A Thesis

entitled

Need for Cognition: The Need for Cognition Scale and its Use With Adolescents

by

Laura Benge

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the

Master of Education Degree in Educational Psychology

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An Abstract of

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The purpose of this study was to examine the ability of adolescents to respond to items on the Need for Cognition Scale (NCS) (Cacioppo, Petty & Kao, 1984). The research questions examine whether adolescents understand the meaning of the items on the NCS and whether adolescents demonstrate Need for Cognition (NFC). Due to the limited research available on the use of the NCS with children and adolescents, this study will fill a gap in the literature on NFC and its relationship to other aspects of cognition which include metacognition, problem solving, performance expectancies, and motivation. These areas have important implications for how students learn and engage in thinking in the classroom. The readability and vocabulary of the NCS were measured by grade level. A group of 96 students aged 10-18 ($M = 14.77, SD = 2.5$) participated in cognitive interviews using the short 18-item NCS. Differences in the number of items participants understood and their NFC scores were examined based on participants’ ages. Results indicated that a higher number of participants in Group 1 (ages 10-12) did not comprehend certain items on the scale. In Group 1, an average of 14 of the 18 items were understood ($M = 13.95, SD = 3.72$), which was three items less than the overall average and two less than the average for other age groups. Determining how to measure NFC
accurately will lead to the development of materials and interventions for educators to use to increase students’ levels of NFC. These interventions should focus on increasing NFC in students with low levels and maintaining NFC in students who already have high levels.
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Chapter One

Introduction

Thinking is defined as “the action of using your mind to produce ideas and decisions” (Merriam-Webster.com, 2014). In a society in which ideas and decisions are crucial to education, the economy and discourse, knowing how to think is crucial. Children use critical thinking skills in school from a very early age, and situations that demand critical thinking multiply throughout life, making this skill increasingly important. From the educational process to solving problem in the workplace, thinking is an essential skill. Furthermore, citizens in a successful democracy must use critical thinking to determine and contribute to the way that society operates. Because thinking is crucial for all ages and in many different situations, it is important to examine thinking to develop an understanding of how it develops.

One way of understanding how thinking develops is captured in the research on Need for Cognition (NFC), which measures how much a person enjoys thinking and is motivated to do so (Cacioppo & Petty, 1982). NFC is an intrinsic motivational trait that is displayed in how an individual approaches a task that involves thinking (Fleischhauer, Enge, Brocke, Ullrich, & Strobel, 2010). Individuals with high levels of NFC enjoy cognitive effort, while those with low levels of NFC do not enjoy tasks that require them to think. People who have high levels of NFC seek out situations that will challenge them to think and apply all of their cognitive resources to these tasks. On the other hand, people who have low levels of NFC do not seek out situations where they will be required to think. Instead these individuals often try to discover ways to avoid circumstances where they are expected to think (Cacioppo & Petty, 1982).
NFC is important because it is related to so many other constructs in educational psychology and helps to clarify and elucidate the research in other aspects of cognition. These areas include metacognition, problem solving, performance expectancies, motivation, and types of processing. The relationships between these topics and NFC have been examined in the literature. Metacognition, for example, is related to NFC and is important in the process of critical thinking because it involves engaging cognitive effort to evaluate assertions and make informed decisions (Kuhn, 1999). NFC is also related to problem solving in that individuals with higher levels of NFC are more successful at solving problems, their achievements are higher, and they consider many issues and aspects of a problem when making decisions (Nair & Ramnarayan, 2000). The literature on NFC and performance expectancies shows that those who have higher levels of NFC predict their performance on tasks better than those with low NFC (Dickhauser & Reinhard, 2009). In relation to motivation and types of processing, it has been found that task difficulty affects those with high NFC more than it affects those with low NFC, causing them to avoid tasks on which they do not expect to perform well (Reinhard & Dickhauser 2009). The aforementioned studies demonstrate that NFC has influences several aspects related to academic performance. For this reason, it is important to examine NFC among students and determine the effectiveness of the Need for Cognition Scale (NCS) for use among adolescents.

In addition to its usefulness in the academic arena, NFC research also informs contexts outside of school. Those who have higher levels of NFC are better able to make informed decisions and are more likely to search for information when making decisions (Curseu, 2011). Citizens with higher levels of NFC are more likely to make judgments
that are based on higher quantities of information. Determining the NFC levels of adolescents will allow for the improvement of NFC throughout the educational process using tasks related to critical thinking. Development of higher levels of NFC will in turn provide opportunities for adolescents to engage in society more effectively and become better informed citizens. This is because those with high levels of NFC are able to effectively use evidence and logic to make informed decisions (Mendelberg, 2002). This is significant in a democratic society wherein individual and aggregate decisions affect government and public policies.

While there is current research using the NCS with college-aged participants, there is very little research on NCS among children and adolescents (Bors, Vigneau, & Lalande, 2006; Preckel, Holling, & Vock, 2006; Preckel, 2013). This dearth of research is disconcerting because the abstractness of the NCS as a measure of NFC may or may not be suitable for the developmental age of children and adolescents. In particular, the readability and vocabulary of the items on the NCS may be too difficult for younger age groups to understand. This poses a risk for inaccuracy because if a participant does not understand the items on the scale, then the score will not accurately reflect the individuals’ NFC. Evaluating whether or not adolescents understand the items on the NCS will help to improve the scale as a measure for assessing NFC in children and adolescents. The objective of this study is to determine the suitability of the NCS and its items among adolescents aged 10-18. The goal of examining the suitability of this scale is to improve the NCS as a measure for use with younger age groups.

This thesis is structured in five chapters. These sections are: the introduction, a review of the literature on NFC, the methods used to evaluate the NCS, the results of the
current study, and a concluding discussion of what the results of this study mean for the use of the NCS among adolescents.
Chapter Two

Review of the Literature

The topic of NFC, “the tendency for an individual to engage in and enjoy thinking”, originally received attention when Cacioppo and Petty (1982) studied this concept to develop a way to assess it as a construct. Those who had high levels of NFC were considered “cognizers” who enjoyed thinking and engaging in activities that allowed them to think. On the other hand, individuals who possessed low levels of NFC were said to be cognitive “miser” who did not enjoy thinking and seem to avoid it at all costs. This theory has also been widely used in the years following the original study. In 1996 Cacioppo, Petty, Feinstein, and Jarvis conducted a literature review which examined empirical research studies on the topic of NFC and illustrates how extensively this research theory is still used. The conclusion based on the 100 research studies examined was that the concept and consequences of NFC were found to be consistent across all of these studies. NFC was found to be a stable trait that is based on individual differences in motivation to engage in cognitive activity.

The studies by Petty and Cacioppo helped them to develop the NCS, a tool to measure NFC, which is now used widely. In other studies, the NCS has been used as a measure for engagement and enjoyment of thinking related to the other psychological traits of metacognition (Kuhn, 1999), problem solving (Coutinho, Wiemer-Hastings, Skowronski, & Britt 2005; Erbas, 2012; Nair & Ramnarayan, 2000; Gulgoz, 2001; Shestowsky, 1998; Curseu, 2011), performance expectancies (Reinhard & Dickhauser, 2009), motivation (Steinhart & Wyer, 2009; Preckel, Holling, and Vock, 2006), and types of processing (Sadowski & Gulgoz, 1996). The NCS was determined to be an effective
measurement tool for the construct of NFC and has been used in other countries and found to be reliable, proving its effectiveness as a scale for measuring NFC (Gulgoz, 2001; Erbas & Okur, 2012; Nair & Ramnarayan, 2000; Curseu, 2011; Bertrams & Dickhauser, 2010; Reinhard & Dickhauser, 2009; Dickhauser & Reinhard, 2009; Ginet & Py, 2000). This use of the NCS in other countries is discussed in more detail in the section on translation and use of the scale in other countries. NFC and its relation to the topics of metacognition, problem solving, performance expectancies, motivation, and types of processing are examined in this literature review, with a focus on the lack of research devoted to NFC in adolescents. The literature review concludes with the purpose of this research study and the research questions that were examined.

**NFC’s Relationship to Metacognition**

The NCS has been used to examine other topics related to NFC, one of which is metacognition. Metacognition is the individual ability to think about one’s own thinking and use this knowledge to improve performance (Flavell, 1979). The development of metacognition enables individuals to improve metastrategic skills (Kuhn, 2000). Metastrategic skills are important for critical thinking because they allow an individual to evaluate assertions and make informed decisions (Kuhn, 1999). Some individuals are unable to develop metastrategic skills and thus are unable to think critically; individuals who lack the skills to think critically also lack the metacognitive awareness to solve problems effectively (Erbas, 2012). In the academic setting, it is essential for students to develop critical thinking skills because contemporary curricula require the effective use of these skills. An example of this is in the curricula is that students are asked to write argumentatively and must consider two sides to an issue. When students are asked to
write in a way that requires them to think about multiple perspectives this allows them to
“assess the validity of their own thinking, and anticipate counterclaims in opposition to
their own assertions” (NGA, 2010). Looking at an issue from different sides is a task that
involves critical thinking and it is through the use of tasks such as these that the
development of critical thinking occurs in the school setting. These skills are included in
curricula because critical thinking is a skill that contributes to lifelong learning and
success in various domains. Critical thinking is essential in the workforce (Halpern,
1998), everyday decision-making (Nair & Ramnarayan, 2000), and citizenship in a
democratic society (Mendelberg, 2002). The ability to think critically is reflected in how
problems are approached. Individuals who have high NFC are more likely to value and
engage in critical thinking than are those with low NFC (Cacioppo & Petty, 1982) and
this cognitive engagement enhances performance and decision making throughout all
domains.

**Problem Solving and NFC**

In a study by Coutinho et al. (2005), individuals with higher NFC were more
aware of their own performance on tasks and thus performed better in tasks involving
problem solving. The ability to think critically and the desire to engage in and enjoy
thinking (high NFC) were important in solving problems. Metacognition played a role in
problem solving because individuals with metacognitive skills were better able to deal
with difficulties that arose while trying to solve a problem (Erbas, 2012). Individuals who
were unable to think about the problems they were trying to solve could not develop
strategies to help them reach solutions.
A further examination of the research involving problem solving also revealed a relationship between problem solving abilities and NFC (Nair & Ramnarayan, 2000). Since problem solving involves being highly engaged in thinking, it would be expected that those who have higher levels of NFC also would be better at solving problems. In a study by Nair and Ramnarayan (2000), it was found that NFC was positively related to problem solving. Individuals with higher levels of NFC were more successful in solving problems, their achievements were higher, and they considered many issues and aspects of the problem when making decisions. The willingness to engage in thinking matters greatly in the problem solving process and makes individuals better problem solvers.

