Latent profiles of attitudes toward print and digital reading among adolescents

Bong Gee Jang[1] · Ji Hoon Ryoo[2] · Kristin Conradi Smith[3]

Abstract

A growing body of research has highlighted the important role attitudes play for adolescent readers, but few have examined differences in attitudes across purposes and contexts. With shifts in literacy moving students' reading habits from traditional texts (e.g., books and magazines) to more digital contexts, it becomes necessary that we investigate how students' attitudes differ by context and purpose. For the present study, we identified latent profiles of readers based on four different types of reading attitudes. Data from over four thousand middle school students in the United States were analyzed. Our analyses produced four stable and interpretable profiles of readers: (1) print preferred readers, (2) willing readers, (3) reluctant readers, and (4) avid readers. These latent profiles suggest that both purposes for reading and modes of reading play a role in shaping and developing attitudinal profiles of adolescent readers in the twenty-first century. We discuss in detail how our study contributes to an evolving understanding of digital literacies in today's adolescents.

Keywords Adolescent literacy · Digital literacy · Latent profiles · Reading attitudes · Reading motivation

✉ Ji Hoon Ryoo
   ryoox001@yonsei.ac.kr

   Bong Gee Jang
   bojang@syr.edu

   Kristin Conradi Smith
   keconradi@wm.edu

[1] Department of Reading and Language Arts, Syracuse University, 202 Huntington Hall, Syracuse, NY 13244, USA

[2] Department of Education, School of Education, Yonsei University, 512 Educational Science Building, 50 Yonsei-Ro, Seodaemoon-Gu, Seoul 03722, South Korea

[3] Department of Curriculum and Instruction, William and Mary, 301 Monticello Avenue, Williamsburg, VA 23185, USA

Introduction

In the last three decades, we have made remarkable progress in our understanding of how children learn to read and why students might encounter difficulties with reading (see Snow, Burns, & Griffin, 1998; NICHHD, 2000). An area receiving increasing attention towards that end is the role that motivation plays in contributing to literacy development and achievement (Alexander & Fox, 2013). Not only have researchers established a strong relationship among aspects of motivation and reading achievement, but they also have demonstrated that these aspects contribute to reading achievement over and above cognitive variables alone, reinforcing the notion that the ability to read must be coupled by the desire to do so (Morgan & Fuchs, 2007; Petscher, 2010).

A shortcoming of some of the previous research, however, is the tendency to conflate various aspects of motivation despite longstanding research suggesting its complexity (Schiefele, Schaffner, Möller, & Wigfield, 2012). It has been well-established that reading motivation is multidimensional (Wigfield & Guthrie, 1997), but researchers often confuse, substitute, or conflate distinct motivational constructs, complicating our understanding of the research (Conradi et al., 2014; Murphy & Alexander, 2000; Toste, Didion, Peng, Filderman, & McClelland, 2020). Further, we know students' feelings towards reading vary based on several factors (Ivey, 1999), yet much of the research conducted fails to consider how the purposes or the contexts for reading play a role in shaping students' motivation (Klauda, 2009; Moje, 2006; 2008; Nolen, Horn, & Ward, 2015). Moreover, these studies fail to account for shifts in reading practices; students are engaging with literacy in ways that are often unaccounted for by traditional motivation measures (Davis, Tonks, Hock, Wang, & Rodriguez, 2018). With few exceptions (e.g., Rosenzweig & Wigfield, 2017), more sophisticated analytic techniques have not been widely applied to literacy motivation research.

In this study, we employed a latent profile analysis to identify profiles of adolescents based on their attitudes towards reading print versus digital texts for academic versus recreational purposes. Further, given established differences in motivation based on both gender (e.g., Logan & Johnston, 2009; McGeown, Goodwin, Henderson, & Wright, 2012) and grade (McKenna et al., 2012; Bussert-Webb & Zhang, 2016), we investigated relationships of students' profiles with their gender and grade.

