP assessment than 10th grade students in a traditional U.S. History course?
2. Do 10th grade students in a U.S. History-with-Decision-Quality-training course score significantly higher on the Decision-making Competence Index than 10th grade students in a traditional U.S. History course?
3. Is there difference by NAEP item by knowledge form and intellectual operations by group?
4. Will students in the Experimental Group recall and apply the decision-making model 10 months after posttest to a novel, distal problem?

CHAPTER III

METHODS

School Setting

The study took place in tenth grade U.S. History classrooms in a comprehensive high school of 1472 students in a city of approximately 50,000 residents in the Pacific Northwest. The high school demographics reflect the district's changing trend: an increased enrollment of students of color, specifically Hispanic students. The student body was comprised of 83.9.6 % Caucasian, 1.2 % African American, 1.6% Asian/Pacific Islander, 6.5 % Hispanic and 1.8% Alaskan/Native American and 3.7% multiethnic students. According to the Statewide Accountability System, 1.1% of the student population was enrolled in English as a Second Language Programs. The high school was staffed with 68.3 teaching positions. Teachers averaged 12.2 years of experience, and 83.8% of the teaching staff held a Master's degree or higher. According to the federal definition, highly qualified teachers taught 100% of the classes. The students state-testing participation rate was 96.5%.

Students enroll in this high school from four middle schools within the district. The four feeder middle schools ranged in size from one K-8 school with 170 students to the largest middle school in the district with 623 students. According to the Oregon Department of Education (2008), the school had a NCES 85.7% graduation rate, a 3.4% drop out rate for 2008-2009, an attendance rate of 91.1%, and a 15.1% mobility rate. Oregon state assessment summary results combined for 2008-2009 and 2009-2010 school years indicated 68% met or exceeded the reading standards, 58% met or exceeded the math standards. Thirty-four percent of students completed the Scholastic Aptitude Test

(SAT) and averaged 511 in critical reading, 520 in math, and 480 in writing. The diploma-graduation rate for 2008-2009 was 85.5%. For the 2009-2010 school year, neither the school nor the district met federal requirements for Adequate Yearly Progress (AYP), as defined by the No Child Left Behind Act of 2001.

Participants

The participants in this study included all 358 sophomore (10th grade) students. Specifically, students receiving special services (individual education plans or English language learner services) were included in both the treatment (Experimental) and Control Groups. However, students with severe cognitive disabilities requiring a specialized self-contained placement were not included in the sampling plan. From the sampling of all sophomores, a stratified random sampling was used to place them into either the Experimental or Control Group. Stratification for the 358 sophomores was by (a) gender, (b) socio-economic status (identified by participation in free and reduced meals), (c) eighth-grade statewide assessment reading scores, and (c) ninth-grade grade point average (GPA). Demographic variables for the two groups will be detailed in the next section.

Research Design

This Experimental/Control Group, pretest-posttest design study utilized a stratified random sampling procedure to identify participants for the Experimental Group. Stratification was by (a) gender, (b) socio-economic status, (c) eighth-grade state assessment reading scores, and (c) ninth-grade GPA. In April of 2009, according to this high school's practice, five teachers were identified to deliver the two-trimester sophomore U.S. History curriculum. In June, two of those five teachers were trained on

the independent variable, the Decision Quality model. The Experimental Group of 107 was comprised of students randomly assigned to these two teachers. The Control Group was comprised of 279 students randomly assigned to three teachers. Both Experimental Group teachers taught the 2-trimester sequence of U.S. History curriculum integrated with Decision Quality content. All U.S. History teachers administered (a) a U.S. History content, and (b) a decision-skills pretest in the first seven days of students' first trimester of instruction in U.S. History, and again during the final seven days at the end of the second trimester. The pretests and posttests were identical in content, format, and administration. The two tests will be detailed in a later section of this chapter.

Procedures

The study occurred throughout the 2009-2010 school year. In order to minimize the impact of student mobility resulting from student class schedule changes, data collection began after the first week of the trimester. Two of the five teachers assigned to teach U.S. History were selected for the Experimental Group. The two Experimental teachers were selected to participate in training and implementation of the integrated U.S. History-Decision Quality course had two and six years of experience in teaching social studies, all at the high school of interest. Although both teachers had previously taught U.S. History, neither teacher taught U.S. History the school year immediately before the study year.

The Experimental Group teachers were selected because they represented the mid-range of the Social Studies Department in terms of teaching experience and expertise. Neither Control Group teacher had experience with decision education or

training in decision quality. Both teachers earned a Masters degree in Education and met the No Child Left Behind education standard for highly qualified teacher in U.S. History.

The three Control Group teachers who taught the non-Decision Quality U.S. History (traditional U.S. History) curriculum had two, five and 32 years of experience in teaching social studies, with two, four, and 18 years at the high school of interest, respectively. All three teachers had taught U.S. History courses the previous school year. Two of the three teachers earned Masters degrees in Education. The other teacher earned a Masters degree in History. All three teachers met the No Child Left Behind education standard for highly qualified teacher in U.S. History. All three Control teachers also had experience teaching U.S. History. However, none of the three Control teachers had experience with decision education, which was important to eliminate any possibility of curricular contamination of the independent variable.

Assignment

The Experimental Group was comprised of approximately four sections of 25-30 students; the Control Group held 10 sections of 25-30 students. Because of the previously cited mobility factor, only 279 of the 358 sophomores completed both the NAEP U.S. History and the Decision-making Competence (DMC) pretests and posttests. The Control Group numbered 177 10th graders and the Experimental Group included 102 10th graders.

Experimental Versus Control Group Equivalence on Demographic Variables

After students were randomly assigned to either the Experimental or Control Groups, (but prior to the intervention starting), I measured group equivalence on demographic variables. Equivalence testing occurred in August, prior to the start of participants' tenth grade school year. Groups were assessed for differences on SES-level,

overall grade point average, reading ability, attendance, gender, and special education status. I used free and reduced meals (FARMS) participation as a proxy for SES-level. SES correlates to a host of other academic variables (Bradley & Corwyn, 2002; Kanyongo, Certo, & Launcelot, 2006), thus equalizing groups was important. Overall grade point average was used to approximate whether either group was more academically inclined than the other. If one group were more academically motivated than the other, it would introduce a plausible alternative hypothesis to any content knowledge or decision competence outcomes observed. Reading ability is a gateway or access skill to content area learning (Carnegie Council on Advancing Adolescent Literacy, 2010). Therefore, making sure both groups had comparable reading ability was essential. Because no standardized reading tests are given to ninth graders (the statewide reading assessment is administered in the spring of the tenth grade school year), I utilized the student's eighth grade statewide reading tests as the reading measure. Gender equivalence by group was assessed. Some researchers (Rottinghaus, Larson, & Borgen, 2003; Tindal, 2002) believe that gender differences account for research differences rather than the ascribed research interventions. To alleviate that potential, gender makeup between groups was analyzed. Finally, for special education status students were identified as either having an individual education plan (IEP) or not. Students that require an IEP may have a more difficult time learning content area material because their learning disability interferes with the knowledge acquisition (Boyle, et al., 2006).

No significant differences for the above identified demographic variables were found. First, the *t*-test for FARMS revealed no significant differences between the Experimental and the Control Group, $t(279) = -0.68, p = .50$. Mean scores for FARMS

(with standard deviations in parentheses) for the Experimental Group and the Control Group were 0.33 (0.22) and 0.29 (0.46), respectively. Second, the t -test for GPA showed no significant differences between the Experimental and the Control Group, $t(279) = 962$, $p = .34$. Mean scores for GPA (with standard deviations in parentheses) for the Experimental Group and the Control Group were 2.84 (0.96) and 2.95 (0.95), respectively. Third, the t -test for reading ability showed no significant differences between the Experimental and the Control Group, $t(279) = -0.18$, $p = .83$. Mean scores for reading ability (with standard deviations in parentheses) for the Experimental Group and the Control Group were 235.17 (6.12) and 234.99 (7.35), respectively. Fourth, the t -test attendance conveyed no significant differences between the Experimental and the Control Group, $t(279) = -0.91$, $p = .36$. Mean scores for attendance (with standard deviations in parentheses) for the Experimental Group and the Control Group were 4.12 (3.24) and 3.69 (4.15), respectively. Fifth, the t -test gender revealed no significant differences between the Experimental and the Control Group, $t(279) = 0.01$, $p = .99$. Mean scores for gender (with standard deviations in parentheses) for the Experimental Group and the Control Group were 0.46 (0.50) and 0.46 (0.50), respectively. Lastly, the t -test for special education status showed no significant differences between the Experimental and the Control Group, $t(279) = 0.32$, $p = .75$. Mean scores for gender (with standard deviations in parentheses) for the Experimental Group and the Control Group were 0.04 (0.19) and 0.05 (0.21), respectively.

Study Description

Students in the study were enrolled across two (2) trimesters of U.S. History as part of the required high school curriculum. As part of the district approved curriculum,

all sophomores must complete one credit of U.S. History, which spanned two trimesters: one trimester covered historical content from the 1865 to 1939; the second trimester spanned from 1940 to the early 2000s. Across the two trimesters, the curriculum included content and analysis of Reconstruction, Industrialization, American Imperialism, Progressivism, the Great Depression, World Wars I and II, Cold War conflicts and ideology (including emphases on Korea, Vietnam, and nuclear arsenal proliferation), and American politics, thought and cultural movements in the 1960s, 70s, 80s, and 90s. In delivering the approved district U.S. History curriculum, all teachers in the study utilized warm-up questions, textbooks, lectures, simulations, reading and writing assignments, video presentations, within-unit quizzes and end-of-unit tests to provide instruction and learning according to content standards as outlined by the Oregon State Department of Education. Teachers provided instruction within the 12-week trimester in 70-minute class periods each school day.

In addition to the district approved U.S. History curriculum and common instructional activities, participants in the Experimental Group received training in an integrated U.S. History-Decision Quality curriculum. They received additional instruction through U.S. History-decision-making prompts, direction instruction in the Decision Quality model, and practice in evaluating and making decisions with the Decision Quality tool in hypothetical historical contexts across all teaching units. The integrated Decision Quality curriculum will be described in detail below.

Experimental Group Teacher Training

In the summer prior to the school year of data collection, both Experimental Group teachers received training in Decision Quality designed by the Decision Education

Foundation. Training occurred over one week at the Stanford University campus and was administered through the Strategic Decision Risk Management certificate program as part of the Stanford Center for Professional Development and Strategic Decisions Group. After the training and prior to the start of the school year, both teachers collaborated to review previously developed Decision Quality social studies activities and integrate Decision Quality concepts, activities, and assessments with district-approved U.S. History curriculum. After reviewing Decision Quality classroom curriculum, the Experimental Group teachers developed their U.S. History lessons, activities, and assessments with integrated Decision Quality content and agreed to deliver them concurrently through the school year.

Independent Variable Materials

Formalized in decision engineering consultation and developed during 30 years of management consultation by the Strategic Decision Group, Decision Education Foundation's Decision Quality curriculum utilizes Howard's (2007) six elements of a quality decision to instruct professionals and adolescents in effective decision-making strategies. Rooted in Howard's decision-analysis construct of decision quality, the curriculum combines aspects of normative decision theory, systems engineering, organizational behavior, cognitive psychology, and Deming's total quality movement to assist decision-makers in identifying the best alternative when facing uncertainty. An overview of the Decision Quality model is provided below.

The Decision Quality Model Curriculum

The six elements of Decision Quality Model Curriculum collectively constitute the *prescriptive* model that incorporates *normative*, systematic reasoning with a broader

understanding of *descriptive* bias and heuristic tendencies in decision-making. The six elements also function together as a schema that concretizes coordinated S1-S2 processing. The schema is designed to improve decision quality because it trains student to actively monitor bias and engage in analytical thinking. It provides a tool to sort, process, and analyze information. Rather than taking the *first thought* in a personal decision or in processing content in the classroom, students learn how and when to think longer or harder about a decision. For many students, this requires effort and training. The quality of a decision can be dramatically enhanced by deliberate reflection on elements of a decision, such as the decision problem frame, one's values, possible alternatives, basic logic, or the commitment to act on a quality decision. The same can be said for deliberate, analytical thinking; it is effortful, and few engage in it without prodding.

The Decision Education Foundation adapted Howard's (2007) conception of decision-making and decision quality into a prescriptive tool designed to improve decision-making skills. In addition to prescriptive decision theory, Keelin, Schoemaker, and Spetzler (2008) of Decision Education Foundation drew from psychology, group dynamics, mathematics, economics, and probability in their development of the Decision Quality tool for describing decision-making and teaching it to adolescents. The Decision Quality model simplified normative and descriptive aspects of decision theory by distinguishing head and heart decisions, respectively. In the language of the Decision Quality model, a quality decision *makes sense* (head aspect) and *feels right* (heart aspect).

Overview. Decisions begin with alternatives or choices. If one has no choice, one does not have a decision to make. Many decisions are easy and can be made quickly;

some decisions are difficult and require more attention. In general, people tend to make decisions or solve problems without much reflection. They “go with the flow” (Keelin, et al., 2008, p. 3) or use decision-making shortcuts that involve the head (deliberate, rational thinking) or the heart (feelings, impulses, intuition) to varying degrees. When shortcuts lead to biases, they can reduce the quality of a decision. Biases affect decision-making capability by influencing how people filter and interpret information and by prompting people to seek information that confirms their “way of thinking” (Keelin, et al., 2008, p. 17).

Declaring a decision. A decision is a choice among alternatives. A quality decision is a rational interpretation of one’s preferences and the information available in making the choice. In order to organize preferences and useful information, one can use probability to estimate and describe both aspects of a decision. Because of uncertainty, decision quality is not the same as outcome quality for a decision. People can learn to recognize the freedom to choose and exercise it in a way that increases the likelihood of desired outcomes from decisions.