The ability to solve problems is also affected by the difficulty of the task (Gulgoz, 2001). When individuals were told that a problem was going to be hard, this expectation of difficulty affected their ability to solve the problem. Having low NFC had more of an effect on problem solving ability, as individuals with low NFC preferred not to invest effort into thinking. When individuals with low NFC were told that the problem would be hard, they started to believe they could not solve the problem (Gulgoz, 2001). This resulted in less effort toward solving the problem. In contrast, participants with high NFC were less affected by the anticipated level of difficulty.

Problem solving in groups has also been examined in relationship to NFC. In observations of groups of two individuals, one with high NFC and one with low NFC, it was found that those who had higher NFC were more influential in the decision that was reached (Shestowsky, 1998). This result indicated that individuals with high NFC have more influence in a group setting because they are more persuasive than those with low NFC. This effect has important implications for many situations involving group work.
That is, there is a relationship between NFC and the decision that is reached. In groups composed of individuals with different levels of NFC, decisions are likely to be driven by those with higher levels of NFC. These decisions will more often be based on an evaluation of a great quantity of the information that was presented because those with high NFC are more likely to engage in thinking and would assess the material that was given to them before coming to a conclusion.

A study by Curseu (2011) found that NFC plays a role in problem solving in small groups because individuals who had high levels of NFC were able to act as information integrators and bridge boundaries that existed in the group. This result provided a rationale for forming groups based on NFC. The trait of high NFC made individuals better able to help their groups reach a decision. It also provided the implication that individuals with high NFC were important participants in these group settings. Determining adolescents’ levels of NFC will help teachers to create mixed groups that reflect these varying levels of NFC. This process may even help students to develop higher levels of cognition so that they are better able to effectively solve problems.

**NFC, Self-Concept and Performance Expectancies**

Performance expectancies have been examined in relation to NFC because forming expectancies is associated with cognitive activity. Expectancies are beliefs about the future state of affairs, and performance expectancies are ratings of how well an individual expects to perform on an achievement-related task (Reinhard & Dickhauser, 2009). Self-concept, an individual’s beliefs about himself or herself, informs how that individual expects to perform on a task (Reinhard & Dickhauser, 2009). A positive self-
concept leads to the expectation for high performance on a task, while a negative self-concept leads to the expectation for poor performance. Reinhard & Dickhauser (2009) attempted to determine the relationship among NFC, task difficulty, and performance expectancies in six different studies.

In their first study, Reinhard & Dickhauser (2009) established that those with higher NFC had decreasing performance expectancies as task difficulty increased, while the performance expectancy of those with low NFC did not change when the task difficulty increased. Their result is contradictory to that found in the problem solving research by Gulgoz (2001), which found that task difficulty affected only those with low NFC. These differences in results may be due to the difference in the types of tasks used by Gulgoz (2001) and Reinhard & Dickhauser (2009). Gulgoz used multiple-solution anagrams, while Reinhard and Dickhauser used manipulation tasks, such as building pyramids. The type of task may have had an influence on how participants approached the task, regardless of their NFC.

In their second study, Reinhard and Dickhauser (2009) found that the interaction of NFC and task difficulty affected performance expectancies significantly. Performance expectancies decreased as task difficulty increased for those who had high NFC. This finding further explains how NFC affects performance expectancies, especially in those with high NFC.

Expectancies predicted achievement on difficult tasks only for participants with higher NFC in Reinhard and Dickhauser’s (2009) third study. Therefore, NFC moderated the relationship between task difficulty and performance expectancies. This finding
highlighted the fact that NFC serves as an influence during difficult problem solving tasks and changes the performance expectancies of those with high NFC especially.

In Reinhard and Dickhauser’s (2009) fourth study, they found that NFC moderated the relationship between task difficulty and performance expectancies on a social skill task. This outcome showed that NFC was also influential on tasks outside the domain of problem solving.

In study five, NFC was found to moderate the relationship between task difficulty and performance expectancies in a physical task. Performance expectancies rose when those with lower NFC had an increased general self-concept. For individuals with higher NFC, differences were observed in specific self-concept. (General self-concepts are beliefs about how well a person thinks they will do on any task. Specific self-concepts are beliefs about how well a person thinks they will do in a particular subject such as math or science. General and specific self-concepts are also influenced by NFC.)

In the sixth study, the findings of study five were replicated in the domain of academic tasks. The participants were in either an easy or difficult task condition. Participants’ achievement was measured by the number of correctly solved analogy tasks. NFC was again found to moderate the relationship between task difficulty and performance expectancies, with performance expectancies rising with increasing general self-concept for those with low NFC.

The findings of these studies were then used to examine general and specific self-concept in subjects such as English and Math. Reinhard and Dickhauser (2009) established that performance expectancies predicted actual performance on tests in these subject areas. In addition, the higher an individual’s NFC, the stronger the relationship
between specific self-concept and actual performance. Individuals who had higher levels of NFC were better at predicting their performance than were those with low NFC. These results showed how NFC influenced the ability of individuals to judge their capacity for success on a task. This finding has implications in education because students who have high NFC are better able to determine how successfully they can complete a particular task, which might affect students’ motivation to apply effort to tasks on which they predict they will be unsuccessful.

**Motivation and NFC**

Approach motivation and avoidance motivation, two specific types of motivation, have been studied with connection to levels of NFC. Approach motivation is the desire to attain positive outcomes of a behavior or decision. In this type of motivation an individual’s behavior is directed by the possibility of a positive consequence to their behavior. The individual will choose the behavior that allows them to be rewarded (Elliot, 1999). Avoidance motivation is the desire to avoid negative consequences. In this type of motivation an individual’s behavior is directed by the possibility of a negative consequence to their behavior. The individual will choose the behavior that allows them to avoid the negative consequence (Elliot, 1999). Three experiments were conducted by Steinhart and Wyer (2009) to determine the differences in approach and avoidance motivation of individuals with different levels of NFC.

In their first experiment, Steinhart and Wyer (2009) found that when individuals with high NFC thought they might fail, they were more likely to demonstrate avoidance motivation than were individuals with low NFC, unrelated to task difficulty. Participants who had higher NFC solved more anagrams than did those with low NFC. This
difference was greater when participants expected a difficult task on which they were likely to fail than when they expected a simple task or a difficult but solvable task.

Steinhart and Wyer (2009) also found in their second experiment that participants with high NFC had higher avoidance motivation than those with low NFC. This avoidance motivation was increased when the task was expected to be difficult. This result, combined with that of the first study, showed that individuals with high NFC were more likely to try to avoid negative outcomes when they expected the task to be difficult.

Results from Steinhart and Wyer’s (2009) third study indicated that participants with high NFC showed more avoidance when they expected a difficult task than when they expected an easy one. They were more likely to make compromised choices in the product decision task and more likely to prefer equality in the resources allocated task.

In total, the results of these studies indicated that NFC and motivation of individuals are linked, especially when tasks are expected to be difficult. This was aligned with the research on problem solving and performance expectancies. It was found that in terms of motivation, task difficulty affects those with high NFC more than it affects those with low NFC, causing them to avoid tasks on which they do not expect to perform well (Reinhard & Dickhauser 2009).

Motivation was also studied among adolescents in grades seven through ten by Preckel, Holling, and Vock (2006). They examined the relationship of cognitive motivation and achievement motivation among academic underachievers. Results showed that underachievers had lower levels of NFC and achievement motivation compared to higher achievers. This was thought to be influenced by anxiety because students who did not have positive experiences with examining complex information were more likely to
experience anxiety when presented with achievement tasks. Intervention programs to
increase NFC levels may be able to teach students how to engage in metacognitive
activities in order to reduce students’ levels of anxiety when asked to perform
achievement tasks.

Types of Processing and NFC

Along with motivation, another aspect of thinking that is affected by NFC is the
type of processing used to examine materials. Some individuals use elaborative
processing, which means that they examine problems in an in-depth manner, whereas
individuals with non-elaborative processing techniques only examine surface issues of a
problem. Research has found that those with higher NFC scores are more likely to use
elaborative processing, indicating an ability to explain and use materials more effectively
to solve problems. In addition, those with higher NFC scores had more elaborative
explanations and performed better on tests (Sadowski & Gulgoz, 1996). These results
demonstrate the importance of NFC in how individuals study topics and perform tasks.
With higher levels of NFC comes an increased willingness to examine issues in-depth,
also leading to better outcomes on tests. Hence, it is important for adolescents to learn
how to think about topics in-depth because this will help them to become better critical
thinkers. The ability to think critically is central to the Common Core Curriculum, which
will affect the majority of students in the US, thus teaching students to use elaborative
processing early on will help them to perform better in school.
Table 1:

Summary of Research on NFC

<table>
<thead>
<tr>
<th>Research Studies</th>
<th>High NFC</th>
<th>Low NFC</th>
</tr>
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<tbody>
<tr>
<td>Metacognition</td>
<td>More likely to engage in critical thinking (Cacioppo &amp; Petty, 1982).</td>
<td>Not likely to engage in critical thinking (Cacioppo &amp; Petty, 1982).</td>
</tr>
<tr>
<td>Problem solving</td>
<td>Aware of their own performance on problem solving tasks and performed better (Coutinho et al., 2005).</td>
<td>Low NFC had more of an effect on problems solving and when problems were anticipated to be hard they were more likely to give up (Gulgoz, 2001).</td>
</tr>
<tr>
<td></td>
<td>More successful in solving problems and considered many issues and aspects of the problem (Nair &amp; Ramnarayan, 2000).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less affected by the level of difficulty of the problem (Gulgoz, 2001).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>More influential in decisions reached (Shestowsky, 1998).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Act as information integrators when in groups (Curseu, 2011)</td>
<td></td>
</tr>
<tr>
<td>Performance Expectancies</td>
<td>Have decreasing performance expectancies as task difficulty increases (Reinhard &amp; Dickhauser, 2009).</td>
<td>Performance expectancy does not change when task difficulty is increased (Reinhard &amp; Dickhauser, 2009).</td>
</tr>
<tr>
<td>Motivation</td>
<td>When they thought they might fail, they were more likely to demonstrate avoidance motivation (Steinhart &amp; Wyer, 2009).</td>
<td>Had lower avoidance motivation, even when task difficulty increased (Steinhart &amp; Wyer, 2009).</td>
</tr>
<tr>
<td>Types of processing</td>
<td>Have more elaborative processing (Sadowski &amp; Gulgoz, 1996).</td>
<td>Have less elaborative processing (Sadowski &amp; Gulgoz, 1996).</td>
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Stability of the Need for Cognition Scale (NCS).

In addition to the research on NFC, the stability of the NCS as a measurement tool for NFC has also been examined. In addition to the original 34-item NCS, a second short-form NCS was developed by Cacioppo and Petty (1984). This scale contains 18 items rather than the original 34 items and has been shown to be more efficient and comparably accurate as an instrument for assessing NFC (Cacioppo & Petty, 1984). The study by Cacioppo and Petty was replicated by Sadowski (1993), and results indicated that the 18-item scale efficiently measured NFC as a construct. Sadowski (1993) further extended the Cacioppo and Petty (1984) study by showing that the scale is gender neutral in homogenous populations.

