Development of the Adaptive Reading Motivation Measures

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Development of the Adaptive Reading Motivation Measures

Motivation to read continually surfaces as a critical contributor to reading achievement (Biancarosa & Snow, 2004; Curtis, 2002; Kamil, 2003; National Reading Panel, 2000; RAND Reading Study Group, 2002; Retelsdorf, Köller, & Möller, 2011; Schiefele, Schaffner, Möller, & Wigfield, 2012). This is due, in part, to a realization that the cognitive aspects of reading do not, by themselves, explain why some children and adolescents disengage from the reading process, read infrequently, and resist reading activities in academic learning environments. Thus, while reading skills and strategies are critical, if students lack the motivation to engage in reading, reading improvement will be limited (Baker, Afflerbach, & Reinking, 1996; Guthrie, McGough, Bennett, & Rice, 1996; Guthrie & Wigfield, 1999; Paris & Oka, 1986) and may actually decline (Baker & Wigfield, 1999; Unrau & Schlackman, 2006). In the end, it is motivation that activates the behavior to engage in reading, making motivation an important factor in efforts to improve literacy (Guthrie & Wigfield, 2000).

Because reading motivation can affect literacy achievement (Guthrie et al., 2007; Schaffner, Philipp, & Schiefele, 2016; Taboada, Tonks, Wigfield, & Guthrie, 2009), learning about and measuring reading motivation is crucial in both designing interventions and measuring student response to those interventions. Unfortunately, few valid, reliable measures of reading motivation that can inform instructional decisions exist. Currently, measures of reading motivation are targeted to young children, lack the psychometric properties that show validity and reliability, or have findings of efficacy that are inconclusive or contradictory (Unrau & Schlackman, 2006; Watkins & Coffey, 2004). Although new measures of adolescent reading motivation have been developed recently (Guthrie, Cambria, & Wigfield, 2011; Henk, Marinak,

& Melnick, 2012; McKenna, Conradi, Lawrence, Jang, & Meyer, 2012; Pitcher et al., 2007), not nearly as many scales are available for adolescents as for elementary school students.

In response to these needs, a team of experts in reading motivation, adolescent development, and modern psychometrics has developed and validated a new measure called the Adaptive Reading Motivation Measures (ARMM). The ARMM consists of multiple measures that build from an established theoretical framework of reading motivation. The ARMM was developed using evidence-centered design (ECD) and hierarchical item response theory (IRT) and is administered in a computerized adaptive format to measure the multiple constructs that make up reading motivation. The computerized adaptive format provides high reliability and reduces the amount of time needed to take the assessment.

Literature Review

The Construct of Reading Motivation

Guthrie and Wigfield's (2000) definition of reading motivation as an "individual's personal goals, values, and beliefs with regard to the topics, processes, and outcomes of reading" (p. 405) was the starting point for our instrument development. This viewpoint assumes that reading motivation is likely to differ at an individual level. Indeed, Wigfield and Guthrie (1997) assert that a student's motivation can differ based on different contexts, such as school and home, and on type of text, such as informational or narrative. This definition also implies that reading motivation is multifaceted and complex, in that readers possess a variety of motivations to engage in reading, a feature supported empirically by Wigfield and Guthrie (1997).

Motivations for reading identified by the literature include self-efficacy, intrinsic motivation, extrinsic motivation, interest, and social motivations. We focus on these constructs in our reading motivation measures because each construct has a solid theoretical base and the research literature supports each as key to student motivation and achievement (Eccles & Wigfield, 2002; Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006). In the following section, we briefly describe the theoretical base of each of these motivations, followed by theoretical and empirical support for each construct. Note that we approach the motivational constructs from a broad perspective in order to show the strong base of research supporting each construct.

Self-efficacy. Self-efficacy is defined as individuals' assessments of their ability in specific activities and their sense that they can accomplish those activities (Bandura, 1997; Schunk & Pajares, 2002). People generally are motivated to engage in activities in which they feel quite competent, as shown by research on self-efficacy and other highly related constructs such as ability self-concepts and the need for competence (Eccles & Wigfield, 2002). One explanation for why high self-efficacy is motivating can be found in self-determination theory (SDT). Ryan and Deci (2000b) explain that humans have a psychological need to feel competent in some aspect of their lives. When this need is fulfilled (i.e., when people feel competent or self-efficacious), they are then more motivated.

Linnenbrink and Pintrich (2003) synthesized existing literature to establish that self-efficacy improves behavioral, cognitive, and motivational engagement. Students with high self-efficacy persist at tasks and work to succeed at those tasks (Schunk, 1989; 2003), use more cognitive strategies, get higher grades (Pintrich & De Groot, 1990), and develop higher value beliefs for tasks at which they succeed (Wigfield, 1994) than students with low self-efficacy do. Thus, self-efficacy is an extremely powerful and important construct in students' motivation.

In reading research, self-efficacy has been shown to relate to word and nonword identification (Cartwright, Marshall, & Wray, 2016) and reading comprehension skills (Guthrie et al., 2007; Katzir, Lesaux, & Kim, 2009; Park, 2011; Retelsdorf et al., 2011). Recently there has been some debate as to whether self-efficacy is a construct of reading motivation. Both constructs have been included in reading motivation scales (Baker & Scher, 2002; Chapman & Tunmer, 1995; Coddington & Guthrie, 2009; Gambrell, Palmer, Codling, & Mazzoni, 1996; Guthrie et al., 2011; Malloy, Marinak, Gambrell, & Mazzoni, 2013; Schutte & Malouff, 2007; Wigfield & Guthrie, 1995). However, Schiefele et al. (2012) have argued that reading self-efficacy should be considered an antecedent to reading motivation rather than an actual reading motivation construct.

Intrinsic motivation. Intrinsic motivation is a well-known construct among educators, widely described as motivation that comes from within a person (Eccles & Wigfield, 2002). Intrinsically motivated students engage in school out of interest and enjoyment. Research clearly shows that high intrinsic motivation leads to higher academic achievement and increased learning (Wigfield et al., 2006). Intrinsic motivation has also been shown to promote engagement in school, which then promotes achievement (Fredricks, Blumenfeld, & Paris, 2004). Researchers have used a variety of theoretical frameworks to describe intrinsic motivation. Using SDT, Ryan and Deci (2000a) describe intrinsically motivated behavior as a prototype of motivated behavior stemming from the inherent satisfaction from doing a task. For example, a student who is a devoted fiction reader might feel intrinsically motivated to read a novel of her own choosing. She would experience enjoyment from reading that novel and would not be concerned about someone evaluating her reading or about receiving a reward for reading. When engaging in an intrinsically motivating text, students may experience *flow*, described by Csikszentmihalyi (1990) as a deep state of absorption. Students experience flow when they are deeply involved in a book that provides the right degree of challenge (Wigfield & Guthrie, 1997).

One subcomponent of intrinsic motivation is preference for challenge, which refers to the desire to read relatively difficult or challenging texts. Intrinsic motivation is optimized when individuals believe they can master the challenges they face (Csikszentmihalyi, 1988). Children who prefer to take on challenges in reading enjoy the challenge of mastering new words and complex ideas presented in text. When children undertake challenging reading materials, their reading comprehension skills grow, as does their motivation to read.

Another subcomponent of intrinsic motivation is curiosity – the desire to gain understanding about a topic. Curiosity is an integral part of intrinsic motivation for reading because it refers to the quest for learning about a person, topic, or event for its own sake (Harter, 1981). A child does not attempt to satisfy a curiosity in order to receive an external reward. There is a debate as to whether a related construct—reading because of interest in a particular topic—is also a construct of reading motivation (Schiefele et al., 2012). The construct of individual interest (also called personal interest or topic interest) is theoretically highly related to intrinsic motivation. Researchers define individual interest as personal preferences toward topics (Alexander, Kulikowich, & Jetton, 1994; Hidi, 1990; Wigfield et al., 2006). In SDT, interest is a precursor to intrinsic motivation (Reeve, 2005). Therefore, a teacher with knowledge of students' interests can encourage intrinsic motivation by providing texts about topics that students prefer.

Findings from reading motivation research indicate that intrinsic motivation, as well as subconstructs such as curiosity and preference for challenge, are related to reading amount (Guthrie, Wigfield, Metsala, & Cox, 1999; Stutz, Schaffner, & Schiefele, 2016), word recognition (Andreassen & Bråten, 2010), and scores on standardized tests (Guthrie et al., 2007).

Intrinsic motivation has even been shown to predict future reading achievement (Becker, McElvany, & Kortenbruck, 2010; Guthrie et al., 2007; Schaffner et al., 2016).

Two constructs, value and preference for autonomy, are discussed in reading motivation literature and are related to intrinsic motivation. Value for reading derives from Eccles' and Wigfield's work on subjective task values (Eccles et al., 1983; Wigfield & Eccles, 1992). Value for reading concerns the "value students place on reading tasks and activities, particularly in terms of frequency of engagement and reading-related activities" (Gambrell et al., 1996, p. 522). Value has been shown to relate to reading comprehension (Cartwright et al., 2016) and engagement in reading activities (McGeown, Duncan, Griffiths, & Stothard, 2015). The second construct related to intrinsic motivation is preference for autonomy. Self-determination theorists define autonomy as "being the perceived origin or source of one's own behavior" (Ryan & Deci, 2002, p. 8) or an "internal perceived locus of causality" of behavior (Ryan & Deci, 2000b, p. 70). When students feel autonomous in their reading, they perceive that they have some control over what they are reading or that they have some choice in their reading.