Distinguishing types and quality of decisions. There are three categories of decisions: (a) big, life shaping decisions, (b) significant decisions, and (c) in-the-moment decisions. A *big* decision might include what career one chooses or whether to take a year off before going to college. *Significant* adolescent decisions include selecting a summer job, deciding among extracurricular activities, or considering whether to continue or end a relationship. *In-the-moment* decisions range from choosing what to order in a restaurant to choosing to ride in a car with a driver who has been drinking. Big and significant decisions require time and effort to iterate through the decision process, though with

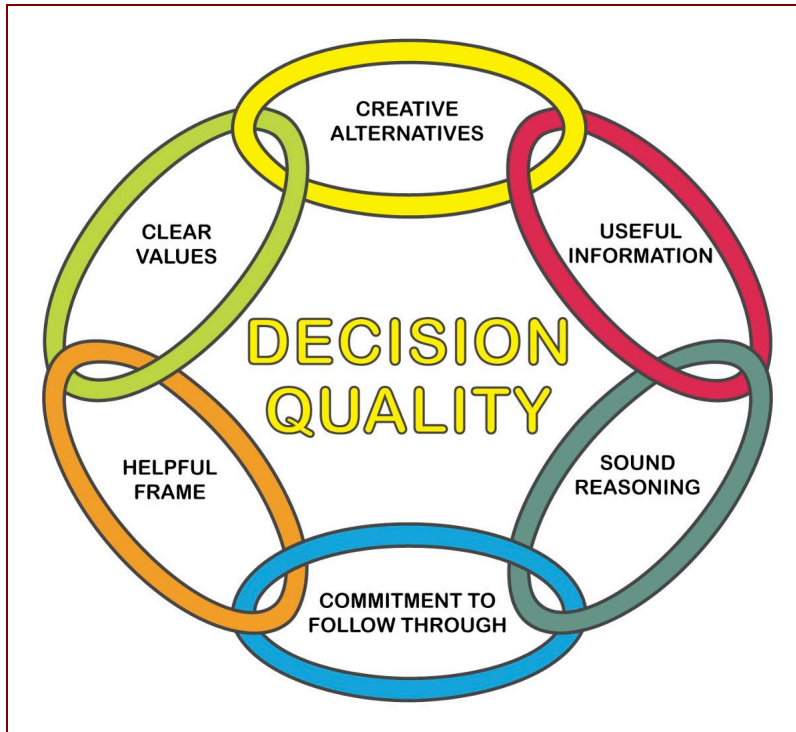
varying depth. In-the-moment decisions rely on automatic responses and instant judgments. Small decisions may prove to have a greater influence over outcomes in one's life than the big or significant decisions. Thus, it is important for adolescents to develop both an understanding of prescriptive decision-making process and awareness of automatic decision habits in order to increase the decision quality.

The quality of a decision is best measured by the choice being made, not the outcome of the choice. Threats to decision quality include failing to pause and consider if the decision is big or significant and thus requiring thoughtful consideration, becoming overwhelmed by the details and over-thinking, and consistently making in-the-moment decisions that do not align with values (preferences) or sound reasoning (a rationale) that result in poor decision habits. Again, in determining decision quality, quality decisions do not ensure quality outcomes. For instance, choosing to apply for a job and not being the successful candidate does not imply that it was a poor decision to apply. Still, quality adolescent decisions are more likely to lead to consistently better outcomes.

The Decision Quality model contains six elements of a quality decision and operates as a checklist for gauging and a guide for making a quality decision. These six elements are: (a) Helpful Frame (b) Clear Values, (c) Creative Alternatives, (d) Useful Information, (e) Sound Reasoning, and (f) Commitment to Follow Through. The Decision Quality model was designed to improve adolescents' understanding of personal preferences and biases, to help leverage natural strengths, and to anticipate where additional help or effort might improve their decisions. Often, this requires one to slow down the process or to have developed habits that increase the chances for a quality decision. Declaring a conscious choice is important in making a decision. The six

elements of decision quality help to structure a decision, iterate through an established normative decision-making process, and incorporate techniques for “knowing ourselves better” (Keelin, et al., 2008, p. 16) in order to recognize personal preferences and counteract biases. Figure 1 depicts Keelin et al.’s six elements of decision quality.

Figure 1. *Decision Quality Model*



Helpful frame. Framing is defining the decision to be made. A decision frame answers the question, “What problem am I trying to solve?” (Stanford Strategic Decision and Risk Management, 2009, p. 5). Keelin, Schoemaker, and Spetzler’s (2008) Decision Quality model uses three components to frame a decision: (a) purpose, (b) scope, and (c) perspective. The *purpose* is the desired outcome or the problem we intend to solve by making a decision. The *scope* identifies “what decisions are included and excluded in considering the situation” (Stanford Strategic Decision and Risk Management, 2009, p. 7). Students can use a decision hierarchy to determine the scope of decision. The

hierarchy helps identify decisions already made, the decision to address now, and future decisions. The scope provides focus to the decision frame by narrowing the parameters for the other elements of a decision, especially clear values, useful information and creative alternatives. The *perspective* is the point of view about the decision. Considering multiple perspectives includes considering how other people might approach the problem. This can help a student recognize what aspects of a decision or its outcomes are under his or her control. An effective decision frame clarifies the purpose, scope, and perspective of a decision so that adolescents can align values, alternatives and useful information to select a course of action most likely to achieve a desirable outcome.

Clear values. Values are the “wants, needs, likes, and dislikes” (Keelin, et al., 2008, p. 7) that influence a person to select one alternative (option or choice) and its likely outcomes over others. Here, values are synonymous with preferred outcomes of a decision (preferences). Often, alternatives in significant or big decisions involve trade-offs in preferences because none of the alternatives can satisfy all values. For instance, in choosing a summer job, one might be asked to choose between money and enjoyment of the work. In general, when people make mistakes related to values, they overemphasize short-term outcomes of a decision, become attached to unlikely outcomes (one that is highly preferred, but unlikely to occur), overreact to risk, or ignore risks that jeopardize desired outcomes (Keelin, et al., 2008). People also fail to recognize what they truly value or want to result from a decision. Taking time to clarify values is crucial in making quality decisions. This entails identifying how the selection of one alternative might lead to future outcomes that align with personal preferences. It also involves being explicit about how important one preference may be when compared to another. Defining one’s

values is an exercise that takes time but is crucial to identifying the optimal choice among alternatives.

Creative alternatives. An alternative is simply a possible course of action. Without alternatives, there is no decision to be made. Quality alternatives are: “(1) under one’s Control, (2) significantly different, (3) potentially attractive, and (4) doable” (Keelin, et al., 2008, p. 8). The quality of a decision is limited by the alternatives identified. In failing to make a quality decision, people may assume they have few or no alternatives or do not identify an alternative that aligns with personal values, they consider too many alternatives that vary little from one another, or they consider alternatives that are not sufficiently within their Control. For example, a student may choose not to engage in schoolwork because they intend to pursue a professional sports career. He or she may fail to recognize the likelihood of achieving their goal of being a professional athlete and limit future opportunities by failing to consider other alternatives in the classes they choose to take or the amount of time they spend preparing for rigorous college entrance requirements. Taking time to brainstorm alternative courses of action or consult others to gather alternative perspectives on a decision problem helps to identify creative alternatives that improve the likelihood of a quality decision.

Useful information. According to Keelin et al. (2008), “Useful information is anything we know, would like to know, or should know that might influence our decision-making but is not under our control. This includes factual information from the past and judgments about current or future situations that help us anticipate the consequences of acting on our alternatives” (p. 9). In choosing to buy a car, one would pay attention to the sales price, the make, model, and reputation for reliability of the car,

and potential resale value. “Useful information should come from a credible and unbiased source, be timely, and acknowledge uncertainty” (p.9), so that it can inform one’s selection of alternatives. In failing to acquire useful information, people may not take the time or effort to find useful information, they may overload information in the process, they may engage in wishful thinking that avoids difficult trade-offs in values or effort, or they may assume the future will be just like the past. In so doing, they may fail to utilize useful information that would otherwise improve the quality of a decision.

Sound reasoning. “Reasoning is the process of combining clear values, useful information, and creative alternatives to arrive at a decision...It completes the sentence, ‘I am choosing this alternative because...’” (Keelin, et al., 2008, p. 10). Sound reasoning requires an explanation, justification, or rationale for selecting one alternative over others. It is not enough to choose an alternative because it feels right. Often, the rationale is poor and this jeopardizes decision quality. Ideally, people choose an alternative because they determined it offered the greatest likelihood of realizing preferred outcomes, it involved less risk, and it was better for people they care about. To justify the decision, we identify the alternatives considered, the information taken into account, the values and trade-offs considered, and the methods for combining these elements in determining the optimal choice. When decision quality is low, people tend to ignore alternatives that delay the realization of preferred outcomes, assume there is one alternative that guarantees desired outcomes, misinterpret factual information, ignore relevant information, or rely on preferred outcomes that cannot recover lost resources from previous decisions, engage in wishful thinking, emphasize familiar alternatives over difficult or undeveloped ones, commit errors in logic, or overanalyze and fail to actively

decide. The Decision Quality model promotes utilizing pro-con lists, decision and probability trees, and diagrams of a decision that can assist in applying sound reasoning to optimize decision quality. Sound reasoning takes time and effort and often entails developing a skill that is not often developed or used when making significant or big decisions.

Commitment to follow through. Commitment to follow through means a person is set to make a decision and do so with a clear purpose. Commitment proceeds from an understanding of the other five elements of decision quality and the determination to overcome obstacles inherent in a course of action. Even when people make a mental commitment to a course of action, they often fail to accept the personal costs of following through with the decision. They may not employ the time, effort, money, advice, or other resources necessary to overcome obstacles that get in the way of acting on decision (Keelin, et al., 2008). They may procrastinate and fail to act in a timely manner and, as a result, alternatives may change. For instance, applying for college or a scholarship before the deadline, changing a class schedule, and saving money require a commitment of time, effort, and other resources. The process of identifying the decision frame, values, alternatives, and useful information, and of submitting these elements to sound reasoning, is intended to improve commitment to follow through that completes the process of making a quality decision.

Summary of decision quality. The Decision Education Foundation describes its Decision Quality tool as applied best practice from behavioral decision-making (how people make decisions naturally) and prescriptive decision-making (how people should make decisions to maximize values, beliefs, and preferences in outcomes) (Spetzler,

2009). Decision Quality curriculum emphasizes decision fitness, separating decisions into three groups: *In-the-moment*, quick, frequent decisions which rely on habits; *significant*, conscious, strategic decisions which utilize the Decision Quality tool as a checklist in order to rationally align preferences, alternatives, and information and avoid biases; and *big*, rigorous, far-reaching decisions that may involve formal analysis and structural modeling (pro-con lists, decision and probability trees, decision diagrams) to determine the optimal course of action. Decision fitness includes being able to apply the best practice according to the decision type and need. Engaging in simulations and practice with fidelity in applying the six decision quality elements in each decision type is said to establish habits and policies that empower and improve individual decision-making skills. With regard to adolescent decision-making, decision fitness is presented as reflexive, developmental, and improvable. By practicing a reflection process of recognizing personal decision habits, making deliberate decisions with the Decision Quality model, committing to follow through, and practicing, adolescents can practice effective decision habits and become more competent to make quality decisions.

Measurement

Dependent Measures

In this study I used four dependent measures. The first was the National Assessment of Educational Progress (NAEP) U.S. History Content Knowledge Test. This was a measure of student's history content knowledge. The second was the Decision-Making Competency Index. This assessed decision-making skills. The third measure was Tindal and Nolet's Levels of Intellectual Functioning. NAEP items that showed a significant difference between groups were identified and analyzed. The fourth measure

utilized flowchart scoring to analyze selected Experimental students' interviews for recall and application of decision training. All four measures are described more fully below.

NAEP U.S. History Content Knowledge Test. The National Center for Educational Statistics (NCES) developed and implemented the NAEP test in U.S. History, beginning in 1986. The test is administered to fourth, eighth, and 12th grade students in the United States. Though the online NAEP questions are still considered secure, they have been retired and are no longer being utilized in current NAEP History assessment. Williams, Laser, Reese, and Carr (1995) defined the NAEP as a “Congressionally mandated survey administered by the National Center for Education Statistics (NCES), U. S. Department of Education. Since 1969, NAEP has reported on the educational achievement of America’s students and provided accurate and useful information to parents, educators, and policy makers at the national, state, and local level” (p. 1). The NAEP history test required students not only to demonstrate knowledge of facts, events, and people, but also to display understanding, appreciation, reasoning, and a broad view of history. The NAEP was created with questions that would “plumb whether students do or do not know the basic facts of American history” (p. 17). The NAEP focuses on the presence or absence of discrete bits of information; thus, points are awarded to each correctly answered factual recall and explanation recall question.

To measure student content knowledge in the pretest posttest format, multiple choice questions were taken from the database of retired NAEP questions for US. History. Questions that addressed a historical period ranging from the 1880s to the 1980s were used because they aligned with the curriculum delivered to all sophomores in this study. Questions rated easy, medium, or hard were compiled, photocopied in the same

format presented on the database. All U.S. History teachers administered a 42-question NAEP test at the beginning of the school year before any history instruction began. They re-administered the same NAEP test at the end of the second trimester [end of class] of instruction. Students were instructed to mark their answers on the paper-pencil test and were given as much time as they desired to complete it. Teachers from both the Experimental and Control Group reported students completed the test in one sitting; one class period or less. Students were administered Pretest and posttest scores were analyzed. The factual knowledge dependent measure for each student was the proportion of NAEP history items answered correctly on the pretest and the posttest by each subject.

As noted above, the 42 NAEP items were curriculum-referenced questions, which were identified by the school-based researcher who was familiar with the curriculum but not one of the teachers. The district-approved sophomore U.S. History course scope and sequence was used as the item source for the curriculum-referenced questions. Figure 2 shows an example of a NAEP item (not an item from the test because those are still secure) released for publications by Williams et al. (1995). Although Figure 2 is not an exact student NAEP item, it conveys the essence of a factual knowledge test question.

Figure 2. *Examples of NAEP History Items (Williams et al., 1995, p. 41-42)*

-
1. During the 1500's and 1600's, what was the major cause of death among Indians of the Americas?
 - A. Warfare among tribes
 - B. Warfare between Native Americans and Europeans
 - C. Infections and diseases brought by Europeans
 - D. Changing climatic conditions
 2. The Great Awakening of the 1730's was important because it led people in the American colonies to
 - A. increase toleration for Roman Catholic
 - B. examine the different positions of men and women in society
 - C. reaffirm that God gave kings their right to rule
 - D. question the authority of church and government leaders
-

Decision-Making Competence Index. To measure decision-making competence, Bruine de Bruin, Parker and Fischhoff (2007) used seven decision-making tasks to “represent skills needed by normatively competent decision makers” (p. 938), and “reflect the traditional normative approach to decision-making competence (Edwards, 1954; Finucane & Lees, 2005; Raiffa, 1968)” (p.949). Participants’ performances across the seven tasks are aggregated into a Decision-Making Competence (DMC) index score. The seven decision-making tasks include: (a) resistance to framing, (b) recognizing social norms, (c) under/overconfidence, (d) applying decision rules, (e) consistency in risk perception, (f) resistance to sunk costs, and (g) path independence. Each task domain is described more fully below. Six subtests of a total of 134 questions make up the test battery. For the purposes of this study, the DMC was modified. Modifications included the addition of contextual clues appropriate to adolescents’ interests, the removal of items with content unrelated to adolescent experience (e.g. home finance), and the elimination of inappropriate questions for a school setting (e.g. sexual behavior or drug use). After modifications, 110 of the 134 questions were utilized. A DMC total score is the sum of the standardized (z-scored) scores from six subtests that comprise the battery (Parker, 2010). Higher scores denote greater competence.