The dimensionality and polarity of the NCS questions have been tested for both the long and short forms. When negatively worded items were reworded positively, this did not affect the results of the scale. This indicated that the scale is multidimensional and that the polarity of the questions (whether they are worded positively or negatively) does not affect the dimensionality of the scale (Lord & Putrevu, 2006). However, a study by Preckel (2013), which studied NFC in adolescents, also examined the multidimensionality of the NCS and found conflicting results from those concluded in the Lord and Putrevu’s (2006) study. Preckel’s (2013) study was conducted with adolescents aged ten and older. It was determined that the item wording affected the structure of the scale. Students who were more motivated were more likely to approve positively worded items, while lower achieving students were more likely to approve negatively worded items. Since Preckel (2013) studied adolescents and Lord and Putrevu (2006) studied undergraduate students, the difference in their results suggests that the scale may be read
differently by adolescents, particularly where the item wording is concerned. This theory about the NCS and its interpretation among adolescents is supported by a study with school children conducted by Bors, Vigneau, and Lalande (2006) that measured the relationship between students’ vocabulary ability and item polarity of the questions to levels of NFC. This study used the French version of the NCS and a vocabulary scale to measure the students’ vocabulary abilities. The researchers found that vocabulary performance and scores on the NCS were positively correlated, suggesting that the ability for students to comprehend the items on the scale influenced their scores. Those with lower vocabulary scores seemed to have more difficulty with the negative polarity items on the scale. This finding provided the implication that item polarity might have an effect on the construct being measured, especially when vocabulary levels are low. The results of this study also suggest that the negative polarity items require greater vocabulary ability. However, the multidimensionality of the scale may also be in question when used with individuals of a younger age range. The differences in scores may be caused by either, or a combination of, the vocabulary level of the participants or the dimensionality of the scale.

The NCS is effective for measuring NFC in many different populations and with respect to many different topics. On the other hand, it has not been studied with respect to adolescents and the question remains whether or not adolescents, ‘due to their vocabulary ability, are able to understand the items on the scale.

**Translation and Use of the Scale in Other Countries**

The NCS has been used in other countries to assess the construct of NFC. The Turkish NCS, which has been examined for reliability and has been found to be just as
consistent as the English version (Gulgoz, 2001), has been used in studies involving metacognition and problem solving abilities (Erbas & Okur, 2012). Similarly, the Dutch NCS has been used as an effective measure for assessing NFC in small student groups (Curseu, 2011). In a study conducted in Germany by Bertrams and Dickhauser (2010), the German version of the NCS was determined as very reliable in both the long and short forms. As a result of this scale’s reliability, the German NCS has been used in a number of studies that evaluate the relationship of NFC to other traits such as performance expectancies (Reinhard & Dickhauser, 2009; Dickhauser & Reinhard, 2009). The scale has also been translated into French and has been used with children (Ginet & Py, 2000; Bors, Vigneau, & Lalande, 2006). Interestingly, the NCS has not been used in the United States among children or adolescents.

The scales’ ability to be used reliably in other countries and cultures provides evidence that the scale is not culturally biased. It also shows that the construct of NFC is present in multiple cultures and is not something that is culturally created. The scales’ reliability and consistency shows that the scale is measuring what it is intended to measure. Since the scale has been used repeatedly and has maintained its reliability and consistency, researchers can be fairly certain that the NCS is measuring the construct of NFC. Therefore, it can be used in the United States to determine whether or not it is an effective instrument to use among adolescents.

**Emerging Issues**

Although the NCS has been validated time and time again for its reliability as a scale for measuring NFC as a construct (Cacioppo & Petty, 1984; Lord & Putrevu, 2006; Sadowski, 1993), there is very little research to determine whether the NCS works well
among adolescents. Participants in studies on NFC have mainly been college students or adults. Exploring the use of the NCS among adolescents will help to expand the research on NFC and determine whether adolescents have NFC.

Research shows that NFC is related to other forms of cognition and motivation such as problem solving (Coutinho et al., 2005; Curseu, 2011; Erbas, 2012; Nair & Ramnarayan, 2000; Shestowsky, 1998; Gulgoz, 2001), performance expectancies (Dickhauser & Reinhard, 2009; Reinhard & Dickhauser, 2009), and motivation (Sadowski & Gulgoz, 1996; Steinhart and Wyer, 2009). Evaluating if adolescents comprehend the items contained on the NCS and discovering if the scale is just as reliable for adolescents will allow researchers to use this scale in conjunction with studies on numerous topics related to NFC.

The construct of NFC needs to be better understood so that it can be encouraged and developed in adolescents. Educators can learn how to improve students’ willingness to engage in tasks that involve critical thinking through additional research on the topic of NFC in adolescence. In addition, new curriculum standards require students to learn topics in depth rather than just repetitively skimming the surface. Adolescents with high levels of NFC would be better able to think critically and solve problems than those with low levels of NFC. This is also important because NFC influences how individuals respond to events in their everyday life. If NFC is increased in adolescents these individuals would be better able to make decisions for their lives. NFC is also significant in how individuals act as citizens. Individuals who have had their NFC increased may be able to help make better decisions about the way that government is run.

**Research Purpose and Questions**
The purpose of this study is to examine NFC in the United States of America with an adolescent population. Little research has been conducted among adolescents, compared to the vast amount of research on adults and college students with relation to multiple topics linked to NFC. This research study attempts to close this gap in the research by examining 10 to 18 year olds’ understanding of the items on the short NCS. The research questions that guided this study were:

1) Do adolescents understand the meaning of the items on the Need for Cognition scale?
   1.1) Are the levels of difficulty in the readability of the items on the Need for Cognition scale appropriate for adolescents?
   1.2) Are the levels of difficulty in the vocabulary of the items on the Need for Cognition scale appropriate for adolescents?
   1.3) What are adolescents’ / participants’ comprehension levels of the items on the Need for Cognition scale?

2) Do adolescents have Need for Cognition?

   The rationale for the preceding theoretical question was that before an empirical analysis of the items could take place, through the cognitive interviews, a theoretical analysis was required to better understand how the items themselves were worded. The theoretical step helped to determine if there was a bias in the measurement. The theoretical analysis of the items informed the researcher of how to methodologically assess the adolescents understanding of the items. This analysis also helped the researcher to understand why participants may or may not understand certain items. Based on the results of the theoretical analysis, the researcher determined that the difficulty level of the items could be a confounding variable that needs to be controlled in
the research design. The potential bias due to lack of readability (not vocabulary comprehension) of the items was circumvented by reading the items to the participants. To further assess the comprehension – that is, the readability and vocabulary difficulty – students were asked to explain the meaning of the item using their own words instead of paraphrasing the item with existing vocabulary (i.e., cognitive interviews). The results of the theoretical item analysis were anticipated to help explain the findings of the empirical question. That is, the researcher could triangulate the results of the theoretical question with those of the empirical question to try and get a better understanding of why participants may or may not understand certain items on the NCS.
Chapter Three

Methods

Theoretical Analysis: Item Difficulty Based on Readability Assessment

In this section, the method used for the theoretical analysis is discussed. The focus is on the five readability assessments. There were no participants for the readability analysis of the items; the items alone were used for this examination. These results were later triangulated with the results of the vocabulary analysis and the cognitive interviews to provide an explanation of why some items may be more difficult than others for adolescents to understand.

Materials and Procedures. The items on the NCS were analyzed to determine the readability of each of the items on the scale. This analysis consisted of taking each statement from the scale and calculating the grade level at which the statement could be easily read. Five different readability formulas (Flesch-Kincaid Reading Ease, Gunning-Fog Index, Coleman-Liau Index, Simple Measure of Gobbledygook [SMOG], and the Automated Readability Index [ARI]) were used to calculate five individual readability scores for each item. The scores were then averaged to determine the grade level at which each item should be easily comprehended. These formulas are based on character count, syllable count, word count, sentence length, characters per word, syllables per word, and words per sentence (Simpson, 2010).

*Flesch-Kincaid Reading Ease.* This readability measure has been used in many different fields and has been validated by a number of studies as a reliable scoring system for readability (Flesch, 1948). It has also been revised to increase the reliability of the formula as a measure of the reading abilities of the today’s student populations (Hayes,
Jenkins, & Walker, 1950; Powers, Sumner, & Kearl, 1958). The Flesch-Kincaid Reading Ease measure has also been supported as a measure of reading comprehension in analyzing reading material (Peterson, 1956). The formula for the Flesch-Kincaid Grade Level used in this study is a revised version of the original Flesch readability measure and uses the formula: 0.39 x (words/sentences) + 11.8 x (syllables/words) - 15.59 (Simpson, 2010).

**Gunning-Fog Index.** The Gunning-Fog Index formula is a simplification of the Flesch-Kincaid formula and has also undergone revisions to reflect the reading levels of today’s student populations (Powers et al., 1958; Stossel, 2012). It has been widely used along with the Flesch-Kincaid formula over the last couple of decades (Thomas, Hartley, & Kincaid, 1975; Gunning, 1952). Grade level was calculated in this study by using the formula: 0.4 x (words/sentences) + 100 x (complex words/words) (Simpson, 2010).

**Coleman-Liau Index.** This measure was developed as a way to calculate readability with a computer or other machine for better ease of scoring (Coleman & Liau, 1975). The formula used to calculate the grade level of the items for this assessment was: 5.89 x (characters/words) - 0.3 x (sentences/words) - 15.8 (Simpson, 2010).

**Simple Measure of Gobbledygook (SMOG).** This measure of readability was developed by McLaughlin (1969). The calculation of the grade level for this scale was based on the number of words with more than three syllables (Shieh & Hosei, 2008). This index has been used to determine the readability of printed health information materials (Shieh & Hosei, 2008). Grade level for this readability assessment was calculated in this study by using the formula: 1.0430 x sqrt (30 x complex words/sentences) + 3.1291 (Simpson, 2010).
Automated Readability Index (ARI). The fifth formula used for calculating readability was the Automated Readability Index (ARI). This formula is more recent than the Flesch-Kincaid and Gunning-Fog formulas (Thomas et al., 1975), and it has been validated as a reliable measure in studies with military personnel and for use in job training programs (Smith & Kincaid, 1970; Kincaid & Delionbach, 1973; Kincaid et al., 1972). This assessment used the formula: 4.71 x (characters/words) + 0.5 x (words/sentences) - 21.43 (Simpson, 2010).

Averaged Grade Level. These five formula scores were then averaged to determine the grade level at which an individual should be able to comprehend each statement easily. This was done by adding the five readability measure grade levels and dividing by five. This provided the average grade level at which each item should be easily understood.