Extrinsic motivation. Extrinsically motivated students act for reasons outside of the self, such as for a reward or to avoid punishment. In education settings, many extrinsic motivators exist, including grades, recognition for good behavior (or punishment for bad), and competition between students. The use of extrinsic rewards is the most common motivational practice in education, (Fawson and Moore, 1999; Guthrie and Coddington, 2009). Research indicates that middle school and high school teachers more frequently emphasize extrinsic motivation over intrinsic motivation than elementary school teachers do (Eccles et al., 1993; Guthrie & Davis, 2003). In a review of the limited studies in that area, McQuillan (1997) found no causal relationship between incentives and students' reading improvement. Also, teacher emphasis on intrinsic motivation may lead to increases in extrinsic motivation (Guthrie et al.,2004).

Past research indicates that extrinsic motivators, such as rewards, may actually harm intrinsic motivation. For example, Deci (1971) found that when rewards were presented to children for participating in interesting tasks such as coloring a picture or solving a puzzle, children were less likely to participate in these activities once the reward was removed (Deci, 1971). However, more recently Cameron, Pierce, Banko, and Gear (2005a 2005) had a contradictory finding. That is, students who were rewarded only for achieving a certain performance level on puzzle tasks were more motivated to pursue those tasks after the reward was removed.

The latest meta-analytic research shows that rewards generally increase students' intrinsic motivation to perform uninteresting tasks (Cameron, Banko, & Pierce, 2001; Deci, Koestner, & Ryan, 1999). Rewards also increase intrinsic motivation to complete interesting activities under certain conditions, such as when "participants are verbally praised for their work, when tangible rewards are presented in an informational manner, when rewards signify competence at an activity, and when the rewards are offered and given for achieving performance standards or goals" (Cameron et al., 2005, p. 642). Under all these conditions, rewards are seen as informational rather than manipulative. Rewards presented in this manner may increase motivation because they help children form or maintain their self-efficacy for a task. For example, if a competent reader who enjoys Shakespeare receives an A in her English class, the grade increases her self-efficacy for English language arts. This kind of result is especially important for unmotivated students who likely lack self-efficacy for a task. When students are praised for completing small tasks, their self-efficacy may rise, which may encourage them to try more challenging tasks in the future. This process shows how students can be both intrinsically and extrinsically motivated for the same activity.

Several studies have shown a positive relationship between extrinsic motivation and reading amount (Guthrie et al., 1999; Wigfield & Guthrie, 1997). Further, Guthrie et al. (1999) indicated that the combination of both intrinsic and extrinsic motivation explains increases in the amount of reading better than each construct alone. However, using structural equation modeling, Wang and Guthrie (2004) found that extrinsic motivation was negatively associated with reading comprehension when intrinsic motivation was controlled. Further, intrinsic motivation was positively associated with both reading comprehension and extrinsic motivation. They concluded that “extrinsic motivation contributed to comprehension through its close connection to intrinsic motivation” (Wang & Guthrie, 2004, p. 180). Therefore, extrinsic motivation will have a positive association only when it leads to or is associated with intrinsic motivation. A large number of studies have also shown either no relation or a negative relation between extrinsic motivation and reading and achievement (Andreassen & Bråten, 2010; Becker et al., 2010; Law, 2009; Park, 2011; Retelsdorf et al., 2011; Stutz et al., 2016; Unrau & Schlackman, 2006; Wang & Guthrie, 2004).

Social motivation. The social motivation construct is related to the psychological need for relatedness, described by Ryan and Deci (2000b). According to these theorists, students’ motivation increases when they feel connected with other individuals and with their community. This finding is related to research on the positive effects on motivation provided by caring teachers (Ryan, Stiller, & Lynch, 1994; Wentzel, 1997). For our purposes, we define social motivation as a feeling of acceptance and alliance with others in the classroom. Therefore, social motivation will be determined by the actions of the teacher as well as by those of classmates.

This feeling of acceptance has been shown to relate to achievement and motivation (Furrer & Skinner, 2003).

Guthrie and Wigfield (2000) included social interaction among learners as a key part of student engagement perspective on reading comprehension. Guthrie, Schafer, Wang, and Afflerbach (1995) reported that adolescents' social interactions with friends and family regarding reading were positively associated with the frequency and breadth of their reading. In addition, research points to numerous ways to support students' social motivation to read, such as through small-group collaboration. Many researchers have found that small-group collaboration motivates students to read difficult texts and increases their comprehension (e.g., Klingner, Vaughn, & Schumm, 1998; McKinstery & Topping, 2003). However, some studies indicated a negative relation between social motivation for reading and reading achievement (Mucherah & Yoder, 2008; Unrau & Schlackman, 2006).

Researchers have further examined different social goals for reading, meaning, "what an individual wants to achieve in a particular situation" (Wentzel, Filisetti, & Looney, 2007, p. 896). Based on this definition, prosocial goals in the classroom context reflect a student's desire "to help, cooperate, and follow rules in the classroom" (Wentzel et al., 2007, p. 896). Students with prosocial goals may share their own opinions about reading or show interest in classmates' reading, even offering to help classmates with reading (Coddington, 2009). In contrast, a student with antisocial goals is one who tries to avoid helping other students, attempts to avoid interacting with other students, and makes fun of other students' opinions and comments about reading (Coddington, 2009). Antisocial interactions include desires and behaviors that make fun of classmates' opinions about reading, disrespecting other students' opinions about reading, and convincing classmates that reading is a waste of time. Thus, students may be motivated to participate in reading activities to the extent that they can engage in antisocial goals.

Reading avoidance. Some scales of reading motivation include a measure of reading avoidance (Wigfield & Guthrie, 1997). The conceptualization of avoidance motivation is a combination of amotivation from SDT and work avoidance from goal theory. Amotivation is "a state in which individuals cannot perceive a relationship between their behavior and that behavior's subsequent outcome" (Legault, Green-Demers, & Pelletier, 2006, p. 568). This perception can lead the individual toward exhibiting work avoidance goals and behaviors, to the extent that they "deliberately avoid engaging in academic tasks or attempt to minimize the effort required to complete academic tasks" (Dowson & McInerney, 2001, p. 36).

Reading Motivation Scales for Adolescents

In the past 10 years, a small number of reading motivation scales for adolescents have been developed. Most of these scales have been adapted from previous elementary school measures. For example, the Adolescent Motivation to Read Profile (Pitcher et al., 2007) was adapted from the Motivation to Read Profile (Gambrell et al., 1996) and measures adolescents' self-concept for reading and value for reading. A second scale, the Reader Self-Perception Scale 2 (RSPS2; Henk et al., 2012), was adapted from the Reader Self-Perception Scale (Henk & Melnick, 1995). The RSPS2 is based on Bandura's theory of perceived self-efficacy (Bandura, 1977, 1982) and measures four aspects of reading self-efficacy: observational comparison, social feedback, physiological states, and general self-efficacy. Two other scales were developed without being adapted from former elementary school measures. The first of these scales is the Motivations for Reading Information Books (MRIB; Guthrie et al., 2011). The MRIB scales measure motivation for reading in school (MRIB-S) and out of school (MRIB-N) and include measures of intrinsic motivation, valuing of reading, self-efficacy, peer acceptance of reading, devaluing of reading, difficulty reading, peer rejection of reading, and reading avoidance. The second of these scales, the Survey of Adolescent Reading Attitudes, was developed by McKenna et al. (2012) to measure motivation for academic digital, academic print, recreational digital, and recreational print reading. Unlike the elementary scales, only one of the scales designed for adolescents, the MRIB, measures the seven constructs of reading motivation described by Schiefele et al. (2012). Also unlike the elementary school scales, scales for adolescents have not been used extensively in reading research.

Development of the Adaptive Reading Motivation Measure

The Adaptive Reading Motivation Measure (ARMM) is a computer adaptive measure of reading motivation for adolescents in grades 5 through 12. Following the approach suggested by Mislevy and Riconscente (2005), we used a five-stage evidence-centered design (ECD) development process that included domain analysis, domain modeling, conceptual assessment framework, assessment implementation, and assessment delivery. While many achievement and licensure tests have used ECD, to the best of our knowledge, the ARMM is the first affective assessment based on this approach. In this section, we will describe both the rationale for using ECD and how we used the five-stage process.

Rationale for Using ECD

Historically, tests have been written with much attention given to the theoretical foundation of the content but with no theory underlying the test development process. Specifically, test development frameworks lacked a direct connection between the process of developing test items and the evidence needed to support inferences based on test scores (Mislevy, Almond, & Lukas, 2003). In 2003, Mislevy, Steinberg, and Almond published their seminal paper on the structure of educational assessments, outlining the philosophical and procedural underpinnings of ECD. Mislevy and Riconscente (2005) described ECD as "a framework that makes explicit the structures of assessment arguments, the elements and processes through which they are instantiated, and the relationships among them" (p. 1). In the context of a motivation measure, these assessment arguments support the answers to four key questions.