Theoretical framework

Two different theories undergird this work. Within motivation, we kept our focus on the role of adolescents' attitudes towards reading; as a result, our work is guided by attitude theory. Second, given the shifting nature of literacy, we also considered New Literacies (Leu, Kinzer, Coiro, Castek, & Henry, 2013) and how students' attitudes towards reading is—to some extent—contingent on the context for reading.

Attitude theory

Ajzen and Fishbein (2005) proposed the theories of reasoned action and planned behavior, which suggests that an individual's attitudes ultimately influence his or her actions (or behavior). In addition, a variety of broader contextual factors help mediate this relationship; in 2005, they extended a previous (1991) model to include the influences of sociocultural factors by listing individual (e.g., personality, emotion, values, and experience), social (e.g., age, gender, income, religion, and ethnicity), and information factors (e.g., knowledge, media, and intervention) under overarching background factors. The most unique aspect of this new model is that it acknowledges the effect of different media on attitude acquisition. Recently, de Brabander and Martens (2014) extended the Ajzen and Fishbein's model into a unified theory of task-specific motivation by combining it with related motivation theories such as self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000) and expectancy-value theory (Wigfield & Eccles, 2000). In this new theory, attitudes were reconceptualized as valence expectation, which is defined as "the specific configuration of affective and cognitive valences connected to a course of action" (p. 36). The valence expectation is the outcome of "an intricate interplay of affective and cognitive, positive and negative motivators" (p. 38) and directly influence an individual's decision to perform a specific task.

In reading, McKenna (1994, 2001) also proposed the importance of social factors in the acquisition of reading attitudes by including a focus on context in his model. These social structures and environments may include peer interactions, family support for reading, physical environment, and contexts for reading that influence acquisition and development of attitudes toward both academic and recreational reading activities. In this study, we adopted the definition of attitudes toward reading proposed by McKenna et al. (2012), defining attitudes as "acquired predispositions to respond in a consistently favorable or unfavorable manner with respect to aspects of reading" (p. 285).

New literacies theory

Advances in technology over the last few decades have led to significant shifts in terms of how we even operationalize reading (Coiro, Knobel, Lankshear, & Leu, 2008a, b). Previously, measures of reading habits and behaviors were restricted to "traditional" texts; that is, how often students read novels, books, magazines, etc. (c.f., Worthy, Moorman, & Turner, 1999). But the rapid development of both digital media and Internet has greatly influenced adolescents' reading habits and practices. While they still read multiple forms of traditional texts, such as books and magazines, they are also actively engaged in reading digital texts such as websites, eBooks, and text messages (Coiro et al., 2008a, b). In fact, according to the OECD (2015) report, adolescents of the OECD countries spend at least 2 h online at home every day. The online activities in which they participate at home include "browsing the Internet for fun, participating in social networks, and reading news on the

Internet" (p. 41). In addition, adolescents reported spending at least 25 min using computers at school every day. These statistics suggest that digital media and content is already a huge part of adolescents' everyday literacy practices.

To better understand these various new digital practices, the concept of new literacies was proposed and advanced by several researchers (Lankshear & Knobel, 2011; Leu, Kinzer, Coiro, & Cammack, 2004; Leu et al., 2013)—and it includes various subsets of literacy that have emerged in multimedia and technology settings. Among those scholars, Leu et al. (2004) emphasized cognitive, affective, and social aspects of new literacies in a balanced way by defining new literacies as "the skills, strategies, and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world and influence all areas of our personal and professional lives" (p. 1572). These dispositions can be understood as attitudes, as Conradi et al., (2014) suggested.

Since adolescents are reading in both "newer" and less studied settings—and because research reinforces decided differences between reading in traditional versus digital settings (e.g., Kong, Seo, & Zhai, 2018; Murphy, Long, Holleran, & Esterly, 2003), it becomes important for researchers to explicitly study the differences. Previous researchers, in fact, have suggested that unless explicitly asked, some adolescents disqualify online reading as reading, failing to accurately represent their reading habits (see Pitcher et al., 2007). This inspired the development of some measures that have delineated between reading contexts (e.g., McKenna et al., 2012); still, in a review of motivation measures, the authors called for the inclusion of more digital items (Davis et al., 2018).