Theoretical Analyses: Item Difficulty Levels Based on Vocabulary Usage

Along with determining the readability of each item on the NCS, the vocabulary used in the items on the scale was analyzed. This vocabulary analysis was conducted because the readability measures failed to account for the vocabulary difficulty of the items, instead focusing only on the text complexity (Schinka, 2012). Similar to the readability analysis, there were no participants for the vocabulary analysis of the items; the items alone were used for this examination. These results, along with the results of the readability analysis, were later triangulated with the cognitive interviews to provide an explanation as to why some items may be more difficult than others for adolescents to understand.
**Material and Procedures.** One word from each item was analyzed using *The Living Word: A National Vocabulary Inventory* (Dale & O’Rourke, 1976). This inventory contains a list of 43,000 words that were tested among students in grades four, six, eight, ten, and twelve, as well as college freshmen (grade level thirteen) and seniors (grade level sixteen). For each word, a grade level was determined at which the majority of participants understood the word. The importance of this measurement of vocabulary difficulty is that it helped to account for the ability of a subject to comprehend the meaning of an item.

The most difficult word in each statement was chosen based on length and difficulty of all of the words in each item on the NCS. When the results of the readability and vocabulary analyses were combined, they provided the theoretical assessment of the difficulty of the items on the NCS.

**Theoretical Analysis: Overall Item Difficulty Level**

Based on the average readability grade level and the vocabulary difficulty of each item on the NCS, the items were assigned a grade-appropriate level. This theoretical difficulty score was determined by adding the average grade-level scores for readability and vocabulary and dividing that sum by two. This score provided the theoretical difficulty by grade level for each item on the scale.

**Empirical Analysis: Item Difficulty Levels Based on Cognitive Interviews with Participants**

In addition to the theoretical analysis of the items on the NCS, the items were used in interviews with adolescents to determine which items were more difficult than others for participants to understand.
**Participants.** The researcher interviewed 96 participants (36 male, 60 female). Participants ranged in age from 10 to 18 years old ($M = 14.77$, $SD = 2.5$) and were White/Caucasian (77.08%), African American (8.33%), Hispanic (2.08%), and Other (12.51%). Participants were from both public and private elementary, middle, and high schools in small local school districts. The schools were located in Northwest Ohio and Southeast Michigan.

Participants were placed in one of three groups based on age: Group 1 (10-12 years) ($n = 22$), Group 2 (13-15 years) ($n = 28$), and Group 3 (16-18 years) ($n = 46$). Participants were divided into these three age-based groups to compare the differences in their comprehension of the items on the NCS based on age.

**Sampling and Recruiting Strategies.** Participants were selected by convenience sampling from schools located in Northwest Ohio and Southeast Michigan. Convenience sampling, which is also called accidental or opportunity sampling, is a procedure wherein participants are selected by recruiting people that are of easy access to the researcher and often within close geographical proximity (Clark-Carter, 2004). Every preteen and teen in the age category of 10 to 18 years of age at the selected schools qualified to participate in the study. The researcher visited the classrooms at the data collection sites and informed the students about the study. Students could ask questions about the research study. Each student received an assent form and a consent form for parents/guardians. Students took home forms about the study to discuss with their parents/guardians and were asked to return the forms to their classroom teachers. Students and parents/guardians had the opportunity to contact the researcher with questions or concerns via phone and/or email communication. The researcher recruited every student interested in participating in the
study at the data collection sites. Students who did not assent and/or whose parents/guardians did not consent did not participate in the study.

**Method Cognitive Interviewing.** In general, an interview is a way to obtain self-report data through a one-on-one conversation (Clegg & Stevenson, 2013). The interviews used in this study were semi-structured; therefore, clarifying ad hoc questions were permitted when necessary (Flick, 1998).

In this study, interviews were used to gain an idea of how participants understood the items on the NCS. Specifically, the method used can be best described as cognitive interviewing, a type of semi-structured interview most commonly used to gain a better grasp of surveys and survey items that are in the development stages. The purpose of this method is to collect verbal responses to the items on a survey (Greene, Torney-Purta, Azevedo, & Robertson, 2010). Cognitive interviewing is an especially important method for use among adolescents, as it can help researchers gain improved insight into how the participants understand the meaning of the items. Reading the items to the adolescent and having them verbalize explanations of the meaning can help the researcher to uncover participants’ misunderstandings or confusion with the items (Flick, 1998). In addition, it has been suggested that cognitive interviewing is a useful tool when developing measures for abstract constructs, like NFC, while working with adolescents (Greene, Torney-Purta, Azevedo, & Robertson, 2010). The NCS contains items with vocabulary that could be considered abstract such as “the notion of thinking abstractly is appealing to me” (*Item 14*, Appendix A). Some adolescents might not comprehend the meaning of the item because they do not know how to define the word “abstractly” or describe it in their own words.
In this study, the items on the NCS were read to the participants with the purpose of removing readability/sentence comprehension as a confounding variable. One goal of the cognitive interviews was to solicit responses from the adolescent to understand (a) whether they comprehended the meaning of the items on the NCS, (b) if they did not understand the item, to identify potential reasons why they did not, and (c) to uncover whether or not certain vocabulary words were barriers to adolescents’ understanding of the items.

**Materials.** The materials used in this study were the interview protocol, an audio recorder, and a pen for recording the answers given by the participants. A computer was used to transfer the recorded audio files to be transcribed.

During the first part of the interview protocol, participants were asked to provide information about their age, gender, and ethnicity. In the next step, participants were asked to respond to each of the 18 items as they are worded on the *Need for Cognition Scale* (Cacioppo, Petty, & Kao, 1984; see Appendix A). Participants were first asked to describe in their own words what they thought each item meant. They were then asked to indicate their agreement with the statements on a 4-point Likert scale (4 = I strongly agree, 3 = I agree, 2 = I disagree, 1 = I strongly disagree). In addition, they were asked to give an example from their own life to explain their choice of agreement or disagreement with the statement. By explaining the meaning of each item in their own words and providing an example for each item’s rating, participants provided information that allowed the researcher to assess their understanding of the items. The cognitive interview protocol is provided in Appendix B.
Procedure. Before participants were interviewed, consent forms were collected from the parents and assent forms were collected from the students. Thirty-minute-long cognitive interviews were conducted in the libraries at the schools. Interviews were conducted one-on-one with the participants and followed the interview protocol described above. The interview responses were recorded with an audio recorder and also recorded in writing on the protocol sheet. At the start of each interview, the participants were told that there were no “right” or “wrong” answers to the questions and that it was acceptable if they could not answer some of the questions. Participants were also told that they could ask for clarification if they did not understand an item. The researcher recorded the level of item comprehension on the interview protocol sheet with “FA” for “failed”, “WH” for “with help”, or “WO/H” for “without help” in the top field of the interview protocol box A (see Appendix B). Next, participants were asked how strongly they agreed or disagreed with the statements. Finally, participants were asked whether they could provide an example from their experiences that illustrated their agreement or disagreement with the statement. If the participants then discussed such an experience, details were noted on the protocol sheet. If the participants were unable to give an example, the researcher marked this on the protocol sheet with an “X” in the bottom field of the interview protocol box C (see Appendix B). After the completion of the interview protocol, the researcher thanked the participants for their participation and asked if they had any questions that they would like answered. Audio recordings from the interviews were converted to a digital file to be transcribed. De-identification occurred by providing each participants’ interview protocol and audio file with an identification number and replacing identifiers in the interviews.
Cognitive Interview Analysis. After collection of all data and transcription of the interviews, the following steps of the data analysis were completed: 1) calculation of total number of statements answered, 2) calculation of the Need for Cognition scores, and 3) interview responses to the items.

The total number of statements was calculated for each individual participant by counting all of the items answered “WH” or “W/OH”. Items marked with “FA” were excluded. Each participant received a score that ranged from 1 to 18.

NFC scores were calculated by taking the total amount of points received by the participant and dividing that number by the total number of items understood. Possible scores ranged from 1.0 (strongly disagree) to 4.0 (strongly agree) and indicated participants’ level of agreement with each of the items. Higher scores indicated higher levels of Need for Cognition. Table 2 shows the scale used to evaluate the scores.

The interview responses were also analyzed. This analysis used the participants’ statements about the items to establish which vocabulary words were considered difficult. The participants’ responses also helped to determine whether or not the participants understood the meaning of the item. The results of the participants’ responses, when combined with the ability of participants to answer the items, helped to establish which items were most and least difficult for participants to understand.

Scores of the participants were compared based on age. Items that participants failed or answered with help were given special attention because these were predicted to indicate a lack of understanding of the associated items. These results were then triangulated with the results of the readability and vocabulary analyses to provide sound
reasoning for why participants experienced difficulty comprehending specific items on the NCS.

Table 2:

*Need for Cognition Scale*

<table>
<thead>
<tr>
<th>Need for Cognition Score</th>
<th>Likelihood to engage in and enjoy thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 1.5</td>
<td>Participant is not very likely to engage in and enjoy thinking.</td>
</tr>
<tr>
<td>1.6 to 2.5</td>
<td>Participant is not likely to engage and enjoy in thinking.</td>
</tr>
<tr>
<td>2.6 to 3.5</td>
<td>Participant is likely to engage and enjoy in thinking.</td>
</tr>
<tr>
<td>3.6 to 4.0</td>
<td>Participant is very likely to engage in and enjoy thinking.</td>
</tr>
</tbody>
</table>
Chapter Four

Results

The Results section reports on the findings of (a) the theoretical analyses of the difficulty level of each based on their overall readability levels and vocabulary usage and (b) the empirical analysis of participants’ comprehension of and responses to the survey items during the cognitive interview process.

Theoretical Analysis: Item Difficulty Based on Readability Assessment.

The difficulty level of each item was assessed using five different readability assessments that currently exist in the field of reading comprehension. These measures were 1) Flesch-Kincaid Reading Ease (Flesch, 1948; Hayes et al., 1950; Powers et al., 1958; Peterson, 1956), 2) Gunning-Fog Index (Powers et al., 1958; Thomas et al., 1975; Gunning, 1952), 3) Coleman-Liau Index (Coleman & Liau, 1975), 4) Simple Measure of Gobbledygook (SMOG), (McLaughlin, 1969; Shieh & Hosei, 2008), and 5) Automated Readability Index (ARI) (Thomas et al., 1975; Smith & Kincaid, 1970; Kincaid & Delionbach, 1973; Kincaid et al., 1972). The readability (sentence comprehension) of a text is typically assessed using semantic and syntactic criteria such as character count, syllable count, word count, sentence length, characters per word, syllables per word, and number of words per sentence (e.g., Hahne, Eckstein, & Friederici, 2004; Meltzer, McArdle, Schafer, & Braun, 2010). The readability level indicates the grade level at which average students should be able to comprehend the text. Possible scores ranged from grade 1 to grade 22. Scores at the high school level ranged from grade 9 to grade 12. Any scores higher than grade 12 indicated readability at the college level. For example, Item 15 had an item difficulty score of 13.8. This score indicated that a student would
need to be at the college level to comprehend this item. A brief description of the five analyses is provided subsequently. Table 3 provides an overview of these analyses for each item separately, including their averaged readability levels.