Resistance to Framing assesses the effect of variations in problem descriptions. The DMC instrument used a strength-of-preference six-point rating scale to elicit a relative preference. It also presented a sure-thing option and a risky-choice option for each scenario. Questions presented risk-gain scenarios such as the risks of pesticide use and its effect on endangered animals, dropping out of school, contracting an unusual disease, or soldiers suffering leg injuries. Questions were designed to present a decision

in a positive or negative frame; positively and negatively framed questions appeared in separate question sets within the DMC battery.

Recognizing Social Norms measures how well participants assess peer social norms (Bruine de Bruin, et al., 2007). This task was chosen to help ascertain a participant's identification of values by his or her attention to a common value: social norms. First, participants judge whether "it is sometimes okay" (p. 942) to engage in 16 unprincipled behaviors (e.g. stealing under certain circumstances). Later in the test battery, participants approximate "how many out of 100 people your age" (p. 942) would agree with each behavior.

Under/overconfidence gauges how well participants recognize the extent of their knowledge. Participants respond to true-false states, and then rate their confidence in each answer from 50% (just guessing) to 100% (absolutely sure). In an effort to provide question content relevant to a diverse audience, Bruine de Bruin, Parker and Fischhoff created 34 statements about interpersonal relationships, finance, health, and organizing life priorities to rate under/overconfidence to help assess under/overconfidence as it relates to the integration of beliefs and values in decision-making.

Applying Decision Rules measures how participants select a DVD player among five options according to decision-rule constraints. Bruine de Bruin, Parker and Fischhoff (2007) measured performance by the percentage of items for which the correct DVD/BlueRay players were chosen, based on the applicable decision rule. The intended effect was to increase the attention, perceived value, and interest of adolescents in the purchase decision.

Consistency in Risk Perception assesses the ability to follow probability rules. Twenty items ask participants to judge the chance of an event happening to them on a linear scale ranging from 0% (no chance) to 100% (certainty). Participants judge 10 events twice: once for estimating the likelihood of the event occurring next year and a second time for it occurring in the next five years.

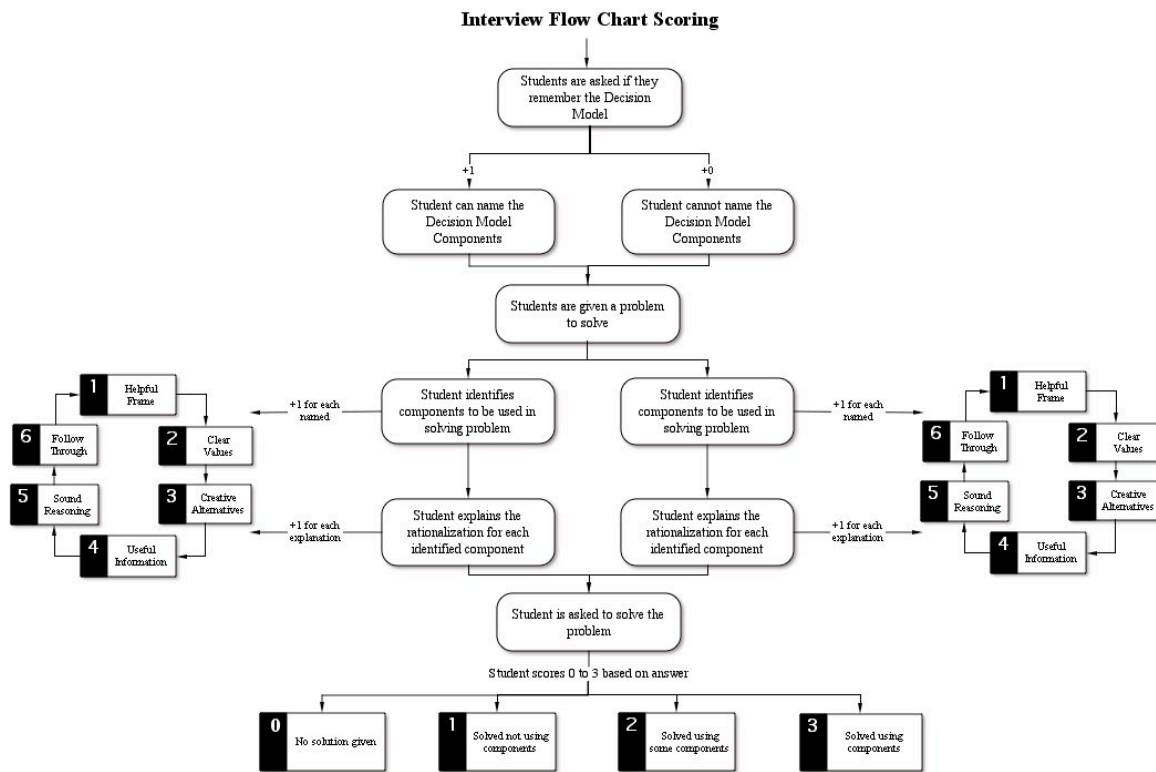
Resistance to Sunk Costs measures the ability to ignore prior investments when making decisions. Following normative reasoning, unrecoverable past expenditures should be ignored in a decision so that decisions incorporate only future gains or losses. Using 10 items and a rating scale from 1 (most likely to choose [sunk- cost option]) to 6 (most likely to choose [normatively correct option]), performance is measured by the average rating across all items.

Path independence gauges the consistency of participants' choices in games of chance. Performance is measured by the percentage of consistent choices made across item pairs. Here, the instrument tests the consistency of the axiom that a series of risk-reward choices should not be affected by normatively irrelevant changes in order of play. According to the axiom, participants should give consistent responses, regardless of whether options are presented as single-stage or two-stage plays. Six items pose a choice between a sure thing (e.g. win \$50 for sure) and a coin flip (e.g. if head, then win \$100, if tails, win \$0). Each is paired with an item presenting the same choice, presenting irrelevant information about the outcome of an earlier coin flip. Six additional items present a choice between a play involving two coins (e.g. if two heads, then win \$100, otherwise \$0) and a play involving one coin (e.g. if heads, then win \$50, otherwise \$0). Each is paired with an item presenting the same plays as two consecutive steps: the first

step is a coin flip which will lead to the second step only if the coin shows heads. The second step involves a choice between a play (e.g. if head, then win \$100, otherwise \$0) and a sure thing (e.g. win \$50 for sure).

Follow-up interview flowchart scoring. The flowchart instrument used to score the follow-up student interviews was based upon prior research from the University of Oregon (Hollenbeck, Tindal, & McCleery, 2002; Tindal & Nolet, 1995). The interview flowchart (see Figure 3) used a sixteen-point scale to assign a quality score of 0 to 16. Tindal and Nolet (1995) stated that the use of flowchart scoring “reduced the judgmental aspect of this measurement system to a minimum” (p. 18) when assessing how students applied problem-solving concepts in their responses. The interviews were scored in four global areas: (a) students’ ability to recall the decision-making model, (b) students’ explanation of the six elements of the Decision-Quality tool in relation to a problem, (c) students’ rationalization of how each element related to solving the problem, and (d) students’ application of element to solve the problem. Figure 3 displays the flow chart used for scoring follow-up student interviews. Students earned one point for recalling the decision-making tool, one point for each element of a decision. Recall earned one point, an explanation of each element earned one point apiece, a rationalization of the relationship of each element for problem-solving earned one point each, and the application of elements in solving the problem earned one, two or three points according to level of application.

Figure 3. *Experimental Group Follow-up Student Interview Scoring Flow Chart*



Analysis

Questions One and Two: Group Differences on NAEP and DMC Posttest Scores

Student results on the pretest and posttest NAEP-sample U.S. History content test and the DMC were used to compare individual results in the Experimental and Control Group. Training in the Decision Quality model is intended to improve decision making competence by providing tools to increase adolescents' awareness of distortions and practice techniques that build decision making skills in definitive framing, value identification, identifying alternatives, applying useful information, and using sound reasoning. In my study, the DMC index scores were used as the primary measure of competence in decision-making skills. Differences between the pretest and posttest scores were analyzed using a repeated measures ANOVA.

However, before conducting any posttest analysis, it is important to evaluate the pretest scores for statistical differences. To determine if there was an effect from the intervention, it is essential to establish the statistical similarity between the Experimental and Control Group pretest scores. To illustrate the similarity between groups at pretest, I conducted a *t*-test analysis of (a) the U.S. History Knowledge (NAEP) scores and (b) the Decision-Making Competence (DMC) scores.

Pretest Scores

NAEP pretest scores. No statistical differences were found between the Experimental and Control groups on the NAEP pretest. The *t*-test showed no significant differences between the Experimental and the Control Group, $t(294) = -1.22, p = .23$. The mean scores for the NAEP pretest (with standard deviations in parentheses) for the Experimental Group and the Control Group were 18.19 (5.35) and 17.41 (5.38), respectively.

DMC pretest scores. As with the NAEP, no statistical differences existed between the Experimental and Control Groups on the DMC pretest. The *t*-test showed no significant differences between the Experimental and the Control Group, $t(292) = -1.62, p = .11$. The mean scores for the DMC pretest (with standard deviations in parentheses) for the Experimental Group and the Control Group were 0.01 (0.42) and -0.09 (0.51), respectively.

Because the pretest scores between groups did not differ statistically, any statistically significant difference in posttest scores on either measure could show an effect of the intervention. The unit of analysis was individual students.

Question Three: NAEP Item Analysis

NAEP items were analyzed to determine if there were differences in three areas: (a) performance between groups (b) item type by knowledge form, and (c) item type by intellectual operations. To determine differences in performance between groups, I used a *t*-test to analyze posttest scores on each item, using mean score differences. The constructs of (a) knowledge forms and (b) intellectual operations were used to analyze NAEP items where significant differences were observed in performance between groups.

Knowledge forms. According to Tindal, Nolet and Blake (1992), content information can be organized into three knowledge forms: facts, concepts, and principles. *Facts* are limited “simple associations between names, objects, events, places, etc.” that entail only one example or instance (p. 7), like the city of Miami, the Versailles Treaty of 1919, or the names of presidents during the Cold War. *Concepts* are “clusters of events, names, dates, objects, places, etc. that share a common set of defining attributes or characteristics” (p. 7), like Gulf of Tonkin Resolution, or cold war propaganda, or Kennedy space program. Concepts bind together facts according to rules of association. These rules provide the basis for organizing the characteristics of the concept and the criteria for distinguishing examples and non-examples. *Principles* “indicate relationships among different facts or concepts” and usually represent “an if-then or cause-effect relationship” (p. 8), such as fascism or Great Society politics. NAEP item analysis by knowledge form helped distinguish how information was structured, and how information structuring related to students’ intellectual operations, such as sorting, organizing, and analyzing content information.

Intellectual operations. Using Tindal et al.'s (1992) characterization of intellectual operations allows for further distinction between test items and may provide clues to the effect of training in decision-making on content learning. Six intellectual operations provide a classification scheme of increasing complexity in cognitive operations: (a) reiteration, (b) summarization, (c) illustration, (d) prediction, (e) evaluation, and (f) application. Using Tindal et al.'s definitions, *reiteration* is a verbatim reproduction of content that was previously taught. *Summarization* is paraphrasing or rewording of content. *Illustration* is the identification of a previously unused example of a concept or principle. *Prediction* is the anticipation of a likely outcome, given a set of conditions or associations related to content. *Evaluation* refers to the analysis of a problem based on key criteria for the purpose of making a decision about content. *Application* refers to the description of conditions that would bring about a given outcome. Application can be thought of as the reverse of prediction. Finally, *evaluation* applies primarily to principles, where a student must select criteria, associate criteria with content information (facts and concepts), and make a decision based on these associations. Principles lie at the heart of complex decisions in history. Training in the use of the decision-making schema equated to training in developing useful associations and practicing intellectual operations associated with evaluation of details and the concepts of history.

Knowledge forms and intellectual operations. Tindal et al. (1992) explained common patterns in the relationship between knowledge forms and intellectual operations. First, reiteration and summarization can occur with all three knowledge forms, since students engage in these operations “when they recite facts, recall definitions

or concepts, or restate lawful relationships” (p. 12). Second, facts cannot be illustrated because each consists of a single entity. Third, illustration can be used only with concepts and principles because it requires a student to recognize or generate previously unused examples based not on remembering content details but upon making associations with concepts or principles.

Hypothesized differences between items and groups. In relation to the theoretical conceptual framework, The Decision Quality tool served two purposes for students. First, the tool operated as a schema for students to sort, organize and analyze complex U.S. History content according to six elements of a quality decision. Because each element is a concept, I hypothesized that students in the Experimental Group who applied a concept-based thinking strategy for sorting, organizing and analyzing the vocabulary, facts, concepts and principles (e.g. Sloman’s (1996) rules of the content domain) of U.S. History would score higher on content questions that addressed concepts or principles. Second, training and practice in the Decision Quality schema utilized System 2-driven critical, analytical, and creative thinking as students processed complex content information in the context of making a decision. I hypothesized that Experimental Group students who were trained in deliberate, procedural, rule-governed S2-thinking would score higher on NAEP test items that involved more complex intellectual operations. Thus, I would observe a NAEP item difference between groups according to knowledge form and by intellectual operation.

Question Four: Experimental Group Student Interviews

Approximately 10 months after the completion of the intervention and posttests, follow-up interviews were conducted with Experimental Group students to determine if

students recalled the decision-making tool and could apply it to a familiar adolescent decision. Students' DMC post-test scores were compiled and divided equally into three subgroups: (a) low, (b) middle, and (c) high performance. Five students were selected randomly from each of the three subgroups to be interviewed as part of the school district's program evaluation of the decision training intervention. A district employee interviewed participants at the high school of interest. Although the intervention focused on making decisions with U.S. History content, the follow-up interview asked students to apply the decision-making tool to a personal decision: purchasing a car. A practical application question allowed students to apply the training in decision-making more broadly. Also, it suited the context of a student interview by a third-party school district interviewer because the interviewer had no knowledge of the 10th grade U.S. History curriculum intervention.