1. What personal characteristics do assessment users want to assert are demonstrated by assessment results (claims)?
2. What kinds of observations will provide evidence about whether specific claims hold for a particular examinee?
3. How should tasks best be structured to provide this evidence?
4. How many tasks of which types are necessary to establish the claims within a level of confidence appropriate for the purpose of the assessment?

ARMM Domain Analysis

Domain analysis began with a comprehensive review of published literature on adolescent reading motivation. We conducted two searches to (a) examine which constructs and subconstructs have been established in motivation theory and (b) collect the psychometric properties of commonly used reading motivation assessments, especially those used to measure motivation of adolescents. We found articles through ERIC and PsycINFO, using search terms such as motivation, reading, literature, adolescent, high school, middle school, and interest. In the theory review, we gathered information from each article about the age and number of participants and the constructs discussed or measured in the study, noting the article format (e.g., research study, literature review) and briefly summarizing the findings. The measurement review included the following information: (a) the main reading motivation assessment(s) used, (b) the number and label of the constructs measured, (c) reliability data, (d) item analysis findings, (e) factor and confirmatory analysis, and (f) other findings related to the measurement of reading motivation. Many papers were included in both reviews. We established a set of one general and 15 specific constructs and organized them into a domain model that would inform both the creation of the conceptual assessment framework and item-writing activities.

ARMM Domain Modeling

The domain model shows relationships among the constructs and subconstructs described in the literature. From the domain analysis, we hypothesized a 15-construct domain model and two possible higher order constructs, which are described in Table 1. We initially investigated two different hierarchical structures relating these constructs. One structure consisted of a general reading motivation factor that subsumes all 15 constructs. The alternative was a three-level model with a general reading motivation factor, a second level that contains self-efficacy (third levels: general self-efficacy, perceived difficulty); intrinsic (third levels: curiosity, challenge, involvement, value, interest); autonomy; extrinsic (third levels: recognition, grades, competition); avoidance; and social (third levels: general social, prosocial, antisocial). Tables 2a and 2b present the two competing models, respectively.

Table 1

Definitions of 15 Subconstructs in the Domain Model

Construct	Definition	Supporting literature
Self-efficacy	Sense that one can accomplish reading tasks	Baker & Scher (2002) Bandura (1997) Chapman & Tunmer (1995) Coddington & Guthrie (2009) Henk & Melnick (1995) Schunk & Pajares (2002) Wigfield & Guthrie (1997)

Perceived difficulty	Belief that reading is hard or problematic	Chapman & Tunmer (1995) Coddington & Guthrie (2009)
Curiosity	Desire to read in order to learn more about new topics	Harter (1981) Wigfield & Guthrie (1997)
Challenge	Preference for reading relatively difficult or challenging texts	Csikszentmihalyi (1988) Wigfield & Guthrie (1997)
Involvement	Deep engagement with a text	Wigfield & Guthrie (1997)
Value	Belief that reading is important, relevant, or useful	Baker & Scher (2002) Eccles et al. (1983) Gambrell et al. (1996) Wigfield & Eccles (1992) Wigfield & Guthrie (1997)
Individual interest	Personal preferences toward reading certain topics	Alexander et al. (1994) Hidi (1990)
Autonomy	Perception that one has some control over one's reading choices	Ryan & Deci (2002) Klauda (2008) Klauda & Wigfield (2007)
Recognition	Pursuit of recognition for success in reading	Wigfield & Guthrie (1997)
Grades	Pursuit of high reading grades in school	Wigfield & Guthrie (1997)
Competition	Desire to outperform others in reading	Wigfield & Guthrie (1997)
Reading avoidance	Deliberately avoiding texts or minimizing effort when reading in school	Coddington (2009) Dowson & McInerney (2001) Wigfield & Guthrie (1997)
Social motivation	Reading in order to feel connected with others	Wentzel (1996) Wigfield & Guthrie (1997)
Prosocial goals	Desire to help, cooperate, or follow rules of the classroom related to reading	Coddington (2009) Wentzel et al. (2007)
Antisocial goals	Desire to not help, to avoid interaction, or to make fun of others regarding reading	Coddington (2009)
Higher order construct: Intrinsic	Motivation to read that comes from within	Eccles & Wigfield (2002) Gottfried (1985, 1990) Wigfield et al. (2006) De Naeghel, Van Keer, Vansteenkiste, & Rosseel (2012)
Higher order construct: Extrinsic	Desire to receive a reward for reading or avoid punishment for not reading	Wigfield & Guthrie (1997) De Naeghel et al. (2012)

Table 2a

Proposed Confirmatory IRT Model: Two-Level Structure

First-level construct	Second-level construct
General reading motivation	Self-efficacy
	Perceived difficulty
	Intrinsic: curiosity
	Intrinsic: challenge
	Intrinsic: involvement
	Intrinsic: value
	Individual interest
	Autonomy
	Extrinsic: recognition
	Extrinsic: grades
	Extrinsic: competition
	Reading avoidance
	Social motivation
	Prosocial goals
	Antisocial goals

Table 2b

Proposed Confirmatory IRT Model: Three-Level Structure

First-level construct	Second-level construct	Third-level construct
General reading motivation	Self-efficacy	SE: General Self-efficacy
		SE: Perceived difficulty
	Intrinsic	Intrinsic: curiosity
		Intrinsic: challenge
		Intrinsic: involvement
		Intrinsic: value
		Intrinsic: interest
	Autonomy	–
	Extrinsic	Extrinsic: recognition
		Extrinsic: grades
		Extrinsic: competition
	Reading avoidance	–
	Social motivation	Social: General Social
		Social: Prosocial goals
		Social: Antisocial goals

Table 1 also notes articles that were used to derive the construct definition or articles that describe the measurement of the construct. In the list are two constructs that were considered to represent a lack of motivation: reading avoidance and perceived difficulty. Students who score high on these constructs have less reading motivation. The constructs derived from the literature and targeted for the ARMM provide a starting point for the development of the task and evidence models of the conceptual assessment framework. Ultimately, the domain model guides item development and provides structures that were tested for parsimony in later phases of assessment development.

ARMM Conceptual Assessment Framework

The conceptual assessment framework outlines the technical details of how the assessment will be implemented. The conceptual assessment framework includes the student model, the task model, the evidence model, the assembly model, the presentation model, assessment and implementation, and assessment delivery. A description of each component follows.

ARMM student model. The student model consists of the person-level variables the assessment is intended to measure. A thorough review of the literature in the domain-analysis phase and the articulation of a domain model identified 15 components of reading motivation that could be observed in adolescent students. Items were created for all 15 components. The student model originated as presented in Table 2b but was refined during the research process, leading to the final student model presented in Table 3.

Table 3

Final Model

First-level construct	Second-level construct
Reading motivation	Perceived difficulty[a]
	Intrinsic
	Autonomy
	Extrinsic
	Reading avoidance
	Social motivation

[a]Perceived-difficulty and self-efficacy items appear to be at opposite ends of the same scale and were combined under the name *perceived difficulty*, consistent with the direction of the scale (higher levels indicating negative motivation).

ARMM task model. The task model describes how the assessment will elicit student responses that provide necessary evidence. Building from the domain analysis and student model, we explored potential task models. We arrived at four general task models: (1) statements and (2) questions that focus on student behaviors, and (3) statements and (4) questions that focus on student interests. Table 4 provides examples of task models that were considered.

Table 4

ARMM Task Models

Stimulus example	Response options
In the last week, I read a book that was not required for school.	Yes / No
In the last week, how many books did you spend time reading that were not required for school?	None / One / More than One
How much is the following statement like you? "My best friends think reading is fun."	Very much like me / A little like me / Neither like me nor not like me / A little not like me / Very much not like me
Do your best friends think reading is fun?	Yes / Not sure / No

A review of the literature on rating-scale construction confirmed that, in general, six or seven rating points are optimal for high reliability, validity, and sensitivity (Cox, 1980; Diefenbach, Weinstein, & O'Reilly, 1993; Lehmann & Hulbert, 1972; Martin, 1973). Since the exclusion of a neutral point does not significantly affect an individual's composite score on a Likert scale (Guy & Norvell, 1977) and the respondent utilization of the uncertain alternative is typically low on a 7-point scale (Matell & Jacoby, 1972), a 6-point rating scale was chosen.

For the labeling of points on the rating scale, the literature suggested that scale points be labeled when the questions ask about attitude (Bradburn & Miles, 1979). Additionally, the literature indicated that simple labels are clearer (Bartram & Yielding, 1973) and that point labeling does not affect the reliability and sensitivity of the rating scale (Bendig & Hughes, 1953; Peterson, 1994). Finally, and perhaps most importantly, labeling of all points benefited the read-aloud feature that was necessary for many students who are blind or visually impaired. This aspect of the task model can be seen in the section on the presentation model.

ARMM evidence model. The evidence model describes how values are assigned to constructs based on student responses. An evidence model is further broken down into the *evidence rules* and the *measurement model*. The evidence rules specify which observable aspect of the assessment process will lead to a score. In the case of the ARMM, the evidence rule will be simply the answer choice chosen, as opposed to the amount of time an examinee needed to choose a response or a judgment of whether a response was correct or incorrect. The measurement model is used to accumulate evidence across items. The ARMM measurement model is hierarchical partial-credit IRT.