**Flesch-Kincaid Reading Ease.** The first readability assessment used to identify the difficulty level of the items was the Flesch-Kincaid (Simpson, 2010). The difficulty levels that were identified showed a large range of variability ($M = 7.05, SD = 3.74$) among the items on the NCS. **Item 7** had the easiest readability score, at the grade level of 1. **Item 18** had the most difficult readability score at the grade level of 13.1. The difficulty level of a considerable number of the items ($n = 6$) was at or above the high school level (i.e. grade level 9 or higher = **Items 2, 4, 5, 15, 16, and 18**).

**Gunning-Fog Index.** The second readability assessment was the Gunning-Fog Index (Simpson, 2010). The results demonstrated similar broad levels of variability among items ($M = 9.01, SD = 4.77$). The items with the easiest readability levels were **Item 1** and **Item 3**, each with a readability grade level of 2.8. **Item 15** had the highest grade level difficulty, with a grade level of 17.9. Although the items with the single lowest and highest scores for this measure were not the same as those identified by the Flesch-Kincaid Reading Ease, the item scores demonstrated a similar large variability in item readability levels. A larger number of items ($n = 10$) were identified as having readability levels at or above high school grade levels using the Gunning-Fog Scale (**Items 2, 4, 5, 6, 11, 14, 15, 16, 17, and 18**) in comparison to the Flesch-Kincaid Reading Ease, which identified six such items.

**Coleman-Liau Index.** The Coleman-Liau readability measure was the third assessment used to determine the readability of the items (Simpson, 2010). This
assessment, like the Flesch-Kincaid Reading Ease and Gunning-Fog Index, demonstrated a large variability among items ($M = 9.87, SD = 4.08$). As in Flesch-Kincaid test, the item with the lowest readability grade level was Item 7 with a score of 0.5. The item with the highest readability grade level was Item 4, with a readability level at grade 15.5. A large number of items ($n = 13$) had readability grade level scores at the high school level or higher (Items 1, 2, 4, 5, 6, 8, 9, 11, 12, 14, 15, 16, and 18). Among all the readability assessments, the Coleman-Liau measure yielded the largest number of items identified as at or above a high school readability level.

**Simple Measure of Gobbledygook (SMOG).** Using the SMOG readability measure (Simpson, 2010), large variability among the readability scores on NCS items was identified ($M = 5.84, SD = 3.95$), similar to the outcomes of the preceding assessments. Interestingly, the SMOG identified a considerable number of items ($n = 8$) with low readability scores of 1.8 (Items 1, 3, 7, 8, 9, 10, 12, and 13), perhaps resulting from the formula SMOG uses to calculate readability. The SMOG formula focuses only on the number of complex words divided by the number of sentences in each item to calculate the score, and items on the NCS contain single sentences. This formula does not account for the number of words or syllables to calculate readability like some of the formulas used in other readability measures. The item with the highest level of readability was Item 15 with a grade level of 12.9; this item was also identified as the most difficult item using the Gunning-Fog Index. A small number of items ($n = 4$) were identified to have high levels of readability (Items 4, 5, 15, 18). Again, this distribution was probably a result of the formula used to calculate readability in this measure.
Automated Readability Index (ARI). The last readability assessment, the Automated Readability Index (Simpson, 2010), found similar levels of variability ($M = 8.01$, $SD = 4.42$). *Item 7* had the lowest readability grade level, with a grade level of -3.8. This score was negative as a result of the formula used for this assessment. The ARI uses the number of words, which was low in this sentence, causing the result to be negative. *Item 7* was also identified as the easiest item by the Flesch-Kincaid Reading Ease, the Coleman-Liau Index, and SMOG measure. *Item 4* scored the highest level of readability at 13.1 and was also identified as the most difficult item using the Coleman-Liau Index. A small number of items ($n = 4$) scored at or above the high school readability level (*Items 4, 5, 15, and 16*).

Averaged Grade Level. In the following step of the readability analysis, the average readability levels were calculated for each item; these are reported in Table 3. Overall, the scores for the average readability varied considerably from item to item ($M = 7.53$, $SD = 3.73$). For example, *Item 7* had an average readability grade level of 1 (i.e., *I only think as hard as I have to*), while *Item 15* (i.e., *I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought*) had a readability level of grade 14. A considerable number of items ($n = 8$) were identified to have readability level at or above the high school level (*Items 2, 4, 5, 6, 14, 15, 16, 18*).

Theoretical Analyses: Item Difficulty Levels Based on Vocabulary Usage.

Each item was screened for its difficulty level based on the most difficult vocabulary words used in the written statements. While readability assessed the comprehension of the items at the sentence level, vocabulary difficulty focused on the
single most difficulty word within the item. The difficulty level of the vocabulary words was identified based on *The Living Word: A National Vocabulary Inventory* (Dale & O’Rourke, 1976) and, similar to the readability levels, scores were indicated by school grade levels. Possible scores ranged from grade 1 to grade 16. Any score higher than grade 12 indicated college-level vocabulary. Using this inventory, no vocabulary words were identified to score above grade 12. For example, *Item 14* had a grade level vocabulary score of 12, based on the word “abstractly”. This represented the highest vocabulary score in this analysis and indicated that a student would need to be at high school grade 12 to comprehend this item. The following list encompasses the vocabulary words that were identified as most difficult within each item and are sorted by grade levels: *Excite* (Grade 4), *Puzzles* (Grade 4), *Something* (Grade 4), *Thinking* (Grade 4), *Challenge* (Grade 6), *Relying* (Grade 6), *Responsibility* (Grade 6), *Require* (Grade 6), *Satisfaction* (Grade 6), *Solutions* (Grade 6), *Complex* (Grade 8), *Long-term* (Grade 8), *Anticipate* (Grade 10), *Deliberating* (Grade 10), *Intellectual* (10), and *Abstractly* (Grade 12). The words *Thinking* and *Deliberating* occurred twice as the most difficult vocabulary words in separate items.

Comparing the items to each other, a large amount of variability was identified in the difficulty levels of the vocabulary words ($M = 6.89$, $SD = 2.51$). For example, *Items 3, 7, 12, 13, and 17* ($n = 5$) were scored at the lowest difficulty grade level of 4, while *Items 5, 6, 14, 15, and 18* were scored at the high school grade level ($n = 5$). While the grade level difficulty of *The Living Word: A National Vocabulary Inventory* stops at grade level 16, no grade levels beyond high school were identified among the vocabulary words contained in the items, unlike the readability assessments. It is important to note
that this analysis was based on the single most difficult vocabulary word in each item. The fact that some items contained more than one difficult vocabulary word was disregarded in this analysis. Table 3 provides an overview of the vocabulary words and their grade difficulty levels for each item.

**Empirical Analysis: Item Difficulty Levels Based on Cognitive Interviews with Participants**

Cognitive interviews were used to identify the ability of participants to comprehend the meaning of the items on the Need for Cognition Scale (NCS). The following analysis reports whether or not participants were able to explain the meaning of each item in their own words (i.e., without help) or with the help of the researcher (i.e., with help), or whether they failed to understand the item even with help of the researcher (i.e., failed).

It is important to note that the researcher included information originating from the preceding theoretical item difficulty analyses. This additional step of data triangulation was applied to further strengthen the overall credibility of the results and to determine the final item difficulty levels. Table 4 provides an overview of the comprehension levels for each item of the scale. In addition, Figure 1 provides a visual representation of the data for the items understood without help.

**Item 1.** The cognitive interviews showed that participants from Group 1 had difficulty comprehending *Item 1 (i.e., I prefer complex to simple problems).*, while older Groups 2 and 3 did not experience as much difficulty. In Group 1, only 36% of the participants understood the item without help (18% with help; 45% failed). This percentage was very low in comparison to the other age groups. In Group 2, 79% of
participants understood the item without help (14% with help; 7% failed), and in Group 3, 83% of participants understood this item without help (4% with help, 13% failed).

During the interviews, several participants in Group 1 did not comprehend this item as a result of misunderstanding the word order. For example, one student said, “simple problems are hard” (10 years, male). This reflects an error in understanding the order of the words in the item. This confusion in word order might also be related to the outcome of the theoretical readability analysis. Due to the vocabulary word “complex”, Item 1 had an average item difficulty score of grade level 7. Both data points provided an explanation for why the participants in the youngest age group had difficulty understanding this item. The theoretical difficulty level of the item (grade level 7) was beyond the comprehension level of Group 1.

**Item 2.** The analysis of interviews for Item 2 (i.e., *I like to have the responsibility of handling a situation that requires a lot of thinking.*) indicated that the item was not understood easily by the younger age group. In Group 1, 41% of the participants understood the item without help (27% with help; 32% failed). This percentage was very low in comparison to the other age groups. In Group 2, 82% of participants understood the item without help (4% with help; 14% failed), and in Group 3, 89% of participants understood the item without help (7% with help; 4% failed). Participants in the younger age group who did not understand this item struggled to provide an example of a “situation that required a lot of thinking”. One student gave this example: “Like when I babysit, I really don’t think that much about what I should do” (11 years, female). This example does not reflect the type of situation that this item references. This was evidence that the participant did not understand the meaning of the item. This result also coincides
with the theoretical readability analysis. Item 2 had an average item difficulty score of grade level 8. Both data points explain why the younger age group, Group 1, had difficulty with this item. The theoretical difficulty level of the item (grade level 8) exceeded the comprehension level of Group 1.

Item 3. The cognitive interviews showed that Item 3 (i.e., Thinking is not my idea of fun.) was easily understood across all three age groups. In Group 1, 95% of the participants understood this item without help (5% with help; 0% failed). This percentage was similar in other age groups. In Group 2, 96% of participants understood this item without help (4% with help; 0% failed), and in Group 3, 83% of participants understood the item without help (7% with help; 11% failed). Even in Group 1, participants were able to explain this item. For instance, one student said that she thought this item meant that someone, “would really rather be doing something else than thinking” (10 years, Female). This is an accurate interpretation of this item’s meaning. In addition, based on the results of the cognitive interviews and the theoretical item difficulty level at grade 3, Item 3 was easily understood by the majority of participants.