A broadening conceptualization of reading into new literacies disrupts traditional classifications of what it means to be a proficient and engaged reader. For example, a student considered as avid in reading print texts might be reluctant to read digital texts (Merga, 2015). By contrast, a student thought to be "disengaged" in reading print texts might be actively engaged in reading digital texts when s/he is motivated to read (Cantrell et al., 2017; O'Brien, Beach, & Scharber, 2007). In addition, the gender gap in reading comprehension was narrower in digital reading than print reading assessment in PISA 2009 (OECD, 2011). It means that both male and female readers perform in a different manner while reading either print or digital texts. Consequently, we believe that our study investigating attitudinal profiles of adolescent readers for different purposes and in various settings can contribute to an evolving understanding of youth's new literacies.

Previous research

Reading medium and attitudes

Given shifts in literacy, which have been reflected in the newer models of attitude theory (e.g., Ajzen & Fishbein, 2005), the medium influences an individual's intention and attitudes toward certain activities, such as reading and writing. Many reading researchers have already delineated medium to include two

separate entities, print and digital environments, and have investigated how they influence both motivation (e.g., Cuevas, Russell, & Irving, 2012; Wu & Peng, 2016) and attitudes (e.g., Coiro, 2012; Putman, 2014, 2015; Lee & Wu, 2012; Putro & Lee, 2017). Other researchers (e.g., McKenna et al., 2012, 2017) perceived the medium as texts with different modalities such as print (e.g., books and magazines) and digital texts (e.g., e-mails and text messages). Regardless of how medium is understood, attitudes toward print and digital reading were identified as distinct constructs each of which contribute to shaping overall reading attitudes, respectively (McKenna et al., 2012; Putro & Lee, 2017).

It is notable that Singer and Alexander (2017) made a clear distinction between what they call "reading digitally" and "digital reading" (p. 1031). Reading digitally, in their view, involves simply reading traditional texts that are delivered via technology; whereas digital reading requires navigating hypertext and webpages, etc. In this study, we adopted their broader perspective and focus on digital reading practices of adolescents. Although some researchers broaden the scope of digital reading by including reading images and viewing videos, for the purpose of this study, we confined digital reading to reading digital texts with written language (emails, text messages, and blog postings).

Reading purposes and attitudes

Both reading motivation and attitudes are influenced by the purposes of reading (e.g., De Naeghel, Van Keer, Vansteenkiste, & Rosseel, 2012; McKenna et al., 2012). Reading purposes are sometimes differentiated by the types of reading activities such as to prepare for a test or reading to have a discussion with friends and teachers (e.g., Bråten & Samuelstuen, 2004). Other researchers, such as Moore, Alvermann, and Hinchman (2007), conceptualized reading purposes based on different locations where a reading activity occurs (either at home or at school). These studies reported that adolescent readers tend to perceive reading within school as an academic activity, involving learning or evaluation, and out-of-school reading as a personal activity, based on their own preferences.

Despite the important roles of these different purposes of reading in developing motivational aspects of reading, different reading purposes have not been examined in previous profile analyses. Most profile studies (e.g., Guthrie, Coddington, & Wigfield, 2009; Schiefele and Löweke 2018) delineated instead based on orientations of motivation, such as intrinsic versus extrinsic, or based on various aspects of motivation, such as self-efficacy, value, and curiosity. Based on this gap in the research, we employed McKenna et al., (2012) definition of reading purposes as "perceived reasons for reading texts in different settings" and we divided the different reading purposes into two major categories: recreational and academic. This distinction aligns with the comprehensive attitude model proposed by McKenna (1994), suggesting that both personal purposes and externally-imposed purposes for reading help to develop an individual's overall reading attitudes.