ARMM assembly model. The assembly model specifies how many and what types of tasks or items will be presented to the student. The ARMM consists of three sections. Each section contains 15 items, one item for each second-level construct described in Table 2a.

ARMM presentation model. The presentation model describes how items look on the computer screen. Several different ARMM presentation models were investigated. We initially considered having examinees use radio buttons to choose a response to individual statements, using a two-, three-, four-, or five-choice response scale. We also explored the use of sliders or drag-and-drop answers. We eventually chose the presentation model shown in Figure 1.

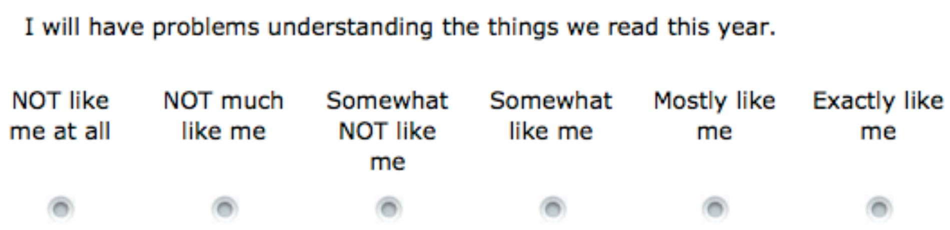

Figure 1. ARMM presentation model 1; 6-point scale, with labels on all points.

The draft conceptual assessment framework was reviewed and discussed with an expert panel of researchers in reading motivation, as well as local reading teachers. This process was iterative; development of each stage informed and had implications for previous stages. Once the iterations of the conceptual framework converged to a final product, that product provided strong direction to the item-writing process.

ARMM Assessment Implementation

The fourth layer of the ECD framework, assessment implementation, involves "constructing and preparing the operational elements" outlined in the conceptual assessment framework (Mislevy & Haertel, 2006, p. 16). In the ARMM development process, the first stages of assessment implementation involved writing items aligned to the conceptual assessment framework. In spring 2011, ARMM staff contacted regional school districts, requesting volunteers to serve on the expert panel and attend a summer item-writing workshop. Thirteen teachers with expertise in reading and language arts instruction were recruited: seven middle school teachers and six high school teachers. ARMM project staff, including principal investigators and consultants, also attended the workshop.

The workshop, led by ARMM staff, began with an overview and active discussion of the general construct and hypothesized subconstructs of adolescent reading motivation. Additionally, the panel received an overview of item-writing procedures and reviewed an item-writing template. Working in pairs, members of the panel then wrote over 700 draft items, covering all of the hypothesized subconstructs of adolescent reading motivation.

ARMM staff reviewed this large item pool several times. First, we created a computer algorithm to identify duplicate or very similar items. ARMM staff reviewed the results and deleted the items that were confirmed to be too similar. Additionally, an experienced test-item editor revised the items for clarity and reading level. ARMM staff conducted a final review of the items, 600 of which were included in a pilot study.

ARMM Assessment Delivery

The final layer in the ECD framework involves assessment delivery; in this stage, students interact with items, and their responses are collected and reported (Mislevy & Haertel, 2006). All data collection for the ARMM was delivered online via a proprietary test administration system.

Validity Evidence

We performed three separate activities to collect data regarding the validity of inferences made based on test scores. Study 1 was a large field test (7,457 students) in which test items were grouped and administered to guide item selection for the final test administration pool and to determine the optimal structural model. Study 2 was a large-scale (1,937 students) administration of three measures: a final adaptive test, a 10-item measure of the frequency of various reading behaviors, and a 10-item measure of the variety of ways in which students engage with reading. Study 3 was based on a subset of students from study 2 for whom we also collected reading and mathematics achievement scores.

For Studies 1 and 2, students were recruited from each participating school site; parental or guardian consent was received before the assessment was administered. Students were seated with their classmates at computers, usually in a lab, and were instructed how to sign in to the KITE system. Using password-protected access to the system, students took the ARMM assessment, completing the items that had been assigned to them. Participating school districts provided matched achievement data for Study 3.

Study 1: Determining the Structural Model

Participants

The participants for Study 1 consisted of a total of 7,457 public school students recruited from different research and teaching networks and from schools in the United States. Self-identified gender included 3,030 males and 2,711 females; 1,716 students gave no response. Grade-level distribution included 813 students in grade 5; 1,428 in grade 6; 1,160 in grade 7; 1,090 in grade 8; 1,355 in grade 9; 563 in grade 10; 576 in grade 11; 413 in grade 12; and 59 who did not identify their grade.

Data

A total of 10 forms containing 300 unique items (20 items for each of the 15 constructs) were administered to the sample of 7,457 students. Each student responded to 60 items, four items for each construct. The four items per construct were divided into two pairs for placement on forms. Table 5 shows how these sets of four items overlapped across test forms to allow them to be calibrated on a common IRT metric.

Table 5

Structure of Item Pair Overlap

	Item number													
Form	1	2	3	4	5	6	7	8	9	10	11	12	13	14	…
A	X	X	X	X											
B			X	X	X	X									
C					X	X	X	X							
D							X	X	X	X					
…									X	X	X	X			

Methods

Based on the research literature, we hypothesized a trilevel model comprising one first-level general construct, five second-level constructs, and 14 third-level constructs. Models were estimated using IRTPRO 2.1 (Cai, Thissen, & du Toit, 2011), which uses the expectation–maximization (EM) algorithm (Bock & Aitkin, 1981) and the Metropolis–Hastings Robbins–Monro (MH-RM) algorithm (Cai, 2010). The proposed model structure was previously presented in Table 2b.

Using the entire span of constructs and the originally hypothesized, three-tier data model presented in Table 2b, convergence could not be achieved. That is, the item parameters for that model could not be estimated. There are many reasons why convergence might not be obtained: The structural model may not fit the data or insufficient data may be available. We then decided to identify a more computationally tractable model; guided by the previous research literature, we looked at alternative structures within two subareas of the hypothesized model.

Results 1a. The first submodel exploration looked at the relationships among social motivation constructs. Three bifactor models and one unidimensional model were compared. The same general social factor presented in Table 2b was present in each bifactor model. Model 1 had three subsocial constructs: social, prosocial, and antisocial. Model 2 combined social and prosocial, for two subsocial constructs. Model 3 also had two subsocial constructs but combined prosocial and antisocial, allowing them to pose two ends of a single subscale. Model 4 was the unidimensional model, with all items loading on a single factor.

Model 2 did not converge. For the other three models, we used deviance (−2 log likelihood), the Akaike information criterion (AIC), and the Bayesian information criterion (BIC) to indicate the model that best fit the data. The criterion value for Model 1 was lower than for the other three models, indicating it was the preferred model. Table 6 presents the model fit indices for those models that converged.

Table 6

Fit Indices of Four Social Motivation Models

Model	−2 log likelihood	AIC	BIC
1	237,009.18	237,849.18	240,756.36
2	---	---	---
3	237,632.61	238,472.61	241,379.79
4	246,702.36	247,422.36	249,914.23

Note. AIC = Akaike information criterion. BIC = Bayesian information criterion. Model 2 did not converge so no fit statistics are provided

Results 1b. Two models were compared to determine whether the autonomy items should load on the intrinsic construct or should constitute a separate autonomy construct. The fit statistics presented in Table 7 support treating autonomy as a separate level-two factor.

Table 7

Two Intrinsic Related Comparison Model Fit Indices

Model	−2 log likelihood	AIC	BIC
Intrinsic including autonomy	1,269,200.61	1,273,400.61	1,287,940.152
Intrinsic separating out autonomy	1,268,159.17	1,272,359.17	1,286,898.712

Note. AIC = Akaike information criterion. BIC = Bayesian information criterion.

Table 7 shows smaller model fit indices for the model in which the autonomy construct was separated from the intrinsic construct, indicating better fit. Based on the model fit comparison results, we chose a bifactor model composed of one first-level general construct and six second-level constructs as the final confirmatory IRT model for estimating students' reading motivation scores (previously presented in Table 4).

Comparison of final model with unidimensional model. The final bifactor model was compared to the unidimensional model. Based on all fit statistics presented in Table 8, this bifactor model with a general factor and six subfactors fit much better.

Table 8

Bifactor and Unidimensional Model Fit Indices

Model	−2 log likelihood	AIC	BIC
Final bifactor	1,268,159.17	1,272,359.17	1,286,898.71
Unidimensional	1,323,288.90	1,326,888.90	1,339,351.36

Study 2: Administration of Final Instrument

Participants

The ARMM was administered to a convenience sample of 1,937 students from across several states, of whom 926 (47.8%) were female and 1,011 (52.2%) were male. The students were in grades 5 through 12: 728 (37.6%) in grade 5; 1,066 (55.0%) in middle schools; and 143 (7%) in high schools. Of these 1,937 students, 34 (1.7%) were Black, 12 (0.6%) were Asian, 77 (4.0%) were Native American, 1,805 (79.7%) were White, and nine (0.4%) were something else. The ethnic composition of the sample consisted of 178 Hispanics (9.2%) and 1,759 non-Hispanics (90.8%). Some but not all students had previously participated in Study 1.

Instruments

Three instruments were administered in Study 2: the ARMM, a 10-item measure of reading behaviors, and a 10-item measure of reading engagement.