Item 4. The analysis of interviews for Item 4 (i.e., I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.) indicated that the meaning of this item was not easily understood across all three age groups. In Group 1, 68% of participants understood this item without help (14% with help; 18% failed). In Group 2, 86% of participants understood this item without help (4% with help; 11% failed), and in Group 3, 87% of participants understood the item without help (9% with help; 4% failed). Perhaps due to the length of this item, participants failed to comprehend part of the item and only explained certain sections of it. For example,
one participant said, “A person would like something more challenging; they want something to challenge them” (12 years, female). This statement only reflected the second half of this item and showed that the participant did not understand this item, perhaps because of its length. These results suggested that this item was understood by most participants from the two older age groups, Groups 2 and 3, while participants in Group 1 experienced some difficulty. This result coincided with the theoretical analysis of Item 4 with a difficulty level of grade 9.5. The theoretical comprehension level of the item was higher than the actual grade levels of Groups 1 and 2.

**Item 5.** The cognitive interviews demonstrated that Item 5 (i.e., *I try to anticipate and avoid situations where there is a likely chance I will have to think in-depth about something.*) was not understood equally across all three age groups. In Group 1, 59% of participants understood this item without help (32% with help; 9% failed). In Group 2, 82% understood this item without help (11% with help; 7% failed), and in Group 3, 90% of participants understood this item without help (7% with help; 7% failed). Even though the word “anticipate” was identified as the hardest word in this item, some participants in Group 2 had difficulty understanding what the word “in-depth” meant. For example, one student asked, “What would that mean, like think in-depth?” (14 years, female). The results of the cognitive interviews and the averaged item difficulty level of Grade 10.5 explain why even Group 2 had difficulty with this item. The theoretical difficulty level of the item (grade level 10.5) was higher than the comprehension levels of Groups 1 and 2.

**Item 6.** The analysis of Item 6 (i.e., *I find satisfaction in deliberating hard and for long hours.*) indicated that Group 1 experienced more difficulty in the comprehension of the item compared to the older groups, Groups 2 and 3. In Group 1, 41% of participants
understood this item without help (36% with help; 23% failed). In Group 2, 79% of participants understood this item without help (14% with help; 7% failed), and in Group 3, 78% of participants understood this item without help (11% with help; 11% failed). The vocabulary in this item might have been difficult, even for some participants in the middle age group. For example, participants asked, “What is deliberating?” (14 years, female). This result also coincided with the outcome of the theoretical item difficulty analysis. That is, Item 6 had an average item difficulty score of grade level 10 due to the vocabulary word “deliberating”. Both data points provided an explanation for why the participants in the youngest age group had difficulty understanding this item. The theoretical difficulty level of the item (grade level 10) was beyond the comprehension level of Group 1.

**Item 7.** The cognitive interviews demonstrated that Item 7 (i.e., I only think as hard as I have to.) was understood without help by the highest number of participants across all age groups. In Group 1, 91% of participants understood this item without help (0% with help; 9% failed). The other two groups also had very high percentages of participants who understood this item without help. In Group 2, 100% of participants understood this item without help (0% with help; 0% failed), and in Group 3, 96% of participants understood this item without help (2% with help; 2% failed). Even participants in the youngest age group were able to explain this item well. For example one participant said, “You don’t like to challenge yourself; you would rather do as much as you need to and be done with it” (12 years, female). This result was further explained by the item difficulty score of this item. The results of the cognitive interviews and the theoretical difficulty analysis of grade level 2.5 seem to explain why the meaning of Item
7 was easily understood across all groups. Both the item readability and vocabulary
difficulty levels were below grade level of even the youngest participants.

**Item 8.** The analysis of Item 8 (i.e., *I prefer to think about small, daily projects to long-term ones.*) indicated that it was understood by the majority of participants, with a significant increase in comprehension based on age. In Group 1, 59% of participants understood this item without help (18% with help; 23% failed). In Group 2, 89% of participants understood this item without help (7% with help; 4% failed), and in Group 3, 91% of participants understood this item without help (4% with help; 4% failed).

Participants did not seem to understand the difference between “short-term” and “long-term”. For example, one student said this item meant, “I like to think about small projects and big projects.” (10 years, male). This statement did not reflect an understanding that there was a difference between doing a “short-term” and “long-term” project. This result overlapped with the outcome of the theoretical difficulty analysis. **Item 8** had an average difficulty score of grade level 6.5 due to the vocabulary word “long-term”. Both data points provided an explanation for why the participants in Group 1 had difficulty understanding this item. The theoretical difficulty level of the word “long-term” (grade level 8) was beyond the comprehension level of Groups 1 and 2.

**Item 9.** The cognitive interviews indicated that the meaning of Item 9 (i.e., *I like tasks that require little thought once I’ve learned them.*) was understood across all age groups. In Group 1, 73% of participants understood this item without help (14% with help; 14% failed). In Group 2, 89% of participants understood this item without help (4% with help; 7% failed), and in Group 3, 85% understood this item without help (9% with help; 7% failed). Even participants in Group 1 could explain this statement in their own
words. For example, one student said, “They like to do questions that they have already learned” (10 years, female). The ability to comprehend this item was also reflected in the low difficulty score of grade level 5.5. Based on the results of the cognitive interviews and the theoretical difficulty analysis, Item 9 was easily understood by the majority of participants.

**Item 10.** The analysis of Item 10 (i.e., *The idea of relying on thought to make my way to the top appeals to me.*) demonstrated that it was most difficult for participants in the youngest age group. In Group 1, 36% of participants understood this item without help (27% with help; 36% failed). In Group 2, 71% of participants understood this item without help (7% with help; 21% failed), and in Group 3, 87% of participants understood this item without help (7% with help; 7% failed). Participants from Group 1 may have had difficulty with this item because they did not understand what “make my way to the top” meant. For example, one student in Group 1 did not even include the meaning of this phrase in her explanation and might have confused it with the word “in-depth” from a previous item: “They think of something, but they keep thinking so they can go more in-depth” (12 years, female). By contrast, participants in Groups 2 and 3 did not have as much difficulty with this item, most likely due to their familiarity with the phrase. For example, one student stated that the meaning of this item was that, “You like to be challenged and you like to set goals and your expectations for yourself to do what you want in life to succeed” (14 years, female). This difference in comprehension among the groups was not reflected in the average item difficulty score of grade 5 for Item 10, since the word “relying” was determined to be the most difficult vocabulary word in the item. The misunderstanding or failure to understand the phrase “make my way to the top” may
account for the difference between the results of the cognitive interviews and the item difficulty analysis.

**Item 11.** The cognitive interviews demonstrated inconclusive results for *Item 11 (i.e., I really enjoy a task that involves coming up with new solutions to problems.*) based on the ability of the groups to comprehend this item. The percentage of participants who understood the item increased from Group 1 to Group 2, but decreased in Group 3. In Group 1, 73% of the participants understood this item without help (18% with help; 9% failed). In Group 2, 93% of the participants understood this item without help (4% with help; 4% failed), and in Group 3, 87% of the participants understood this item without help (7% with help; 7% failed). Those in Group 1 had a more difficult time giving an example of this item and restated it in ways that did not reflect the meaning of the item as a whole, which suggested that participants in Group 1 did not understand this item. For example, one participant in Group 1 stated the meaning of this item as, “You like thinking about problems for other people and for your own.” (11 years, female). This restatement of the item failed to state the word “solutions” or a similar word as part of the meaning of the item. In addition, *Item 7* had an average difficulty score of grade level 7.5 due to the vocabulary word “solutions”. This helped to explain why this item was more difficult for Group 1. The theoretical difficulty level of the word “solutions” (grade level 6) was beyond the comprehension level of Group 1.

**Item 12.** The analysis of *Item 12 (i.e., Learning new ways to think doesn’t excite me very much.*) indicated that this item was fairly easily understood across all groups. In Group 1, 82% of the participants understood this item without help (18% with help; 0% failed). In Group 2, 93% of participants understood this item without help (0% with help;
7% failed), and in Group 3, 91% understood this item without help (4% with help; 4% failed). Even participants in the youngest age group restated this item in a way that reflected the main points of the original item, which demonstrated that it was easily understood across all groups. For example, one student from the youngest age group gave this explanation of the item: “You like doing new stuff and figuring out what it is or how you do it.” (10 years, male). The empirical analysis was supported by the results of the difficulty analysis score of grade level 4.5. Based on the results of the cognitive interviews and the theoretical difficulty analysis, this item was easily understood by the majority of participants.

**Item 13.** The cognitive interviews indicated that *Item 13 (i.e., I prefer my life to be filled with puzzles that I must solve.*) was easily comprehended across all groups. In Group 1, 82% of participants understood this item without help (14% with help; 5% failed). In Group 2, 86% of participants understood this item without help (0% with help; 14% failed), and in Group 3, 91% of participants understood this item without help (7% with help; 2% failed). Most of the participants in Group 1 explained this item with all of the main points, which demonstrated that this item was easily understood. For example, one participant said, “I like to think a lot and figure stuff out.” (10 years, male). The results of the cognitive interviews were also supported by the average difficulty score of grade level 4. Based on the results of the cognitive interviews and the results of the difficulty analysis, this item was easily understood by the majority of participants.

**Item 14.** The analysis of *Item 14 (i.e., The notion of thinking abstractly is appealing to me.*) indicated that across all age groups, participants had difficulty with this item. In Group 1, 14% of participants understood this item without help (36% with help;
50% failed). In Group 2, 57% of participants understood this item without help (29% with help; 14% failed), and in Group 3, 74% of participants understood this item without help (13% with help; 13% failed). During the interviews, several participants in Group 1 asked for help with the word “abstractly” and “notion”; this occurred less commonly in Groups 2 and 3. For example, one participant said, “I don’t understand ‘notion’, and I also don’t understand ‘abstractly’.” (11 years, female). This result mirrored the outcome of the theoretical item difficulty analysis. Item 14 had an average item difficulty score of grade level 11 due to the vocabulary word “abstractly”. The reason participants did not understand this item might be that they did not understand the words “notion” and “abstractly”. Although “notion” was not included in the current vocabulary analysis, both data points provided an explanation for why the participants in Group 1 had difficulty understanding this item. The theoretical difficulty level of the word “abstractly” (grade level 12) was beyond comprehension level of Groups 1 and 2.

**Item 15.** The cognitive interviews demonstrated that Item 15 (i.e., *I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.*) was most difficult for those in the youngest age group, Group 1. In Group 1, 36% of the participants understood this item without help (9% with help; 55% failed). In Group 2, 72% of participants understood this item without help (18% with help; 11% failed), and in Group 3, 85% understood this item without help (4% with help; 11% failed). Those in Group 1 did not explain this item in its entirety. This may be due to the length of the item. For instance, one of the participants said the meaning of this item was, “You would prefer something difficult but does not require much thought to the question” (11 years, female). This statement only paraphrases the
first and the last part of the item, with no distinction between the two parts, which is an important factor for understanding this item. Younger children may have failed to comprehend the item because of its length as well. This was supported by the item difficulty score of grade level 12 for Item 15. These two data points helped to explain why the youngest participants had so much difficulty comprehending this item. The theoretical difficulty level of the item (grade level 12) exceeded the comprehension levels of Groups 1 and 2.