Gender and grade differences in reading attitudes

There is inconsistent evidence regarding the gender gap in attitudes toward reading. Traditionally, literacy researchers have reported that female students tend to harbor more positive reading attitudes than male students (e.g., Logan & Johnston, 2009; McGeown et al., 2012; McKenna, Kear, & Ellsworth, 1995; Swalander & Taube, 2007). For example, Logan and Johnston proposed that the gender gap in reading attitudes is larger than that in reading ability. However, more recent literature has offered somewhat contradictory findings about the gender gap in reading attitudes. For example, Lupo et al., (2017) reported that there was no significant gender difference for attitudes toward recreational digital (RD) reading. They explained that the social nature of the items on RD subscales might have played a role in narrowing the gender gap. In addition, Scholes (2019) showed that boys enjoyed personal reading activities and girls tend to enjoy the social aspects of reading.

In line with the gender differences, the grade differences in reading attitudes is a complex and controversial issue. Although there is a large volume of published studies reporting that reading attitudes tend to worsen as students become older (e.g., Ley, Schaer, & Dismukes, 1994; McKenna et al., 1995; McKenna et al., 2012), some studies—including Bussert-Webb and Zhang (2016), McQuillan (2013) and Mitchell and Ley (1996)—offer counter evidence, suggesting that reading attitudes do not significantly decline as students grow older. For example, both Bussert-Webb and Zhang (2016) and Mitchell and Ley (1996) found that there was no significant difference in reading attitudes among high school students; in fact, Bussert-Webb and Zhang (2016) reported reading attitudes of the high school students became slightly more positive from ninth to twelfth grade. McQuillan (2013) further compared reading attitudes of high school students with those of middle school students and found that there was no significant change from 8th grade to 12th grade students in terms of their reading attitudes.

Motivational profiles in reading research

To date, there are only a few studies that have reported motivational profiles of readers (e.g., Guthrie et al., 2009; Rosenzweig & Wigfield, 2017; Scholes, 2019; Vansteelandt, Mol, Caelen, Landuyt, & Mommaerts, 2017). Because of this small number—and because of our desire to compare the profiles from our analyses with previous research—we describe previous studies in detail below and present a summary in Table 1.

Using both intrinsic motivation and avoidance assessments, Guthrie et al. (2009) reported four motivational profiles of reading in elementary school students: *avid, ambivalent, apathetic, and averse readers*. Their definitions of each profile are as follows:

> A reader with an avid profile is both intrinsically motivated and nonavoidant.
> A reader with an avoidant profile is low on intrinsic and high on avoidance.
> The apathetic profile is low on intrinsic motivation and low on avoidance; the

Table 1 Previous reading motivational profile research

Authors	Year	What was measured	Analyses	Sample	Key findings
Guthrie et al.	2009	Motivation and avoidance	Hierarchical multiple regressions	Elementary students	4 Profiles: • Avid readers • Apathetic readers • Ambivalent readers • Averse readers
Rosenzweig and Wigfield	2017	Self-efficacy, perceived value, and devalue of informational texts	Cluster analysis	Adolescents	4 Profiles: • High affirming/low undermining motivation • Low affirming/high undermining motivation • High self-efficacy and low perceived difficulty, but also high devalue and low value • Moderate levels of all constructs
Vansteelandt et al.	2017	Attitudes, perceived reading competence, and reading behavior	Cluster analysis	Preservice teachers	3 Profiles: • Personally oriented readers • Socially oriented readers • Low-affect readers
Schiefele and Löweke	2018	Two aspects each of intrinsic and extrinsic motivation	LPA	Elementary students	4 Profiles: • High intrinsic • High involvement • High quantity • Moderate quantity
Scholes	2019	Students' attitudes towards various in-school activities	Cluster analysis	Elementary students	6 Profiles: • Profile titles were not provided

ambivalent profile is high on intrinsic and high on avoidance; and the averse is low on intrinsic motivation and high on avoidance motivation (p. 341).