The follow-up interview consisted of three open-ended questions. First, participants were asked, "Do you remember the decision-making tool you learned in history class last year? If so, name as many parts of the tool as you can remember." If he or she did not recall the tool, the participant was shown a copy of the Decision Quality tool (see Figure 1). Second, students were presented with a decision that read, "Here is a practice question for how you might use what you learned about decision-making: In making a decision like whether or not to buy a car, what parts of the decision-making tool would you pay attention to? Choose the parts of the tool and explain why you would pay attention to them." Students were given time to respond and develop their thinking around the elements of Decision Quality. Lastly, students were asked, "Would you buy the car or not, based on your thinking about the decision?" Students could then

summarize their thinking and come to a conclusion about the hypothetical purchase of a car.

CHAPTER IV

RESULTS

Questions One and Two results, using posttest scores, tested the effectiveness of U.S. History instruction integrated with decision training on (a) history content knowledge and (b) decision-making competence. Results are organized by research questions. Question One addressed content knowledge using a NAEP U.S. history content test score, and Question Two addressed decision competence using a DMC index score. The research design afforded random assignments to groups (Experimental and Control) and administration of pretests and posttests to investigate changes in NAEP and DMC scores. Students in the Experimental Group received U.S. History instruction integrated with decision training, while students in the Control Group received traditional U.S. History instruction. The NAEP and DMC pre- and posttests were identical.

Question Three addressed NEAP item differences by group. Specifically, this question investigated the intellectual functions involved in individual test questions. I ran a t-test for each item. Only items that were found to be significantly different were analyzed for intellectual functioning levels. Question Four analyzed whether students in the Experimental condition recalled and applied the Decision Quality model approximately six months after the posttest. A random sub-sample of Experimental students was asked to (a) name the parts of the problem-solving tool and (b) apply it to the problem of purchasing a car. Student responses were scored by a flowchart.

Group Differences

For an analysis of the treatment effect on NAEP and DMC performance, I present descriptive statistics followed by a repeated measures analysis of variance (ANOVA) results for NAEP and DMC data.

Question One: U.S. History Knowledge (NAEP Scores)

Question One investigates differences between the Experimental and Control groups on a NAEP U.S. History Knowledge posttest. I utilized an ANOVA to determine if a difference existed. Because no significant differences existed at pretest (see previous NAEP pretest statistics), assumptions of homogeneity of covariance between pretests and posttest were maintained.

ANOVA. A 2 X 2 ANOVA for the NAEP history test resulted in a significant group by time interaction effect, $F(1, 294) = 6.84, p = .01$. Analysis of simple main effects indicated group differences were not statistically different at pretest, $F(1, 294) = 1.55, p = 0.21$. The groups were different statistically at posttest, $F(1, 294) = 8.15, p = 0.01$. The results indicated that the treatment was effective with respect to NAEP test performance. The effect size at posttest was small, at Cohen's $d = 0.35$. Table 4 provides descriptive statistics for the NAEP results and Table 5 provides a summary of the repeated measures ANOVA for Question One.

Table 4
NAEP Descriptive Statistics

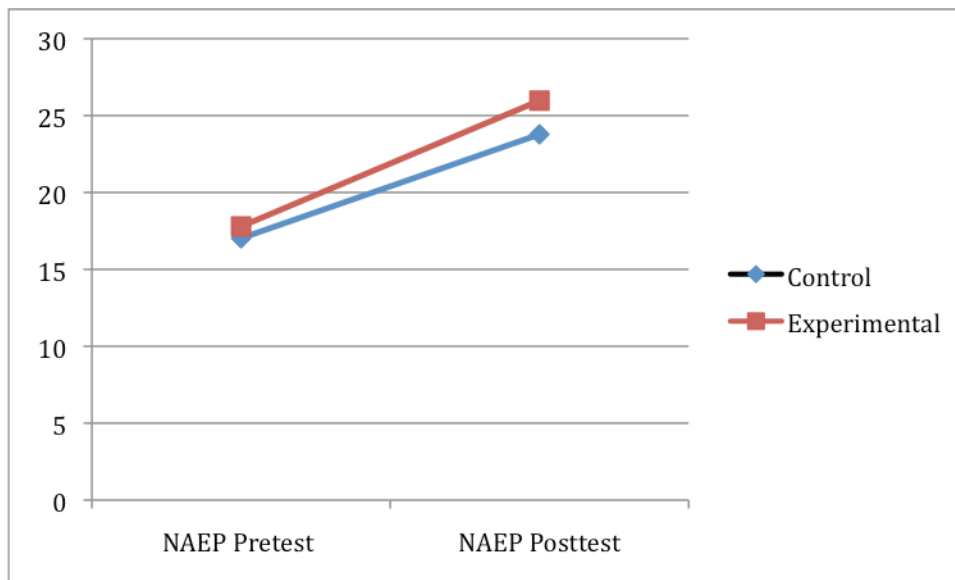
	<i>Group</i>	<i>M</i>	<i>SD</i>	<i>95% Confidence Interval</i>	
				<i>Upper Bound</i>	<i>Lower Bound</i>
Pretest	Control ($n = 187$)	17.02	5.14		
	Experimental ($n = 109$)	17.79	5.17		
Posttest	Control	23.78	6.60	23.38	24.67
	Experimental	25.97	6.01	24.69	26.39

Table 5

Pre/Post NAEP Test by Group Two-Way Repeated Measures Summary

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Between					
Intercept	246152.09	1	246152.09	4310.66	0.001
Group	3.03.72	1	303.72	5.32	0.02
Error	16788.33	294	57.10		
Within					
Time	7687.99	1	7687.99	752.86	0.001
Time by Group	69.83	1	69.83	6.84	0.01
Error	3002.25	294	10.21		
Corrected Total		296			

Figure 3 depicts the change in NAEP scores over time. Both the Experimental and the Control Group's pretest mean scores were approximately the same. However, the significant NAEP mean score differences were more prominent at the posttest.

Figure 4. *Change in NAEP Group Score Means Over Time*

Question one summary. After one year of classroom instruction, students in the Experimental Group scored significantly higher on the U.S. History NAEP assessment than students in the Control Group, $p = .01$. Posttest means (with standard deviations in

parentheses) for the Experimental Group and the Control Group were 25.97 (6.01) and 23.78 (6.60), respectively.

Question Two: Decision-Making Competence (DMC Scores)

Question Two asked if any difference existed between the Experimental and Control Groups on the Decision-Making Competence (DMC) posttest. I utilized a repeated measures analysis of variance (ANOVA) to determine if a difference existed. Prior to conducting the ANOVA, the DMC pretest scores from both groups were analyzed using a *t*-test for differences. Because no significant differences existed at pretest (see previous DMC pretest statistics), assumptions of homogeneity of covariance between pretests and posttest were maintained.

ANOVA. A 2 x 2 ANOVA for the DMC test resulted in a significant group main effect, $F(2, 290) = 5.65, p = 0.02$, and a significant main effect for time, $F(1, 290) = 16.16, p = 0.001$. The effect size for the group main effect was small, Cohen's $d = 0.33$. The interaction effect was not statistically significant, indicating the Experimental and Control Group were different over time, and both groups achieved higher DMC scores. Although the interaction effect was not significant, an analysis of simple main effects did indicate that the group main effect was attributable to the posttest difference, $F(1, 290) = 6.99, p = 0.01$. The group difference at pretest was not significant at pretest, $F(1, 290) = 2.66, p = 10$. Table 6 provides descriptive statistics for the DMC results and Table 7 provides a summary of the repeated measures ANOVA for Question Two.

Table 6
DMC Descriptive Statistics

<i>Group</i>		<i>M</i>	<i>SD</i>	<i>95% Confidence Interval</i> <i>Upper Bound Lower Bound</i>	
Pretest	Control (<i>n</i> = 189)	-.09	6.60		
	Experimental (<i>n</i> = 105)	.01	6.01		
Posttest	Control (<i>n</i> = 189)	-.01	.49	.48	.70
	Experimental (<i>n</i> = 103)	.14	.42	.57	.79

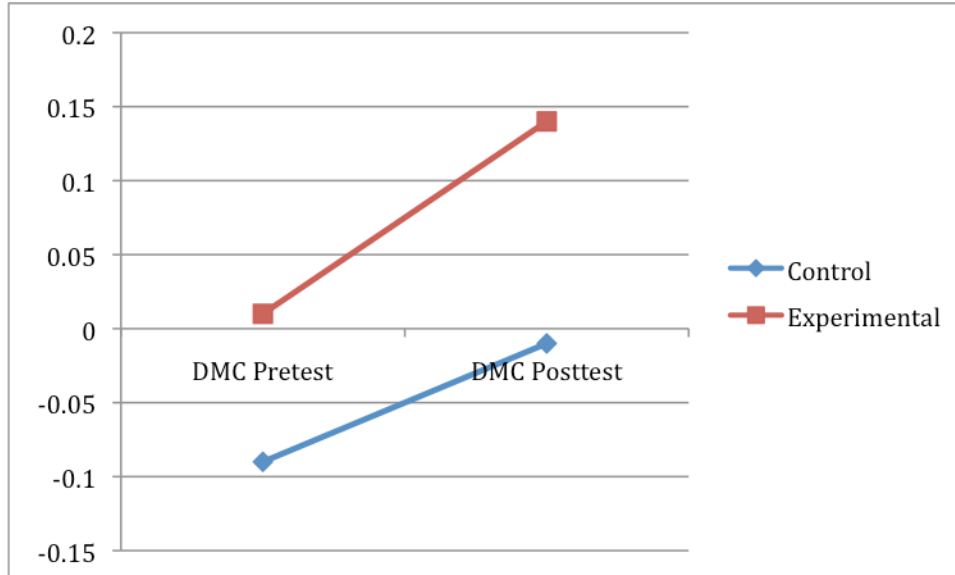
Table 7
Pre/Post DMC Test by Group Two-Way Repeated Measures Summary

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Between					
Intercept	0.07	1	0.07	0.20	0.65
Group	.20.2	1	2.02	5.65	0.02
Error	103.64	290	0.36		
Within		289	.137		
Time	1.43	1	1.43	16.16	0.001
Time by Group	0.10	1	0.10	1.10	0.30
Error	25.58	290	0.09		
Corrected Total		292			

Figure 5 below depicts the change in NAEP scores over time. Both the Experimental and the Control Group's pretest mean scores were approximately the same. As with the NAEP posttest scores, the mean DMC posttest score differences showed considerably more defined disparity.

Question two summary. After one year of classroom instruction, students in the Experimental Group also scored significantly higher on the Decision-making Competence (DMC) Index than students in the Control Group, $p = .04$. Posttest means (with standard deviations in parentheses) for the Experimental Group and the Control Group were .14 (.42) and -.01 (.49), respectively.

Figure 5. *Changes in DMC Score Group Means Over Time*



Question Three: NAEP Item Analysis

Question Three asked if item differences existed between the Experimental and Control Groups on a NAEP U.S. History Knowledge Posttest based on knowledge forms and intellectual operations. A *t*-test was performed on each NAEP posttest item to identify differences in Experimental and Control Group performance. Ten NAEP items rendered significant differences between groups: Questions 3, 8, 14, 19, 24, 28, 29, 32, 36, and 39. All but two items – Questions 32 and 39 – favored the Experimental Group. Using Tindal, Nolet, and Blake's (1992) item classification scheme, these 10 items were then analyzed by knowledge form and intellectual operations in order to check response variance / differences by group. Analysis for knowledge forms identified four *fact*-based, four *concept*-based, and two *principle*-based items. Analysis for intellectual operations identified three items requiring *reiteration*, three requiring *summarization*, and four requiring *illustration*. None of the 10 items required prediction, evaluation, or application

operations. Below, I summarized differences for each question according to group performance, knowledge form, and intellectual operation in Table 6.

Table 8

NAEP Item Analysis by Knowledge Forms and Intellectual Operations

Item	Group	Knowledge Forms			Intellectual Operations		
		Fact	Concept	Principle	Reiterate	Summarize	Illustrate
3	E	F				S	
8	E	F			R		
14	E		C			S	
19	E			P			I
24	E		C				I
28	E		C				I
29	E		C			S	
32	C	F			R		
36	E			P			I
39	C	F			R		
Total		4	4	2	3	3	4

To summarize the analysis for Question Three, Item 3 was a Knowledge Form: fact / Intellectual Operation: summary question; Item 8 was a Knowledge Form: fact / Intellectual Operation: reiteration question; Item 14 was a Knowledge Form: concept / Intellectual Operation: summary question; Item 19 was a Knowledge Form: principle / Intellectual Operation: illustration question; Item 24 was a Knowledge Form: concept / Intellectual Operation: illustration type question; Item 28 was a Knowledge Form: concept / Intellectual Operation: illustration question; Item 29 was a Knowledge Form: concept / Intellectual Operation: summary question; Item 32 was a Knowledge Form: fact / Intellectual Operation: reiteration question; Item 36 was a Knowledge Form: principle / Intellectual Operation: illustration question; and, finally, Item 39 was a Knowledge Form: fact / Intellectual Operation: reiteration question.