**Item 16.** The analysis of Item 16 (i.e., *I feel relief rather than satisfaction after completing a task that requires a lot of mental effort.*) indicated mixed results across all age groups. In Group 1, 56% understood this item without help (18% with help; 27% failed). In Group 2, 82% understood this item without help (14% with help; 4% failed), and in Group 3, 78% understood this item without help (7% with help; 15% failed). This item had inconclusive results because the percentage of participants who understood the item without help increased from Group 1 to Group 2, but then decreased in Group 3. The inconclusiveness of this data may be due to the length of the item. Some participants may have been able to comprehend the item as a whole, while other participants only understood part of it. For example, one student reworded this item to say, “You didn’t think you were going to get through it but you did and you feel better about it than you did before.” (11 years, female). This participant understood the part of the item that dealt with the feeling of relief, but did not reword the item to include the aspect of mental effort. This was also evidenced in the statements made by participants in the Group 2. For example, one participant restated this item to say, “You like to satisfy yourself that you did something good or something bad.” (14 years, female). This statement also reflected
only part of the item and not the item as a whole. The theoretical analysis score of grade level 8.5 also helped to explain why this item appeared to be difficult for some participants to understand. The cognitive interviews, paired with the results of the theoretical analysis, explained why this item was particularly difficult for Group 1. The theoretical difficulty level of the item (grade level 8.5) was beyond the comprehension level of Group 1.

**Item 17.** The cognitive interviews indicated that *Item 17* (*i.e.*, *It’s enough for me that something gets the job done; I don’t care how or why it works.*) was easily understood across all age groups. In Group 1, 72% of participants understood this item without help (9% with help; 18% failed). In Group 2, 92% of participants understood this item without help (0% with help; 7% failed), and in Group 3, 93% of participants understood this item without help (2% with help; 4% failed). An explanation of *Item 17*, by a participant in Group 1, demonstrated that this individual understood this item. The participant said, “You would prefer something that would get the job done, you don’t care what it is, just that it gets done.” (11 years, female). The score of grade level 5 from the item difficulty analysis helps to explain why this item was understood by most of the participants. Based on the results of the cognitive interviews and the results of the overall theoretical analysis, this item was easily understood by the majority of participants.

**Item 18.** The analysis of *Item 18* (*i.e.*, *I usually end up deliberating about issues even when they do not affect me personally.*) indicated that participants across all age groups had some difficulty with this Item. In Group 1, 36% of participants understood this item without help (36% with help; 27% failed). In Group 2, 79% of participants understood this item without help (14% with help; 7% failed), and in Group 3, 87%
understood this item without help (4% with help; 9% failed). Similar to Item 6, younger children had difficulty understanding the word “deliberating”. Participants in Group 1 were likely to ask for help with the word “deliberating”. For example, one participant said, “I don’t know what that word means - deliberating” (11 years, female). This result overlapped with the outcome of the theoretical difficulty analysis. Item 18 had an average difficulty score of grade level 11 due to the vocabulary word “deliberating”. Both data points provide an explanation for why the participants in Group 1 had difficulty understanding this item. The theoretical difficulty level of the word “deliberating” (grade level 10) exceeded the comprehension levels of Groups 1 and 2.

**Within Group Analysis of Items.** The ability of participants to understand items on the NCS was also analyzed based on items that were the easiest and the most difficult for participants in each of the three groups to understand. Group 1 had the least difficulty with Item 3 (i.e., Thinking is not my idea of fun.). In this group, 95% of the participants understood this item without help. Both Group 2 (0% with help; 0% failed) and Group 3 (5% with help; 5% failed), had the least difficulty with Item 7 (i.e., 7. I only think as hard as I have to.). This item was the second most easily understood item among Group 1. Item 14 (i.e., The notion of thinking abstractly is appealing to me.) had the highest level of difficulty across all age groups and was the most misunderstood in Group 1 (36% with help; 50% failed), Group 2 (29% with help; 14% failed), and Group 3 (13% with help; 13% failed).

**Overall Results for NCS Items.** This analysis used the results for all participants in all three age groups to determine which items were the most difficult and the easiest for participants to understand. Overall, Item 14 (i.e., The notion of thinking abstractly is
appealing to me.) was understood the least by participants. Out of all the participants, 45% did not understand this item. This result was possibly the product of participants not comprehending the meaning of the word “abstractly”. Overall, Item 7 (i.e., I only think as hard as I have to.) was understood most easily (without help) by participants. Only 0.04% of participants had difficulty understanding this item. This result may be due to the short length of the item and the simple vocabulary used.

An exploratory analysis of the items using SPSS was not possible, as the comprehension levels of item differed within and among age groups, and the sample sizes for Groups 1 and 2 were too small (n < 30).

**Number of Items Understood By Participants.** The average number of items understood by the participants was analyzed. This analysis was used to determine whether participants in Group 1 understood the same number of items as those in Group 2 and Group 3. The analysis was based on the number of items participants understood both with help and without help. The reason for including the items participants answered with help was that when participants were given help, they were able to provide an cogent example that demonstrated that the participant understood the item, which allowed it to be included in the total. Differently from the preceding analysis, this calculation was concerned more with the total number of items understood and not each item individually. The highest number of items that could be understood was 18 items. These results can be found in Table 4. In Group 1, an average of 14 items were understood (M = 13.95, SD = 3.72), which was three items less than the averages of the other age groups and two items less than the overall average. An average of 17 items was understood in Group 2 (M = 16.5, SD = 2.08) and Group 3 (M = 16.67, SD = 1.74), which was three
items more than the average for Group 1. Averaged across all age groups, participants understood 16 of the 18 NCS items (M = 16, SD = 2.64). Furthermore, the standard deviations of Groups 2 (SD = 2.08) and 3 (SD = 1.74) were much lower in comparison to Group 1 (SD = 3.72), which indicated that the number of items participants comprehended became more stable as the participants’ ages increased.

**NFC Scores.**

The actual NFC scores were averaged for each age group and across all groups. These results can be found in Table 5. Each item was scored on a Likert-scale ranging from 1.0 point (strongly disagree) to 4.0 points (strongly agree), with some items reverse-scored, depending on the wording of the item. Items that qualified for the calculation of a NFC score were those that the participants understood without help and with help. These items were used in the calculation because the explanations given by participants indicated that they understood the item; items failed were excluded because students did not comprehend the meaning of the items.

Results for Group 1 (M = 2.48, SD = 0.33), Group 2 (M = 2.49, SD = 0.41), and Group 3 (M = 2.64, SD = 0.45) indicated that all participants demonstrated some level of Need for Cognition, and the average score for all participants provided evidence that there was some level of NFC across all three age groups (M = 2.55, SD = 0.42).
Table 5:

**NFC Scores**

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Number of Items Scored (Comprehended With Help and Without Help)</th>
<th>Need for Cognition Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10-12 years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>13.95</td>
<td>2.48</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>3.72</td>
<td>0.33</td>
</tr>
<tr>
<td><strong>Group 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(13-15 years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>16.5</td>
<td>2.49</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.08</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Group 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(16-18 years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>16.67</td>
<td>2.64</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.74</td>
<td>0.45</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>16</td>
<td>2.55</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.64</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Note. This table displays the Mean and Standard Deviation for the number of items comprehended with help and without help along with the Need for Cognition scores. In this study, these scores were reported for all three age groups and across all groups. The participants’ comprehension of items increased with age, which is supported by the Standard Deviation decreasing with an increase in age for the number of items scored. There is some level of NFC across all age groups. However, based on the Standard Deviation, the construct of NFC became more stable as age increased.
Chapter Five

Discussion

This discussion includes an interpretation of what the results mean in relationship to the research questions raised, after which the findings are compared to the literature on the topic of NFC. Limitations of this study that may have contributed to the results are examined. In the conclusion, new questions are raised that were not answered by this study, with a focus on what direction this research could take in the future.

*Question 1.1 (Are the levels of readability difficulty of the items on the Need for Cognition scale appropriate for adolescents?)* and *Question 1.2 (Are the levels of vocabulary difficulty of the items on the Need for Cognition scale appropriate for adolescents?)* were both answered by examining the items on the NCS. The results for the readability analysis showed that there was considerable variability for the average readability scores ($M = 7.53$, $SD = 3.73$). The item with the lowest readability grade level was *Item 15*, with a readability grade level of 1, while the item with the highest readability grade level was *Item 1*, with a readability grade level of 14. Based on these levels of readability difficulty, the answer to *Question 1.1* is that the readability levels of some items are appropriate for adolescents, while the readability levels of other items are beyond the vocabulary level of adolescents.

The results of the vocabulary analysis also showed a similar level of variability in scores to that of the readability analysis ($M = 6.89$, $SD = 2.51$). For example, *Items 3, 7, 12, 13, and 17* ($n = 5$) were identified at the lowest difficulty grade level of 4, while *Items 5, 6, 14, 15, and 18* ranged at the high school grade level ($n = 5$). Based on these levels of vocabulary difficulty, the answer to *Question 1.2* is that the vocabulary difficulty of some
items is appropriate for adolescents, while the vocabulary difficulty of other items is not appropriate for adolescents.

The results for the readability and vocabulary analyses of the items on the NCS are difficult to compare to the literature on this topic because there are few studies to date that examine this specific aspect of the NCS. However, a study conducted by Bors, Vigneau, & Lalande (2006) measured the relationship of vocabulary ability and item polarity of the items on the NCS to NFC scores. This study used the French version of the NCS and a vocabulary scale that measured the students’ vocabulary abilities. It was found that vocabulary performance and scores on the NCS were positively correlated, suggesting that the ability for students to read the items on the scale influenced their scores. The findings of the current study provided additional support for this idea because in this study, it was also found that vocabulary may have had some effect on the ability of participants to answer the items on the NCS.

While there is currently little research to support these findings, the results of the readability and vocabulary analyses are important to the research of NFC. The lack of studies using the NCS with adolescents may be a consequence of the research on NFC conducted thus far being concerned with topics that could be studied more easily with an older population. It is often difficult to study the adolescent population due to the barrier of additional consent from parents/guardians. This does not mean that research on this topic should be limited by this constraint but simply that it is sometimes easier to gain access to adults for participation in research studies. The information gathered in this study about the readability level of this scale is important because it establishes a basis for future research on the topic of NFC with a younger population. It also provides the
implication that is important to consider if measures used for adults can be used with adolescents equally as well. In this case, some of the items on the NCS were found to not be suitable for the reading level of adolescents. This new finding allows for the consideration of a new revised scale to be used with adolescents.