These four profiles can be represented as four distinctive "composites of high and low intrinsic motivation and avoidance" (p. 325). However, their profiles were constructed from multiple hierarchical multiple regressions focusing on how intrinsic motivation and avoidance predicted reading comprehension. Therefore, as they stated, they "defined profiles from their position on each scale to construct relatively high groups and relatively low groups, based on theoretical rather than empirical criteria such as those used in cluster analysis" (p. 338) or latent class/profile analysis.

Rosenzweig and Wigfield (2017) measured four motivational factors (self-efficacy, perceived difficulty, value, and devalue) of 1134 middle school students regarding reading school information texts. Using cluster analysis, they reported the following distinctive profiles:

(1) high affirming and low undermining motivation,
(2) low affirming and high undermining motivation,
(3) high self-efficacy and low perceived difficulty but also high devalue and low value,
(4) moderate levels of all four constructs (p. 143)

Adolescents with high affirming and low undermining motivational patterns showed the highest reading comprehension of informational texts. By contrast, adolescents with low affirming and high undermining patterns had the lowest comprehension scores on informational texts. There was no significant gender effect on the membership of the four profiles. This study is unique in that it focuses on adolescents' motivation specifically to read informational texts for academic purposes.

A third study that identified attitude profiles focused on the reading attitudes of pre-service teachers (Vansteelandt et al., 2017). Employing a cluster analysis method, three distinct profiles emerged: personally-oriented readers (26.9%), socially-oriented readers (33.6%), and low-affect readers (39.5%). Although this study did not focus on adolescents—which is the target population of our study—it provides unique implications for this study in that (1) it focuses on attitudes, not motivation; and (2) the findings foreground the social nature of attitudes development.

Recently, Scholes (2019) assessed elementary school students' attitudes toward school-related activities, such as independent reading, spending time on computers and the Internet, social reading, non-competition activities, competitive sport activists, and video games. A cluster analysis yielded six profiles, none of which were given explicit titles. Contrary to previous research, there was no clear difference between boys and girls in terms of their membership in profile groups showing positive attitudes toward reading books. Another unique finding from the study is that boys were more likely to belong to clusters suggesting positive attitudes toward independent reading activities, but less likely to be members of clusters suggesting positive attitudes toward social aspects of reading (e.g., reading to teacher and friend).

Schiefele and Löweke (2018) was one of the few studies we found that employed latent profile analyses (LPA) to identify motivational profiles in reading. After assessing two aspects of intrinsic motivation (involvement and curiosity) and two additional aspects of extrinsic motivation (recognition and competition) in third and fourth graders' reading, they identified the following four profiles:

(1) high intrinsic: high on involvement and curiosity, low on recognition and competition,
(2) high involvement: high on involvement, low on the remaining dimensions,
(3) high quantity: high on all dimensions, and
(4) moderate quantity: low to moderate on all dimensions (p. 405)

They additionally reported 35% of profile membership changed between the third and fourth grade period. This confirms the effect of grade on the membership of each reading motivation profile.

Present study

This study is different from previous studies in that it focuses on developing reader profiles (1) of adolescents; (2) of reading attitudes in both print and digital settings; (3) of reading attitudes for academic and recreational purposes; and (4) based on LPA. As shown in Table 1, the majority of previous analyses focused on elementary populations, with one study focusing on adolescents (Rosenzweig & Wigfield, 2017) and one on preservice teachers (Vansteelandt et al., 2017). In addition, previous work has highlighted the multidimensionality of motivation, but has failed to capture distinct differences as they relate to digital settings (e.g., Guthrie et al., 2009; Rosenzweig & Wigfield, 2017). Given the call to include digital items in motivation measures (Davis et al., 2018), our work assumes a complementary perspective to the studies that precede this. Also, as stated earlier, although various reading purposes (recreational and academic) play important roles in developing motivation and attitudes in reading, only one study (Vansteelandt et al., 2017) included both purposes into their analyses. Finally, we hope to further add to the field's understanding of adolescent attitudes by employing LPA. As discussed earlier, most previous research employed clustering approaches including hierarchical and K-means cluster analysis, which use data-driven/distance-based categorization criteria to assign a case to a homogeneous class. We decided to use LPA because it has several benefits compared with those clustering techniques (Lesaux & Kieffer, 2010; Stanley, Kellermanns, & Zellweger, 2017). LPA identifies the heterogeneity in the population via a model-based clustering approach, that is, a specification of a probabilistic model describing the relationship between the latent classes and the observed indicators. As a result, LPA enables researchers to be aware of the heterogeneity of the population and