Question three summary. U.S. History NAEP item analysis showed statistically significant differences in performance between groups on 10 NAEP questions. Students

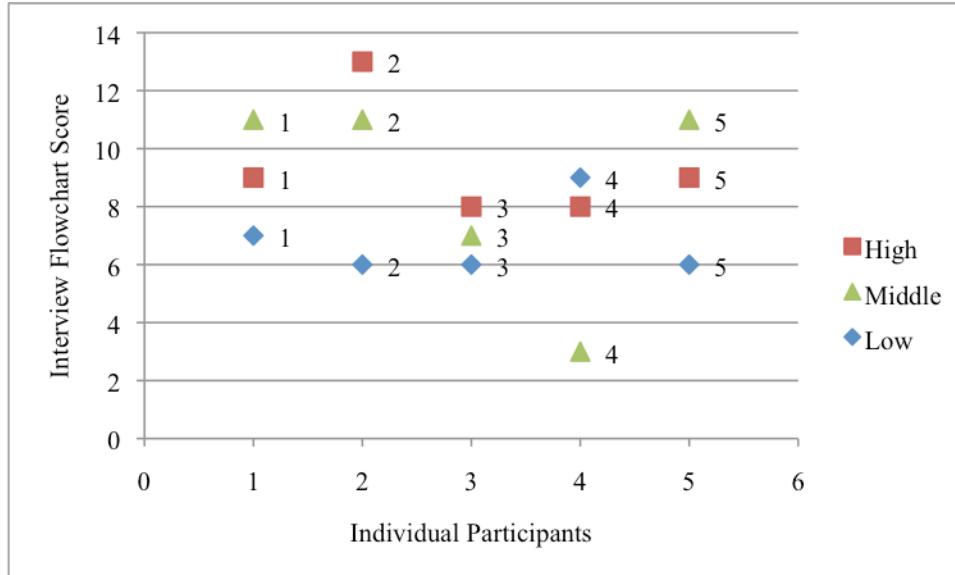
in the Experimental Group scored higher on all items that required *concept* or *principle* knowledge forms. The two items that favored the Control Group were questions of *fact*. Of the eight questions favoring the Experimental Group, three required *summarization* and four required *illustration*. Those questions favoring the Control Group (Question 32 and 39) required reiteration, the lowest level of intellectual operation. Students in the Experimental Group scored significantly higher on all items above the reiteration level.

Question Four: Experimental Group Student Follow-up Interviews

Student interviews were scored according to the flow chart presented in Figure 3 in Chapter 3. Below, Figure 6 presents a scatter plot of all 15 students' interview scores according to subgroup (High, Middle, or Low). A shape (e.g. rectangle, triangle, diamond) and number (1-5) symbolizes each student's score and corresponds with his or her subgroup and the order of score reported, respectively. The x-axis simply reports the number of participants (again, there were five participants in each of the three groups). The y-axis records the students' scores. Keep in mind, 16 possible points represented a perfect score. Two raters scored student interviews with a rater agreement ratio on flowchart scoring of .96.

In general, student scores on the follow-up interviews followed students' DMC posttest scores. Students in the high subgroup scored highest on follow up interviews, on average, followed by the middle subgroup. Interview score averages for the High, Middle and Low subgroups were 9.4, 8.6, and 6.8 points per interview, respectively. Although a student from the high subgroup posted the highest individual score, the Middle-4 student posted the lowest score of three (see Figure 6). Students in the low subgroup carried the lowest group average score and recorded four of the five lowest interview scores.

Figure 6. Experimental Group Follow-up Interview Flowchart Scores



When asked if they remembered the decision-making tool they learned in history class, none of the students recalled any specifics or identified any elements of Decision Quality. After the interviewer presented a paper copy of the tool, every student remarked aloud that they recalled the tool and its use in the classroom. When asked what parts of the tool they would use in making a decision about purchasing a car, to varying degrees students identified elements of Decision Quality (Helpful Frame, Clear Values, Creative Alternatives, Useful Information, Sound Reasoning, Commitment to Follow Through) and described how they would use the elements to make the decision. Each student referred directly to the paper copy of the Decision-Quality tool in his or her description of the process he or she would use to make the decision. Finally, when asked if they would purchase the car or not based on their thinking about the decision, students replied yes or no with varying references to elements of the decision-making tool as the basis for their choice.

In determining students' recollection and application of the decision-making tool used in their U.S. History instruction, the three-question follow-up interview assessed aspects of Dual Process Theory and distal effects of decision training. The first interview question asked if students recalled the decision-making tool. This question was used to determine if students had established an S1-level familiarity with the tool and could recite it from memory. The second question asked student to apply the tool to making a practical adolescent decision (e.g. purchasing a car). Following a visual prompt of the decision-making tool, students responded to the cue and engaged in S2 thinking as they sorted, organized, and analyzed elements of a quality decision. The third question checked to see if students would summarily use the prompted S2 analytical thinking to make a quality decision.

In response to the second question, students in the high and middle subgroups identified and applied more elements of the Decision Quality tool than students in the low subgroup, with the high and middle groups averaging 4.2 and 4.6, respectively, and the low group averaged 3.4. In response to question three, students most frequently applied three elements in making a decision. Eight of 15 participants explained the rational application of three elements of Decision Quality in making their decision, those being Useful Information, Creative Alternatives, and Clear Values. Again, the frequency of explanations and rationalizations followed suit by subgroup, with the high group averaging 3.2 elements, and the middle and low groups each averaging 1.8 elements explained. In response to question four, students in the high group consistently solved the problem by applying three elements or more elements from the decision-making tool, while students in the middle and low subgroups commonly applied less than three.

Note the scoring for question four was not averaged; instead, it was the total points scored (from the Figure 3 flowchart) according to students' failure to offer a solution to the problem (no points), to solve the problem without using elements of Decision Quality (one point), to solve it using some of the elements (two points), or to solve it using the elements identified by the student in question three (three points).

Question four summary. When asked to apply the decision-making model 10 months after posttest to a novel, distal problem, students who performed better on the DMC posttest scored higher in follow-up interviews on the decision of purchasing a car. Students in the High, Middle and Low subgroups averaged 9.4, 8.6 and 6.8 points per interview, respectively.

CHAPTER V

DISCUSSION

My study was designed to explore the effect of U.S. History instruction integrated with decision training on measures of U.S. History content knowledge and decision-making competence in 10th grade U.S. History classrooms. No previous studies were located that rigorously evaluated the integration of decision training with history instruction. To examine the effect of a non-traditional instructional intervention for U.S. History and decision training, I investigated two principal research questions: (a) Did 10th grade students in a U.S. History-integrated-with-decision-training course score significantly higher on a U.S. History NAEP assessment than 10th grade students in a traditional U.S. History course? and (b) Did 10th grade students in a U.S. History-with-Decision-Quality-training course score significantly higher on the Decision-making Competence (DMC) Index than 10th grade students in a traditional U.S. History course? To further explore the effect of the intervention on learning U.S. History content and decision skills, I investigated two secondary questions: (a) Was there a NAEP item difference for knowledge forms and intellectual operations by group? and (b) Would students in the Experimental group remember and apply the decision-making model ten months after posttest using a novel problem? In my discussion of findings with regard to these questions, I (a) provide a summary of results, (b) address limitations to the study's findings, (c) consider ties between the theoretical empirical framework and practical implications of these results, and (d) identify areas for future research that connects teaching history to decision-making and problem-solving.

Summary of Results

The purpose in analyzing these data was to explore the effect of an intervention where students were simultaneously trained in decision skills and instructed in a U.S. History curriculum. Results for Question One and Two showed a significant effect for group, favoring the Experimental group, on the two dependent variables (mean posttest scores).

Question One: NAEP U.S. History Scores

After one year of classroom instruction, students in the Experimental Group scored significantly higher on the U.S. History NAEP assessment than students in the Control Group, $p = .01$. Posttest means (with standard deviations in parentheses) for the Experimental Group and the Control Group were 25.97 (6.01) and 23.78 (6.60), respectively. These findings indicated a relationship between the treatment and the dependent variable factor, NAEP U.S. History posttest score. These findings suggest an effect from the intervention that contributed to improved performance on the measure for U.S. History content knowledge.

Question Two: DMC Index Scores

After one year of classroom instruction, students in the Experimental Group also scored significantly higher on the Decision-making Competence (DMC) Index than students in the Control Group, $p = .04$. Posttest means (with standard deviations in parentheses) for the Experimental Group and the Control Group were .14 (.42) and -.01 (.49), respectively. These findings indicated a relationship between group and the dependent variable factor, DMC Index posttest score. As with Question One, the DMC

findings imply an effect from the intervention that contributed to improved performance on the measure for decision-making competence.

Question Three: Item Analysis

U.S. History NAEP items were analyzed to determine if there were differences in three areas: (a) performance between groups-by-item, (b) item type-by-knowledge form, and (c) item type-by-intellectual operations. Results showed statistically significant differences in performance between groups on 10 NAEP questions. Item type analysis of these 10 questions revealed additional patterned differences that concur with Tindal et al.'s (1992) conceptual explanation of knowledge form and intellectual operations. Item analysis of the 10 questions followed Tindal et al.'s patterns. Four fact-based questions required reiteration or summarization. Four concept-based and two principle-based questions required summary or illustration. All principle-based questions required summarization – the highest level of complexity in intellectual operations required in the item sample analyzed.

Knowledge forms. Students in the Experimental Group scored higher on all items that required *concept* or *principle* knowledge forms. The two items that favored the Control Group were questions of *fact*. These findings suggest that students who were trained in the decision-making schema were more successful in answering questions that required an understanding of concepts or principles. Students who received training and practice in sorting, organizing, and analyzing high school U.S. History content according to the concepts of Decision Quality may have developed the skills necessary for grasping more complex knowledge forms.

Intellectual operations. Similar differences were observed between groups when I analyzed group performance and intellectual operations. Of the eight questions favoring the Experimental Group, three required *summarization* and four required *illustration*. Those questions favoring the Control Group (Question 32 and 39) required reiteration, the lowest level of intellectual operation. According to Tindal et al. (1992), these differences by item type suggest the Experimental Group performed better on items that required more than rote recall. Reiteration, as an intellectual operation, is associated with S1 automatic processing. Although NAEP items did not assess the higher intellectual operations of prediction, evaluation, or application, students in the Experimental Group scored higher on all items above the reiteration level. This may be due to training in S2-thinking through the application of the decision-making schema to learning history content. Training in the use of the decision-making schema equated to practicing intellectual operations associated with organizing and analyzing the facts, concepts, and principles of history knowledge with increasing complexity.

Question Four: Experimental Group Student Follow-up Interviews

When asked to apply the decision-making model 10 months after posttest to a novel, distal problem, students who performed better on the DMC posttest scored higher in follow-up interviews on the decision of purchasing a car. Students in the High, Middle and Low subgroups averaged 9.4, 8.6 and 6.8 points per interview, respectively.

Limitations

Prior to addressing the relevance of findings in light of the research questions, it is worthwhile to consider both the strengths and limitations of this study's design.

The sampling plan and testing procedures lend strength to this study. The limitations are tied to four factors that may impact the validity of findings: (a) mortality, (b) generalizability, (c) instrumentation, and (e) reliability of implementation.

Mortality

In any school year, student mobility and absence patterns cause unforeseeable shifts in the student population at the high school of interest. Student mobility impacted participant mortality. The high school sophomores who did not complete both assessments because of a change in school, change in schedule, or extenuating circumstances (study mortality) may have been students who tended to perform more poorly on assessments of content knowledge and decision-making competence. Although the random assignment to group of all tenth grade students enrolled at the high school at the beginning of the year added to the strength of the design and likely distributed divergent variables such as attendance or mobility that can be associated with certain student sub-populations, this study could not and did not test students who left school for various reasons.

Generalizability

This study measured the effects of an intervention delivered at one school, at one grade level, in one content area, and in one school year. Findings related to the effect of an intervention on decision-making competence or content knowledge in U.S. History over the course of a school year generalize more dependably to (a) similar decision training in U.S. History courses and (b) other tenth grade students and in school settings with similar demographics and curricular foci. Because of the school's relatively homogeneous population by ethnicity, generalizing results by representative populations

are more limited. However, this study's strength in design – equivalent groups – provides clear lines to generalize groups by age. Although limited generalizability impacts external validity, it provides lines of future research for different grade levels and in schools or districts with more diverse student populations.

Instrumentation

Potential adaptations to the original tests and original designs may introduce confounds that limit the reliability of measures of history content knowledge and decision-making competence. Measures for both dependent variables – the NAEP U.S. History test and the DMC decision test – were adapted for use in this pilot study. Neither the content validity of individual NAEP questions, nor the internal consistency of the DMC test battery was scrutinized. Although both tests were designed with validated theoretical and empirical bases, neither test was originally used to measure a change in performance over time at the individual student level.

NAEP. The NAEP content knowledge test is described as a test that requires students to both demonstrate knowledge of the basic facts, events, and people, but also to display reasoning and a broad view of American history (Williams, et al., 1995). The NAEP test was designed to report on educational achievement and estimate distributions of scores by school, state, region, or the nation for subgroups of students (Shepard & Ryan, 2008). The original / intended use of the NAEP U.S. History questions was not specific to this research study. However, in consultation with Doug Carnine (personal communication, August 19, 2010) and Todd Twyman (personal communication, November 23, 2010), it became apparent that the NAEP database was the most viable source of content knowledge questions that had been rigorously evaluated for content

validity and could provide a sufficient number of curriculum-referenced questions. In their review of this study's design, Carnine and Twyman each affirmed that by extracting questions based on their relation to the historical period covered by district curriculum, this study relied upon the content validity of each NAEP item, rather than the content validity of the test as a whole. It is worth noting that no state (large-scale) test of U.S. History knowledge was in use at the time of this study.

DMC. Bruine de Bruine, Parker and Fischhoff (2007) designed the original adult Decision Making Competence (DMC) battery as a potential individual-differences measure of decision competence. Parker and Fischhoff (2005) initially developed the concept of a decision-making competence index score in their investigation of decision patterns of adjudicated youth. To check decision patterns, the DMC battery utilized six subtests that entail seven normative decision-making tasks, which were chosen to represent decision-making competence. The original DMC battery of subtests had not previously been used to measure adolescent performance or change in performance over time. As part of this study, Parker (personal communication November 15, 2010) used three reliability tests to compare students' performance to previous adult samples: (a) a Chronbach alpha to assess internal consistency, (b) subscore intercorrelations to check for concurrent validity, and (c) pre-test-post-test correlations to assess test-retest reliability. In Parker's analysis, he reported the current scale used in this research was a valid measure of decision-making competence (personal communication, November 15, 2010). In consultation with Bruine de Bruine and Fischhoff, Parker (personal communication November 15, 2010) concurred that the DMC, as used in this study, represented adolescent decision-making competence.

Reliability of Implementation

As this was a pilot study based on extant data, its design did not account for potential variance inherent in a classroom-centered intervention. Although confounds related to teacher training, level of implementation, and classroom practices can be expected in an exploratory study of extant data, these confounds should be addressed as possible limitations.