ARMM

The final ARMM was developed using item parameters estimated in Study 1. From a student perspective, the ARMM consists of three 15-item blocks, or 45 items in total. Each block has one item for each hypothesized construct in Table 2. In the first stage, every student took one of three random, parallel blocks. That is, each of the three blocks was developed to have a similar information function to each other, and all were designed to most accurately estimate reading motivation for students in the central part of the distribution of reading motivation. Then the second- and third-stage blocks were administrated to students according to their responses on all items in the previous-stage blocks. Students identified in the first stage as having high reading motivation received a second block designed to differentiate optimally among such students. Similarly, students identified as having relatively low reading motivation received a block designed to differentiate well at the low ends of the scales. This process was repeated for the third block.

The final instrument was designed to produce seven reading motivation scores: (a) general, (b) intrinsic, (c) extrinsic, (d) autonomy, (e) perceived difficulty, (f) reading avoidance, and (g) social motivation. The general score is based on information extracted from all 45 items. The other scores are based on 15, 9, 3, 6, 3, and 9 items, respectively.

Behavior and Engagement Inventories

The behavior inventory consisted of 10 items regarding the frequency of various reading behaviors. Frequency descriptors included *never or almost never* (1), *once or twice a month* (2), *once or twice a week* (3), and *every day or almost every day* (4). Examples of items include "I read for fun," "I read things I choose myself," and "I read books that explain things."

Coefficient alpha for the full behavior inventory was .71, but one of the 10 items ("I read with a computer") had a low item-total correlation (.17). Coefficient alpha would have been slightly higher (.72) with the item removed from the scale; nonetheless, the item was left in the scale as the decrement was small.

The engagement inventory consisted of 10 Likert-type items regarding the ways in which students engaged with reading activities. Anchor statements ranged from *not at all like me* (1) to *very much like me* (6). "Very much like me" and the intermediate score points had no descriptors. Examples of statements include "Reading is one of my favorite activities," "I often carry a book around with me," and "I spend a lot of time at the library." Coefficient alpha for the engagement questionnaire was .89.

The correlation between the behavior and engagement inventories was .61; when corrected for unreliability, it was .77, demonstrating the two questionnaires measured different, though related, constructs (59% shared true variance).

Data

Scores were transformed to the ARMM score scale by multiplying each estimated theta by 16 and adding 50. Behavior and engagement data are based on the total number of points across items. Table 9 presents summary statistics for each of these measures.

Table 9

Summary Statistics for Measures in Study 2

Measure	*M*	*SD*	Skew	Min	Median	Max
General	51.78	12.48	−0.47	8	53	79
Self-efficiency	47.76	9.22	−0.09	10	47	86
Intrinsic	48.81	8.23	−0.20	23	49	78
Autonomy	42.16	9.21	0.15	8	42	75
Extrinsic	47.58	10.70	−0.09	11	48	82
Reading avoidance	45.18	9.34	0.38	17	44	84
Social	51.15	10.87	−0.16	12	52	87
Behavior	15.05	5.53	−0.21	0	15	30
Engagement	26.81	11.65	−0.24	0	27	50

Study 2a

Methods. For the reading motivation measures, reliabilities were calculated for each scale by averaging the conditional variance error of measurement for each examinee on that scale (reciprocal of test information) and the observed variance of that scale. Reliabilities were then calculated as 1 – (mean variance error of measurement/observed variance). Reliabilities for reading behaviors and reading engagement are actually coefficient alphas.

Results. Table 10 presents the number of items and estimated reliability of the general reading motivation score and the six subscores. Reliability of the first-level general reading motivation was very high at .94. With the exception of intrinsic reading motivation, reliability was also high for the six other constructs. Because the test for intrinsic reading motivation is longer than the tests for other subareas, its low reliability is surprising (15 items versus nine for the second longest subareas: extrinsic reading motivation and social reading motivation).

Table 10

Number of Items and Reliabilities of Scales Used in Study 2

Reading construct	No. of items	Reliability
General reading motivation	45	.94
Perceived difficulty reading motivation	6	.80
Intrinsic reading motivation	15	.62
Autonomy reading motivation	3	.70
Extrinsic reading motivation	9	.84
Reading avoidance reading motivation	3	.72
Social reading motivation	9	.83
Reading behaviors	10	.72
Reading engagement	10	.89

Study 2b

Methods. Intercorrelations among the seven ARMM scores were calculated.

Results. Table 11 presents the intercorrelations among observed ARMM scores in the lower triangle, the reliability of each measure on the diagonal, and the estimated correlation among true scores (correlations corrected for attenuation or unreliability) in the upper triangle.

Table 11 shows fairly low correlation between observed scores for general reading motivation and observed scores for subfactors of reading motivation, ranging in absolute value from .03 to .30. This result is not surprising as the use of a hierarchical IRT model extracts all common variance into the general factor. For similar reasons, the intercorrelations among the observed reading motivation subscores are also fairly low, ranging in absolute value from .03 to .41. Because of the large sample size, almost all of the observed correlations differed from zero (*p* <.05).

Table 11

Reading Motivation Intercorrelations

	General	Perceived difficulty	Intrinsic	Autonomy	Extrinsic	Reading avoidance	Social
General	**.94**	.03	.25	−.37	−.18	−.06	.06
Perceived difficulty	.03	**.82**	.07	−.33	−.19	−.41	.24
Intrinsic	.19	.05	**.62**	−.62	−.04	−.19	.15
Autonomy	−.30	−.25	−.41	**.70**	−.14	.10	−.51
Extrinsic	−.16	−.16	−.03	−.11	**.84**	−.23	−.23
Reading avoidance	−.05	−.31	−.13	.07	−.18	**.72**	−.39
Social	.05	.20	.11	−.39	−.19	−.30	**.83**

Note. Observed correlations with an absolute value of .05 or above differed from zero ($p < .05$). Diagonal entries in boldface are reliability estimates.

Study 2c

Methods. Correlations between ARMM scores and behavior and engagement scores were calculated.

Results. Table 12 presents the correlations between the seven reported ARMM scores and the behavior and engagement survey scores. The last two columns present the correlations between estimated true scores (corrected for attenuation).

The data in Table 12 also show that the extent to which one expresses a general motivation to read is fairly strongly related to reading engagement and somewhat less to reading frequency. The specific form of motivation (after factoring out the variance due to general reading motivation) is much less related to either behavior or engagement.

Table 12

Relationship Between ARMM Scores and Survey Scores

	Observed correlations		Corrected correlations	
	Behavior	Engagement	Behavior	Engagement
General	.50	.77	.61	.84
Perceived difficulty	.21	.14	.28	.17
Intrinsic	.23	.28	.35	.38
Autonomy	−.25	−.31	−.36	−.39
Extrinsic	−.04	−.08	−.05	−.09
Reading avoidance	.01	−.01	.01	−.01
Social	.19	.21	.25	.24

Study 3: Relationship with Academic Achievement

Participants

The participants for Study 3 were drawn from one Idaho school district and consisted of 892 students who had scores on both the ARMM and on the reading and mathematics components of the Measures of Academic Progress (Northwest Evaluation Association, 2003). The sample consisted of 425 (47.6%) females and 467 (52.4%) males. The students were in grades 5 through 8: 605 (67.8%) in grade 5, 78 (8.7%) in grade 6, 105 (11.8%) in grade 7, and 104 (11.7%) in grade 8. All students were identified as White. Seventy-nine (8.9%) of the students were identified as Hispanic and 813 as non-Hispanic (91.1%).

Instruments

This study used the seven reading motivation scores measured by ARMM and a reading and mathematics achievement score. The seven reading motivation scores include general, intrinsic, extrinsic, autonomy, perceived difficulty, reading avoidance, and social motivation. The two achievement scores are the MAP reading and MAP mathematics scores.

Data. Table 13 presents descriptive statistics for the sample of students that participated in Study 3.

Table 13

Summary Statistics for Measures in Study 3

Measure	*M*	*SD*	Skew	Min	Median	Max
General	53.96	11.67	−0.58	8	55	78
Self-efficiency	47.97	8.62	−0.15	13	48	75
Intrinsic	48.85	8.34	−0.08	23	49	78
Autonomy	41.47	9.03	0.16	8	41	74
Extrinsic	46.97	10.87	−0.03	11	47	78
Reading avoidance	45.50	9.50	0.47	18	44	84
Social	50.87	10.89	−0.19	12	51	79
MAP reading	219.95	13.31	−0.65	147	221	257
MAP math	230.54	14.78	−0.22	175	231	287

Methods. Correlations between ARMM scaled scores and MAP RIT scores were calculated.

Results. Since achievement was expected to improve at higher grade levels, analyses were conducted separately for each grade to prevent grade level from acting as a confounding variable. Weighted averages across grades were calculated first by performing a Fisher's *Z* transformation of the correlation, weighted by sample size, and then by performing an inverse transformation back to the correlation metric. Table 14 presents these results.