utilize the class memberships (Vermunt & Magidson, 2002). Our hypotheses are that a robust measure of reading attitudes will yield unique profiles of adolescent readers and these profiles may have different effects of gender and grade. Specifically, this study addresses the following two research questions:

1. What are the most representative attitudinal profiles explaining adolescents' attitudes toward reading print and digital texts?
2. How are those attitudinal reading profiles related to gender and grade?

Methods

Participants and settings

We used data collected as a part of our larger national survey of reading attitudes (McKenna et al., 2012; Conradi et al., 2013). This dataset included 5080 middle school students enrolled in 23 states in the United States. We deleted 589 cases because of missing data. Table 2 presents the demographic data for the final sample of the dataset analyzed in this study. Nearly a quarter (24.7%) of the participants were in 6th grade, 30.5% were in 7th grade, 41.5% were in 8th grade, and 3.3% were mixed grades. Less than half of the sample (46.6%) were male.

The institutional review board (IRB) office classified this study as exempt because the survey administration was considered as a part of normal educational practices. No parental permission was involved in this study for the same reason. Teacher-participants were recruited by posting advertisements on listservs of literacy organizations including the Literacy Research Association (LRA), the International Reading Association (IRA), and the National Council of Teachers of English (NCTE). Once we identified classroom teachers who were willing to participate in our study, we sent them packets of surveys with clear directions and a postage-paid return envelope, via mail. The classroom teachers administered the surveys to their students, providing students with the choice to opt out of the survey by leaving it blank. Among all the students who received the surveys, 97.5% chose to participate and completed the survey, with only 2.5% of students deciding not to participate by turning in blank surveys.

Table 2 Frequencies of middle school students

Grade	N	Gender	N
6	1253	Male	2369
7	1548	Female	2609
8	2108	Not identified	102
Mixed	171		

Measures and procedure

We administered the Survey of Adolescent Reading Attitudes (SARA, McKenna et al., 2012; Conradi et al., 2013), which was constructed and piloted in 2008 with about 900 American adolescents. SARA delineates the broad construct of attitude towards reading into (1) reading for academic versus recreational purposes; and (2) reading in print versus digital modes. These distinctions can be thought of in a 2×2 matrix, comprising four subscales:

1. Attitude toward reading print texts for recreational purposes (RP, 5 items): reading a self-selected paperback.
2. Attitude toward reading digital texts for recreational purposes (RD, 3 items): reading a text messages or e-mail from a friend.
3. Attitude toward reading print texts for academic purposes (AP, 5 items): reading a print textbook.
4. Attitude toward reading digital texts for academic purposes (AD, 5 items): reading news online for class (see Conradi et al., 2013 for more details).

A six-node numerical rating scale is used for all items, asking participants to rate a series of reading activities from 1 (strongly disagree) to 6 (strongly agree). Cumulatively, the potentially lowest score is 18 and the highest possible score is 108. There were no items that included negative wording, so higher scores in each construct basically indicate more positive attitudes toward each type of reading activity. Internal consistency reliability coefficients were 0.86 for the RP scale, 0.80 for the RD scale, 0.82 for the AD scale and 0.78 for the AP scale, which fall in the acceptable range (Nunnally, 1978).

Data analysis

Reading attitude data were analyzed using latent profile analysis (LPA; Gibson, 1959; Moustaki, 1996; Vermunt & Magidson, 2002; Williams & Kibowski, 2016). LPA allowed us to identify latent variables that represent major profiles of adolescents who score similarly on the four observed variables, AD, AP, RD, and RP, of the SARA. The probability that an adolescent reader was accurately classified was estimated simultaneously within the overall LPA model (Hill, Degnan, Calkins, & Keane, 2006). To find the best fitting model, models are estimated with classes added iteratively.