Essentially, two teachers who delivered the intervention also designed the intervention based on their one-week Decision Quality training and documents received from the Decision Education Foundation (DEF). These teachers collaborated over summer vacation and during the school year to integrate Decision Quality training into district approved U.S. History curriculum. They did not deliver intact Decision Education Foundation-designed training. Instead, the teachers incorporated decision-making graphics, terminology, and concepts from DEF into self-generated instructional activities. Accordingly, the intervention was not standardized by content or administration according to any DEF standard. Teachers agreed to teach an introductory unit on decision-making using DEF materials at the beginning of U.S. History course sequence, and to incorporate the Decision-Quality tool into each teaching unit thereafter. In doing so, they co-created teaching units that integrated decision training and history content at their discretion: this served as the intervention. Classroom observations and samples of the integrated curriculum were collected to determine if the intervention was in use. See Appendix A and B for an example of the curriculum.

Summary of Limitations

Alongside limiting factors of mortality, generalizability, instrumentation, and reliability of implementation, possible changes in the learning environment and teacher factors may have influenced results. This pilot study operated in a predominantly cognitive theoretical-conceptual framework. However, another plausible research conclusion was the possibility that the effect of the intervention may have been associated with changes in the environment and teacher practices. From a behavioral perspective, the changes may be attributable to increased interactions between the experimental teacher and his or her students, rather than cognitive processing. Changes in the learning environment or a change in the effectiveness of teacher practices were not measured. However, behavioral factors may have implications that could be explored in further studies.

Ties to Theoretical Framework and Practical Implications

This study found its impetus in the cognitive skills necessary for decision-making and problem-solving that are in high demand in the classroom (Bain, 2005; Conley, 2005, 2010; Wineberg, 2001), in the marketplace (Carnevale & Desrochers, 2002; Laskey & Campbell, 1991; Stasz, 2001), and in the personal (Reyna & Farley, 2006) and civic (Jacobs, 2010) spheres of society. The development of these cognitive skills has risen to the top of the educational policy agenda (National Governors Association, 2008), yet explicit training in decision-making and problem-solving has not emerged with the same prominence in education research literature or in the crowded academic scope and sequence prescribed to today's adolescents. Research on teaching and training in

decision-making and problem-solving skills has not caught up with the policy demand for adolescents to develop these skills.

A second impetus for this study was the recognition of the unique nature of U.S. History instruction, with its attention to far-reaching decisions and the relevant, real-world consequences that followed. U.S. History classrooms provide rich opportunities to learn, apply, and improve quality decisions skills as students build their content knowledge. Yet U.S. History content is a complex collection of details with unfamiliar and distant names, dates, people, places, and events. Students need tools and thinking strategies to effectively sort, organize, analyze, and synthesize fact-heavy details into larger concepts and ideas.

The quality of historic decisions is always under scrutiny. The elements of a quality decision provide both a schema for sorting and processing content, and an analytical framework for actively thinking about historic problems and decisions. The schema guides students in deliberate, conscious analyses of details according to applicable associations and concepts in history and in decision-making. Decision Quality provides students with a tool for evaluating historic decisions and a means to organize and analyze historic details in a meaningful context. By applying the Decision Quality concepts of the intervention to problems in U.S. History, students build upon a personally relevant skill – decision-making – that fosters analytical thinking in service of problem-solving and content learning. In theory, analytical, this form of System 2 thinking becomes progressively more accessible, fluid and effortless with use (Kahneman, 2003; Klein, 1998; Sloman, 1996). As students construct historical content knowledge with the Decision Quality tool, students can see how actual decisions were made, how biases and

shortcuts short-circuited some decisions and elicited long-term consequences the world still contend with today (e.g. atomic warfare and the dangers of nuclear reactors). This form of analysis makes both history and decision-making relevant and relatable to the real world experiences of adolescents.

In my study, high school U.S. History students were trained to use the Decision Quality model as a schema to sort, process, and analyze content information according to the six elements of a decision. In learning to sort, process and analyze, student practiced thinking skills that enabled them to access to increasingly complex historical concepts that contributed to a deeper, more connected understanding of U.S. History. Training in the use of the decision-making schema equated to practicing intellectual operations associated with organizing and analyzing the facts, concepts, and principles of history knowledge with increasing complexity. As a result of the training, students can develop the cognitive skills necessary for quality and decision-making and problem-solving, and a deeper understanding of history.

Problem-solving and critical-thinking skills – aspects of the U.S. History instruction integrated with decision training used in this study – have been broadcast as essential for equipping 21st century students, citizens, employees, entrepreneurs, and well-rounded people (Jacobs, 2010; National Governors Association, 2008). Recall the report cited earlier from the American Diploma Project that stated, “increasingly, the computer will do the computation... [but] thinking about the problem, developing the problem, understanding the problem, looking at it from all sides, deciding what important information is relevant to the problem...is the harder part” (Achieve, 2004, p. 2). My study showed that classrooms can and should operate as a training ground for adolescents

to develop their ability to solve problems. In my discussion of findings and possible explanations of my study's results, I further apply the concept of problem-solving to link the conceptual domains of U.S. history content learning, decision training, and cognitive processing.

Problem-Solving Skill Development and Intervention Design

The decision training provided in the intervention addressed the challenge presented by the American Diploma project. The training was designed to equip students with a tool to think, develop, understand, analyze, and act on a solution to a documented problem in U.S. History. Used as a schema for organizing, analyzing, and simplifying both a decision and complex, unfamiliar U.S. History content knowledge, the Decision Quality tool (see Figure 1) was used to systematically guide students through a rational problem-solving process that can be applied to real-world situations, past or present. When students used the decision making tool to frame a problem (Helpful Frame), clarify desired outcomes (Clear Values), identify alternative courses of action (Creative Alternatives), seek out and sort information (Useful Information), analyze potential consequences (Sound Reasoning), and determine the optimal course of action (Commitment to Follow Through), they practiced a broad, adaptable problem-solving skill. By building their capacity to sort, organize, and analyze information and apply it in a variety of contexts, the intervention equipped adolescents with problem-solving skills that can serve them in the classroom, in post-secondary education, in the workplace, and in their personal lives.

Problems with Implementing Decision Training in a Current High School Model

At the outset of my study, it was my premise that students who received training and practiced using a decision-making model to investigate and make decisions in the context of U.S. History would perform better on separate measures of U.S. History content knowledge and decision-making competence. Although students in the Experimental group performed better on posttest measures of U.S. History content knowledge (NAEP) and decision-making competence (DMC test battery), the effect size was smaller than anticipated.

After completing the study, I suggest the small effect sizes are related to two systemic hindrances inherent in a classroom-based social studies intervention: (a) curricular complexities and cognitive demands, and (b) constraints in the high school learning environment. These hindrances concur with findings from previous research on teaching problem solving (Ehman, et al., 1990; Memory, et al., 2004; Saye & Brush, 1999; Wright, 2002) and with findings from decision research (Finucane, et al., 2000; Jacobs & Klaczynski, 2002; Stanovich & West, 2000; Tversky & Kahneman, 1974).

These hindrances also concur with Dual Process Theory and the distinctions between S1 and S2 processing. To mitigate these hindrances and foster the critical and analytical thinking associated with S2 processing, adolescents will need tools, training, and time to practice problem-solving skills in a supportive learning environment. These needs present a challenge schools will need to overcome if classrooms are indeed the training ground for adolescents to develop as learners and problem solvers. For the remainder of this discussion, I will explain potential ties between the effect size, systemic hindrances, previous research, and practical implications from my study.

Curricular Complexities and Cognitive Demands

Students who received decision training integrated with U.S. History instruction scored significantly higher on the NAEP U.S History content knowledge posttest than students who received traditional U.S. History instruction. The lack of a larger effect size may be accounted for by the complexity of subject matter and the cognitive demands involved in a problem-solving approach to teaching history. In Chapter II (p. 34), I summarized impediments to classroom instruction with problem-inquiry and critical-thinking approaches. Ehman, Glen, Johnson and White (1990), Saye and Brush (1999), and Memory, Yoder, Bollinger, and Wilson (2004) surfaced three challenges that pertain to the development of problem-solving skills in the classroom: (a) pressure to cover a broad scope and sequence of complex content, (b) lack of students' prior knowledge, and (c) student motivation or interest. Each challenge tended to impede the development of active, rigorous thinking necessary for problem solving in the classroom. I suggest the broad scope and sequence, complex content, and lack of students' prior knowledge in U.S. History and decision-skills hindered the effectiveness of the intervention. Curricular complexities and cognitive demands inherent in a problem-solving approach to learning history and decision skills represent a systemic hindrance that impacted the effect size.

Question one and three: U.S. history and curricular complexities. A problem-solving approach to learning high school U.S. History content knowledge is broad and complex. High school history content knowledge has been characterized as complex, disconnected and multifaceted in its collection of facts, concepts, and association-based knowledge (Bain, 2005; Harniss, et al., 2004; Ketterlin-Geller, et al., 2006). Teachers and students face time pressure to cover a vast body of material and may merely expose

students to content without developing key associations between details and concepts. Traditional textbook-driven instruction has not sufficiently provided schema or training necessary to assimilate historic terms, events, documents, and details into lasting connections among concepts (McKeown & Beck, 1994). As a result students are unlikely to develop the essential prior knowledge or understanding of the content in order to effectively apply this knowledge in a problem-solving approach.

Curricular complexity and the intervention. In my study, the intervention was designed to reduce the complexity of content and to build students' prior knowledge by taking a non-traditional (non-textbook) approach to learning history. By design, students in the Experimental Group used the Decision Quality tool to sort, organize and analyze U.S. History content in the context of making a personal judgment about a course of action faced by people in the past. The Decision Quality tool was to operate as a schema to assist students in connecting unfamiliar historical facts and concepts of a particular period in time, Where textbooks typically fail to provide students with the necessary connections that anchor an understanding of complex content, the decision-making schema provided a process for organizing new information and placing it in the context of solving a problem. The problems were framed in terms relevant to students' experience and relevant to the details and concepts of history. As a result, when students encountered discrete historical details in the context of complex, relevant historic problems like civil disobedience, workers' rights, prohibition, and the ethics of warfare. Decision Quality schema provided a context for learning new content information. Yet the hindrances inherent in complex U.S. History content and students' lack of prior knowledge remained. These hindrances may have limited the effectiveness of the

intervention to bolster students' content knowledge, as measured by the NAEP test, given the limits of time and previous instruction.

Statistically significant group differences revealed by the NAEP posttest item analysis (Question Three) suggested students benefitted from training in the decision schema. As hypothesized, students in the intervention outperformed students who received traditional U.S. History instruction on NAEP questions that required knowledge forms more complex than factual identification. Students who practiced sorting, organizing, and analyzing historical content with the Decision Quality schema scored higher on NAEP content questions that asked students to connect facts to broader concepts or more complex principles. Similarly, students who received training in the decision-making schema performed better on NAEP questions that required intellectual operations beyond reiteration (e.g. summarization and illustration). This suggests that students who practiced processing content information in the context of making a decision were more successful in organizing and processing historical details in more cognitively complex tasks.

Question two: Decision-making and cognitive demands. Results showed a statistically significant difference on the DMC posttest, favoring the Experimental Group, but with a small effect size. Effect size may be related to the magnitude of cognitive demands related to learning a procedural decision-making model. As I described in Chapter II, decision research identified patterns that hinder a deliberative, rational approach to problem solving. First, recall Kahneman and Tversky's (1974) heuristics and bias research: Heuristics operate as cognitive shortcuts that provide for efficient processing of details for in-the-moment decisions but insufficient processing for

significant or big decisions. Second, research by Stanovich and West (2000), Jacobs and Klaczynski (2002), and Finucane, Alhakami, Slovic, and Johnson (2000) documented human tendencies to overuse heuristic shortcuts in making judgments with limited information. These studies have shown when people face complex decision situations that require rigorous and time-consuming processing, they utilize mental shortcuts instead of engaging in conscious, procedural deliberation. These shortcuts increase bias and errors in judgment and circumvent reasoned analytic processing that may be needed to reach a quality decision. Keep in mind, a quality decision aligns personal preferences with relevant information and the likelihood of realizing preferred outcomes (Howard, 2007). Biases and heuristics reduce decision quality by circumventing the procedural analysis of preferences, relevant information, and likelihood of preferred outcomes and putting forth quick, automatic, un-scrutinized judgments.

Like building U.S. History content knowledge, using a decision-making process is complex, rigorous, and time-consuming. Though research suggests adolescents possess the requisite reasoning capacity, it is not clear that they consistently apply reasoning skills in making decisions (Jacobs & Klaczynski, 2002; Reyna & Farley, 2006; Romer, 2003; Slovic, 2001; Steinberg, 2003). As Kahneman (2003) observed, “people are not accustomed to thinking hard and are often content to trust a plausible judgment that quickly comes to mind” (p. 699). Decision-making aimed at problem-solving requires rigorous and critical thinking that does not come naturally, either in learning complex history content or in making decisions to solve complex problems. Thus, both domains require rigorous and critical-thinking that does not come naturally to adolescents (or adults). As Bain (2005) noted, "Learning history entails teaching students to think quite

differently than their natural inclinations" (p. 180). The same is true for processing complex problems in decision-making. In the face of complex scenarios, people naturally use shortcuts that limit the quality of processing (Kahneman). Even those who are highly trained make patterned errors in judgment as a result of S1-automatic responses to complex information (see Tversky & Kahneman, 1974). Teaching and practice in using a decision-making schema that develops sorting and analytical skills may help to improve students' problem-solving skills, but the complexity and cognitive demands of a problem-solving approach to learning U.S. curriculum and decision-making likely hinder students' progress in developing the requisite cognitive focus or discipline.

Cognitive demands and the intervention. In my study, the decision training provided by the intervention was new. Decision training was not part of the school district's curriculum at any grade or in any subject area. Similarly, the decision tasks required in the Decision Making Competence (DMC) test battery are not familiar tasks to adolescents or easily accomplished by people in general. Decision tasks included cognitively demanding analysis of information for resistance to framing effects, risk perception, and sunk cost bias – all tasks that decision research has identified as potential pitfalls that introduce bias and reduce the likelihood of reasoned responses. Despite their first exposure to a tool and training in decision making, it is unlikely that students developed a highly accessible procedural approach for processing information related to elements of decision quality or cognitively demanding decision tasks. Yet students in the Experimental Groups performed significantly better in these scenarios on the DMC, on average. Again, the effects of the intervention – increased familiarity with the elements of

Decision Quality and practice in making procedural, reasoned, conscious decisions – may have assisted students in beginning to manage the increased academic cognitive demands.