Table 14

Correlations of ARMM with MAP Reading and Mathematics Achievement Scores

	Grade				
Measure	5	6	7	8	Average
General					
Reading	.40	.39	.40	.58	.42
Mathematics	.29	.33	.19	.50	.32
Self					
Reading	−.23	−.24	−.28	−.01	−.21
Mathematics	−.17	−.13	−.33	−.01	−.16
Intrinsic					
Reading	−.01	−.13	−.06	.07	−.02
Mathematics	−.05	−.05	.01	−.01	−.04
Autonomy					
Reading	.03	.13	−.01	.25	.06
Mathematics	.01	.03	.07	.24	.05
Extrinsic					
Reading	−.01	−.26	.17	−.09	−.02
Mathematics	.00	−.26	.16	−.02	−.01
Reading avoidance					
Reading	.05	.27	.13	−.05	.07
Mathematics	.05	.35	.18	−.12	.07
Social motivation					
Reading	−.07	−.11	−.23	−.01	−.09
Mathematics	−.08	−.03	−.22	−.02	−.08

Note. Observed correlations with an absolute value of .15 or above differed from zero ($p < .05$).

Discussion

The ARMM is the first motivation measure, and perhaps the first affective measure, to use ECD in its construction. Results of this process seem very promising. The 45 items are typically administered in about 10 minutes and produce a general reading motivation score with a reliability of .94, in addition to six second-order factor scores with reliabilities ranging from .62 (intrinsic) to .84 (extrinsic). The seven scores are not highly intercorrelated.

While the motivation constructs of the ARMM are largely based on the results of other researchers (in particular, Chapman & Tunmer, 1995; Coddington & Guthrie, 2009; and Wigfield & Guthrie, 1997), the present studies provide evidence of a structure of reading motivation that differs significantly from theories proposed over the last 30 years. Structural analyses reported in Study 1 support a bifactor solution with a separate general reading motivation factor and six second-order factors. Use of the bifactor model extracted common variance from all items to constitute a general factor. As shown in Table 11, the remaining six factors are relatively independent of the general factor, with observed correlations between −.05 and .19 for all but one of the pairs; autonomy scores correlated −.30 with the general reading motivation factor. Similarly, the six second-order factors were relatively independent: 10 of the 15 correlations were .20 or lower. The largest magnitude of the intercorrelations was between autonomy and intrinsic, at −.41; however, the structural analysis reported in Study 1b supported keeping these factors discrete. Previous reading motivation researchers used simpler scoring methods and found, in contrast to the ARMM findings, a set of highly intercorrelated reading motivation constructs. For example, in an examination of the intercorrelations among 11 constructs of reading motivation, Wigfield and Guthrie (1997) found 67% of the 55 observed intercorrelations fell above .30. By contrast, in the ARMM analysis, only 14% of the 21 observed intercorrelations fell above .30. The lower absolute magnitude of the intercorrelations among the ARMM constructs is a result of accounting for the variance in general reading motivation in the bifactor model.

Further support for the importance of a general reading motivation construct can be seen in the relationships between the ARMM scores and the behavior and engagement surveys. The general factor correlated .50 and .77 with behavior and engagement, respectively (.61 and .84

when corrected for unreliability). The six second-order constructs had correlations with behavior that ranged between −.25 and .21 and correlations with engagement that ranged from −.31 to .28. This result shows that the total amount of motivation, as measured by the general factor, determines the strength of relationship with behaviors and engagement, while the particular second-order factors leading to the total general reading motivation make relatively little difference. The magnitude of correlation between general reading motivation and behavior exceeds correlations found in past research. For example, Wigfield and Guthrie (1997) found that a behavior measure of amount and type of book reading in the fall correlated with reading motivation constructs; absolute correlations were between .06 and .30, and 64% of these 11 correlations were above an absolute magnitude of .20. The ARMM findings, in contrast, indicated a stronger relation between behavior and general reading motivation than the constructs in the previous study, with an observed correlation at .50. The observed correlations between behavior and the other six constructs, however, were below an absolute magnitude of .25, with only half of the correlations falling above .20.

Relationships between reading motivation factors and reading and mathematics achievement add further support to this interpretation. As seen in Table 14, general reading motivation scores are much more strongly related to achievement in reading (.40) than any of the second-order factors are (.21–.07); only one of the six second-order factor correlations is statistically significant at the .05 level. This finding suggests that it is the total amount of general motivation that predicts achievement, and not the specific type of motivation. Also, the general reading motivation factor correlates more strongly with reading achievement than with mathematics achievement. The .95 confidence interval of the correlation of the general reading motivation scores with reading achievement is .36–.47, which does not include the .32

correlation of general reading motivation with mathematics achievement. The .95 confidence intervals of all second-order factors include the observed correlations of motivation scores with mathematics achievement scores.

This general reading motivation factor that amalgamates all sources of motivation that are predictive of reading achievement is consistent with Wang and Guthrie's (2004) results. They found that extrinsic motivation was overall positively correlated with achievement but negatively correlated when intrinsic motivation was controlled. The existence of this general reading motivation factor is a more parsimonious explanation of Wang and Guthrie's finding than an interaction effect between intrinsic and extrinsic motivation. The general factor correlates more strongly with reading achievement than with mathematics achievement, but the second-order factors correlate similarly. This contrast indicates that while the general factor measures motivation to read, the second-order factors might not be specific to reading.

In conclusion, the results of these studies indicate that the use of ECD in the construction of reading motivation scales is promising. Using a bifactor model to score the ARMM, common variance from all items was extracted from the other constructs to form a general factor. This general factor demonstrated higher reliability and stronger relationships to behavior, engagement, and reading achievement than the other six reading motivation constructs did. In comparison to research using traditional scale construction, findings from the current studies indicate a very different structure of reading motivation than previous literature suggests.

References

Alexander, P. A., Kulikowich, J. M., & Jetton, T. L. (1994). The role of subject-matter knowledge and interest in the processing of linear and nonlinear texts. *Review of Educational Research, 64,* 201–252. http://www.jstor.org/stable/1170694

Andreassen, R., & Bråten, I. (2010). Examining the prediction of reading comprehension on different multiple-choice tests. *Journal of Research in Reading, 33,* 263–283. doi:10.1111/j.1467-9817.2009.01413.x

Baker, L., Afflerbach, P., & Reinking, D. (1996). Developing engaged readers in school and home communities: An overview. In L. Baker, P. Afflerbach, & D. Reinking (Eds.), *Developing engaged readers in school and home communities* (pp. xiii–xxvii). Mahwah, NJ: Erlbaum.

Baker, L., & Scher, D. (2002). Beginning readers' motivation for reading in relation to parental beliefs and home reading experiences. *Reading Psychology, 23,* 239–269. doi:10.1080/713775283

Baker, L., & Wigfield, A. (1999). Dimensions of children's motivation for reading and their relations to reading activity and reading achievement. *Reading Research Quarterly, 34,* 452–477. doi:10.1598/RRQ.34.4.4

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84(2), 191–215. Medline doi:10.1037/0033-295X.84.2.191

Bandura, A. (1982). Self-efficacy mechanism and human agency. American Psychologist, 37(2), 122–147. doi:10.1037/0003-066X.37.2.122

Bartram &Yielding (1973), "The Development of an Empirical Method of Selecting Phrases Used in Verbal Rating Scales: A Report on a Recent Experiment," *Journal of the Market Research Society*, 15(3), 151-156.

Becker, M., McElvany, N., & Kortenbruck, M. (2010). Intrinsic and extrinsic reading motivation as predictors of reading literacy: A longitudinal study. *Journal of Educational Psychology, 102,* 773–785. doi:10.1037/a0020084

Bendig, A. W. (1953). The reliability of self-ratings as a function of the amount of verbal anchoring and of the number of categories on the scale. *Journal of Applied Psychology, 37*(1), 38.

Biancarosa, G., & Snow, C. E. (2004). *Reading next—A vision for action and research in middle and high school literacy: A report to Carnegie Corporation of New York*. Washington, DC: Alliance for Excellent Education.

Bock, R. D., & Aitkin, M. (1981). Marginal maximum likelihood estimation of item parameters: Application of an EM algorithm. *Psychometrika, 46,* 443–459. doi:10.1007/BF02293801

Bradburn, N. M., & Miles, C. (1979). Vague quantifiers. *Public Opinion Quarterly, 43*(1), 92.

Brophy, J. (1999). Toward a model of the value aspects of motivation in education: Developing appreciation for particular learning domains and activities. *Educational Psychologist, 34,* 75–86.

Cai, L. (2010). High-dimensional exploratory item factor analysis by a Metropolis–Hastings Robbins–Monro algorithm. *Psychometrika, 75,* 33–57. doi:10.1007/s11336-009-9136-x

Cai, L., Thissen, D., & du Toit, S. H. C. (2011). *IRTPRO: Flexible, multidimensional, multiple categorical IRT modeling* [Computer software]. Chicago, IL: Scientific Software International.

Cameron, J., Banko, K. M., & Pierce, W. D. (2001). Pervasive negative effects of rewards on intrinsic motivation: The myth continues. *The Behavior Analyst, 24,* 1–44.

