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The Impact Of Cooperative Learning On The Development Of Need For Cognition Among First-Year College Students

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THE IMPACT OF COOPERATIVE LEARNING ON THE DEVELOPMENT OF
NEED FOR COGNITION AMONG FIRST-YEAR COLLEGE STUDENTS

by

Thomas Dee Castle Jr.

A thesis submitted in partial fulfillment of the requirements
for the Doctor of Philosophy degree in
Educational Policy and Leadership Studies
in the Graduate College of The University of Iowa

December 2014

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CERTIFICATE OF APPROVAL

PH.D. THESIS

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ABSTRACT

This study examines the effect of first-year college student participation in cooperative learning activities on the development of need for cognition, using pre-test and post-test data from the Wabash National Study of Liberal Arts Education (WNSLAE). I used Pascarella's (1985) General Causal Model for Assessing the Effects of Differential Environments on Student Learning and Cognitive Development as the theoretical foundation for my study. I examined whether cooperative learning (students teaching each other, faculty encouraging students to work together outside of class, participation in study groups, and students working together outside of class) influenced the development of need for cognition among first-year college students while controlling for student background characteristics, institutional characteristics, academic experiences, and other college student experiences. The results of my study indicate that participation in cooperative learning activities positively influenced the development of need for cognition among first-year college students. This study adds to the literature because it is the first to demonstrate the relationship between cooperative learning and need for cognition. The results are relevant to higher education policy because the study provides evidence that cooperative learning helps students develop a propensity to engage in the thinking process, which will likely impact them throughout their lives. Cooperative learning is considered a good practice in liberal education, so the result of this study provides evidence that liberal education supports positive outcomes related to cognitive processing, which is critical to higher education.

PUBLIC ABSTRACT

This study examines whether cooperative learning strategies influence the development of need for cognition among first-year college students. A growing concern exists on college campuses that critical thinking skills, such as the analysis, synthesis, and evaluation of ideas, are in decline. The results of this study indicate that participation in cooperative learning, which is considered a good practice in liberal education, positively influences the development of need for cognition among first-year college students. As students learn to enjoy engaging in cognitive activities, they develop lifelong needs for cognitive processing that lead to more critical, productive, and engaged citizenship. Therefore, educators may help improve the value of higher education to society by helping students develop need for cognition. If faculty can help students enjoy the thinking process through cooperative learning, students are more likely to enjoy cognitive activities throughout their lives, which may contribute to a stronger society. An individual who enjoys thinking will likely be a more informed voter and active participant in public discourse.

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CHAPTER I

PURPOSE OF THE STUDY

Public scrutiny of higher education in the United States has increased substantially over the past few years, with growing concern that critical thinking skills, such as the analysis, synthesis, and evaluation of ideas (Gokhale, 1995), are in decline on college campuses. Critical thinking generally leads to well-informed, more reasoned decision making (Pascarella, Wang, Trolan, & Blaich, 2013) and is considered vital to the success of a democratic society (Facione, 2010). Without critical thinking skills, society members are less equipped to engage in public discourse and participate in democracy. In a recent presentation at the Time Higher Education Summit, Secretary Arne Duncan (U.S. Department of Higher Education, 2012) challenged colleges to improve teaching of critical thinking skills. Secretary Margaret Spellings (2006) identified these same concerns in her report on the future of U.S. higher education. The report indicated that a growing number of college graduates lacked some of the basic skills and abilities, such as literacy and basic employment skills, necessary to become a contributing member of society. Arum and Roksa (2011) further confirmed this concern when they concluded that students in American colleges and universities were experiencing marginal gains in critical thinking during their time in college. These findings have increased public scrutiny of higher education, particularly as college costs increase and completion rates decrease (Deming, Goldin, & Katz, 2011). Therefore, educators may help improve the value of higher education to society by helping students develop critical thinking skills, including the development of need for cognition—a measure of a person’s need to engage in cognitive activities. If faculty can help students enjoy the thinking process, students are more likely to enjoy cognitive activities throughout their lives, which may contribute to a stronger society. An individual who enjoys thinking will likely be a more informed voter and active participant in public discourse (Facione, 2010). Recent findings regarding critical thinking in higher education

should encourage faculty to embrace teaching strategies that help develop student interest in cognitive activities. However, little research exists that connects students' cognitive development with educational delivery strategies such as active or collaborative learning. This thesis addresses this gap and demonstrates how using cooperative learning strategies may assist students in developing need for cognition.

The current shift toward the commoditization of higher education and the concern for students' lack of cognitive growth pose significant threats to the current structure of liberal education. More students than ever are gravitating toward technical certificates and for-profit colleges which focus less on the broad range of knowledge emphasized in a liberal education (Association of American Colleges and Universities, 2011). This trend towards technical and for-profit education has fueled the public perception that many college students are no longer learning and developing important lifelong learning and critical thinking skills. If educators help students to enjoy the learning process, students may be more prone to continue learning and engaging in critical thinking throughout their lives. Collaborative and active learning reinforce the social, cooperative nature of learning, which often makes learning more enjoyable (Chickering & Gamson, 1987). The Association of American Colleges and University's LEAP (Liberal Education & America's Promise) initiative seeks to promote the value of a liberal education in the 21st century (Association of American Colleges and Universities, 2011). These values help students understand the importance of social responsibility while developing key intellectual skills such as communication, analysis, and problem solving. As such, a strong liberal education is critical to our society's long-term success. In a Department of Education report called *A Crucible Moment: College Learning and Democracy's Future* (Association of American Colleges and Universities, 2012), educators are challenged to expand students' civic, social, and intellectual understanding, which appears to be in decline. As college students become less exposed to a liberal education, members of society lose the ability to engage in productive civil discourse. Educators must reinforce

the critical value of democratic engagement through collaboration among students while appreciating diversity of backgrounds and opinions (Association of American Colleges and Universities, 2012). A strong, positive correlation exists between democracy and higher education (Glaeser, Ponzetto, & Shleifer, 2007). Education tends to increase support for a democratic society by increasing the number of college-educated members in society. Through a liberal education, students develop a desire for cognitive growth which prepares them for lifelong learning and active citizenship.

One way LEAP supports liberal education is through the promotion of high impact educational practices (Kuh, 2008), such as first-year experiences, service learning, undergraduate research, and collaborative learning. Kuh (2008) claimed that classroom collaboration helps students learn to solve problems while deepening individual understanding and improving communication skills. Collaborative learning is considered one of the seven principles of good practice in liberal arts education (Chickering & Gamson, 1987). Collaboration among students is sometimes referred to as either cooperative or collaborative learning. Cooperative and collaborative techniques seek to engage students in the learning process. In this dissertation, I demonstrate that cooperation among first-year college students positively influences cognitive development. The primary measure of cognitive development I use for this dissertation is a student's need for cognition (Cacioppo & Petty, 1982), which measures the degree to which an individual enjoys engaging in cognitive activities. This dissertation is one of the first studies to examine the impact of cooperative learning on the development of need for cognition among college students. The study's results may help guide faculty and administrators in choosing appropriate instructional styles that have a long-term, positive impact on cognitive development. The results may provide a pathway to help students gain critical thinking skills, which Arum and Roksa (2011) indicated has become stagnant on college campuses. I hypothesize that participation in cooperative learning

activities positively influences the development of first-year college student's need for cognition.

Cooperative learning is a highly structured group method requiring interdependence among students (Slavin, 1980). Collaborative learning is a broader term for students working together to achieve learning outcomes (Bruffee, 1999). In both cooperative and collaborative learning, students engage with other classmates, potentially leading to more cognitive processing. Although both methods encourage student collaboration, cooperative learning's structured nature demands more consistent engagement among students than collaborative learning. Some confusion exists within the literature regarding the terminology associated with cooperative learning. In some cases, researchers have used the terms cooperative and collaborative learning interchangeably. Others consider cooperative learning a subset of collaborative learning. Although cooperative learning is collaborative in nature, the execution of cooperative learning is quite different. Barkley, Cross, and Major (2004) use the term CoLT to indicate a blend of collaborative and cooperative learning activities. Similarly, I use the term cooperative learning as a blend between cooperative and collaborative learning approaches. Cooperative learning refers to highly structured classroom experiences involving students teaching each other and working together on projects outside of class. Cooperative learning indicates more intentionally designed group activities as opposed to the less structured collaborative learning (Bruffee, 1999).

The study's purpose is to examine the relationship between cooperative learning and the development of need for cognition among first-year college students. This is the first study I know that uses longitudinal data to link directly cognitive gains in first-year students with the application of cooperative or collaborative learning.

Research Questions

In this dissertation, I answer the following two research questions:

1. Is there a positive relationship between participation in cooperative learning activities and the development of need for cognition among first-year college students?
2. Does the effect of cooperative learning on the development of need for cognition differ based on full-time status, high school involvement, ACT score, number of liberal arts courses taken in the first year, and the pre-test score for need for cognition?

Significance of the Study

Cooperative learning is a tested and effective teaching tool, but recent changes to the delivery of instruction necessitate further validation and support. The growth of online and alternate instructional delivery options in higher education is staggering. The online education market experienced a 10% growth rate in 2010, with more than 6.1 million students reporting that they were taking at least one online course (Allen & Seaman, 2011). Not all of these students take exclusively online classes. Many schools offer a blended approach to education with some face-to-face instruction and some online class components. The growth of the adult student population has spurred much of the development of alternative delivery approaches. Many schools offer adult-focused programs with shortened face-to-face delivery supplemented by extensive online work (Wlodkowski, 2003). The increasing public scrutiny of higher education suggests that scholars continue to evaluate and justify the effectiveness of teaching practices that reinforce cognitive development across all modes of educational delivery. Although previous studies support the instructional benefits of cooperative learning, there is little evidence connecting cooperative or collaborative learning to broader college outcomes, such as the development of need for cognition (Cabrera et al., 2002). This study fills an important gap in research by providing empirical evidence of the cognitive impact of cooperative learning across a variety of institutional types using longitudinal data.

Background for the Study

Studies often focus on the general impact of college student experiences on students' cognitive development, but little evidence supports the direct link between cooperative learning and the development of critical thinking skills (Cabrera et al., 2002), and no research was found that links cooperative learning with the development of need for cognition. As schools gravitate toward online and alternative delivery systems, educators should consider appropriate pedagogy for helping students develop their critical thinking skills. Teaching critical thinking skills should be a primary purpose of higher education, yet several educators and researchers maintain that critical thinking in undergraduate education is in decline. Educators are "questioning whether organizational changes to colleges and universities in recent decades have undermined the core educational functions of these institutions" (Arum & Roksa, 2011, p. 1). Therefore, more research supporting the development of critical thinking skills in college students is imperative to the long-term success of higher education.

Several studies have validated the effectiveness of student engagement strategies such as cooperative, collaborative, and active learning, but most studies are based on test scores and other forms of classroom achievement rather than on critical thinking and other forms of long-term cognitive development (Johnson, Johnson, & Stanne, 2000). These studies generally measure individual performance as a result of student engagement with peers. Although these studies contribute to pedagogy, they fail to consider the longer term impact of specific learning strategies on student cognitive development. Researchers have consistently found a relationship between student engagement and positive classroom outcomes such as attention and classroom performance (Ames, 1992; Carini, Kuh, & Klein, 2006; Kuh, 2003; Pascarella & Terenzini, 2005; Skinner & Belmont, 1993). Although fewer studies have addressed specifically cognitive development, some have found relationships between student engagement and problem solving, retention, and logic skills (Cooper, Cox, Nammouz,

Case, & Stevens, 2008). Others have found that students working closely with a diverse group of peers are more likely to experience gains in the development of need for cognition (Goodman, 2011; Loes, 2009).

Although research generally supports the importance of collaboration in the learning process, Arum and Roksa (2011) pointed out that collaboration may not always be effective at generating critical thinking gains. Students must think deeply about content and interact in meaningful ways for effective collaboration to occur. Unfortunately, some faculty members are not always skilled at assigning and managing the student collaboration process. The positive effects of cooperative learning may be unrealized if students merely divide work among members and forgo the group elaboration process. Effective cooperative learning efforts must be well-designed and implemented, with structured interactions and clearly defined interdependence among members (Slavin, 1980).

As students work together in structured, cooperative teams, they discuss and process information, and thereby are more likely to experience gains in cognitive development than students who work in isolation from each other (Pascarella & Terenzini, 2005). The collective social process of learning together through debate and discussion allows individuals to develop higher mental functioning (Vygotsky, 1978). Students' cooperative efforts in the learning process are based on social constructivist theory, whereby students construct knowledge as they attempt to fill gaps that social interactions with other students uncover. Such gaps are discovered as students work together and recognize differences in their own knowledge and beliefs. These differences motivate individuals to bridge the knowledge gaps between themselves and their peers. Effective teachers often require that students work in groups, which tends to enhance students' learning motivation (Chickering & Gamson, 1987). These student interactions become an important part of the learning process.

As more students engage in online learning, however, the benefits associated with group processing have become harder to achieve. A primary challenge of online learning is the difficulty creating student face-to-face interactions that may help facilitate cooperative learning. Without face-to-face interaction, online students may be less likely to recognize gaps in knowledge between themselves and other students (Palloff & Pratt, 2010)—a critical component of cooperative e-learning. If online students are unable to work cooperatively and recognize these knowledge gaps, they may not engage in the social construction of knowledge, which could result in reduced cognitive development gains (Palloff & Pratt, 2010). Reductions in cognitive gains are not necessarily inherent with online classes; however, online educators, as well as educators in any other delivery format, must be diligent in ensuring the possibility for collaboration among students and faculty.

Student–faculty and student–student interactions are important elements in creating a culture of student success (Kuh, Kinzie, Schuh, & Whitt, 2010). Students often become motivated to learn when faculty members provide appropriate and timely feedback in response to students’ questions (Chickering & Gamson, 1987). Additionally, when students interact with faculty outside of class, they are challenged to think and apply what they have learned; such interactions are crucial to the students’ intellectual development. Students working collaboratively with others to solve problems further improve the learning process (Chickering & Gamson, 1987). Communicating one’s own perspective and evaluating other students’ perspectives serve to reinforce concepts presented by the instructor. These student and faculty interactions help create a more dynamic and active classroom environment conducive for student learning (McKeachie, 1999).

Definitions

Throughout my thesis, I make reference to a variety of instructional terminology. In some cases, researchers and educators have used these terms interchangeably in the

literature, or they have defined these terms more broadly or narrowly. The following definitions will guide the reader toward understanding my interpretation and application of these terms.