The LPA tested profile solutions of one-profile to nine-profile models. We compared those nine models to determine the solution that provided the best fit to the data. Overall model fit was analyzed and interpreted by the bootstrap likelihood ratio test (BLRT), Bayesian information criterion (BIC; Schwarz, 1978), and entropy assessing whether participants were classified into one and only one category (Jedidi, Ramaswamy, & Desarbo, 1993). The BIC is a descriptive fit index wherein smaller value indicates better model fit. The BLRT compares two nested models

wherein $p < 0.05$ indicates the complex model is better while $p > 0.05$ indicates that both models are equally well fitted. Both BIC and BLRT were used to enumerate latent profiles suggested by Nylund, Asparouhov, and Muthén (2007) and Nylund-Gibson and Choi (2018). In the case that more than two possible latent profile models were enumerated by BIC and BLRT, we also considered entropy to confirm the best fitting model. Entropy ranges from 0 to 1, with the higher the better. In addition to these fit indices, each model was evaluated on interpretability and practicality (Logan & Pentimonti, 2016). To conduct this analysis, Mplus 8.4 (Muthén & Muthén, 1998–2017) was used.

To examine the effects of gender and grade, we fit LPA with covariates via a three-step approach in LPA (Asparouhov & Muthén, 2014; Bolck et al., 2004; Croon, 2002; Vermunt & Magidson, 2002). Although there is a simple and intuitive way in LPA with covariates, called a one-step approach, it is known that the one-step approach often cause serious bias in predicting class membership due to the effect of covariates on classifying membership. A three-step approach in LCA deals with the *classify-analyze* method that excludes the effects of covariates when estimating the membership and consider the effects on the memberships as posterior probabilities. Such an earlier version of three-step approach in LCA was developed by Bolck, Croon, and Hagenaars (2004) by taking into account the error in the membership assignment. In other words, when examining the effects of covariates, we consider the posterior probabilities of membership instead of categorized group assignments. We fit the three-step approach in LPA into the dataset, which allows us to identify the latent profiles and obtain regression coefficients and odds ratios (OR) to determine and interpret the relationship among profile membership, gender, and grade.

Results

Descriptive statistics

We first computed mean scores and standard deviations for each subscale by gender and grade and provided them in Table 3. For three subscales, we present raw mean scores instead of standardized scores to help both researchers and educators interpret

Table 3 Descriptive statistics

	Academic digital (5 items)	Recreational print (5 items)	Academic print (5 items)	Recreational digital (3 items)
	M (SD)	M (SD)	M (SD)	M (SD)
Males	18.9 (5.9)	17.1 (6.6)	15.5 (5.7)	4.2 (1.2)
Females	20.2 (5.2)	21.0 (6.4)	17.1 (5.5)	3.7 (1.0)
6th Grade	20.1 (5.7)	19.7 (6.5)	16.5 (5.7)	4.0 (1.2)
7th Grade	19.6 (5.6)	19.0 (6.8)	16.1 (5.6)	4.0 (1.2)
8th Grade	19.2 (5.5)	18.9 (6.9)	16.3 (5.7)	3.8 (1.1)
Total	19.6 (5.6)	19.1 (6.8)	16.3 (5.7)	3.9 (1.1)

the 6-point Likert-type scale easily. For the Recreational Digital scale, however, the score was transformed to avoid a violation of the normality condition, which was also applied in the previous results of factor analysis (McKenna et al., 2012). In that instance, Conradi et al., (2013) had suggested 3.5 as the midpoint of the attitude scale, with item scores exceeding 3.5 indicating positive attitudes. For the composite scores, presented in Table 3, we designated 16.5 as the midpoint for AD, RP, and AP scales (each comprising five items).