For Question 1.3 (What are adolescents’/participants’ comprehension levels of the items on the Need for Cognition scale?), the outcome also reinforced the results of the readability and vocabulary analyses. This question was answered through the cognitive interviews with students and their responses to the items on the NCS. With increasing age, adolescents seem to understand an increasing number of items on the NCS. Eleven items were increasingly better understood based on increased age, while seven items did not show a pattern and were inconclusive. Over the three age groups, the number of items that participants were able to answer also increased with age. Compared to the youngest age group, participants in the oldest age group were on average able to answer two more items (group 1 (ages 10-12), $M = 13.95$; group 3 (ages 16-18), $M = 16.67$). Based on the results of the cognitive interviews, the answer to Question 1.3 is that the comprehension level of adolescents on the items on the NCS depends on the age of the individual and the specific item. Some items were easily understood across all age groups, while others were not.

The answer to Question 1.3 is not comparable to any research on the topic of NFC. Thus far, no studies have examined the ability of participants to comprehend the items on the NCS by asking them to explain what the items mean. This is important to note, since the cognitive interviews and the theoretical examination of the items help to
explain why certain items may be harder for some participants to comprehend than others.

The lack of research on the NCS and its use with adolescents may be a result of the scale being used considerable with adults until now. Researchers may not have been as interested in using the scale with adolescents and did not need to consider whether or not this segment of the population understood the meaning of the items on this scale. The new information gained by answering this question contributes to research on the NCS and its ability to be used among adolescents. If the majority of adolescents do not understand the meaning of an item on the NCS, then it should not be used to measure adolescents NFC. In addition, when these items are used with adolescent who may not understand them, then the research data is flawed concerning their NFC scores. These scores will not accurately reflect the level of NFC that an adolescent has, because they do not understand some items.

*Question 1 (Do adolescents understand the meaning of the items on the need for cognition scale?)* was answered by examining the readability levels of the items, the vocabulary difficulty, and the ability of participants to explain the items during the cognitive interviews. A considerable amount of variability was identified in the difficulty levels of the 18 items of the NCS, based on the readability and vocabulary of the items. As demonstrated in the cognitive interviews, some items were easy to understand for most of the participants across all age groups (e.g., *Item 7*), while other items were difficult to understand for participants in the younger age group in particular (e.g., *Item 14*). When the results of the readability levels, vocabulary levels, and cognitive interviews were combined, it was determined that some items were understood among all
age groups while others were more difficult based on age. While the readability and vocabulary of the items affected participants’ ability to answer the items, with increasing age, adolescents seem to understand items with an increasing difficulty level of readability and vocabulary usage. This finding is important because it highlights the significance of making sure that the items on any scale must be at the readability and vocabulary level of the individual using the scale so that it is an accurate measurement tool. Knowing which items are too difficult for the majority of adolescents can lead to revisions that will allow the use of a scale that is more accurate in measuring NFC in adolescents.

Research Question 2 (Do adolescents have Need for Cognition?) was answered by examining the results of the cognitive interviews. Specifically, the NFC scores of the adolescents were studied. With increasing age, adolescents seemed to demonstrate more clearly their need for cognition. This tendency was observed in the descriptive statistics. This observation cannot be considered significant due to the low number of participants in this study and the inability of some groups to answer certain items on the scale. However, it does warrant further consideration of this issue. Scores on the NCS increased slightly (0.01 points) from the youngest age group to the middle age group. Both of these age groups were classified as not likely to engage in and enjoy thinking. The scores for the NCS also increased slightly from the middle to the oldest age group (0.15 points). This increase moved the oldest age group into the NFC category of likely to engage in and enjoy thinking. The answer to research Question 2 is that older adolescents might demonstrate higher NFC, but due to the limitations of this study, this conclusion is not yet strongly supported.
Results for Question 2 are difficult to compare to current research on this topic because there has not yet been an examination of this subject. This lack of research may be due to, as stated before, a previous absence of a need for a NCS designed for use with adolescents. The NCS has been used previously in studies with children and adolescents. Preckel (2013) examined the wording of the items on the NCS but did not examine the actual scores of the adolescents in the study. Bors, Vigneau, and Lalande (2006) also studied school children’s NFC without examining the scores of the participants. However, the main interest in their study was to examine the relationship between NFC scores and vocabulary ability. The current study helped to close this gap in the literature by examining whether adolescents demonstrate NFC. This information is important because it helps to determine if the NCS can be used with adolescents as a measure of their NFC. If adolescents did not have NFC, then there would be no need to use the NCS with this population.

The results of this study provide support for the theory that children have more difficulty with the items on the NCS scale than adults or adolescents have. By comparing, based on age, different groups’ abilities to answer items on the NCS, there appears a clear distinction among the groups. Participants from the 10-12 age group failed to answer or answered with help a higher number of items than the other two age groups. There were some items in particular that participants in only the youngest age group had a high level of difficulty interpreting. Combined with the results for the readability and vocabulary measures used in the item analysis, there is a significant relationship between the items rated at higher levels of readability and items that participants had difficulty with. This further adds to the conclusion that the readability level of certain items is too high for
children to answer. The recommendation is that the current scale is not suitable for younger age group because participants do not understand the meanings of some of the items on the scale. In order for the NFC scores to accurately reflect participants’ NFC, they must understand what the items mean. Revision of the scale so that it can be read easily by adolescents will allow the NCS to be used in other studies of NFC in younger age groups.

**Limitations and Future Research**

There are not any discrepancies between this study and other studies of NFC due to limited research on this topic with adolescents. However, some possible limitations that could have had an effect on the results of this study are lack of prior research, demographic limitations, and the lack of available data. These factors are examined further below.

**Demographic Limitation.** The participants in this study were selected based on convenience sampling, and this did not provide a truly random sample that represents the population accurately. The majority of participants in this study were White/Caucasian (77.08%). This may also have influenced the results. Though this sample was not diverse, the NCS has been used in others countries (Gulgoz, 2001; Erbas & Okur, 2012; Nair & Ramnarayan, 2000; Curseu, 2011; Bertrams & Dickhauser, 2010; Reinhard & Dickhauser, 2009; Dickhauser & Reinhard, 2009; Ginet & Py, 2000) and been proven to be a reliable measurement tool. Adding more diversity to the sample could help to provide a more representative sample so that results could be generalized to the entire population.
**Lack of Available Data.** Although the size of this sample was large for a qualitative research study, it was not large enough to perform a statistical exploratory item analysis. The inability to analyze the results in this way made it more difficult to come to a conclusion about which results were and were not significant. Also, these results cannot be generalized to the entire population. The results of these participants are the only data that can be used to draw conclusions and this is not enough to make strong statements with respect to how other individuals’ results may compare. Increasing the sample size would help to remove this limitation.

In future research on this topic, the limitations previously addressed can be diminished through the study design. The lack of prior research has been addressed with this study. Through the findings of this research study, items have been identified that are the least difficult among all age groups. These items can be used to study NFC in the future. Using only the items within the readability and vocabulary level of participants in the young adolescent age group, the current study could be repeated to determine whether NFC does in fact increase with age. To address the demographic limitation of this study, more schools could be asked to participate. This would also help to remove the limitation of lack of data. By improving the diversity of those interviewed and the number of participants interviewed, the results can be compared to see whether the difficulty of certain items remains consistent. Adding more participants will also allow the results to be generalized to the entire population. Future research could help to create a NCS that can be used among adolescents.
Conclusions

This study helped to expand the research on the topic of NFC. Specifically, it addressed the need to examine the NCS as a measurement tool for use among adolescents. The readability and vocabulary items on this scale were examined to determine at what grade level the items on this scale could be easily read. In addition, cognitive interviews were conducted to compare the results of the readability and vocabulary levels to the participants’ ability to answer in the cognitive interviews. By triangulating these results, the researcher determined which items may or may not be difficult for younger adolescents to comprehend. This was important so that the NCS could be evaluated as an instrument for measuring NFC in adolescents. By defining what items are and are not understood by adolescents, especially those in the younger age group, the NCS can be refined as a measurement tool for adolescents. This is essential to research on NFC because this construct is related to so many other psychological traits such as problem solving, performance expectancies, and motivation. These traits play a role in how students approach tasks that involve critical thinking, which has become central to the curriculum used in schools today. By evaluating students’ NFC, teachers can help to improve students’ ability to think critically.
References


readability formulas. *Journal of Educational Psychology, 49*(2), 99-105. doi:[10.1037/h0043254]


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<tr>
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Table 3 (continued):

Readability of Items on the NCS

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*Note.* This table displays the readability difficulty, by grade level, for the five readability measures. It also displays the vocabulary words in each item, along with the grade level difficulty. The readability difficulty and vocabulary difficulty are also displayed under averaged difficulty level.
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Table 4 (continued):

Participants’ Ability to Answer Each Item

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</table>

Note. This table displays the number of participants that were able to comprehend each item. Participants who failed the item were labeled “FA”. Participants who comprehended the item with help from the researcher were labeled “WH”. Participants who comprehended the item without help were labeled “W/OH”. 

- Table adapted from the original text for clarity and formatting.
Appendix A

Need for Cognition Scale (Cacioppo, Petty, and Kao, 1984)

1. I would prefer complex to simple problems.

2. I like to have the responsibility of handling a situation that requires a lot of thinking.

3. Thinking is not my idea of fun.

4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.

5. I try to anticipate and avoid situations where there is a likely chance I will have to think in-depth about something.

6. I find satisfaction in deliberating hard and for long hours.

7. I only think as hard as I have to.

8. I prefer to think about small, daily projects to long-term ones.

9. I like tasks that require little thought once I’ve learned them.

10. The idea of relying on thought to make my way to the top appeals to me.

11. I really enjoy a task that involves coming up with new solutions to problems.

12. Learning new ways to think doesn’t excite me very much.

13. I prefer my life to be filled with puzzles that I must solve.

14. The notion of thinking abstractly is appealing to me.

15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.

16. I feel relief rather than satisfaction after completing a task that requires a lot of mental effort.

17. It’s enough for me that something gets the job done; I don’t care how or why it works.

18. I usually end up deliberating about issues even when they do not affect me personally.
Appendix B

Example Questions

This is an example of one of the statements (e.g. statement 6) from the 18-item NCS that was used. Each question in the interview protocol consisted of this same format.

#6: I find satisfaction in deliberating hard and for long hours.

A) What do you think this sentence means?

B) Please tell me how much you agree or disagree with this sentence. Do you strongly agree, do you agree, do you disagree, or do you strongly disagree? (Point to the rating scale below).

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<th>I strongly disagree</th>
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C) Could you give me an example from your own life to explain your choice/agreement/disagreement?
Figure 1. Participants Comprehension of Items Without Help on the NCS

This figure illustrates the percentage of participants in all three age groups and overall who comprehended the items on the NCS without help. The item was considered too difficult if the percentage of participants who comprehended the item was 70% or lower.