1. Collaborative learning occurs when students work together to achieve individual goals (Bruffee, 1999; Panitz, 1997). Collaborative learners generally work in teams, but are not necessarily working interdependently toward group goals.
2. Cooperative learners work in small groups trying to achieve shared rewards that are measured on the overall group performance (Slavin, 1980). Key characteristics of cooperative learning are group members' interdependence in the teaching and learning process, and the highly structured group processes.
3. In my study, cooperative learning refers to a hybrid of collaborative and cooperative learning. The research design and the definitions used by the Wabash National Study on Liberal Arts Education (WNSLAE) shaped my definition, where investigators defined cooperative learning by the following four characteristics:
 - a. Students teaching each other
 - b. Faculty encouraging students to work in groups outside of class
 - c. Participation in study groups outside of class
 - d. Working on projects with other students outside of class

Although these four variables fall within the context of cooperative learning, they also fit generally within the context of collaborative learning. My interpretation of cooperative learning is based on the concepts that students teach each other and work together on projects in highly structured groups, indicating more group interdependence and structure than is typically associated with collaborative learning. I display my interpretation of cooperative learning on a matrix in Figure A1 (see Appendix A), which highlights group interdependence and the degree of group structure as the two most relevant conceptual differences between cooperative and collaborative learning for the

purpose of my study. As Figure A1 shows, the cooperative learning measure I use falls more toward the interdependent, structured quadrant of the spectrum. Therefore, cooperative learning, as referred to in this thesis, implies a larger degree of group interdependence and group structure than collaborative learning generally requires. Typical applications of collaborative learning more likely would fall into the lower right quadrant of the model, suggesting less structure and interdependence.

Using longitudinal data from WNSLAE, I evaluated the relationship between cooperative learning and the development of need for cognition among first-year college students. I used ordinary least squares (OLS) regression to account for potential confounding factors—such as organizational characteristics, student background characteristics, classroom experiences, other college student experiences—that may influence the relationship between cooperative learning strategies and the end of first-year need for cognition. In addition, I evaluated whether the net effects of cooperative learning on the development of need for cognition are conditional on a student's full-time status, academic enjoyment, ACT score, race, pre-test score of need for cognition, and the focus on liberal arts coursework in the first year. By evaluating interaction effects, I determined if any of the aforementioned sub-categories were affected differently upon exposure to cooperative learning. Previous research studies (e.g., Loes, Pascarella, & Umbach, 2012) have determined that race and ACT scores significantly moderate the development of critical thinking skills. I chose to run these interaction tests to compare need for cognition changes across sub-groups to determine if differences exist based on pre-college characteristics.

I used a secondary data set, so I was limited to using the cooperative learning measure in the WNSLAE data, which does not distinguish clearly between cooperative learning (a highly structured, interdependent process) and collaborative learning (a broadly defined term for students working together). WNSLAE investigators define cooperative learning as the degree to which students work together on group projects and

study together outside of class. Although these are components of cooperative learning, ideally, I would have defined cooperative learning more closely based on interdependence among group members, and the degree of group structure which links more closely with my research interests. This study cannot be generalized to all types of schools because investigators did not randomly select institutions from the population of schools to participate in the study, and investigators deliberately oversampled from liberal arts schools. Nevertheless, this study provides insights into good teaching practices at all types of institutions. Because the study is longitudinal, attrition occurred between the initial assessment and the follow-up assessment.

I organized this dissertation into five chapters. In this first chapter, I discuss the need for further research on the factors affecting the cognitive development of college students, especially the role that cooperative learning might play in helping students develop need for cognition. In Chapter II, I review the literature on cooperative learning and cognitive development among college students and identify potential gaps in the literature. Chapter III explains the research methodology I employed to test my hypothesis, including a definition of variables and assumptions. Chapter IV contains the results of my study, and I discuss the implications of my conclusions in Chapter V.

CHAPTER II

LITERATURE REVIEW

Cooperative learning is a teaching method that uses small groups working together to maximize the learning potential of each group member (Johnson, Johnson, & Smith, 1991). The cooperation among students creates interdependence which may lead to increased motivation and cognitive processing. Collaboration among students in the learning process is a fundamental principle of effective undergraduate teaching (Antil, Jenkins, Wayne, & Vadasy, 1998; Astin, 1993; Chickering & Gamson, 1987; McKeachie, 1999; Pascarella & Terenzini, 2005; Tinto, 2003). Studies have shown that cooperative learning influences gains in personal development, understanding the sciences, appreciating art, and improving analytical skills (Cabrera et al., 2002). Cooperation may include learning communities, peer study groups, or class project teams. Cooperative learning's basic premise is that students construct knowledge through interaction with other students (Johnson et al., 1991). In such cases, students work together to fill individual gaps that instructors may not recognize. The most critical element of cooperative learning is that students must work together to achieve common interdependent goals (Johnson et al., 1991). Such goals require each student to achieve individual goals in order for other students to achieve their own goals. Instructors who use cooperative learning should design activities and assignments that require students to rely on each other to complete the work. The interdependence of group members provides the advantage of cooperative learning over more traditional group discussion approaches.

Cooperative approaches to learning are not new concepts to teaching and date back to the nineteenth century (Greene, 1986). Colonel Francis Parker (1837–1902), known as the father of the Progressive Movement in education, began working with teachers in the Cook County Normal School to encourage shared work among students. He felt the competitive nature of education was stifling children's creativity. Parker

sought to democratize education by encouraging shared rather than competitive work. Shared outcomes, as opposed to competitive grades, are critical to successful implementation of cooperative learning.

As stated earlier, faculty members often use cooperative and collaborative learning techniques interchangeably. In general, cooperative learning is more structured than collaborative learning. Cooperative learning generally consists of five primary components: (a) positive interdependence, (b) face-to-face promotive interaction, (c) individual accountability, (d) social skills, and (e) group processing (Johnson et al., 1991). Essentially, cooperative learning occurs when students positively work together to achieve group goals. Johnson et al. (1991) suggested that social skills and the promotion of positive interaction contribute to the success of cooperation among group members. Therefore, some students may be better suited to cooperative learning based on their ability to work with others.

The use of positive interdependence in learning environments may improve group achievement through emphasis on rewards, motivation, and improved understanding of role activities (Nam & Zellner, 2011). Positive interdependence describes the degree to which group members are motivated to help each other succeed (Johnson et al., 1991). Within groups, positive interdependence leads to positive conflict management, which improves group cohesiveness and effectiveness (Deutsch 1977; Janssen, Vliert, and Veenstra, 1999). Through positive interdependence, group members are likely to focus on larger, positive group goals, and isolate conflict to the task at hand rather than conflict between group members. The face-to-face interaction among group members enhances the effectiveness of positive interaction because students encourage and challenge each other to achieve group goals, and help each other through feedback and support (Johnson et al., 1991).

Individual accountability is critical to the success of cooperative learning because it makes everyone personally responsible to the other group members. Such personal

accountability helps build a strong sense of community. Essentially, group members become only as strong as the weakest member, which increases individual desire to help others, and to keep up personally with the group. Therefore, group success should be based on a compilation of scores by individuals, thus placing relevance on each student's output (Slavin, 1980). This interdependent approach calls for more individual responsibility than typical collaborative group processes, which may simply divide responsibilities. Group assignments potentially allow for one group member to submit a collective response, which could compensate for weaker members of the group. In such cases, the strongest group member is likely to make up for deficiencies of weaker group members, who subsequently fail to learn. As group members perceive more inequity, satisfaction decreases and conflict increases (Wall & Nolan, 1986).

Group processing requires members to exhibit effective interpersonal communication and group skills. Effective cooperative learning requires that members exhibit social skills appropriate for small group interaction (Johnson et al., 1991). Therefore, groups help students develop trust and respect through positive, face-to-face interactions. Such strong social skills enhance a group's ability to achieve the benefits of cooperation. Group members who are not socially skilled in group communication may inhibit the collaborative efforts of the group because they are less able to communicate and collaborate with other members. When strong individual skills are evident in all members, the group is better able to achieve the goal of effective group processing, because each member is able to communicate and contribute to the group (Morgeson, Reider & Champion, 2005). Group conflict often inhibits groups from reaching consensus, and might erase the positive impact of collaboration if the conflict is based on personal differences. Group members who are strongly connected socially are more likely to engage in task-related conflict, which results in higher cognitive complexity (Curseau, Janssen, & Raab, 2011). Group members who focus on interpersonal conflict are less likely to engage in task-related conflict, which may result in reduced cognitive

complexity. Group processing occurs best when members are able to reflect on group processes, which results in improvements in group functioning (Johnson et al., 1991). Strong group reflection is more likely to occur when group members have built trust, shared equal responsibility, have respect towards each other, and are positively motivated to achieve group goals. Group reflection stimulates growth and improves group effectiveness, ultimately leading to improved student learning.

As more adult students enter college classrooms, adult educators are shifting their instructional methods from teacher-centered pedagogy to learner-centered andragogical approaches (Merriam, 2001). Teacher-centered classrooms rely on a pedagogical style in which the instructor transmits knowledge to the students (Knowles, 1970). In such cases, the student is highly dependent on the instructor for learning. In andragogical classrooms, by contrast, instructors serve as learning facilitators rather than the sole knowledge source. The student becomes the focal point rather than the teacher, a technique that researchers have shown to improve thinking skills (Knowles, 1970; Tinto, 1997). Therefore, learner-centered classroom environments are more likely to elicit higher order thinking gains than teacher-centered classrooms (Peterson & Walberg, 1979). In learner-centered classrooms, students are more likely to work interdependently, which requires them to help each other in the learning process. The act of helping others and learning through interaction with others creates interdependence between students, which may lead to an increased desire for cognitive growth. Holtham, Melville, and Sodhi (2006) found that interdependent groups performed much more effectively than students who simply allocated work evenly among members. The key to interdependence is students relying on each other for learning, and success depends on group members learning from each other. Of course, faculty must carefully design groups to create appropriate interdependence based on abilities and interests. By doing so, students are able to realize the benefits of working cooperatively toward solving problems.

Benefits of Cooperative Learning

Cooperative learning is a teaching strategy that requires small student groups to work interdependently on learning activities in order to achieve and receive group rewards or recognition (Slavin, 1980). The primary benefit of cooperative learning is that students may learn better when they work together because they are held accountable to each other. Reciprocity and cooperation, which are two of Chickering and Gamson's (1987) seven principles of good practice in undergraduate education, are core components of cooperative teaching. Learning is enhanced when students collaborate with others and when they discuss multiple perspectives. Another advantage of cooperative learning is that it allows for simultaneous teaching approaches for multiple audiences and student levels (Antil et al., 1998). For instance, high achieving students may assist low achieving students, resulting in deeper learning for both. Students who teach other students must integrate and verbalize knowledge, which may deepen the learning process. Students who learn from other students may be less threatened by their lack of knowledge and, therefore, more comfortable asking questions from a fellow student rather than a professor. Furthermore, problem solving and verbalization are keys to the development of student critical thinking skills (McKeachie, 1978) and are also integral to the cooperative learning process. An effectively designed, cooperative group solves problems through interactive discussion among members. Therefore, cooperative learning approaches may lead to the development of need for cognition, by helping students enjoy the process of learning together.

Characteristics of Cooperative Learning

Cooperative learning's distinguishing characteristics are the interdependence of group members in the learning process, and the degree of structure within groups. However, cooperative learning takes many shapes and may differ based on the instructor and grade level. The four primary approaches to cooperative learning include Teams-Games-Tournament, Student Teams Achievement Divisions, Jigsaw, and Small-Group

Teaching (Slavin, 1980). The Team-Games-Team approach divides the class into teams of four to five students, which are tasked with preparing the group for an academic competition. The goal is to get each team member ready so teams compete with similar teams, using all levels of ability within each team. The competition then matches students from each team with students of equal ability from other teams. This provides incentive for each team to assure that all members are prepared. The Student Teams Achievement Divisions approach uses the same team structure but measures performance based on quizzes. Individual students earn points for their team based on their own relative performance. The Jigsaw method uses similar teams, but it assigns specific content to individuals within each team. Students with similar content assignments work together, across teams, studying the same topic area. These individuals then return to their respective teams to teach their content specialty area to their teammates. Team scores are based on how well individuals taught their other team members. This method provides maximum individual accountability to the team, since team member grades depend on each individual teaching the content. The final method, Small-Group Teaching, allows students to work in small discussion groups, somewhat autonomously, preparing for a class presentation. Although this method provides flexibility in learning, it also has the least amount of individual and team accountability.

Studies show that some applications of cooperative learning are more effective than others. Formal approaches to cooperative learning are task-driven with specific learning objectives and pre-determined assignments (Johnson, Johnson, & Smith, 1998). Students are closely monitored, and the instructor assesses results and group processes. Formal approaches include significant group reflection on process. Informal approaches are generally temporary and are likely to have fewer group rewards and reflection. Some instructors use these groups to reinforce a particular element of a more traditional presentation. Cooperative base groups are long-term support groups designed to encourage students to work together for the duration of a course, providing support as

needed. With almost no interdependence, this structure does not achieve the benefits of the more cooperative approaches.

Perhaps the most effective form of cooperative learning is Sharan and Sharan's (1990) Group Investigation Model, which provides students with more control over the content and method of learning. In this method, groups identify the investigation topic and then determine the methods, roles, and group member responsibilities before making a formal presentation of findings to the class. This method maximizes individual and group accountability because students have complete responsibility for the project. The accountability gains result in improved interdependence among group members, which leads to improved group functioning.

Alternatives to Cooperative Learning

As stated earlier, some teachers mistake cooperative learning for collaborative learning because both types of learning involve students working together. Although the two concepts share a student-centered, discussion orientation, important distinctions exist between the two approaches. Collaborative learning, on the one hand, is characterized by students working together to achieve individual goals (Bruffee, 1999; Panitz, 1997). On the other hand, cooperative learning requires task interdependence while working toward shared goals (Johnson et al., 1991). Therefore, each member under a cooperative learning model has incentive to perform and to assure that other members perform as well. Collaborative learners work in teams but are rewarded for individual performance. Students benefit from interacting with each other, but unlike cooperative learning, there are no incentives to assure that each individual student succeeds. Therefore, weaker students in collaborative groups may be left behind, whereas cooperative teams are more likely to support them in achieving learning outcomes.

Active learning (Bonwell & Eison, 1991) is a broad concept of engaging students in higher order thinking and synthesis activities, and it encompasses both cooperative and collaborative learning. Active learning encompasses a wide range of activities designed

to involve students, such as small group discussion, group projects, and personal reflection (Astin, 1993; Chickering & Gamson, 1987; McKeachie, 1999; Pascarella & Terenzini, 2005). Similar to collaborative approaches, students benefit from active learning, but learning generally remains an individual activity rather than a shared responsibility because active approaches may lack structured interdependence.

Some instructors may assign students to group projects or classroom discussion groups, thereby incorporating partial elements of cooperative learning into their classrooms. Although these strategies have several positive outcomes, without interdependence between members, students may fail to achieve the full benefits of a well-designed cooperative learning approach. For instance, small group discussions provide opportunities for students to share ideas with each other. However, without group interdependence, students may not achieve the full benefits associated with accountability among members. Students may simply rely on the most competent student to complete the task for the entire group.