Cameron, J., Pierce, W. D., Banko, K. M., & Gear, A. (2005). Achievement-based rewards and intrinsic motivation: A test of cognitive mediators. *Journal of Educational Psychology, 97,* 641–655. doi:10.1037/0022-0663.97.4.641

Cartwright, K. B., Marshall, T. R., & Wray, E. (2016). A longitudinal study of the role of reading motivation in primary students' reading comprehension: Implications for a less simple view of reading. *Reading Psychology, 37,* 55–91. doi:10.1080/02702711.2014.991481

Chapman, J. W., & Tunmer, W. E. (1995). Development of young children's reading self-concepts: An examination of emerging subcomponents and their relationship with reading achievement. *Journal of Educational Psychology, 87,* 154–167. doi:10.1037/0022-0663.87.1.154

Coddington, C. S. (2009). *The effects of constructs of motivation that affirm and undermine reading achievement inside and outside of school on middle school students' reading achievement* (Doctoral dissertation, University of Maryland). Retrieved from http://drum.lib.umd.edu/bitstream/handle/1903/9821/Coddington_umd_0117E_10740.pdf?sequence=1&isAllowed=y

Coddington, C. S., & Guthrie, J. T. (2009). Teacher and student perceptions of boys' and girls' reading motivation. *Reading Psychology, 30,* 225–249. doi:10.1080/02702710802275371

Cox III, E. P. (1980). The optimal number of response alternatives for a scale: A review. *Journal of Marketing Research*, 407-422.

Csikszentmihalyi, M. (1988). The flow experience and its significance for human psychology. In M. Csikszentmihalyi & I. S. Csikszentmihalyi (Eds.), *Optimal experience: Psychological* *studies of flow in consciousness* (pp. 15–35). Cambridge, England: Cambridge University Press.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience.* New York, NY: Harper & Row.

Curtis, M. E. (2002, May). *Adolescent reading: A synthesis of research.* Paper presented at the National Institute for Literacy/National Institute of Child Health and Human Development Adolescent Literacy Workshop II, Baltimore, MD.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18,* 105–115. doi:10.1037/h0030644

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125,* 627–668. doi:10.1037/0033-2909.125.6.627

De Naeghel, J., Van Keer, H., Vansteenkiste, M., & Rosseel, Y. (2012). The relation between elementary students' recreational and academic reading motivation, reading frequency, engagement, and comprehension: A self-determination theory perspective. *Journal of Educational Psychology, 104,* 1006–1021. doi:10.1037/a0027800

Diefenbach, M. A., Weinstein, N. D., & O'Reilly, J. (1993). Scales for assessing perceptions of health hazard susceptibility. *Health Education Research, 8*(2), 181.

Dowson, M., & McInerney, D. M. (2001). Psychological parameters of students' social and work avoidance goals: A qualitative investigation. *Journal of Educational Psychology, 93,* 35–42.

Eccles J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), Achievement and achievement motivation (pp. 75–146). San Francisco, CA: W. H. Freeman.Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53,* 109–132. doi:10.1146/annurev.psych.53.100901.135153

Eccles, J. S., Wigfield, A., Midgley, C., Reuman, D., Mac Iver, D., & Feldlaufer, H. (1993). Negative effects of traditional middle schools on students' motivation. *The Elementary School Journal, 93,* 553–574. doi:10.1086/461740

Fawson, P. C., & Moore, S. A. (1999). Reading incentive programs: Beliefs and practices. *Reading Psychology, 20,* 325–340. doi:10.1080/027027199278385

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74,* 59–109. doi:10.3102/00346543074001059

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology, 95,* 148–162.

Gambrell, L. B., Palmer, B. M., Codling, R. M., & Mazzoni, S. A. (1996). Assessing motivation to read. *The Reading Teacher, 49*(7), 518–533. doi:10.1598/RT.49.7.2

Gottfried, A. E. (1985). Academic intrinsic motivation in elementary and junior high school students. *Journal of Educational Psychology, 77,* 631–645. doi:10.1037//0022-0663.77.6.631

Gottfried, A. E. (1990). Academic intrinsic motivation in young elementary school children. *Journal of Educational Psychology, 82,* 525–538. doi:10.1037//0022-0663.82.3.525

Guthrie, J. T., Cambria, J., & Wigfield, A. (2011). *Motivations for reading information books school questionnaire (MRIB-S) and motivations for reading information books nonschool* *questionnaire (MRIB-N).* Retrieved from http://www.cori.umd.edu/measures/MRIB-S.pdf

Guthrie, J. T., & Coddington, C. S. (2009). Reading motivation. In K. Wentzel & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 503–526). New York, NY: Routledge.

Guthrie, J. T., & Davis, M. H. (2003). Motivating struggling readers in middle school through an engagement model of classroom practice. *Reading & Writing Quarterly: Overcoming Learning Difficulties, 19,* 59–85. doi:10.1080/10573560308203

Guthrie, J. T., Hoa, A. L. W., Wigfield, A., Tonks, S. M., Humenick, N. M., & Littles, E. (2007). Reading motivation and reading comprehension growth in the later elementary years. *Contemporary Educational Psychology, 32,* 282–313. doi:10.1016/j.cedpsych.2006.05.004

Guthrie, J. T., McGough, K., Bennett, L., & Rice, M. E. (1996). Concept-oriented reading instruction: An integrated curriculum to develop motivations and strategies for reading. In L. Baker, P. Afflerbach, & D. Reinking (Eds.), *Developing engaged readers in school and home communities* (pp. 165–190). Mahwah, NJ: Erlbaum.

Guthrie, J. T., Schafer, W., Wang, Y. Y., & Afflerbach, P. (1995). Relationships of instruction to amount of reading: An exploration of social, cognitive, and instructional connections. *Reading Research Quarterly, 30,* 8–25. doi:10.2307/747742

Guthrie, J. T., & Wigfield, A. (1999). How motivation fits into a science of reading. *Scientific Studies of Reading, 3,* 199–205. doi:10.1207/s1532799xssr0303_1

Guthrie, J. T., & Wigfield, A. (2000). Engagement and motivation in reading. In M. L. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. 3, pp. 403–422). Mahwah, NJ: Erlbaum.

Guthrie, J. T., Wigfield, A., Barbosa, P., Perencevich, K. C., Taboada, A., Davis, M. H., Scafiddi, N.T., & Tonks, S. (2004). Increasing reading comprehension and engagement through concept-oriented reading instruction. *Journal of Educational Psychology, 96,* 403–423. doi:10.1037/0022-0663.96.3.403

Guthrie, J. T., Wigfield, A., Metsala, J. L., & Cox, K. E. (1999). Motivational and cognitive predictors of text comprehension and reading amount. *Scientific Studies of Reading, 3,* 231–256. doi:10.1207/s1532799xssr0303_3

Guy, R. F., & Norvell, M. (1977). The neutral point on a Likert scale. *Journal of Psychology: Interdisciplinary and Applied, 99*, 199-204.

Harter, S. (1981). A new self-report scale of intrinsic versus extrinsic orientation in the classroom: Motivational and informational components. *Developmental Psychology, 17,* 300–312. doi:10.1037/0012-1649.17.3.300

Henk, W. A., Marinak, B. A., & Melnick, S. A. (2012). Measuring the reader self-perceptions of adolescents: Introducing the RSPS2. *Journal of Adolescent & Adult Literacy, 56,* 311–320. doi:10.1002/Jaal.00144

Henk, W. A., & Melnick, S. A. (1995). The Reader Self-Perception Scale (RSPS): A new tool for measuring how children feel about themselves as readers. *The Reading Teacher, 48,* 470–482. http://www.jstor.org/stable/20201471

Hidi, S. (1990). Interest and its contribution as a mental resource for learning [Special issue]. *Review of Educational Research, 60,* 549–571. http://www.jstor.org/stable/1170506

http://www.jstor.org/stable/1170660

Kamil, M. L. (2003, November). *Adolescents and literacy: Reading for the 21st century*. Retrieved from Alliance for Excellent Education website: http://all4ed.org/wpcontent/uploads/AdolescentsAndLiteracy.pdf

Katzir, T., Lesaux, N. K., & Kim, Y.-S. (2009). The role of reading self-concept and home literacy practices in fourth grade reading comprehension. *Reading and Writing*, *22,* 261–276. doi:10.1007/s11145-007-9112-8

Klauda, S. L., & Wigfield, A. (2007, April). *Fifth-graders' perceived support for their reading: Relations with demographic variables, reading motivations, and reading frequency.* Poster presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Klauda, S. L. L. (2008). *The relations of children's perceived support for recreational reading from parents and friends to their motivation for reading* (Doctoral dissertation). ProQuest Dissertations & Theses A&I. Retrieved from http://search.proquest.com/docview/250796955.

Klingner, J. K., Vaughn, S., & Schumm, J. S. (1998). Collaborative strategic reading during social studies in heterogeneous fourth-grade classrooms. *The Elementary School Journal, 99,* 3–22.

Law, Y.-K. (2009). The role of attribution beliefs, motivation and strategy use in Chinese fifth-graders' reading comprehension. *Educational Research*, *51,* 77–95. doi:10.1080/00131880802704764

Legault, L., Green-Demers, I., & Pelletier, L. (2006). Why do high school students lack motivation in the classroom? Toward an understanding of academic amotivation and the role of social support. *Journal of Educational Psychology, 98,* 567–582. doi:10.1037/0022-0663.98.3.567

Lehmann, D. R., & Hulbert, J. (1972). Are three-point scales always good enough? *Journal of*

Marketing Research, 444-446.

Linnenbrink, E. A., & Pintrich, P. R. (2003). The role of self-efficacy beliefs in student engagement and learning in the classroom. *Reading & Writing Quarterly: Overcoming Learning Difficulties, 19,* 119–137.