Summary of curricular complexities and cognitive demands. High school U.S. History knowledge and training in decision-making is complex, cognitively demanding, and unfamiliar to adolescents. The intervention paired training in the Decision Quality model with training in sorting, organizing, and analyzing content details in order to solve a problem in history. A crowded, discrete curriculum and traditional U.S. instruction do not provide tools or training to process complex content knowledge or apply it for problem solving. Despite its social and academic value, decision training in the context of problem solving is not part of the broader high school curriculum either. The training provided by the intervention was new and the learning was complex. It is highly unlikely students possessed the essential prior knowledge of U.S. History content, decision-making concepts, or schemas for sorting, organizing, or analyzing complex history content necessary to utilize a problem-solving approach to learning history and decision skills. As a result, curricular complexity, cognitive demands, and lack of students' prior content knowledge may have limited the effect of the intervention.

Practical Implications: S2 Tools and Training

Students need tools and training to build their capacity to incorporate complex content knowledge, make decisions and solve problems. The Decision Quality tool served both as a schema for sorting, organizing, and analyzing history content and as training in practical, procedural decision-making skills. The training required new or undeveloped cognitive skills, akin to S2 processing, that are not adequately taught to high school students. If society expects schools to produce problem-solvers, this needs to

change. Prior to my study, there was no clear evidence from rigorous research of the effect of training in decision-making integrated into social studies content. However, results from my study of training designed to expand adolescents' capacity to process complex information and make complex decisions showed a modest effect: students who received tools and training performed better on measures of U.S. History content knowledge and decision-making competence.

Students' unfamiliarity with tools and training may explain the smaller effect size on the NAEP U.S. History test and the Decision-Making Competence battery. Given the complexity, rigor, and unfamiliarity of both domains, it may be that students had not sufficiently incorporated the Decision Quality schema into their schema for learning history content or for making decisions. Though a statistical effect was observed, recognizing that secondary content and procedural decision-making is complex and new to students, the modest effect size in favor of the Experimental Group may suggest that the benefits of the intervention were just beginning to take hold. It is clear: although the reasoning capacity needed for active, procedural thinking is highly valued, it is not part of the high school curriculum. Instructional tools and explicit training that develop adolescents' problem-solving capacities are missing in conventional social studies curricula.

Sloman (1996) asserted that training in S2 processing helped students learn content knowledge. As described previously (see Chapter II), students who develop a capacity for deliberate, procedural S2-thinking can apply this thinking to develop useful associations between the vocabulary, facts and concepts that serve as the rules of a content domain. The Decision Quality intervention provided tools and training to assist

students in S2-thinking and to incorporate a schema for learning content. It is possible that after years of instruction in disconnected details and the lack of previous explicit training in S2-thinking, a one-year, one-course training may have a limited effect on a student's content learning or decision-making skills. My study suggests students benefit from tools, training, and time to develop a schema for learning complex content and making decisions so that it becomes more accessible and less effortful with use, as Sloman (1996) proposed. Developing such a schema and the necessary S2 processing skills may improve adolescents' ability to handle the complexities inherent in developing content knowledge and decision-making skills.

Constraints in the High School Learning Environment

A second, paired set of systemic hindrances may have interacted to produce the significant but small effect size. Both decision research and the literature on problem-solving approaches to learning social studies describe constraints in the learning environment and in time that impact student learning and motivation. First, research on decision-making identified distractions in the learning environment that impair S2 processing. Classroom distractions range from intercom interruptions for announcements to the vice principal visits that shift focus and heighten emotions, to notes delivered from the counseling office that pull students from the learning environment, to the obligatory transitions from one learning activity to another during the class period, to the insistent bell system that signals the end of learning in one class period and the required physical transition to another location in the building. These distractions interrupt S2 processing with its deliberate, effortful, procedural approach to analyzing details and reinforce established automatic S1 processing of new complex information. Second, literature on

teaching problem solving in the classroom recognized the effect of time constraints and student motivation and interest on rigorous learning opportunities. Coupled with distractions in the learning environment, the residual effect of a broad disconnected curriculum, years of textbook-driven instruction and rote recall classroom activities may have engrained autopilot responses to new and more complex content information. Given the focus of the intervention on more demanding S2 problem-solving skills, an interaction between a familiar S1-dominated rote learning environment and the unfamiliar time-intensive cognitive demands of S2-processing may account for the effect size.

S2 processing and disruptions in the learning environment. In decision research, hindrances to analytical reasoning associated with S2 processing include: time pressure (Finucane, et al., 2000), affect (Slovic, et al., 2002), time of day (Bodenhausen, 1990), mood (Bless, et al., 1996), and concurrent tasks (Gilbert, 1989, 2002). These factors were shown to hinder S2 processing, leaving decision-makers with only engrained S1 autopilot responses in the face of complex processing scenarios (Kahneman, 2003). The environmental distractions / hindrances to and interruptions of S2 processing are omnipresent in high school classrooms, as listed previously. Add to these disruptions the pressure teachers exude to cover a demanding content scope and sequence, multiple learning agendas in multiple classes, rigid time schedules that do not flex when students are engaged in active thinking, common adolescent fluctuations in mood, early morning or late afternoon classes, and the flurry of socio-emotional, physical, and cognitive tasks adolescents juggle during the school day, and it is easy to recognize how the learning environment and the adolescent learner's daily experience can suppress the effect of the

intervention designed to improve the frequency and quality S2 processing in the classroom.

Student motivation and interest in S2 learning. The smaller effect size may also be related to levels of student motivation and interest. In the same manner the learning environment impacts students' abilities to engage in cognitively demanding S2 learning activities, longstanding patterns in the learning environment may have shaped student willingness to actively engage in incorporating a schema for learning and decision making that requires rigorous effort (Kahneman, 2003). In social studies, a student's prior approach to learning has been shaped by a systemic emphasis on rote responses to a parade of details and basic factual regurgitation (T. L. Epstein, 1994; Harniss, et al., 2001; Ketterlin-Geller, et al., 2003), not by the challenges of critical-thinking or active, rigorous sorting and analysis of complex information that build conceptual connections in U.S. History knowledge. A learning environment fraught with interruptions and geared toward grooming simple S1 memorization in content learning may constrain connected, effortful, deliberate, analytical S2 thinking.

In their U.S. History classes, students in the Experimental Group were trained to practice rigorous, procedural thinking. Decision Quality training provided students with a tool and guided practice in wrestling with complex questions. Students were trained to recognize when S1-generated pat answers may be poor answers to complex problems in history. Yet prior experience in learning U.S. History likely focused more on memorizing facts and less on making conceptual connections in detailed information. The former approach may be familiar and fairly automatic to students in history classes; the latter requires more effort, time, and support than the current learning environment provided. In

decision-making, biases and heuristics come easily. Rational analysis of preferences, alternatives, and likely outcomes does not. If Kahneman (2003) is correct and people tend to accept the first plausible, S1-generated explanation – whether in learning content or in making decisions – autopilot responses predictably dominate a student’s encounters with new information in high school history classes.

S2 hindrances in an S1 learning environment. As noted earlier, the operational structures of the school day and the classroom engrain an S1 autopilot response to learning in the classroom. Active procedural thinking requires focus and conscious attention. Despite the priority assigned to developing adolescents’ problem-solving and analytical thinking skills, the traditional high school learning environment decidedly reinforces S1 processing. The larger school learning environment tends to divide and disrupt students’ focus and segment learning opportunities in a manner contrary to the development of S2 processing in the classroom. In the classroom, familiar lesson structures like scanning the textbook for answers, passive note taking during PowerPoint lectures, or answering fact-based multiple choice or true-false test questions cue familiar habit-based responses that have been learned and engrained by years of traditional group instruction. Students have learned autopilot S1 responses to passive habit-based S1 classroom activities in an S1-supportive learning environment. S1 classroom behaviors were not the focus of the intervention, but they may have hindered students’ receptiveness to more unfamiliar, effortful procedural thinking.

Breaking the cycle of S1 responses may be difficult, given the disruptive learning environment and engrained autopilot responses to learning history content knowledge. Environmental constraints may have limited the effect size and stunted the development

of S2 processing that the study's design anticipated would improve students' content learning and decision-making competence. The level of exposure to the intervention in this pilot study may relate to the effectiveness of the intervention. Rather than prepare students to respond to the challenges of complex cognitive processing scenarios that require active S2-driven critical, analytical, and creative thinking, the traditional high school learning environment may reinforce what Kahneman (2003) recognized as a more natural response – a path of least cognitive resistance.

The distractions and disruptions of the learning environment push adolescents to use heuristic automatic processing. Familiar, repetitive learning activities further embed autopilot responses and harbor resistance to new, rigorous approaches to learning. Even when analytical thinking is the focus of a lesson, as was the case with lessons that integrated the Decision Quality Schema for processing content information and practice in procedural decision-making, students may simply remain in autopilot S1 processing patterns because of a resistance to utilizing the more cognitively demanding S2 approach. Given the myriad interruptions and the precedents established by textbooks and S1 learning activities, the student response to rigorous thinking is explicable. When adolescents run into problems of learning or dilemmas in decision-making, the automatic response is to go with what is plausible and most accessible instead of pressing through a demanding procedure that promises a more analytical, quality response but at the expense of effort, time, and focus. Unless there are tools, training, and time to practice in a supportive learning environment, an intervention designed to improve students' capacity to utilize S2 processing for problem-solving is likely to have a small effect.

Question four: Experimental group follow-up interviews. It is worth noting all of the students recalled the decision training as part of their U.S. History instruction once they were prompted with a visual copy of the decision-making tool, yet none of the students recalled the tool on their own. Once students had the tool in hand, every student applied the tool to make a hypothetical yet weighty purchasing decision (e.g., the purchase of a car). At least in the context of the interview, these observations suggest that after a two-course sequence in one year of their formal education, students had not incorporated the decision-making tool as part of their rote, automatic S1 learning. Yet after limited exposure, students demonstrated the capacity to apply S2 tools and training in the context of making a decision, but to do so required a prompt. This reinforces students' need to tools and training and the potential benefits of time to practice in a supportive learning environment.

Practical Implications: Increased Exposure and Time for Practice

To realize a large effect of training in decision skills, it may take more time and practice than was afforded in this study. Decision Quality training provided a tool, training, and practice in wrestling with questions and recognizing, when S1-generated pat answers may be poor answers to complex questions in history. The Decision Quality tool would likely provide a similar platform in other subject areas. Increased exposure in other courses may provide the additional time for practice that is necessary to realize the potential effect of the intervention. Students were trained in one course for two trimesters in one subject area, in one school year. Given the complexity and challenges of training adolescents to be effective problem-solvers and decision-makers, students will need more

exposure over time, more time to practice and develop their cognitive capacity, and a more supportive learning environment.

Multiple venues to increase time for practice. Sloman asserted that dual processing gets easier with use. One practical implication of the findings from this study is that students may benefit from increased opportunities to practice and develop their ability to sort, organize and analyze new information using critical, creative, and analytical thinking processes that were introduced during the intervention. Developing a network of courses from freshman to senior year, or providing a middle school (6th through 8th grade) introduction may improve the development of the schema and its incorporation of the decision-making schema into a student's approach to content learning and decision-making in high school. It is conceivable to develop a 9-12 or 6-12 approach to training in decision-making and problem solving. An introductory decision-making course as early as 6th grade, or an 8th grade course applied to a student's decisions about course selection for 9th grade and career aspirations could provide an introduction to a schema for sorting information and to the elements of a quality decision. In high school, a department-wide emphasis on problem solving in social studies has merit and support from a theoretical-conceptual base in the literature (Gross & Meussig, 1971; Memory, et al., 2004; Osana, et al., 2003; Wright, 2002). A cross-curricular intervention sequence that includes formal training and practice with the Decision Quality schema in 9th grade health class, a continuation of the 10th grade U.S. History application, a formal 11th grade post-high school decision planning process, and a rigorous 12th grade decision analysis project would dramatically increase opportunities to learn and develop the utility of the decision-making tool.

A supportive learning environment. S2 thinking is not natural, it takes time to develop, and goes against the grain of conventional time and learning structures of high school. S2-driven learning patterns are unlikely to match bell schedules. The teachers, administrative staff, and district office staff privy to my study recognized both the value of the training and the absence of similar training in the K-12 articulation. It is worth noting that, partly as a result of participating in this study and in part from the realization that students need to develop cognitive and problem- solving skills, the participating high school shifted its focus from improving tests scores or graduation credit to developing a framework for teaching and learning thinking skills. This represents a change in school culture and focus. It may also portend a necessary change in the structures of a high school, such as flexible class periods, grading periods (extended trimesters) or school years in order to promote adaptive use of time that builds the capacities of students' critical, analytical, and creative S2 thinking. One in-district arts-based charter school in the school district of interest recently integrated the Decision Quality framework into its school curriculum. It is worth noting that the school currently operates with a schedule that adapts to the ebb and flow of student learning by instituting time structures that flex according to the day of the week, the grading period, and the school year. An adaptive approach to time structures may be ideal for developing the critical, analytical and creative outlets associated with training in decision-making.

Future Research

Future research should expand on evidence from this pilot study that suggests training in decision skills can improve content learning and decision-making competency. This is the first rigorous study of the effect of building a schema for sorting, organizing,

and analyzing complex information that can be used as a decision-making tool or a tool for building U.S. History content knowledge. One clear opportunity for future research is the replication of this study with another cohort of sophomore students at the school of interest or at another school at the same grade level and with like teacher training.

Beyond replication, research should investigate the feasibility and effectiveness of developing a more programmatic and articulated approach to providing tools, training, and time to practice using a decision-making schema to analyze content information and problem solve. Areas for future research include: (a) integration throughout social studies and other subject areas, (b) increased exposure in different grade levels, (c) the influence of the learning environment, (d) increasing teacher training and expertise, and (e) distal effects of decision training.

Studies of Integration Throughout Social Studies and Other Subject Areas

The integration of decision skills training in other social studies courses or in other content areas may help determine the effect of increased exposure to the decision-making schema on content learning and decision-making competence across the high school curriculum. The schema is adaptable to any social studies course or subject area where students sort, organize, and analyze complex content in the context of problem solving. Thus, research on the effect of integration of decision training in other social studies courses should be conducted. This will allow comparison of results in U.S. History courses to results in courses such as government, world history, world cultures, and economics, and provide additional documentation of the applicability to a problem-solving approach in social studies. Future studies of applications of the decision-making schema in Physical Science, Biology, Chemistry and Physics can investigate the effect of

training in decision-making on students' use of scientific inquiry skills. Research on the effect of integrating decision training in language arts should include the application of the schema to organizing the elements of a persuasive argument, expository writing, and literature analysis. Additional research in areas like student government or personal health can explore how students might benefit from increased exposure and practice in sorting, organizing, analyzing complex information for the purpose of decision-making and problem solving.