Effective Design of Cooperative Learning

The three distinguishing components defining cooperative learning are positive interdependence, individual accountability to the group, and group processing (Johnson et al., 1998). Positive interdependence involves students working together and providing positive support for each other's contributions to the entire group's learning outcomes (Brewer & Klein, 2006). When students feel the positive support of other group members, they are motivated to succeed and to help others succeed. Cooperative learning requires positive interdependence among group members to assure appropriate group commitment among members. Interdependence among group members leads to individual accountability to group goals. Students who are dependent on other group members develop a sense of commitment toward the group. Students engaged in cooperative learning tend to be more active in providing feedback and input into group projects and activities (Tsay & Brady, 2012). By doing so, students build strong group

dynamics and parameters, which contribute to effective cooperative learning (Johnson et al., 1998). Finally, group processing occurs when group members engage in reflection and analysis of group functions. This includes individual contributions, group role dynamics, and group output (Johnson & Johnson, 1994). The group reflection process builds commitment to group success and is one of the key elements of cooperative learning.

Cooperative learning is often used with younger students who are engaged in foundational learning and developing social skills (Bruffee, 1999). The group reflection and interdependent nature of cooperative learning reinforces some of the fundamental elements of pre-college education. Collaborative learning is more commonly associated with college level students, who are more likely to possess the fundamental group skills promoted through cooperative learning. More recently, cooperative learning has become widely accepted in college instruction (Johnson, Johnson, & Smith, 2007). The complexity of the college learning process is positively reinforced through the general principles of either cooperative or collaborative learning (Bruffee, 1999).

Theoretical Perspectives

Cooperative learning relies on the notion that students achieve more when they take personal responsibility for their own learning and when they work interdependently with others toward achieving shared group outcomes. As a result, students may gain appreciation for the learning process, potentially leading to increased need for cognition. This concept is consistent with a constructivist philosophy to education, which maintains that social interaction among students is the critical factor in cognitive development (Nyikos & Hashimoto, 1997). Constructivist theory includes both cognitive and social constructivist schools of thought. Cognitive constructivism is characterized by individual construction of knowledge as individuals interact with the world around them. The basis for this philosophy is that people respond and adapt individually to changes in their environment. Alternatively, social constructivism suggests that cognitive development is

the result of social interactions rather than individual adaptations (Vygotsky, 1978). Thus, students who work in cooperative teams collectively learn and adapt to environmental changes. Using a social constructivist approach, learners create their own sense of reality through their own interpretation of these experiences (Jonassen, 1991). Therefore, social constructivist theory supports the cooperative learning approach to education, which may lead to the development of need for cognition.

Cooperative learning is partially rooted in Jean Piaget's cognitive development theory, which suggests that people learn by adapting to changes in their environment (Wadsworth, 1971). Cognitive development theorists contend that as students are presented with new information, they assimilate or accommodate the information relative to existing knowledge (Block, 1982; Piaget, 1976). The cognitive development process includes "maturation, experience, social interaction, and equilibration" (Wadsworth, 1971, p. 118). Maturation describes the growth that occurs when a student reaches a specific age or life stage. Experience is students' interaction with the environment surrounding them. Social interaction describes the socialization process that occurs when students share experiences. Equilibration occurs when students combine maturation, experience, and social interaction to create a sense of understanding. Students progress through each of these four stages during the learning process. Similar to a social constructivist theory, new information may be discovered as a result of interaction with others and recognizing differences in knowledge between each other. However, cognitive constructionists resolve those differences using an internal process rather than a group process associated with social constructivism. Cognitive constructivism is consistent with objectivist learning theory, which is characterized by a defined reality independent of individual interpretation (Jonassen, 1991). Inconsistent with cooperative learning methods, the objectivist approach assumes learning is designed to strive for understanding of a well-defined reality rather than finding self-defined meaning.

The social constructivist approach tends to be more consistent with cooperative, student-centered forms of learning, while the objectivist approach seems to fit a more traditional, teacher-centered approach. Cooperative learning efforts contribute to the knowledge construction because when students collaborate, they recognize differences between themselves and others, which create internal conflict with previously held beliefs (Johnson et al., 1998). These social interactions then stimulate a desire to reconstruct reality to establish a new equilibrium based on the new knowledge gained from the interactions (Vygotsky, 1978). This reconstruction process serves as the foundation for group interaction and provides valuable positive reinforcement during the cooperative learning process, which in turn may lead to enjoyment of cognitive processes.

Positive reinforcement is consistent with positive interdependence theory, which stems from social interdependence theory. The social interdependence perspective is based on Gestalt psychologist Kurt Koffka, whose work focused on a holistic notion of groups functioning with varying degrees of individual interdependence (Johnson & Johnson, 2009). Koffka claimed people's views were based on the idea that human events were connected to a larger whole rather than merely isolated occurrences. Thus, any change by an individual group member impacts the entire group and each individual within the group. This helps explain why the design of cooperative groups is critical to the learning process. The interdependence between group members shapes the outcome of the group depending on the degree of interdependence, the task at hand, and the group's cohesiveness. Therefore, cooperative groups perform better with clearly defined goals and activities that build group cohesiveness.

Positive interdependence theory claims that individual success depends on others' success (Deutsch, 1962, Johnson et al., 1991) and that group members who work together encourage each other to learn (Johnson et al., 1998). Thus, positive interdependence promotes and rewards cooperation among group members, a fundamental element of cooperative learning. Cooperation within groups tends to improve productivity due to

group pride and harmony resulting from achieving common goals (Deutsch, 1949). Positive interdependence can result from students who fear they will let others in the group down, or from students who thrive on helping others succeed. Deutsch advanced Kafka's social interdependence theory by suggesting that groups and group members can improve performance through the addition of positive interdependence among group members.

Negative interdependence is the opposite of positive interdependence, and presumes that achieving individual goals is dependent on other members of the group failing to achieve their own individual goals. Negative interdependence is often a result of too much internal competitiveness, which could lead to hostility and insecurity among group members who are driven to succeed at the expense of other group members (Johnson & Johnson, 2009). As group members compete for limited degrees of success or power, negative interdependence may cause members to undermine each other, which subsequently undermines group goals. This competitiveness is consistent with more competitive approaches to education that only reward individual efforts. Effectively designed group goals and rewards reduce negative interdependence by eliminating personal gains which result from too much emphasis on individual success.

Interdependence among group members takes many different shapes. Morton Deutsch (1982) identified five distinct dimensions of interdependence:

1. Cooperative–competition reflects the atmosphere surrounding the nature of the task. For instance, one should expect a marriage to be more cooperative, while political tasks may be more competitive.
2. Power distribution influences the degree of true group cooperation rather than cases of group submission. One is less likely to expect open cooperation when one or more group members have real position power over other members.

3. Task-oriented versus social-emotional. This reflects the degree of personal feelings driving the engagement process such as interaction among family and friends versus interaction among co-workers or teammates.
4. Formal versus informal. Informal groups, like families, may have loosely structured norms, while formal groups like work-related committees may have well-defined goals and norms driving group interaction.
5. Intensity or importance. This indicates the degree of relevance for the group decision process. Even within formal groups, some decisions are more intense than others, which will impact the degree of interdependence.

These five dimensions contribute to shaping the relative degree of interdependence within groups. For instance, groups that are more cooperative with high social-emotional content may result in deeper commitment to each other, while more competitive groups may tend to focus on differences between members, which leads to group conflict (Deutsch, 1982). High social-emotional content may distract the group from achieving task-oriented goals and engaging in necessary task-related conflict. The effects of cooperative learning are strongest when group participants feel socially obligated to each other, and each individual's success is equally important.

Behavioral learning theory also explains some of the primary benefits of cooperative learning, where students are motivated to succeed based on either reward or punishment (Johnson et al., 1998; Skinner, 1938). As such, cooperative learners may be motivated to achieve group rewards in addition to individual recognition. An individual's perceived self-efficacy impacts his or her effort and persistence on a learned behavior (Bandura, 1977). The behavioral learning perspective recognizes that people are motivated to achieve positive rewards and avoid negative outcomes from failure. Cooperative learning encourages group members to provide both positive and negative outcomes that reinforce individual behavior. As individuals achieve goals, cooperative groups offer the necessary rewards to reinforce positive behavior. Alternatively, if an

individual does not achieve his or her goals, group members may provide negative feedback, creating motivation for the individual to avoid future negative consequences.

Cooperative approaches to learning compare favorably with feminist pedagogy, where students become empowered as they work together to construct knowledge, rather than relying on an authoritative figure (Sandell, 1991) often prevalent in traditional education. Each student has a right to contribute an opinion, thereby contributing to a learning environment built upon input from students rather than solely through the instructor. As students contribute to the class, they become more empowered and motivated to learn. This approach reflects a student-centered teaching approach rather than the traditional teacher-centered approach.

The primary theoretical foundation of cooperative learning lies within social constructivist, positive interdependence, and feminist pedagogical theories. Cooperative learning encourages students to work interdependently toward shared goals, which is fundamental to feminist pedagogy. This process allows for social construction of knowledge as students work together to resolve individual differences in understanding. This resolution process encourages students to learn interdependently through both positive and negative reinforcement.

Applications of Cooperative Learning

Much of the cooperative learning literature focuses on the short-term impact on student learning rather than on long-term cognitive development. Additionally, many studies focus on the application of cooperative learning within particular disciplines. Studies on cooperative learning typically consider outcomes such as classroom achievement or standardized test scores. For instance, Jalilifar (2010) compared differences in reading comprehension between English language learners in conventional classrooms instruction and student teams, a cooperative learning environment, and found that student teams achieved significant improvement in performance on a standardized English language proficiency test. Bowen (2000) found similar results when he evaluated

cooperative learning in the fields of science, technology, engineering, and math (STEM). Although insightful, these outcomes may not capture fully cooperative learning benefits (Slavin, 1980). Standardized test scores and individual performance measures are typically associated with teacher-centered classrooms, as opposed to measures used in student-centered, cooperative classrooms (McKeachie, Pintrich, & Lin, 1985). Unlike previous studies, this study considers the impact of cooperative learning on broader cognitive gains.

An exception is Quitadamo, Brahler, and Crouch's (2009) study in which they evaluated the impact of peer-led teams on critical thinking in undergraduate science courses. Although isolated to math and science students, the study supports the hypothesis that cooperative learning leads to gains in critical thinking. Quitadamo et al. (2009) used the California Critical Thinking Skills Test (CCTST) as the outcome measure, and determined that science (but not math) students who worked in the peer-led teams showed gains in critical thinking and academic performance compared to students who did not participate in a peer-led team. Further evidence, however, is needed to support this conclusion.

The success of cooperative learning partially depends on the faculty's motivation and ability to execute effective group and instructional design. Poor execution undermines the positive benefits of cooperative learning. Some faculty may lack the skills or confidence to implement such a de-centralized approach to teaching. Abrami, Poulsen, and Chambers (2004) identified possible resistance factors preventing teachers from adopting cooperative approaches. Generally, they found that teachers who were more confident in their own ability to implement cooperative learning were more likely to use this method of learning. Teachers with less confidence in their ability to engage students were more likely to fall back on teacher-centered approaches.

Studies connecting the cognitive development gains associated with cooperative learning may help convince faculty to use this approach in their classroom delivery. For

instance, studies show that cooperative learning enhances communication, teamwork, and accountability in physical education students (Dyson, Griffin, & Hastie, 2004).

Karabenick and Collins-Eaglin (1997) sought to help faculty by evaluating student learning strategies to help determine appropriate teaching approaches given desired learning strategies of students. The study concluded that classes that emphasized collaboration were more likely to have students engage in higher order learning activities of elaboration and critical thinking than classes that emphasized individual performance measured by grades.

Learning Communities and Cooperation

Outside the Classroom

Learning communities provide another dimension to the cooperative approach to education. Such communities may span multiple classes and academic years, or might be concentrated in one particular class (Lenning & Ebbers, 1999). The four types of learning communities include curricular, residential, classroom, and student-type. Each type provides a unique structure that allows students to work together to achieve academic goals. Classroom learning communities provide the most direct avenue for collaboration though, because faculty members are able to assign and monitor group processes.

Residential learning communities provide convenient proximity for learners, but may lack the structured interdependence that classroom activities provide. The research is mixed regarding the impact of these residential learning communities on critical thinking. Some argue that learning communities may improve problem solving, collaboration, and teamwork skills, while improving faculty collaboration with students (Dodge & Kendall, 2004). However, little empirical evidence exists to support this claim. Borst (2011) was unable to find statistical significance in his study of the impact of living learning communities on critical thinking. Although evidence does not support a direct relationship between learning communities and critical thinking, some have found that learning communities have a positive general effect on college student outcomes. Using

broad standards of evaluation, Zhao and Kuh (2004) found that participation in more broadly defined learning communities had positive outcomes in nearly all measures including academic performance, knowledge, and overall satisfaction. Collaboration among students might better suit today's learning environment due to the emphasis on teaching responsible citizenship (Cross, 1998). Traditional education was designed for workplace readiness, while collaborative approaches work better under the service learning epistemology.

As learning communities demonstrate, the benefits of collaboration among students are not limited to the classroom. A positive correlation exists between cooperative learning and student achievement as well as personal and social development (Johnson et al., 1991). Researchers have shown that cooperative learning positively impacts students' openness to diversity (Cabrera et al., 2002). In their study of more than 2,000 second year college students, Cabrera et al. (2002) found that cooperative learning helped motivate students towards gains in personal development, openness to diversity, and analytical skills. Although not directly stated, these outcomes support the development of critical thinking skills. Interacting with people from another racial or ethnic background positively influences students' aesthetic appreciation, a component of critical thinking (Kuh, Douglas, Lund, & Ramin-Gyurnek, 1994). Diversity experiences also have a positive effect on critical thinking skills in low-achieving and white students (Loes, 2009). Loes's (2009) longitudinal study of more than 4,500 college students demonstrated that interaction with diverse students had significant impact on the development of critical thinking skills.

Although studies show student collaboration having a variety of positive outcomes, more research is needed to determine whether student collaboration directly impacts students' cognitive development including need for cognition. Only a few studies directly analyze the relationship between cooperative or collaborative learning and cognitive development. The nascent literature supports the claim that students engaging

in cooperative learning groups tend to develop and practice better problem solving skills than those who are not participating in cooperative learning (Pascarella & Terenzini, 2005; Qin, Johnson, & Johnson, 1995). The difference may lie in the relationship between learning goals and incentive structures associated with cooperative learning strategies. Students working in collaborative groups are less concerned with grades and more focused on higher order learning strategies than students working individually (Karabenick & Collins-Eaglin, 1997). Students working collaboratively with other students benefit from the variety of perspectives and student experiences within the student groups (Tinto, 1997). These experiences allow students to make stronger connections to course information. Students also report increased perceptions of intellectual development. Individuals were likely to retain their problem-solving gains upon completion of group activities, suggesting long-term positive gains in cognitive behavior (Cooper et al., 2008).

Using the WNSLAE, Padgett et al. (2010) found that meaningful discussions with diverse peers significantly impacted a student's development of need for cognition. Previous studies found a positive correlation between classroom interactions among students and the development of critical thinking skills (Skon, Johnson, & Johnson, 1981; Smith, 1977).