Malloy, J. A., Marinak, B. A., Gambrell, L. B., & Mazzoni, S. A. (2013). Assessing motivation to read: The motivation to read profile—revised. *The Reading Teacher, 67,* 273–282. doi:10.1002/trtr.1215

Martin, W. S. (1973). The effects of scaling on the correlation coefficient: A test of validity. *Journal of Marketing Research, 10*(3), 316-318.

Matell, M. S., & Jacoby, J. (1972). Is there an optimal number of alternatives for Likert-scale items? Effects of testing time and scale properties. *Journal of Applied Psychology, 56*(6), 506.

McGeown, S. P., Duncan, L. G., Griffiths, Y. M., & Stothard, S. E. (2015). Exploring the relationship between adolescents' reading skills, reading motivation and reading habits. *Reading and Writing, 28,* 545–569. doi:10.1007/s11145-015-9543-6

McKenna, M. C., Conradi, K., Lawrence, C., Jang, B. G., & Meyer, J. P. (2012). Reading attitudes of middle school students: Results of a U.S. survey. *Reading Research Quarterly, 47,* 283–306. doi:10.1002/rrq.021

McKinstery, J., & Topping, K. J. (2003). Cross-age peer tutoring of thinking skills in the high school. *Educational Psychology in Practice, 19,* 199–217. doi:10.1080/0266736032000109465

McQuillan, J. (1997). The effects of incentives on reading. *Reading Research and Instruction, 36,* 111–125. doi:10.1080/19388079709558232

Mislevy, R. J., Almond, R. G., & Lukas, J. F. (2003). *A brief introduction to evidence-centered design* (Research Report 03-16). Princeton, NJ: Educational Testing Service.

Mislevy, R. J., & Haertel, G. (2006). Implications of evidence-centered design for educational testing. *Educational Measurement: Issues and Practice, 25*(4), 6–20. doi:10.1111/j.1745-3992.2006.00075.x

Mislevy, R. J., & Riconscente, M. M. (2005). *Evidence-centered assessment design: Layers, structures, and terminology.* Menlo Park, CA: SRI International. http://padi.sri.com/downloads/TR9_ECD.pdf

Mislevy, R. J., Steinberg, L. S., & Almond, R. G. (2003). On the structure of educational assessments. *Measurement: Interdisciplinary Research and Perspectives, 1,* 3–62.

Mucherah, W., & Yoder, A. (2008). Motivation for reading and middle school students' performance on standardized testing in reading. *Reading Psychology, 29,* 214–235. doi:10.1080/02702710801982159

National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction.* Washington, DC: National Institute of Child Health and Human Development. https://www.nichd.nih.gov/publications/pubs/nrp/documents/report.pdf

Northwest Evaluation Association. (2003). *Technical manual for the Northwest Evaluation Association (NWEA) Measures of Academic Progress and Achievement Level Tests.* Portland, OR: Author.

Paris, S. G., & Oka, E. R. (1986). Children's reading strategies, metacognition, and motivation. *Developmental Review, 6,* 25–56. doi:10.1016/0273-2297(86)90002-X

Park, Y. (2011). How motivational constructs interact to predict elementary students' reading performance: Examples from attitudes and self-concept in reading. *Learning and Individual Differences, 21,* 347–358. doi:10.1016/j.lindif.2011.02.009

Peterson, R. A. (1994). A meta-analysis of Cronbach's coefficient alpha. *Journal of consumer research*, 381-391.

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82,* 33–40. doi:10.1037/0022-0663.82.1.33

Pitcher, S. M., Albright, L. K., DeLaney, C. J., Walker, N. T., Seunarinesingh, K., Mogge, S., … Dunston, P. J. (2007). Assessing adolescents' motivation to read. *Journal of Adolescent & Adult Literacy, 50,* 378–396. doi:10.1598/JAAL.50.5.5

RAND Reading Study Group. (2002). *Reading for understanding: Toward an R & D program in reading comprehension*. Santa Monica, CA: RAND.

Reeve, J. (2005). *Understanding motivation and emotion* (4th ed.). Hoboken, NJ: Wiley.

Retelsdorf, J., Köller, O., & Möller, J. (2011). On the effects of motivation on reading performance growth in secondary school. *Learning and Instruction*, *21,* 550–559. doi:10.1016/j.learninstruc.2010.11.001

Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25,* 54–67. doi:10.1006/ceps.1999.1020

Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55,* 68–78. doi:10.1037/0003-066X.55.1.68

Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination theory: an organismic dialectical perspective. In R. M. Ryan & E. L. Deci (Eds.), *Handbook of self-determination research* (pp. 3-33). Rochester, NY: University of Rochester Press. Ryan, R. M., Stiller, J. D., & Lynch, J. H. (1994). Representations of relationships to teachers, parents, and friends as predictors of academic motivation and self-esteem. *Journal of Early Adolescence, 14,* 226–249. doi:10.1177/027243169401400207

Schaffner, E., Philipp, M., & Schiefele, U. (2014). Reciprocal effects between intrinsic reading motivation and reading competence? A cross-lagged panel model for academic track and nonacademic track students. *Journal of Research in Reading*. doi:10.1111/1467-9817.12027doi:10.1207/s1532799xssr0303_4

Schiefele, U., Schaffner, E., Möller, J., & Wigfield, A. (2012). Dimensions of reading motivation and their relation to reading behavior and competence. *Reading Research Quarterly, 47,* 427–463. doi:10.1002/Rrq.030

Schunk, D. H. (1989). Self-efficacy and achievement behaviors. *Educational Psychology Review, 1,* 173–208. doi:10.1007/BF01320134

Schunk, D. H. (2003). Self-efficacy for reading and writing: Influence of modeling, goal setting, and self-evaluation. *Reading & Writing Quarterly: Overcoming Learning Difficulties, 19,* 159–172. doi:10.1080/10573560308219

Schunk, D. H., & Pajares, F. (2002). The development of academic self-efficacy. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 16–31). San Diego, CA: Academic Press.

Schutte, N., & Malouff, J. M. (2007). Dimensions of reading motivation: Development of an adult reading motivation scale. *Reading Psychology, 28,* 469–489. doi:10.1080/02702710701568991

Stutz, F., Schaffner, E., & Schiefele, U. (2016). Measurement invariance and validity of a brief questionnaire on reading motivation in elementary students. *Journal of Research in Reading*. Advance online publication. doi:10.1111/1467-9817.12085

Taboada, A., Tonks, S. M., Wigfield, A., & Guthrie, J. T. (2009). Effects of motivational and cognitive variables on reading comprehension. *Reading and Writing, 22,* 85–106. doi:10.1007/s11145-008-9133-y

Unrau, N., & Schlackman, J. (2006). Motivation and its relationship with reading achievement in an urban middle school. *The Journal of Educational Research, 100,* 81–101. doi:10.3200/JOER.100.2.81-101

Wang, J. H.-Y., & Guthrie, J. T. (2004). Modeling the effects of intrinsic motivation, extrinsic motivation, amount of reading, and past reading achievement on text comprehension between U.S. and Chinese students. *Reading Research Quarterly, 39,* 162–186. doi:10.1598/RRQ.39.2.2

Watkins, M. W., & Coffey, D. Y. (2004). Reading motivation: Multidimensional and indeterminate. *Journal of Educational Psychology, 96,* 110–118. doi:10.1037/0022-0663.96.1.110

Wentzel, K. R. (1996). Social goals and social relationships as motivators of school adjustment. In J. Juvonen & K. R. Wentzel (Eds.), *Social motivation: Understanding children's school adjustment* (pp. 226–247). New York, NY: Cambridge University Press. doi:10.1017/CBO9780511571190.012

Wentzel, K. R. (1997). Student motivation in middle school: The role of perceived pedagogical caring. *Journal of educational psychology*, *89*(3), 411. doi:10.1037/0022-0663.89.3.411

Wentzel, K. R. (1997). Student motivation in middle school: The role of perceived pedagogical caring. *Journal of Educational Psychology, 89,* 411–419. doi:10.1037/0022-0663.89.3.411

Wentzel, K. R., Filisetti, L., & Looney, L. (2007). Adolescent prosocial behavior: The role of self-processes and contextual cues. *Child Development, 78,* 895–910. doi:10.1111/j.1467-8624.2007.01039.x

Wigfield. A. (1994). Expectancy-value theory of achievement motivation: A developmental perspective. *Educational Psychology Review, 6,* 49–78. doi:10.1007/BF02209024

Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12,* 265–310. doi:10.1016/0273-2297(92)90011-P

Wigfield, A., Eccles, J. S., Schiefele, U., Roeser, R. W., & Davis-Kean, P. (2006). Development of achievement motivation. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology* (Vol. 3, 6th ed., pp. 933–1002). New York, NY: Wiley.

Wigfield, A., & Guthrie, J. T. (1995). *Dimensions of children's motivations for reading: An initial study* (National Reading Research Center Reading Research Report No. 34). Retrieved from ERIC http://files.eric.ed.gov/fulltext/ED384010.pdf

Wigfield, A., & Guthrie, J. T. (1997). Relations of children's motivation for reading to the amount and breadth of their reading. *Journal of Educational Psychology, 89,* 420–432.