Studies of Increased Exposure in Different Grade Levels

Research should be conducted to explore the compounding effects of broad and repeated exposure to decision-making schemas over time, and the impact of repeated exposure on students' content learning and decision-making competence. Rigorous, deliberate analysis of information for the purpose of decision-making and problem solving is not a natural act. Yet students can develop the skills to sort, organize and analyze complex information, given the tools, training, and time to practice. No studies were located that provided a progression of classes at the secondary level that were geared toward developing decision-making or problem-solving skills. A school district that designs and articulates K-12, 6-12, or 9-12 curriculum infused with 21st century skills like problem-solving and critical-thinking may provide such a research opportunity.

Studies of the Influence of the Learning Environment

Determining the impact of traditional and non-traditional high school learning environments on the effective application of tools, training, and time to practice decision skills may provide insight into how decision theory and content learning interact in classrooms. Studies that investigate the impact of a broader integration of a problem-

solving approach to influence the learning environment – one that expands beyond one class period a day in one subject area for one year – may provide more useful insight into how to increase the effectiveness of the intervention. Studies should be conducted in schools that alter the learning environment by using flexible time structures (by school day, grading period, and school year) to provide additional opportunities in the school day to practice solving problems and learning content with a decision-making schema. Studies of the learning environment in schools that have adopted a school-wide focus on increasing students' critical-thinking and problem-solving skills across curriculum areas may provide insight into how collective efforts to reign in S1 patterns in the classroom can create a learning environment that more consistently fosters students' S2-thinking across the high school curriculum. Studies of the learning environment should increase our understanding of the necessary length, depth, and ongoing support student needs in order to effectively utilize the tools and training provided by the intervention.

Studies of Increasing Teacher Training and Expertise

The utility of the Decision Quality model and S2 processing for teachers' instructional decisions was not evaluated in my study. Yet in the training and development of adolescent problem-solving skills, teachers play the role of guide and expert (Ehman, et al., 1990; Memory, et al., 2004; Saye & Brush, 1999; Wright, 2002). Studies of teacher training and expertise will expand the collective resources teachers can access to seek answers to instructional questions about how decision theory, content learning and problem solving interact in the classroom. Studies that explore the effect of training on teacher practices should focus on the effect of training on instructional decisions and teacher collaboration. Studies that detail the impact of ongoing teacher

training and support or the effect of training a high school staff at grade level or in entirety should provide insight into the relationship between teacher training, expertise, and changes in the learning environment.

Studies of Distal Effects of Decision Training

Finally, future research can explore the distal effects of the intervention by following the participants' performance in high school. Data analysis of attendance rates, grade point average, behavior referral incidence rates, graduation rates, post-secondary planning, and college entrance rates may provide comparative indicators of the effects of training in decision-making on life outcomes.

Conclusion

The importance of improving the quality of adolescent decisions and problem-solving skills is hardly debatable. Effective problem-solving skills can guide decisions, decisions lead to actions, and the consequences of these actions are often related to the quality of the decisions that drove them. Better problem solving or decision-making do not always prevent accidents or outpace trying circumstances. Decision-making skills may, however, mitigate those circumstances and minimize unnecessary risks that leverage the limited resource of each adolescent's prospects. Adolescent training in a decision-making model may improve the quality of their decisions if it fosters analytical acuity and mitigates factors that contribute to poor decision-making, but the training must penetrate adolescents' tendencies to just act on a whim, or to know better and still act anyway. Despite powerful influences like statistical immunability (a belief that *it will not happen to me*) and/or impulsivity, this study provides evidence that adolescents can improve their decision-making skills while they improve their learning in U.S. History.

Although opportunities to receive training and practice in decision-making are very limited, this study and its practical implications demonstrate how schools can play a role and utilize its imperfect but resident teaching and training platform of high school at a time when students' decision-making competence is put to the test. School can provide tools, training, practice opportunities, and expert guidance to facilitate the development of critical, creative, and analytical cognitive skills that serve adolescents as learners, decision-makers, and problem-solvers. Adolescents may benefit from analyzing historic failures associated with poor decisions or the complexities of historic decision that appears to have negative consequences but was actually the best decision, given the alternatives, desired results, risks, and information available at the time. Participants in the intervention worked through such decision scenarios in their U.S. History classes.

The final question in determining the effect of training adolescents in decision skills may revolve around the issue transfer – did students transfer learning from historic decisions and historical scenarios to their personal decisions and actual circumstances? This study provides a footing for future research to answer this question more fully. In the gap between the normative ideal of rational, logical decision-making and the descriptive reality of cognitive shortcuts, bias, and heuristic tendencies, the goal is a good decision every time. But in reality, developing quality decision-making skills and the life habits of applying them takes training, tools, practice, time, and a sense that making the effort to make a good decision makes a difference.

APPENDIX A

CURRICULUM SAMPLE ONE: DECISION-MAKING WITH

U.S. HISTORY CONTENT

Steelworkers' Dilemma Scenario

It is 1907 and the typical unskilled laborers at Pittsburgh Steel Works work a 14 hour day, 6 days a week for a salary of \$15 per week—which considerably more than an unskilled worker can earn in other jobs in the area. However, it costs \$3 per day to decently provide for a family.

Additionally, many of the workers are recent immigrants from places like Croatia, Poland and Russia—and the company is constantly recruiting new workers from Southern and Eastern Europe. In an era of very little job security these immigrants, who are desperate for work, are often brought in to replace sick, injured and unproductive employees, sometimes for a lower wage.

The 3500 workers at Pittsburgh Steel Works consider you and your group members to be the most respected and wise members of the workforce and have asked you to make a decision about what they should do about their low pay and long hours.



Process

The teacher will divide the class into groups of 3-5 before presenting them with the scenario handout. After reviewing the scenario, the teacher will guide the groups step-by-step through each of the six elements of the decision chain. During the steps, each group will be given several minutes to discuss and write down their responses to the first of the six elements before the teacher asks for groups to share with the class. This will be repeated for each of the elements.

For Example...

- “What would be a good frame for this issue/problem? In other words, what is being decided?”
- “What are the key values? In other words, what is important to the individuals/group making the decision?”
- “What are some creative alternatives to solving this problem? What are some possible choices for the group? Could they strike? Keep the status quo?”
- “What would be some pieces of information that would be helpful in making a decision?”
- “How could we use our information and possible choices to make a sound decision? How could rate and weight our choices?”
- “How could your group build a commitment to following through with your decision?”

This step-by-step process examination of the simulation and the six elements is being utilized to establish the expectations and format for future decision simulations.

Focus on this simulation should be helpful frame, clear values and important information.

Time

45-60 minutes

APPENDIX B

CURRICULUM SAMPLE TWO: DECISION-MAKING WITH

U.S. HISTORY CONTENT

PROHIBITION

On January 16, 1920 the work of thousands of activists was finally realized when the Eighteenth Amendment to the Constitution came into effect. Prohibition all of alcoholic beverages became the law of the land.

The majority of the population supported Prohibition for a variety of reasons, including: (1) Eliminating drunkenness and the all-to-often side-effect: domestic violence and abuse. (2) Getting rid of saloons and bars where other less desirable activities like gambling and prostitution thrived. (3) Preventing absenteeism and on-the-job accidents that were the result of drunkenness.

However, the passage of Prohibition did not mean that the consumption of alcohol came to an immediate end. The percentage of people obeying the law varied widely from place to place, but the greatest divide was between urban areas, where large percentages of the population continued to drink and rural areas, where the vast majority of people adhered to the new law.

The passage of the law also had other, unintended consequences. As the manufacturing, selling and transporting of alcohol was now illegal despite the fact that demand remained, people turned to “bootleggers” for illegal, private sources of alcohol. Soon organized crime developed in many American cities to supply this illegal source of alcohol.

You will be given one day to research Prohibition in the library (you may use books, the encyclopedia and the internet) in order to answer each of the following questions in essay form. Please make sure to follow the proper essay format, which is outlined below. Only essays in the proper format will be accepted.

1. What was the frame of the supporters of Prohibition?
2. What information did they take into account when deciding to ban alcohol?
3. What values drove their decision to support banning alcohol?
4. What alternatives did they consider?
5. Did they use sound reasoning in their decision to ban alcohol?
6. How did they follow through on their decision?

Essay Format

Paragraph 1

Introduction

Paragraph 2

Frame of Decision Makers

Paragraph 3

Information used by Decision Makers

Paragraph 4

Values of Decision Makers

Paragraph 5

Alternatives considered by Decision Makers

Paragraph 6

Reasoning used by Decision Makers

Paragraph 7

Follow-through of Decision Makers

Paragraph 8

Conclusion

APPENDIX C

FOLLOW-UP INTERVIEW TRANSCRIPTS

Transcription of Low, Middle, and High Student Follow-up Interviews:

Sample: student from Low DMC posttest score subgroup:

S 15760

I: Do you remember that decision-making tool that was taught in your history class last year

S: Yeah

I: Can you name the parts of that decision-making tool

S: I can't. I can't remember now

I: So I'm going to show you a copy of the decision chain and let you look at some of the parts. Does this look familiar?

S: Yeah.

I: Okay, good. All right. So, I'll let you look at that. Now the big question is, if you were going to decide whether to buy a car, what parts of this tool would you pay attention to, and then can you explain how you would use those parts of the tool making that decision?

S: Um. I'd use useful information, just to know about the car.

I: What kinds of things would you want to know about the car?

S: Like gas mileage, and the miles on it already,

I: Okay

S: And I would use commitment to follow through after I went over the useful information, like it was good and uh.

I: So how would you use the commitment to follow through?

S: I would sign the paper to buy the car, and...

I: Okay. Would you use any other parts of the chain while you were making that decision?

S: Um, probably clear values. Because, like, if I bought the car like what I'd do with the money, like after I use the money what else could I also be using, instead of buying a car

I: Okay. Can you give me an example?

S: Like if I bought a car but I needed the money for like, say a cell phone or something, then I probably wouldn't buy the car. And like the consequences of that, um, if I bought the car, then yeah, I wouldn't be able to buy the cell phone.

I: Okay. Do any of the other pieces look like something you would use?

S: Creative alternatives, like what else could I spend the money on. And uh, yeah.

I: Okay. So based what we just talked about and what you walked me through, some of things you'd consider for that decision, um, would you buy the car based on that?

S: Yeah.

I: Okay, perfect. Thank you.

Sample: student from High DMC posttest score subgroup:

S: 158359

I: Okay, so do you remember the decision-making tool that was introduced in your history class last year?

S: The money one. I think it was the money one; I don't know. Where Mr. [teacher] was like, okay, so I'll put out like a dollar and someone else can bet me and then they'll do this little activity to see who wins, and then likes, he'll keep on adding money but the other person has to add some too, and it kind of told us like you have to find out where to stop, or something like, uh, once you go to far you don't want to lose all your money so the guy's at 10 and your at 10 and you both don't want to lose so you just keep going higher and higher cuz you want to win. I don't know, though.

I: Okay, so can you name the individual parts?

S: Like, what do you mean?

I: Here, I'll show you an illustration. Does that look familiar?

S: Yes.

I: Okay, so using this decision tool, if you were going to make a decision whether to buy a car, what parts of this would you use and how would you use them to help you decide?

S: Uh, well, useful information if it's a car, because you want to know how old it is, has it been in accidents, stuff like that. Yeah, I totally remember this now. Um. Probably your values, or clear values, because you want to know what you want, and like the color and the style. I guess that was helpful frame and the consequences. And then, oh for like creative alternatives you want to know all your options for like the cars. And commit to follow through.

I: Can you give me an example?

S: Of this one?

I: Yeah.

S: Uh, so all your options as in. Okay, so, you can have like a BMW, and then you could also have like a Mercedes, but I guess, just to know all the options like the ones that have similar lights, or like the things that you like. And I guess for this one some of these contribute to that one. Like.

I: How so?

S: Like the useful information can contribute, so like maybe the BMW goes faster than the Mercedes, or something like that. And then, uh, sound reasoning, I don't really know. Um, for the car, sound reasoning, am I thinking straight, like is it what I want to do at this time, do I have the money, do I have the time, sorry I'm sick.

I: It's okay. It's that time of year.

S: Yeah. And the commit to follow through. Will you really follow through and actually like, are you really going to buy the car? Are you just looking, your, um, is that the car you want or do you still want to look around and stuff?

I: Okay, so if you went through all of this, would you decide to buy the car or not?

S: Through all of these?

I: Yeah. From what you just told me, looking at things you just mentioned, would you decide to buy the car?

S: Yeah.

I: Okay

Sample: student from Middle DMC posttest score subgroup:

S: 160024

I: Okay, so last year in your history class, a decision-making tool was introduced. Do you remember that tool?

S: Not all the specifics, but I remember it being helpful.

I: Can you describe what you do remember?

S: No, I don't remember much, but I remember that what they did was really helpful. It helped like understand different ways of doing history instead doing it the normally way

I: Okay

S: It was pretty cool.

I: Okay. This is a photo of the decision-making tool. Looks familiar?

S: Yeah.

I: So using this as a key, if you were going to buy a car today, what piece of this would you use and why would you use those pieces?

S: I think I would use all of it because it would really help fully understand what I'm buying.

I: Okay, so walk me through the steps then, with each of these

S: Okay, so I guess you could start with you know, frames. So what is it that I'm deciding? So I'm going to decide like if I'm going to buy this car. Do I want this car? And then, you want your clear values, and like what consequences do I care about? Um, I'm on the spot.

I: I know. Kind of a surprise for Monday morning.

S: Um. Skip clear values, cuz I'm not thinking right now. Creative alternatives. What are my choices? I guess you could have one or more cars. You could get two or three different cars and all your choices between all your cars and all the things about it. I mean that kind of leads into useful information. I mean you've got to know all the information about each one so you can choose which one have everything, you know, good reviews and all that stuff. And then, sound reasoning, am I thinking straight about this. You know, doing all that, you know, will help you understand if this is going to be, if you are on the right path or not, and if not you can go back and restart. And then commitment to follow through is you know obviously just to take the action and then do it.

I: Okay. So based on all the steps that you just walked me through, would you buy the car?

S: Yeah.

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