Need for Cognition

A variety of constructs are available to define cognitive development in students, including critical thinking, reflective judgment, reasoning, and decision making (Brookfield, 1997; King & Kitchener, 1994). Need for cognition is a measure of a person's enjoyment of and tendency to participate in cognitive activities (Cacioppo & Petty, 1982). Students possessing a high need for cognition are more likely to search for information and create personal meaning through higher order thinking. They feel a dissonance when something does not fit into the world they have constructed. People with high need for cognition enjoy evaluating multiple perspectives, which leads to

ongoing learning. Those with low need for cognition are more likely to rely on the opinion of others and are less likely to evaluate multiple perspectives (Cacioppo & Petty, 1982; Cohen, Stotland, & Wolfe, 1955). These people are less open to change or hearing other perspectives.

Need for cognition reflects the desire individuals tend to have to organize new information into a personal meaning (Cohen et al., 1955). When people fail to integrate new information into existing paradigms, they experience a desire to integrate new information into existing meaning in order to resolve this conflict. The strength of this need depends on the individual's ability to tolerate varying degrees of ambiguity. People with high need for cognition generally enjoy thinking about challenging issues, and particularly enjoy complex and ambiguous problems (Cacioppo & Petty, 1982). Those who enjoy the thinking process tend to elaborate on incoming messages more thoroughly than those with low need for cognition. The Elaboration Likelihood Model (Petty & Cacioppo, 1986) indicates that those with high need for cognition are influenced by communication that is central to the primary argument, because they think more carefully in processing information. Conversely, those with low need for cognition are influenced more by peripheral routes to persuasion, resulting in more superficial evaluation of incoming information. Thus, the elaboration process in those with high need for cognition is strongly correlated with better academic performance (Petty & Cacioppo, 1986). According to McKeachie et al. (1985), students engaging in elaboration processes tend to increase their motivation to learn, indicating that the use of elaboration influences a student's desire to continue elaborative processes throughout life.

A study of 51 undergraduate students at Auburn University found that participants who scored high on the need for cognition scale were more likely to perform better academically than those with low need for cognition (Sadowski & Gülgös, 1996). The differences were a result of increased elaboration of those with high need for cognition. Given this result, one might also assume that increased involvement on the learner's part,

through group interaction, would lead to higher degrees of elaboration and improved need for cognition. Nair and Ramnarayan (2000) also concluded that positive scores on the need for cognition scale were strongly associated with an individual's complex problem-solving ability. The authors also suggested that constructivist learning approaches develop students' need for cognition. Mayhew, Wolniak, and Pascarella (2008) found that students' need for cognition evolves over time and is influenced by positive group interactions among peers with multiple perspectives.

No studies were found that directly measured the impact of cooperative learning on need for cognition, but several suggested a relationship between peer interaction and the development of critical thinking. Diversity experiences through peer interactions have positive influences on students' development of need for cognition, particularly among black students (Goodman, 2011). Peer interaction may influence the development of need for cognition more than student-faculty interactions. Diversity experiences also influence the development of critical thinking skills (Loes, 2009). Some studies have shown that students working together in collaborative learning groups develop better critical thinking skills than students learning from a lecture approach (Gokhale, 1995; Tiwari, Lai, So, & Yuen, 2006).

Summary

The literature on cooperative learning is somewhat limited, because much of the research is focused on broader concepts of collaborative and active learning. Although the benefits of collaborative and active approaches to education are well documented (Bruffee, 1999; Chickering & Gamson, 1987; Panitz 1997), the unique advantages of cooperative learning warrant further research. Positive interdependence, individual accountability, and group processes create a stronger learning dynamic than less-structured group activities (Deutsch, 1962; Johnson et al., 1998; Slavin, 1980). Several studies supported the value of cooperative learning in online environments, while others

evaluated the application in specific disciplines such English as a second language and STEM disciplines such as math and science.

Little research exists supporting the idea that cooperative learning positively influences cognitive development, specifically critical thinking and need for cognition. Some studies show that meaningful discussions among diverse peers influence the development of need for cognition among college students (Goodman, 2011; Loes, 2009; Padgett et al., 2010). Others have found a strong correlation between need for cognition and higher degrees of elaboration, but these studies have not drawn conclusions regarding the impact of elaboration on cognitive development. Results are mixed regarding the impact of learning communities on cognitive development. Although one study claimed causality between cognitive skill development and collaborative teaching methodology (Mayhew et al., 2008), other studies have been less conclusive about this causal relationship.

No research is available demonstrating moderating effects of pre-college variables between cooperative learning and the development of need for cognition. However, Loes et al. (2012) showed that the net effect of diversity experiences on critical thinking differed significantly based on race and academic preparation. Goodman (2011) also found that race moderated the effects of diversity experiences on the development of need for cognition. Although these cases do not provide direct links between need for cognition and cooperative learning, the results warrant further investigation.

Conceptual Model

The conceptual model for this study is based on Pascarella's (1985) General Causal Model for Assessing the Effects of Differential Environments on Student Learning and Cognitive Development (see Figure A2, Appendix A) and on Astin's (1970a, 1970b, 1993) input-environment-output (I-E-O) model. Astin's I-E-O model maintains that the impact of a student's college experience is a function of (a) the student's pre-college characteristics at the time of college entry, and (b) the college

environment surrounding his or her academic and social experiences. The interactions of the pre-college characteristics and the college environment determine the outcome or impact on students while they attend college. Pascarella's (1985) General Causal Model is particularly useful for this study because the model accounts for appropriate categories of variables that impact college student learning and cognitive development. This model provides an appropriate structure to demonstrate that cooperative learning leads to higher order cognitive gains, because the data provide two measures of need for cognition: one prior to entering college and one after the first year of college.

Pascarella's (1985) General Causal Model (see Figure A2) identifies five categories of variables influencing learning and cognitive development: (a) institutions' structural/organizational characteristics, (b) students' background/pre-college traits, (c) institutional environment, (d) interactions with socialization agents, and (e) quality of student effort. In this model, structural and organizational characteristics as well as student background traits influence the institutional environment and interaction with socialization agents. Students' interaction with socialization agents, the institutional environment, and their background characteristics influence their quality of student effort. Student background characteristics and institutional characteristics indirectly influence learning and cognitive development.

The study's goal was to explore whether participation in cooperative learning activities resulted in significant changes in the development of need for cognition among first-year college students. To demonstrate this assertion, I developed a conceptual model based on previous research on the impact of college on student cognitive development (see Figure A3, Appendix A). This research indicates that factors influencing students' cognitive development generally fall into the following categories: a school's organizational characteristics, student background and pre-college traits, academic experiences, and non-academic or social experiences (Astin, 1993; Chickering & Reisser, 1993; Kuh et al., 2010; Pascarella, 1985). I chose predictor variables based on previous

research of cognitive outcomes including need for cognition, openness to diversity, and critical thinking (Goodman, 2011; Loes, 2009; Mayhew et al., 2008, Padgett et al., 2010; Tiwari et al, 2006).

As shown in Figure A3 (Appendix A), an individual's background characteristics influence the type of institution a student chooses, such as a liberal arts college or a research university. These background characteristics, along with the college choice, influence students' academic and social experiences and directly influence the development of need for cognition. Academic experiences, including engaging in cooperative learning, taking courses in the liberal arts, the number of hours spent studying, and the quality of interaction with faculty outside of class, ultimately influence the development of need for cognition. Social experiences, such as campus leadership, also influence students' development of need for cognition.

CHAPTER III

DATA AND METHODOLOGY

Funded by the Center of Inquiry in the Liberal Arts at Wabash College, the WNSLAE is a multi-institutional, longitudinal, college-student study designed to evaluate teaching practices, programs, and structures supporting liberal education (Wabash College, 2013). The WNSLAE includes a sample of 19 institutions based on various student enrollment sizes, demographics, geographic locations, and academic selectivity (Wabash College, 2013). Of the 19 schools selected, two are community colleges, 11 are liberal arts colleges, and six are regional and research universities. The selection of these schools reflects the study's liberal arts orientation, while maintaining a cross-section of many different types of institutions. Since liberal arts schools emphasize good practice in liberal education more than other types of schools (Pascarella, Wolniak, Cruce, & Blaich, 2004), the study's over-representation of liberal arts schools may produce cooperative learning effects smaller than effects found from a representative sample of colleges and universities in the United States.

Participants in the WNSLAE study included 4,501 full-time, first-year students in Fall 2006. Investigators asked students to complete a longitudinal study that examined the impact of college on students, which would then help institutions improve the undergraduate experience. Investigators compensated students \$50 for completing the surveys which took approximately 90 minutes. The initial survey gathered information regarding demographic characteristics, educational achievement, family background, educational aspirations, and other background characteristics.

In addition to Fall 2006, 3,081 students completed a follow-up survey in Spring 2007, leading to a 68.5% retention rate. Again, investigators compensated students \$50 for their time. The follow-up survey was designed to collect information regarding student engagement and exposure to good practice in undergraduate education during the first year of college. For instance, students in the follow-up survey completed the

National Survey of Student Engagement (NSSE) and the WNSLAE Student Experiences Survey. The large universities selected a sample of students to complete the study, whereas smaller schools selected all students to complete the survey. This approach may have led to biased estimates because smaller schools were over-estimated in the sample. To make the sample more representative of the population, investigators devised a weighting scale for each institutional population based on sex, race, and ACT score. The weighting scale was used to make the sample look more like the population, but it did not adjust for non-response bias.

Variables

The independent variables for this study (see Table B1, Appendix B) are organized into four categories: student background and pre-college traits, school structural characteristics, academic experiences, and non-academic or social experiences. These variable categories are based on Pascarella's (1985) General Causal Model for Assessing the Effects of Differential Environments on Student Learning and Cognitive Development (see Figure A2, Appendix A).

The organizational/structural characteristic of the schools is based on the institutional types. These include research universities, liberal arts colleges, regional universities, and community colleges. I created a dichotomous variable to distinguish between liberal arts colleges=1 and other=0. Since students are nested within institutions, I adjusted for the nested nature of the data. In addition, I used a sample weight—based on sex, race, and academic ability—to reflect better the population.

Student background includes the pre-test for need for cognition score, gender, race, academic enjoyment, high school involvement, and ACT score. Investigators collected data from these variables at the beginning of the freshman year. I coded race as a dichotomous variable where white=1 and non-white=0. I aggregated non-white students because the total number of non-white respondents in the sample was only 20%, and there is little evidence in the literature suggesting specific racial differences in the

relationship between cooperative learning and the development of need for cognition. Gender is a dichotomous variable with male=1, and female=0. Pre-college academic ability is a composite measure based on ACT, SAT, and Compass scores which each participating school provided directly. Investigators converted SAT and Compass scores into ACT scores. High school involvement is a 7-item scale (Cronbach's alpha = 0.58) measuring the degree to which students participated in high school, including studying with friends, socializing with friends, participating in community service, talking with teachers outside of class, involvement in extracurricular activities, studying by oneself, and using the Internet for homework and/or research. Academic enjoyment measures the extent to which the respondent thinks academic experiences will be the most enjoyable part of college.

I also controlled for students' need for cognition prior to college. Essentially, the pre-test score of need for cognition captures several factors students bring into college relating to the dependent variable, need for cognition. By including the pre-test score for need for cognition, I reduced the concern that this study missed significant background characteristics that could bias the results (Rivkin, Hanushek, & Kain, 2005). Need for cognition is an 18-item scale (alpha = 0.90) developed by Cacioppo, Petty, and Kao (1984). Need for cognition measures the degree to which one enjoys engaging in effortful cognitive activities. Students with high scores on this scale enjoy engaging in thoughtful activities and are better able to process and synthesize information than those with low scores.

The third category of variables, classroom experiences, includes the students' exposure to cooperative learning activities and the number of liberal arts courses taken during the first year of college. Cooperative learning is a four-item scale (alpha = 0.70) and is considered a best-practice in liberal arts education. The scale includes: (a) students taught each other in addition to faculty teaching students; (b) faculty encouraged study groups outside of class; (c) students participated in one or more study group(s) outside of

class; and (d) students worked with other students on projects outside of class. Liberal arts curriculum is a continuous variable that measures the number of courses taken in mathematics, humanities, natural sciences, and social sciences.

The fourth category of variables, other student experiences, includes the degree to which students engaged in leadership activities outside of class, the number of hours spent studying, the quality of relationships with faculty outside the classroom, and students' full-time status. Campus leadership is a dichotomous variable (yes=0 and no=1) representing whether a student held a leadership position in a student club, campus organization, residence hall, or fraternity/sorority. Hours spent studying is the typical number of hours per week preparing for class (e.g., studying, practicing, reading, and writing). Investigators measured this variable as an 8-point scale with categories ranging from 0 to 30 or more hours per week of study time. Quality of relationships with faculty is a continuous variable representing the perceived level of support faculty provides. Responses range from unavailable, unhelpful, and unsympathetic to available, helpful, and sympathetic. Student enrollment status is a dichotomous variable of whether the student enrolls part time (0) or full time (1).

The dependent variable is a student's need for cognition, assessed upon completion of the first year of college. Each of the 3,081 students who completed the survey in Spring 2008 was asked to complete the 18-item need for cognition instrument.

Missing Data

The first step in analyzing data was to deal with missing data. I initially attempted listwise deletion, which meant I deleted cases that had any missing data from the variables in my model. Listwise deletion is appropriate when the missing data are missing completely at random (Little, 1988). In such cases, the responses are not systematically different between those with missing information and those without missing information. A systematic difference between respondents with missing information and respondents with complete information may lead to bias results. Using listwise deletion, I would have

eliminated 58 respondents with missing information. Although small in number, I ran a multiple imputation model, which allowed me to use respondents with only partially missing information. Multiple imputation is a statistical method that combines results of several predicted distributions based on observed data (Sterne et al., 2009). I used 10 imputed data sets to account for uncertainty in estimating the missing values. This approach provided a least error estimate of missing data, while preserving all completed values from partially missing cases. I eliminated 15 cases without information of the dependent variable. The final sample size was 3,066 individuals who completed the surveys at time 1 and time 2.

Data Analysis

The WNSLAE study is longitudinal by design, which provides opportunity to estimate changes in a dependent variable over time. Including a pre-measure of need for cognition, in addition to other control variables, allowed me to estimate more confidently that need for cognition gains are a function of what students experience in college instead of what they bring with them to college (Padgett et al., 2010; Pascarella, Wolniak, & Pierson, 2003).

The next step was to design a model to test for significant effects of cooperative learning on end of first-year need for cognition. I used ordinary least squares regression (OLS) to estimate the effects of student background characteristics, structural/organizational characteristics of institutions, academic experiences, and other college student experiences on the end of first-year need for cognition. In model 1, I regressed the end of first-year need for cognition score on student background/pre-college characteristics. Model 1 helped to explain the degree to which student background/pre-college characteristics (gender, race, ACT score, high school involvement, and pre-college need for cognition) accounted for variation in end of first-year need for cognition. In model 2, I introduce structural/organizational characteristics of the institutions, while controlling for student background/pre-college characteristics. In

model 3, I added academic experiences (extent students engaged in liberal arts coursework and cooperative learning activities) while controlling all variables in models 1 and 2. Finally, model 4 introduced other college student experiences (campus leadership, hours spent studying, quality of student-faculty interactions, full-time status, and liberal arts curriculum) while controlling for variables from previous models.

After estimating main-effects models, the next step was to test for interaction effects of cooperative learning on the development of need for cognition by a host of pre-college indicators. Interaction effects exist when the impact of an independent variable on the dependent variable changes with the existence of another independent variable. For this study, I sought to determine if the impact of cooperative learning on the development of need for cognition differed by particular background characteristics. For example, do males develop more or less need for cognition as a result of their exposure to cooperative learning? Studies show race and prior academic achievement impact differently the effects of engagement on student outcomes (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008). Studies also show gender to influence differently the impact of good practices in undergraduate education on cognitive development (Cruce, Wolniak, Seifert, & Pascarella, 2006). I tested whether the impact of cooperative learning on the development of need for cognition differed by students' full-time status, academic enjoyment, ACT score, race, the focus on liberal arts coursework in the first year, and the pre-test score for need for cognition. I added each interaction term individually, then collectively to the main-effects model in order to determine if there were significant changes in variance (R^2). A significant increase in the R^2 value indicated the existence of interaction effects.

Correlations

Table B2 (see Appendix B) displays the correlations of each variable in my model. As the correlation statistic approaches +1 or -1, the relationship between the two variables becomes stronger. As the correlation statistic approaches 0, the correlation becomes weaker. Not surprisingly, the strongest correlation is between the pre- and post-

test for need for cognition ($r = 0.75$). ACT is also correlated with need for cognition ($r = 0.30$). Additionally, the four components of cooperative learning—worked together outside of class, study groups, student taught each other, and faculty encouraged groups—are moderately correlated with each other. The strongest correlation among these four components is the relationship between faculty encouraging study groups and students participating in study groups ($r = 0.60$), which is expected. When variables are strongly associated with each other, there is a risk of multicollinearity, which may change the size of the estimated coefficients (Kohler & Kreuter, 2009). I ran Variance Inflation Factors (VIF) test to measure for collinearity. A tolerance of less than 0.1 (or a VIF of greater than 10) is cause for concern. The mean VIF was 1.17, which indicates low levels of collinearity. Based on the analysis of the correlation matrix and the VIF test, multicollinearity was not a concern in my models.

Heteroskedasticity is an indication of uneven variance distribution within my model. I tested for heteroskedasticity using a visual inspection based on a residuals-versus-fitted-values plot. If the residuals plot is evenly distributed, then the model is homoskedastic rather than heteroskedastic. The residuals plot indicates the possibility for heteroskedasticity. I used the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, where the null hypothesis is that error variances are equally distributed or homoscedastic. The model indicates the existence of heteroskedasticity ($p < 0.001$) which may lead to inefficient standard errors. OLS regression assumes that error values are independent of each other and are identically distributed. I used a robust estimate of standard errors, which controls for the effect of heteroskedasticity by relaxing the assumptions of independent and identical distributions. The robust estimate does not change the coefficients, but provides an accurate p value (Hayes & Cai, 2007).

Outliers

I conducted several tests to determine the impact of outliers on my model. I ran an added-variable scatterplot of the residuals of each independent variable against the

dependent variable. This analysis uncovered several outlying cases. I then ran a test on studentized residuals, which limits the standard deviation of residuals to 1. Studentized residuals exceeding +2 or -2 should be noted, and studentized residuals exceeding +3 or -3 are cause for concern (Chen, Ender, Mitchell, & Wells, 2003). I found 144 cases where the studentized residual exceeded +2 or -2, and 25 cases where the studentized residual exceeded +3 or -3. I then examined leverage to determine if any observations could influence the coefficient estimates. Leverage reflects the distance between the observation and the mean. The further the observation is from the mean, the higher the leverage of a particular case. However, leverage is not problematic unless the case is influential (Chatterjee & Hadi, 2006). An observation is determined to be influential if the existence of that observation changes the model's prediction. If the observation is omitted and the prediction does not change, then the observation is not influential. Based on Belsley, Kuh, and Welsch (1980), I found 25 cases with potentially high leverage. Finally, I ran a leverage versus residual squared plot to determine the potential impact of each outlier. This analysis revealed that the 25 cases with high leverage had small residuals, which means they had little influence on the regression coefficients. Conversely, I found one case with a high residual but low leverage. Based on this analysis, I did not see cause for concern that outliers were influencing the coefficients.

Limitations

Since the data for this study are secondary, I am limited by the WNSLAE definition and interpretation of cooperative learning. Unfortunately, the data do not distinguish clearly the difference between cooperative and collaborative learning, and there is no indication of the degree of interdependence among participating group members, or the degree of group structure, which would allow for better differentiation between cooperative and collaborative learning. My analysis was based on an assessment of questions used to determine cooperative learning. Preferably, I would have created a cooperative learning scale which includes a clearly defined measure of positive

interdependence and the degree of structure among group members. This key distinction would add significantly to the impact of my research because I could directly measure specific cooperative activities that impact need for cognition. I chose a data set that was primarily focused on liberal arts education outcomes because my dependent variable, need for cognition, is one of the primary outcomes of a liberal education (Wabash College, 2013), and cooperation and active learning are considered best practices in higher education (Chickering & Gamson, (1987). The study is not generalizable to all schools in the United States because the study's institutions were not chosen randomly, and there is an over-representation of liberal arts schools in the sample. This study does provide insights for liberal arts schools which could be applied to other types of institutions. Because the study is longitudinal, there was a drop in response rate between time 1 and time 2.

CHAPTER IV

RESULTS OF THE STUDY

The study's purpose was to evaluate the relationship between students' participation in cooperative learning activities and the development of need for cognition. I estimated the net effect of cooperative learning on the development of need for cognition among first-year college students. In addition, I considered whether a student's full-time status, academic enjoyment, high school involvement, ACT score, the focus on liberal arts coursework in the first year, and the pre-college assessment of need for cognition moderated these effects.

As stated earlier, the focus of this study was to answer the following questions:

1. Is there a positive relationship between participation in cooperative learning activities and the development of need for cognition among first-year college students?
2. Does the effect of cooperative learning on the development of need for cognition differ based on full-time status, high school involvement, ACT score, number of liberal arts courses taken in the first year, and the pre-test score for need for cognition?

The results of the OLS regression analysis are shown in Table B3 (Appendix B). The models are based on four variable blocks identified in my conceptual model, entered sequentially: (a) pre-college characteristics, (b) organizational characteristics of institutions, (c) academic experiences, and (d) other college experiences. The third model includes the cooperative learning scale, which was the key independent variable in my study. These variable blocks are consistent with Pascarella's (1985) General Causal Model for Assessing the Effects of Differential Environments on Student Learning and Cognitive Development. I also ran the model against each individual component of cooperative learning scale, including (a) students teaching each other, (b) faculty encouraging students to work together outside of class, (c) participation in study groups,

and (d) students working together outside of class. I chose to analyze the significance of each component of the cooperative learning scale rather than a global scale of cooperative learning. Conceptually, I was interested in determining if different dimensions of cooperative learning influence the development of need for cognition among variables. A single cooperative learning scale may mask varied effects among lower order dimensions of cooperative learning (An, in press; Hu, 2011). I found moderate to strong correlation values among the four cooperative learning components, ranging from 0.20 to 0.60. Although related, there was adequate unique variation from each component to allow for stable estimates. Using multiple dimensions of cooperative learning could shape future research for those interested in analyzing different components of cooperative learning.

Bivariate Relationship

The results indicated a positive relationship between need for cognition and cooperative learning ($r = .16$, $p < 0.001$). A p-value of < 0.001 indicates statistically a significant correlation between the dependent and independent variable, demonstrating that the relationship is unlikely to have occurred by chance. Each cooperative learning component was also positively correlated with need for cognition, which means an increase in any cooperative learning component is positively associated with the development of need for cognition. The strongest correlation between a cooperative learning component and need for cognition was students teaching other students ($r = .14$, $p < 0.001$). Each of the other correlations of the cooperative learning scale were statistically significant ($p, 0.001$).

The descriptive statistics, including means and standard deviations are included in Table B1 (Appendix B). Approximately 65% of the sample was female and 80% of respondents were white. The survey respondents represented a good cross-section of institutional types from across the country, in which 53% attended liberal arts colleges and 47% attended regional colleges or universities. A notable proportion of students

(24%) held a leadership position in a student club, campus organization, or residence hall. The average ACT of respondents was 27. Only a small percentage of students (1%) reported they attended school part-time. Students engaged in cooperative learning tend to have higher need for cognition than those not engaged in cooperative learning. However, students engaged in cooperative learning may have characteristics that are positively associated with both cooperative learning engagement and need for cognition. Therefore, the influence of cooperative learning on need for cognition is not only due to cooperative learning but also to baseline differences between those engaged in cooperative learning and those not engaged. The regression models control for a host of important variables that confound the relationship between cooperative learning and the development of need for cognition.

Regression Models

Model 1: Student Background Characteristics

Results from the regression models are shown in Table B3 (Appendix B). Model 1 includes student background characteristics and explains over half of the total variance in the development of need for cognition ($R^2 = 0.56$, $p < .001$). This result implies that a large portion of students' need for cognition is "developed" prior to college entry. As expected, the pre-test score for need for cognition contributed significantly to the variation in the model with a regression coefficient of 0.69 ($p < .001$). This means that a one standard deviation increase in the need for cognition pre-test score predicted a 0.69 increase in the need for cognition post-test score. Furthermore, students who scored higher on the ACT were also more likely to experience an increase in need for cognition. The students' ACT score was statistically significant ($p < .001$), with a coefficient of 0.09. This means a one point increase in ACT predicted a 0.09 increase in the development of need for cognition. Race was also moderately significant ($p < .05$) with a coefficient of .09, which means that white students were more likely to experience an increase in the development of need for cognition than non-white students.

Conceptually, results from model 1 were not surprising. High achieving students were more likely to develop and appreciate cognitive processing than students who were not high academic achievers. Additionally, the pre-test need for cognition score likely captured most of the variance of other background variables that were not included in my model. No other background characteristics significantly increased need for cognition.

Model 2: Organizational Characteristics of Institutions

In model 2, I introduced organizational characteristics of institutions. This block reflects the different types of institutions represented in the sample. Including these variables did not increase significantly the variance explained from model 1 ($R^2 = .56$, $p < .001$). There were no statistically significant differences in the development of need for cognition between students attending a liberal arts college and those attending universities and community colleges. This is surprising given that liberal arts colleges emphasize good practice in liberal education, which leads to a variety of positive outcomes such as the development of need for cognition.

Model 3: Academic Experiences

Model 3 adds students' academic experiences, resulting in an $R^2 = .57$ ($p < .001$). In this category, I included variables that focus on activities within the classroom environment, such as cooperative learning. I hypothesized that taking a liberal arts curriculum and engaging in cooperative learning increase the development of need for cognition. The results show that students who engaged in a more liberal arts-focused curriculum were more likely to develop need for cognition. The liberal arts curriculum variable was statistically significant ($p < .05$) with a coefficient of 0.03, which indicates that a one standard deviation increase in liberal arts curriculum led to a .03 increase in need for cognition. The most significant result from students' academic experiences is that students engaged in cooperative learning were more likely to develop need for cognition than those not engaged in cooperative learning. Cooperative learning was statistically significant ($p < .001$) with a coefficient of 0.07, which means that a one

standard deviation increase in cooperative learning resulted in a .07 increase in the development of need for cognition.

Model 4: Other College Experiences

Model 4 includes other academic experiences of students such as holding campus leadership positions, the number of hours of study each week, the quality of faculty relationships, and a students' full-time status with an $R^2 = .57$ ($p < .001$). This category helps explain a variety of experiential differences that exist between students who choose certain types of college activities and lifestyles. Of these other college experiences, two variables significantly influenced the development of need for cognition. The number of hours a student studies increased the development of need for cognition. The number of hours studied was statistically significant ($p < .05$) with a coefficient of .04, which indicates that a one standard deviation increase in hours studied predicted a .04 increase in the development of need for cognition. Essentially, students who study more are slightly more likely to develop need for cognition. Students who attend college full-time are less likely to develop need for cognition than those who attend part-time. A students' full-time status was statistically significant ($p < .01$) with an unstandardized coefficient of -0.18. This means that a student who studied full-time tended to experience a decrease of 0.18 in the development of need for cognition compared to a student who studied part-time. However, less than 1% of the respondents (27) out of the entire sample reported being part-time students. I therefore I caution readers about the substantive conclusion of this result.

Finally, I measured the individual effect of each cooperative learning component on the development of need for cognition among first-year college students. Recall that the cooperative learning scale includes the following four components: (a) students taught each other in addition to faculty teaching students; (b) faculty encouraged study groups outside of class; (c) students participated in one or more study group(s) outside of class; and (d) students worked with other students on projects outside of class. Three of

the four cooperative learning components were significant. The most significant component was faculty encouraging study groups with a coefficient of .07 ($p < .01$). Students teaching each other was moderately significant ($p < .05$) with a coefficient of 0.05. Students working on projects outside of class was also moderately significant ($p < .05$) with a coefficient of 0.03. The only component not significant was students participating in study groups outside of class. This finding makes conceptual sense, because study groups do not necessarily require interdependence among members, which is a critical factor for successful cooperative learning. Interestingly, faculty encouraging study groups was significant, which likely says more about the faculty member's teaching approach than any particular student interaction.

The Moderating Effects of Cooperative Learning on Need for Cognition

In addition to examining the relationship between cooperative learning and need for cognition, I considered whether this relationship differed by full-time status, academic enjoyment, high school involvement, ACT score, liberal arts coursework, and the pre-test for need for cognition (see Table B4, Appendix B). For instance, do full-time students respond differently to cooperative learning than part-time students? I created six interaction terms which were the product of cooperative learning and each potential interaction effect. I introduced these interaction terms into the multiple regression model one variable at a time. In assessing whether to include an interaction term, I analyzed changes in the R-squared value of the regression equation in model 4 ($R^2 = 0.57$) as I introduced each interaction term (see Table 4, Appendix B). I used a Wald chi-square test to determine statistical significance of each interaction variable. Based on this analysis, I found no statistically significant interaction effects within my model.

CHAPTER V

DISCUSSION

My hypothesis for this study was participation in cooperative learning activities positively influence the development of need for cognition among first-year college students. Researchers often study the effectiveness of cooperative learning as an instructional tool, but they generally focus on short-term learning outcomes such as test performance or class grades. This is the first study to measure the longer term impact of cooperative learning on the development of need for cognition. I theorized that the process of students working together interdependently to construct knowledge stimulates the desire for and the enjoyment of the learning process thereby increasing students' need for cognition. Additionally, I sought to determine whether a student's full-time status, academic enjoyment, ACT score, race, pre-test score of need for cognition, and the focus on liberal arts coursework moderate the relationship between cooperative learning and the development of need for cognition in the first year of college. To test my hypothesis, I used data from WNSLAE. The study's participants included full-time, first-year students representing a cross section of colleges and universities from across the country. I used OLS regression to analyze the impact of participation in cooperative learning on the development of need for cognition, using a pre-and post-test need for cognition scale developed by Cacioppo et al. (1984). In this chapter, I review the research methodology used to answer my hypothesis and the limitations of the study. I discuss the results of my analysis and the implications for policy and practice in higher education. I also identify future research opportunities resulting from these findings.

Research Methods Summary

I chose to use the WNSLAE because the focus of the study was liberal arts outcomes resulting from student background characteristics, institutional types, and good teaching practices, which is suited for this study. Furthermore, the study's design allowed for pre-and post-test analysis, which is ideal for measuring outcomes of good teaching

practices. I used the 2006 cohort from the WNSLAE which included 4,501 first-semester freshmen participants representing 19 institutions from across the country. This cohort had the strongest response rate and follow-up rate of any cohort in the study. Of those who completed the initial survey, 3,081 completed the follow-up survey in Spring 2007 following the freshman year of college. Of those who completed the post-test survey, only 15 failed to complete the need for cognition instrument, which left 3,066 participants in my study.

My research model is primarily based on the framework developed in Pascarella's (1985) General Causal Model for Assessing the Effects of Differential Environments on Student Learning and Cognitive Development (Figure A2, Appendix A). According to this model, five categories of variables influence learning and cognitive development among college students: (a) structural/organizational characteristics of institutions, (b) student background/pre-college traits, (c) institutional environment, (d) interactions with agents of socialization, and (e) quality of student effort. I used OLS regression to estimate the effects of student background characteristics, institutional type, academic experiences including cooperative learning, and other college student experiences on the end of first-year need for cognition. I had 58 missing cases in my study, and I used multiple imputation, which allowed me to preserve all partially completed cases.

Results Summary

The study's findings support my hypothesis that cooperative learning positively influences the development of need for cognition among first-year college students. Controlling for pre-college characteristics, institutional type, classroom experiences, and other college experiences, I found that students engaged in cooperative learning were more likely (.06, $p < .001$) to develop need for cognition than students not engaged in cooperative learning. My results reinforce the concept that cooperative learning strategies, such as working in groups, students teaching each other, and working together outside of class, are good teaching practices, particularly at the college level. Employing

such techniques leads to longer term cognitive enjoyment, which leads to a wide range of benefits for students and society. Research on cooperative learning typically focuses on K–12, with a more narrowly defined performance measure. This study provides further evidence of effectiveness within the college classroom. I also provide new evidence of the impact of cooperative learning on long-term cognitive development, which researchers have neglected. This is the first study to demonstrate that cooperative learning in college classrooms directly impacts the development of need for cognition.

Policy Implications

As I discussed in Chapter 1, public scrutiny of higher education is growing as public and private funding becomes more difficult to maintain. Legislators and private citizens are demanding evidence of return on their higher education investment dollars. This shift toward privatizing, or individualizing the benefits of higher education, has contributed significantly toward the commoditization of higher education. In a commoditized industry, students would not differentiate quality among educational institutions, deeming all educational experiences as the same. Such a commoditized state could significantly threaten the reputation and quality distinctions created over the years by higher education institutions, and particularly, liberal arts schools across the country. Historically, liberal arts institutions provide opportunity for curricular and pedagogical innovations that create unique academic experiences for students (Baker, Baldwin, & Makker, 2012). Commoditization threatens to eliminate such innovations that distinguish liberal arts schools. Unfortunately, Arum and Roksa (2011) indicated that students are not developing critical thinking skills while in college which adds fuel to the accountability fire in higher education. If students are not developing critical thinking skills, then why should society fund them through government subsidy, and why should private citizens continue to invest? Since attendance at liberal arts institutions is among the most expensive, this question is even more pertinent.

The results of my study provide evidence that cooperative learning techniques, if employed correctly, contribute significantly to the development of need for cognition among college students. Results indicate that students engaged in cooperative learning are more likely to develop a propensity to engage in the thinking process and will enjoy the challenge of thinking, which will likely impact them throughout their lives. Higher scores in the need for cognition scale are associated with greater academic achievement, better information processing (Cacioppo & Petty, 1982) as well as conscientiousness and greater openness to new experiences (Sadowski & Cogburn, 1997). Since cooperative learning is considered a good practice in liberal education, the results of my study should provide support for the argument that liberal education supports positive outcomes related to cognitive processing and is thus a valuable and differentiating characteristic of higher education. Faculty members who use cooperative learning techniques are helping to develop cognitive thinking skills which appear to be diminishing among college students. The long-term benefits of students who enjoy cognitive processing are numerous. Of particular importance is the degree to which those who enjoy cognition are more likely to participate in the democratic process and be contributing members of society. According to the Association of American Colleges and Universities (2011), a liberal education contributes positively to civil discourse. Cooperative learning is likely to have a positive impact on such discourse as people learn to work cooperatively and appreciate the thinking process.

Researchers should study the effectiveness of cooperative learning in online environments as this delivery method continues to expand rapidly. Proponents of online learning argue that cooperation is entirely possible using online formats, and in fact, may provide additional avenues for collaboration among students that face-to-face classes cannot provide. The results of this study should provide support for instructional technology that enables students to collaborate online and inside the classroom. Opponents argue that collaboration among online students can be difficult to achieve due

to distance and time, which serve as barriers to effective communication. Ultimately, additional research is needed to support cognitive gains due to cooperative learning using online classroom delivery.

Practice Recommendations

Classroom teachers may find the results of this study useful as they consider teaching methodologies across a variety of instructional modalities. With growing evidence that the development of critical thinking is lacking for some college students, an instructor may be optimistic to learn of a good teaching practice with demonstrated effectiveness in cognitive development. Cooperative learning strategies might be an effective teaching tool for those who wish to develop long-term student interest in cognition. Faculty members should be cautioned that cooperative learning must be administered appropriately, focusing on interdependence among group members. In some classrooms, instructors assign students to work in groups, without significant oversight of group dynamics and group member responsibility. Faculty tends to treat college students as adults, allowing groups to divide the work evenly and compile the individual efforts rather than working interdependently. For cooperative learning to be effective, students should rely on each other, with the understanding that each individual is required to contribute toward overall group success. Students who engage in cooperative learning build trust and develop commitment to other group members. Group interdependence may be more challenging to create in the online delivery environment where students do not interact face-to-face. Faculty who teach online should carefully craft group responsibilities and activities that cultivate interdependence among members. Online students should have the same sense of accountability to each other as those who study face-to-face. If such accountability is created, online instructors will likely create similar cognitive outcomes as face-to-face instructors. Since the data for this study did not include substantial online students, further research of online outcomes is required.

Limitations

The results of my study cannot be generalized to all college students because the 19 schools in the sample were not chosen randomly, and there was an over-representation of liberal arts schools. However, the data include a good cross-section of institutions and are particularly useful to those who are interested in studying liberal arts outcomes. Since I used existing data, I was limited by the definitions of the study. I would have preferred to define cooperative learning more narrowly for my study. The WNSLAE study uses a measure that reflects cooperative learning experiences, but does not explicitly include interdependence among group members, which is an important characteristic of cooperative learning. Interdependence creates motivation to contribute to the group effort compared to groups that merely divide responsibility. Future studies might consider a more carefully designed cooperative learning scale that includes group interdependence.

Another limitation of my study is that the data used in my cohort were for first-year college students. A longer-term view of the impact of cooperative learning might be useful. While data exist to study a 4-year impact, the attrition rate is substantial and the power of my study would be reduced significantly. Since most cognitive gains have been shown to occur during the first year of college, this limitation may not be as significant. Additionally, the longitudinal nature of the data means that students will naturally drop out of the study prior to the post-test. I excluded those who did not complete the post-test from the entire study. Clearly, the more students who complete both pre- and post-tests make for a more powerful study.

Impact on Future Research

This study opens several opportunities for future research. One significant opportunity is to study the impact of cooperative learning using online course formats. As stated earlier, the data set for this study did not include substantial online student participants. With the growing number of online program offerings, including the growing adult population, a researcher could evaluate the effectiveness of cooperative

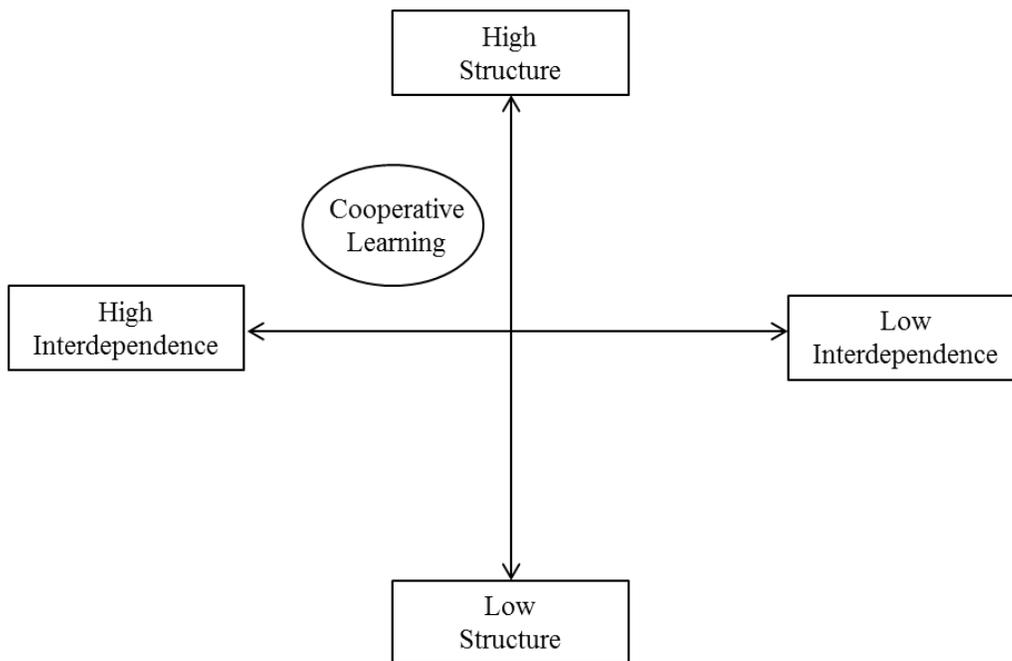
learning within several instructional modalities. This type of study would fill an important gap in the literature of online learning. This would also create an opportunity to study the effectiveness of cooperative learning in adult student populations, which is another significant gap in the literature. In future research, an investigator should carefully monitor how cooperative learning may be carried out using an online delivery format, applied to a variety of student populations. The literature also lacks research on specific elements of cooperative learning, including the interdependence of group members, which is a key theoretical component of cooperative learning. By specifically measuring group interdependence, a researcher could more carefully identify the most effective components of cooperative learning strategy.

Much of the research on cooperative learning is focused on K–12 education, while little exists for college education. One could assume that K-12 is much more formative, providing better opportunity for cooperative learning to be effective. However, this study indicates that cooperative learning among college students may positively impact the development of need for cognition. Further research in college environments will help expand the literature of cognitive development in college. I suggest future research using a 4-year time period while evaluating multiple student populations.

This current study adds significantly to the literature because it is the first study to demonstrate the effects of cooperative learning on the development of need for cognition. In doing so, the study provides college professors and administrators the rationale for an instructional approach that helps students develop more interest in cognitive processing. As students learn to enjoy engaging in cognitive activities, they develop lifelong habits that lead to more critical, productive, and engaged citizenship, which is needed more than ever. In this time of change within higher education, instructors should welcome a teaching approach that helps students develop an interest in learning.

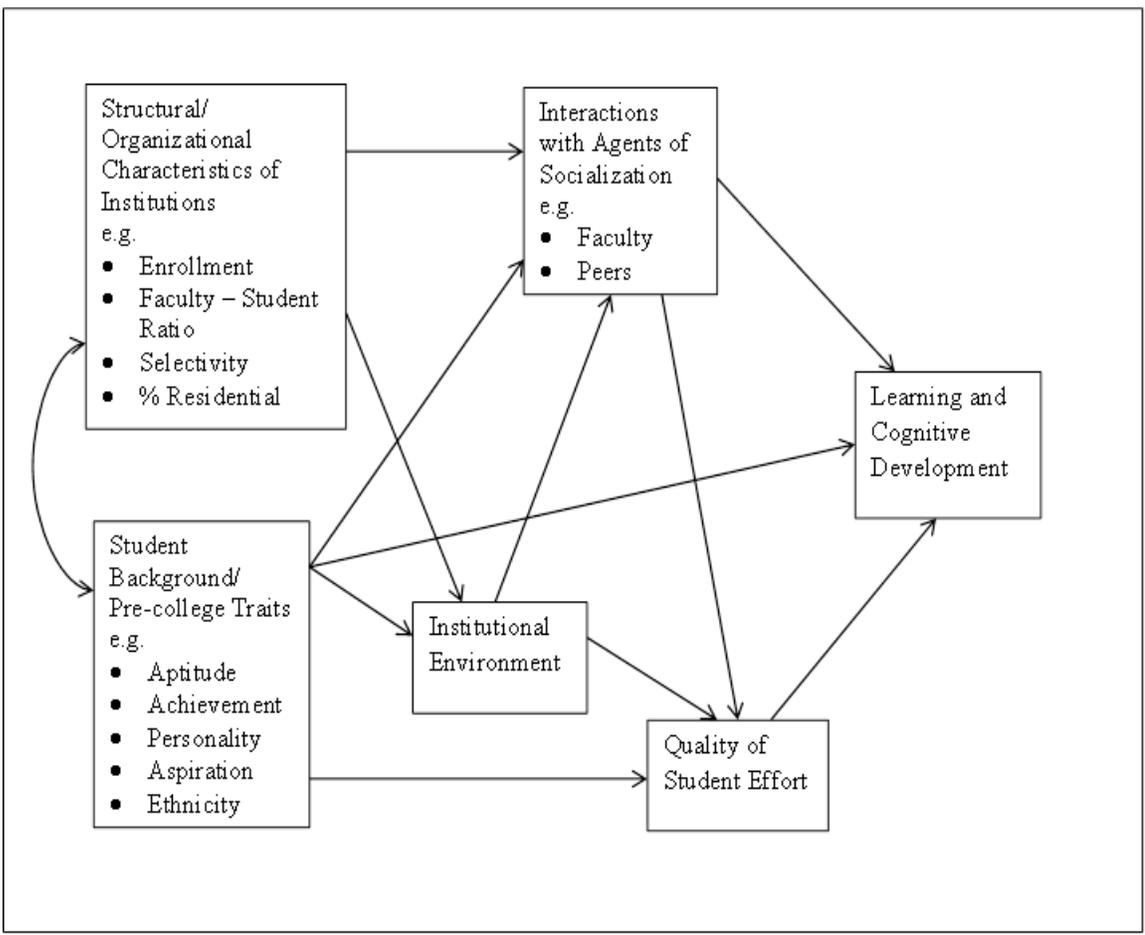
APPENDIX A
FIGURES

Figure A1. Cooperative Learning



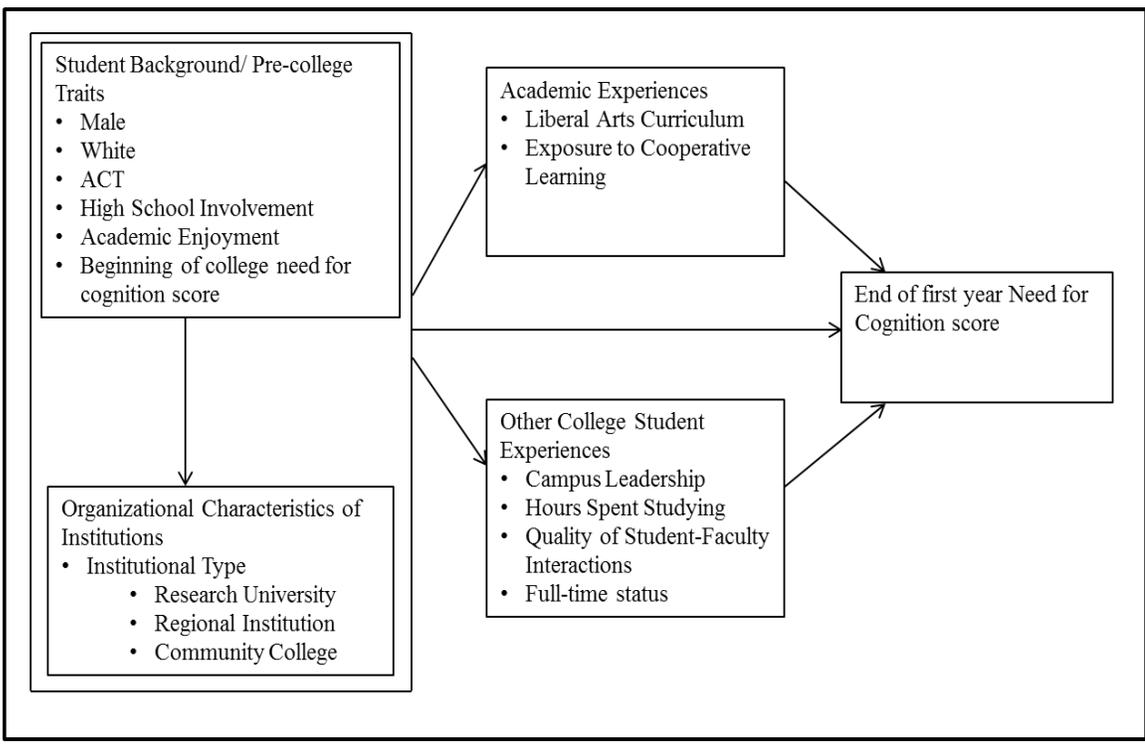
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Figure A2. A General Causal Model for Assessing the Effects of Differential Environments on Student Learning and Cognitive Development



From: Pascarella, E. T. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. *Higher Education: Handbook of Theory and Research*, 1, 1-61.

Figure A3. A Conceptual Model to Examine the Effects of Cooperative Learning on the Development of Need for Cognition



Adapted from: Pascarella, E. T. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. *Higher Education: Handbook of Theory and Research*, 1, 1-61.

APPENDIX B

TABLES

Table B1. Variables, Frequencies, Weighted Means and Standard Deviations

Variable Category	Variable	Frequency (%)	Mean (Std. Dev)	Min	Max
Dependent Variable	Need for Cognition Post-test		3.49 (.63)	1	5
Organizational Characteristics	Liberal Arts College (Regional or University = 0) (Liberal Arts College = 1)	1,493 (47%) 1,627 (53%)	.53 (.50)	0	1
Background Characteristics	Sex Female Male	2,006 (65%) 1060 (35%)	.35 (.48)	0	1
	Race Non-white White	626 (20%) 2,440 (80%)	.80 (.40)		
	ACT Score		26.64 (4.44)	13	36
	High School Involvement (7 item scale, Alpha=0.58)		3.72 (.53)	1.7	5
	Degree of Academic Enjoyment		2.79 (.95)	1	5
	Need for Cognition pre-test (18 item scale, Alpha=.90)		3.51 (.61)	1.2	5

Table B1 (continued)

Variable Category	Variable	Frequency (%)	Mean (Std. Dev)	Min	Max
Academic Experiences	Liberal Arts Curriculum		6.53 (2.01)	0	20
	Cooperative Learning Scale (4 item scale, Alpha=0.70)		-.05 (.72)	-1.9	1.63
	Students taught each other		3.18 (1.03)	1	5
	Faculty encouraged groups		3.19 (1.12)	1	5
	Students used study groups		3.08 (1.29)	1	5
	Worked on projects outside of class		2.54 (0.79)	1	5
Other Student Experiences	Campus leadership No = 0 Yes = 1	716 (23%) 2,342 (77%)	.23 (.42)	0	1
	Hours Spent Studying		4.63 (1.66)	1	8
	Quality of Relationships with Faculty		5.51 (1.12)	1	7
	Full-time Status Part-time Full-time	27 (1%) 3,036 (99%)	.99 (.09)	0	1

Notes: All continuous variables are standardized.

Table B2. Correlation Matrix for All Variables Included in the Study

Variables	NFC1	L/A College	ACT	Outside class	Groups	Taught others	Faculty groups	LA Curric.	Hours Studied	Faculty Relations
Need for Cognition Post-test	1.00									
Attended a Liberal Arts College	.07	1.00								
ACT	.30	-.08	1.00							
Worked together outside class	.09	.05	.08	1.00						
Studied in groups	.10	.07	.03	.40	1.00					
Students taught each other	.16	.02	.05	.21	.29	1.00				
Faculty encouraged groups	.12	.01	.03	.32	.60	.36	1.00			
Liberal Arts Curriculum	.20	-.06	.43	.10	.12	.08	.10	1.00		
Hours studied outside of class	.20	-.01	.19	.20	.18	.11	.14	.18	1.00	
Quality of faculty relationships	.19	.18	-.01	.11	.17	.17	.21	.02	.12	1.00
Held a campus leadership role	.15	-.01	.09	.09	.07	.07	.04	.06	.06	.08
High school involvement	.14	-.03	.09	.19	.22	.10	.20	.01	.22	.11
Degree of academic enjoyment	.20	.10	-.13	.01	.04	.07	.02	-.07	.09	.07
Need for Cognition Pre-test	.75	.05	.31	.08	.08	.14	.09	.19	.16	.14
Cooperative Learning Scale	.13	.05	.06	.66	.79	.64	.79	.14	.22	.23

Table B2 (continued)

Variable	Campus leader	HS Involv	Acad Enjoy	NFC2	Coop Learning
Need for Cognition Pre-test					
ACT					
Worked together outside class					
Studied in groups					
Students taught each other					
Faculty encouraged groups					
Attend Liberal Arts College					
Hours studied outside of class					
Quality of faculty relationships					
Held a campus leadership role	1.00				
High school involvement	.15	1.00			
Degree of academic enjoyment	.03	.09	1.00		
Need for Cognition Post-test	.15	.15	.28	1.00	
Cooperative Learning Scale	.10	.25	.05	.16	1.00

Table B3. Regression Effects of Each Variable Type on the Development of Need For Cognition

		Equation 1	Equation 2	Equation 3	Equation 4
Variable		Background Characteristics	Institutional Type	Academic Experiences	Other Student Experiences
Organizational Characteristics					
	Liberal Arts College		.062 (.042)	.053 (.044)	.042 (.046)
Pre-College Characteristics					
	Gender- Male	.018 (.052)	.018 (.052)	.015 (.048)	.024 (.050)
	Race/Ethnicity- White	.091 (.041)*	.090 (.041)*	.093 (.041)*	.076 (.037)
	Academic Ability- ACT	.094 (.013)***	.091 (.012)***	.070 (.016)***	.069 (.015)***
	Academic Enjoyment	.001 (.023)	-.0001 (.024)	.001 (.022)	-.004 (.023)
	High School Involvement	.024 (.012)	.023 (.011)	-.006 (.010)	-.009 (.011)
	NFC Pre-test	.693 (.016)***	.691 (.015)***	.687 (.015)***	.678 (.014)***
Academic Experiences					
	Liberal Arts Curriculum			.031 (.013)*	.030 (.012)*

Table B4. Interaction Effects between Cooperative Learning and Need for Cognition

	Race x Coop Learning	Full-time x Coop Learning	Acad Enjoy x Coop Learning	L/A Curr x Coop Learning	ACT x Coop Learning	NFC Pre x Coop Learning
Significance	-.053 (.129)	.173 (.028)*	-.060 (.361)	-.101 (.239)	-.205 (.091)	-.159 (.063)
R ² difference	+.0003	-.0001	+.0005	+.0009	+.0013	+.003
Adjusted Wald Test (F)	2.54	5.71	.88	1.48	3.20	3.93

*** <.001; ** <.01; * <.05

REFERENCES

- Abrami, P. C., Poulsen, C., & Chambers, B. (2004). Teacher motivation to implement an educational innovation: Factors differentiating users and non-users of cooperative learning. *Educational Psychology, 24*, 201–216. doi:10.1080/0144341032000160146
- Allen, I. E., & Seaman, J. (2011). *Going the distance: Online education in the United States, 2011*. Retrieved from <http://www.eric.ed.gov/PDFS/ED529948.pdf>
- Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84*, 261. doi:10.1037/0022-0663.84.3.261
- An, B. P. (in press). The role of academic motivation and engagement on the relationship between dual enrollment and academic performance. *Journal of Higher Education*.
- Antil, L. R., Jenkins, J. R., Wayne, S. K., & Vadasy, P. F. (1998). Cooperative learning: Prevalence, conceptualizations, and the relation between research and practice. *American Educational Research Journal, 35*, 419–454. doi:10.3102/00028312035003419
- Arum, R., & Roksa, J. (2011). *Academically adrift: Limited learning on college campuses*. Chicago, IL: University of Chicago Press.
- Association of American Colleges and Universities. (2011). *The LEAP vision for learning: Outcomes, practices, impact, and employers' views*. Retrieved from http://www.aacu.org/leap/documents/leap_vision_summary.pdf
- Association of American Colleges and Universities, The National Task Force on Civic Learning and Democratic Engagement. (2012). *A crucible moment: College learning & democracy's future*. Retrieved from http://www.aacu.org/civic_learning/crucible/.
- Astin, A. W. (1970a). The methodology of research on college impact, part one. *Sociology of Education, 43*(3), 223–254.
- Astin, A. W. (1970b). The methodology of research on college impact, part two. *Sociology of Education, 43*(4), 437–450.
- Astin, A. W. (1993). *What matters in college*. San Francisco, CA: Jossey-Bass.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191–215. doi:10.1037/0033-295X.84.2.191
- Baker, V. L., Baldwin, R. G., & Makker, S. (2012). Where are they now? Revisiting Breneman's study of liberal arts colleges. *Liberal Education, 98*(3), 48–53.
- Barkley, E. F., Cross, K. P., & Major, C. H. (2004). *Collaborative learning techniques: A handbook for college faculty*. San Francisco, CA: Jossey-Bass.
- Belsley, D. A., Kuh, E., & Welsch, R. E. (1980). *Regression diagnostics: Identifying influential observations and sources of collinearity*. New York, NY: John Wiley and Sons.

- Block, J. (1982). Assimilation, accommodation, and the dynamics of personality development. *Child Development*, 53, 281–295.
- Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom*. Washington, D.C., George Washington University School of Education and Human Development.
- Borst, A. J. (2011). *Evaluating academic and student affairs partnerships: The impact of living-learning communities on the development of critical thinking skills in college freshmen* (Doctoral dissertation). ProQuest Dissertations and Theses database. Retrieved from <http://search.proquest.com/docview/879635991?accountid=14663>. (879635991).
- Bowen, C. W. (2000). A quantitative literature review of cooperative learning effects on high school and college chemistry achievement. *Journal of Chemical Education*, 77(1), 116. doi:10.1021/ed077p116
- Brewer, S., & Klein, J. D. (2006). Type of positive interdependence and affiliation motive in an asynchronous, collaborative learning environment. *Educational Technology Research and Development*, 54, 331–354. doi:10.1007/s11423-006-9603-3
- Brookfield, S. D. (1997). Assessing critical thinking. *New Directions for Adult and Continuing Education*, 1997(75), 17-29. doi:10.1007/s11423-006-9603-3
- Bruffee, K. A. (1999). *Collaborative learning: Higher education, interdependence, and the authority of knowledge*. Baltimore, MD: The Johns Hopkins University Press.
- Cabrera, A. F., Crissman, J., Bernal, E., Nora, A., Terenzini, P., & Pascarella, E. T. (2002). Collaborative learning: Its impact on college students' development and diversity. *Journal of College Student Development*, 43, 20–34.
- Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology*, 42, 116–131. doi:10.1037/0022-3514.42.1.116
- Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment*, 48, 306–307.
- Carini, R. M., Kuh, G. D., & Klein, S. P. (2006). Student engagement and student learning: Testing the linkages. *Research in Higher Education*, 47, 1–32. doi:10.1007/s11162-005-8150-9
- Chatterjee, S. & Hadi, A (2006). *Regression analysis by example*. Hoboken, NJ: John Wiley & Sons.
- Chen, X., Ender, P., Mitchell, M. and Wells, C. (2003). *Regression with Stata*. Retrieved from <http://www.ats.ucla.edu/stat/stata/webbooks/reg/default.htm>.
- Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin*, 39(7), 3–7.

- Chickering, A. W., & Reisser, L. (1993). *Education and identity. the Jossey-Bass higher and adult education series*. San Francisco, CA: Jossey-Bass Inc.
- Cohen, A. R., Stotland, E., & Wolfe, D. M. (1955). An experimental investigation of need for cognition. *The Journal of Abnormal and Social Psychology*, *51*, 291–294. doi:10.1037/h0042761
- Cooper, M. M., Cox, C. T., Jr., Nammouz, M., Case, E., & Stevens, R. (2008). An assessment of the effect of collaborative groups on students' problem-solving strategies and abilities. *Journal of Chemical Education*, *85*(6), 866. doi:10.1021/ed085p866
- Cross, K. P. (1998). Why learning communities? Why now? *About Campus*, *3*(3), 4–11.
- Cruce, T. M., Wolniak, G. C., Seifert, T. A., & Pascarella, E. T. (2006). Impacts of good practices on cognitive development, learning orientations, and graduate degree plans during the first year of college. *Journal of College Student Development*, *47*(4), 365–383.
- Curşeau, P. L., Janssen, D. E., & Raab, J. (2012). Connecting the dots: Social network structure, conflict, and group cognitive complexity. *Higher Education*, *63*(5), 621–629.
- Deming, D. J., Goldin, C., & Katz, L. F. (2011). *The for-profit postsecondary school sector: Nimble critters or agile predators?* (No. w17710). National Bureau of Economic Research.
- Deutsch, M. (1949). An experimental study of the effects of co-operation and competition upon group process. *Human Relations*, *2*, 199–232. doi:10.1177/001872674900200301
- Deutsch, M. (1962). *Cooperation and trust: Some theoretical notes*. Lincoln, NE: University of Nebraska Press.
- Deutsch, M. (1977). *The resolution of conflict: Constructive and destructive processes*. New Haven, CT: Yale University Press.
- Deutsch, M. (1982). Interdependence and psychological orientation. In V. J. Derlega & J. Grzelak (Eds.), *Cooperation and helping behavior: Theories and research* (pp. 16–43). New York, NY: Academic Press.
- Dodge, L., & Kendall, M. E. (2004). Learning communities. *College Teaching*, *52*(4), 150–155. doi:10.3200/CTCH.52.4.150-155
- Dyson, B., Griffin, L. L., & Hastie, P. (2004). Sport education, tactical games, and cooperative learning: Theoretical and pedagogical considerations. *Quest*, *56*(2), 226–240. doi:10.1080/00336297.2004.10491823
- Facione, P. A. (2010). *Critical thinking: What it is and why it counts*. Millbrae, CA: Insight Assessment, Measured Reasons and The California Academic Press.

- Glaeser, E. L., Ponzetto, G. A., & Shleifer, A. (2007). Why does democracy need education? *Journal of Economic Growth*, 12(2), 77–99.
- Gokhale, A. A. (1995). Collaborative learning enhances critical thinking. *Journal of Technology Education*, 7, 22–30.
- Goodman, K. M. (2011). *The influence of the campus climate for diversity on college students' need for cognition*. (Doctoral dissertation). ProQuest Dissertations and Theses database. Retrieved from <http://search.proquest.com/docview/879632267?accountid=14663>. (879632267).
- Greene, M. (1986). In search of a critical pedagogy. *Harvard Educational Review*, 56, 427–442.
- Hayes, A. F., & Cai, L. (2007). Using heteroskedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation. *Behavior Research Methods*, 39(4), 709–722.
- Holtham, C. W., Melville, R. R., & Sodhi, M. M. S. (2006). Designing student group work in management education: Widening the palette of options. *Journal of Management Education*, 30(6), 809–817. doi:10.1177/1052562906287967
- Hu, S. (2011). Reconsidering the relationship between student engagement and persistence in college. *Innovative Higher Education*, 36, 97–106. doi:10.1007/s10755-010-9158-4
- Jalilifar, A. (2010). The effect of cooperative learning techniques on college students' reading comprehension. *System*, 38(1), 96–108. doi:10.1016/j.system.2009.12.009
- Janssen, O., Vliert, V. D., & Veenstra, C. (1999). How task and person conflict shape the role of positive interdependence in management teams. *Journal of Management*, 25(2), 117–141. doi:10.1177/014920639902500201
- Johnson, D. W., & Johnson, R. T. (1994). *Learning together and alone: Cooperative, competitive, and individualistic learning* (4th ed.). Boston, MA: Allyn and Bacon
- Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational Researcher*, 38(5), 365–379. doi:10.3102/0013189X09339057
- Johnson, D. W., Johnson, R. T., & Smith, K. A. (1991). *Cooperative learning: Increasing college faculty instructional productivity*. Washington, DC: George Washington University.
- Johnson, D. W., Johnson, R. T., & Smith, K. A. (1998). Cooperative learning returns to college. *Change*, 30(4), 26. doi:10.1080/00091389809602629
- Johnson, D. W., Johnson, R. T., & Smith, K. A. (2007). The state of cooperative learning in postsecondary and professional settings. *Educational Psychology Review*, 19, 15–29. doi:10.1007/s10648-006-9038-8

- Johnson, D. W., Johnson, R. T., & Stanne, M. B. (2000). *Cooperative learning methods: A meta-analysis*. Minneapolis, MN: University of Minnesota Press.
- Jonassen, D. H. (1991). Objectivism versus constructivism: Do we need a new philosophical paradigm? *Educational Technology Research and Development*, 39(3), 5–14. doi:10.1007/BF02296434
- Karabenick, S. A., & Collins-Eaglin, J. (1997). Relation of perceived instructional goals and incentives to college students' use of learning strategies. *The Journal of Experimental Educational*, 65, 331–341.
- King, P. M., & Kitchener, K. S. (1994). *Developing reflective judgment: Understanding and promoting intellectual growth and critical thinking in adolescents and adults*. San Francisco, CA: Jossey-Bass Higher and Adult Education Series and Jossey-Bass Social and Behavioral Science Series.
- Knowles, M. S. (1970). *The modern practice of adult education*. New York, NY: Associated Press.
- Kohler, U., & Kreuter, F. (2009). *Data analysis using Stata* (2nd ed.). College Station, TX: Stata Press.
- Kuh, G. D. (2003). What we're learning about student engagement from NSSE: Benchmarks for effective educational practices. *Change: The Magazine of Higher Learning*, 35(2), 24–32. doi:10.1080/00091380309604090
- Kuh, G. D. (2008). Excerpt from *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities.
- Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., & Gonyea, R. M. (2008). Unmasking the effects of student engagement on first-year college grades and persistence. *The Journal of Higher Education*, 79(5), 540–563.
- Kuh, G. D., Douglas, K. B., Lund, J. P., & Ramin-Gyurnek, J. (1994). *Student learning outside the classroom: Transcending artificial boundaries*. Washington, D.C., George Washington University, Graduate School of Education and Human Development.
- Kuh, G. D., Kinzie, J., Schuh, J. H., & Whitt, E. J. (2010). *Student success in college: Creating conditions that matter*. San Francisco, CA: John Wiley & Sons.
- Lenning, O. T., & Ebbers, L. H. (1999). *The powerful potential of learning communities: Improving education for the future*. ASHE-ERIC Higher Education Report, vol. 26(6). Washington, DC: George Washington University, Graduate School of Education and Human Development.
- Little, R. J. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, 83(404), 1198–1202. doi: 10.1080/01621459.1988.10478722

- Loes, C. N. (2009). *The impact of college residence and diversity experiences on the development of critical thinking in first-year college students* (Doctoral dissertation). ProQuest Dissertations and Theses database. Retrieved from <http://search.proquest.com/docview/304904809?accountid=14663>. (304904809).
- Loes, C. N., Pascarella, E. T., & Umbach, P. (2012). Effects of diversity experiences on critical thinking skills: Who benefits? *Journal of Higher Education*, 83, 1–25.
- Mayhew, M. J., Wolniak, G. C., & Pascarella, E. T. (2008). How educational practices affect the development of life-long learning orientations in traditionally-aged undergraduate students. *Research in Higher Education*, 49(4), 337–356. doi:10.1007/s11162-007-9081-4
- McKeachie, W. J. (1978). *Teaching tips: A guidebook for the beginning college teacher*. Lexington, MA: DC Heath.
- McKeachie, W. J. (1999). *McKeachie's teaching tips: Strategies, research, and theory for college and university professors* (10th ed.). Boston, MA: Houghton Mifflin.
- McKeachie, W. J., Pintrich, P. R., & Yi-Guang Lin. (1985). Teaching learning strategies. *Educational Psychologist*, 20(3), 153. doi:10.1207/s15326985ep2003_5
- Merriam, S. B. (2001). Andragogy and self-directed learning: Pillars of adult learning theory. *New Directions for Adult and Continuing Education*, 2001(89), 3–14. doi:10.1002/ace.3
- Morgeson, F. P., Reider, M. H., & Campion, M. A. (2005). Selecting individuals in team settings: The importance of social skills, personality characteristics, and teamwork knowledge. *Personnel Psychology*, 58(3), 583–611.
- Nair, K. U., & Ramnarayan, S. (2000). Individual differences in need for cognition and complex problem solving. *Journal of Research in Personality*, 34(3), 305–328. doi:<http://dx.doi.org.proxy.lib.uiowa.edu/10.1006/jrpe.1999.2274>
- Nam, C. W., & Zellner, R. D. (2011). The relative effects of positive interdependence and group processing on student achievement and attitude in online cooperative learning. *Computers & Education*, 56(3), 680–688. doi:10.1016/j.compedu.2010.10.010
- Nyikos, M., & Hashimoto, R. (1997). Constructivist theory applied to collaborative learning in teacher education: In search of ZPD. *The Modern Language Journal*, 81(4), 506–517. doi:10.1111/j.1540-4781.1997.tb05518.x
- Padgett, R. D., Goodman, K. M., Johnson, M. P., Saichaie, K., Umbach, P. D., & Pascarella, E. T. (2010). The impact of college student socialization, social class, and race on need for cognition. *New Directions for Institutional Research*, 2010(145), 99–111. doi:10.1002/ir.324
- Palloff, R. M., & Pratt, K. (2010). *Collaborating online: Learning together in community*. San Francisco, CA: Jossey-Bass.

- Panitz, T. (1997). Collaborative versus cooperative learning: A comparison of the two concepts which will help us understand the underlying nature of interactive learning. *Cooperative Learning and College Teaching*, 8(2), 5–7.
- Pascarella, E. T. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. *Higher Education: Handbook of Theory and Research*, 1, 1–61.
- Pascarella, E. T., Pierson, C. T., Wolniak, G. C., & Terenzini, P. T. (2004). First generation college students: Additional evidence on college experiences and outcomes. *The Journal of Higher Education*, 75(3), 249–284.
- Pascarella, E. T., & Terenzini, P. (2005). *How college affects students (Vol. 2): A third decade of research*. San Francisco, CA: Jossey-Bass.
- Pascarella, E. T., Wang, J. S., Trolan, T. L., & Blaich, C. (2013). How the instructional and learning environments of liberal arts colleges enhance cognitive development. *Higher Education*, 66(5), 569–583.
- Pascarella, E., Wolniak, G., Cruce, T., & Blaich, C. (2004). Do liberal arts colleges really foster good practices in undergraduate education? *Journal of College Student Development*, 45(1), 57–74.
- Pascarella, E. T., Wolniak, G. C., & Pierson, C. T. (2003). Explaining student growth in college when you don't think you are. *Journal of College Student Development*, 44(1), 122–126.
- Peterson, P., & Walberg, H. (1979). *Research on teaching: Concepts, findings, and implications*. Berkeley, CA: McCutchan.
- Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology*, 19(1), 123–205. doi:10.1007/978-1-4612-4964-1_1
- Piaget, J. (1976). *Piaget's theory*. Berlin: Springer
- Qin, Z., Johnson, D. W., & Johnson, R. T. (1995). Cooperative versus competitive efforts and problem solving. *Review of Educational Research*, 65(2), 129–143. doi:10.3102/00346543065002129
- Quitadamo, I. J., Brahler, C. J., & Crouch, G. J. (2009). Peer-led team learning: A prospective method for increasing critical thinking in undergraduate science courses. *Science Educator*, 18(1), 29–39.
- Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica*, 73(2), 417–458.
- Sadowski, C. J., & Cogburn, H. E. (1997). Need for cognition in the big-five factor structure. *The Journal of Psychology*, 131, 307–312.

- Sadowski, C. J., & Gülgös, S. (1996). Elaborative processing mediates the relationship between need for cognition and academic performance. *The Journal of Psychology, 130*(3), 303–307.
- Sandell, R. (1991). The liberating relevance of feminist pedagogy. *Studies in Art Education, 32*(3), 178–187.
- Sharan, Y., & Sharan, S. (1990). Group investigation expands cooperative learning. *Educational Leadership, 47*(4), 17–21.
- Skinner, B. F. (1938). *The behavior of organisms: An experimental analysis*. Oxford, England: Appleton-Century.
- Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85*(4), 571–581. doi:10.1037/0022-0663.85.4.571
- Skon, L., Johnson, D. W., & Johnson, R. T. (1981). Cooperative peer interaction versus individual competition and individualistic efforts: Effects on the acquisition of cognitive reasoning strategies. *Journal of Educational Psychology, 73*(1), 83. doi:10.1037/0022-0663.73.1.83
- Slavin, R. E. (1980). Cooperative learning. *Review of Educational Research, 50*(2), pp. 315–342. doi:10.3102/00346543050002315
- Smith, D. G. (1977). College classroom interactions and critical thinking. *Journal of Educational Psychology, 69*(2), 180. doi:10.1037/0022-0663.69.2.180
- Spellings, M. (2006). *A test of leadership: Charting the future of U.S. higher education*. Washington, DC: U.S. Department of Education.
- Sterne, J. A., White, I. R., Carlin, J. B., Spratt, M., Royston, P., Kenward, M. G. & Carpenter, J. R. (2009). Multiple imputation for missing data in epidemiological and clinical research: Potential and pitfalls. *British Medical Journal, 338*, 157-160.
- Tinto, V. (1997). Classrooms as communities: Exploring the educational character of student persistence. *The Journal of Higher Education, 68*(6), 599–623.
- Tinto, V. (2003). Learning better together: The impact of learning communities on student success. *Higher Education Monograph Series, 1*, 1–8.
- Tiwari, A., Lai, P., So, M., & Yuen, K. (2006). A comparison of the effects of problem-based learning and lecturing on the development of students' critical thinking. *Medical Education, 40*(6), 547–554. doi:10.1111/j.1365-2929.2006.02481.x
- Tsay, M., & Brady, M. (2012). A case study of cooperative learning and communication pedagogy: Does working in teams make a difference? *Journal of the Scholarship of Teaching and Learning, 10*(2), 78-89.

- United States Department of Education. (2012, October 18). *Remarks of U. S. Secretary of Education Arne Duncan at the TIME Higher Education Summit*. Retrieved from <http://www.ed.gov/news/speeches/remarks-us-secretary-education-arne-duncan-time-higher-education-summit>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processing*. Cambridge, MA: Harvard University Press.
- Wabash College, Center of Inquiry. (2013). *Center of Inquiry: Wabash College*. Retrieved March 18, 2014 from <http://www.liberalarts.wabash.edu/>
- Wadsworth, B. J. (1971). *Piaget's theory of cognitive development*. New York, NY: David McKay.
- Wall, V. D., & Nolan, L. L. (1986). Perceptions of inequity, satisfaction, and conflict in task-oriented groups. *Human Relations*, 39(11), 1033–1051.
doi:10.1177/001872678603901106
- Wlodkowski, R. J. (2003). Accelerated learning in colleges and universities. *New Directions for Adult & Continuing Education*, 2003(97), 5.
- Zhao, C. M., & Kuh, G. D. (2004). Adding value: Learning communities and student engagement. *Research in Higher Education*, 45(2), 115–138.
doi:10.1023/B:RIHE.0000015692.88534.de