Latent profile analysis

Models with one to nine latent profiles were fit to the data. Results of model selection among nine models were summarized in Table 4. BICs of one-solution to nine-solution LPA decreases as shown in Fig. 1 and we found an elbow point at the four-solution model because the three-solution model deviated from the line connecting all of BICs from 4-solution to 9-solution. On the other hand, BLRT did not give any good indicator for the best-fitting model because all of p values in the comparison from 2-solution to 9-solution were less than 0.05. To the contrary, all of entropies were greater than 0.80. Although entropy should not guide model selection (Maysn, 2013), our holistic approach of interpretability and practicality includes the entropy along with the BIC and BLRT. When comparing the three- and four-factor models, we found the four-factor model more appealing, both in terms of BIC and in terms of its pragmatic value. Specifically, the four-solution model better delineated students' preferences for reading and proved more consistent both with our comprehensive literature review and with our own practical experiences with adolescents. Based on these factors, we decided the four-solution model was the best-fitting model.

The overall sample standardized means on latent profiles used to interpret the four-profile model are presented in Fig. 2. It should be noted that we took a couple of factors into consideration in naming each profile. In considering each profile, we looked at the profile's variation across the four subscales and we also considered

Table 4 Model selection among models with one to nine latent profiles

Latent profiles	AIC	BIC	Entropy	LMR LRT	p value
1-Profile solution	50,995.62	51,046.90			
2-Profile solution	40,406.81	40,515.77	0.90	10,468.51	0.00
3-Profile solution	35,371.81	35,538.46	0.86	4987.11	0.00
4-Profile solution	**33,146.45**	**33,370.79**	**0.86**	**2214.11**	**0.00**
5-Profile solution	31,846.48	32,128.51	0.86	1300.78	0.00
6-Profile solution	30,890.30	31,230.02	0.86	961.48	0.00
7-Profile solution	30,119.08	30,516.49	0.87	778.93	0.00
8-Profile solution	29,467.09	29,922.19	0.87	661.26	0.30
9-Profile solution	28,875.54	29,388.32	0.88	615.68	0.01

Bold values represent the final model selected

AIC Akaike information criterion; *BIC* Bayesian information criterion; *LMR LRT* Lo–Mendell–Rubin likelihood ratio test
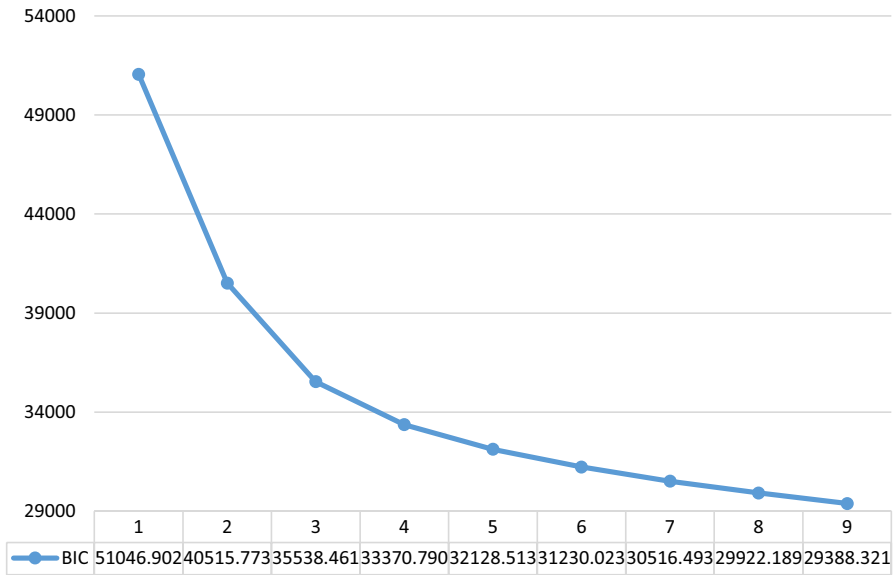
Fig. 1 BIC distribution across the different profile solutions

	1	2	3	4	5	6	7	8	9
BIC	51046.902	40515.773	35538.461	33370.790	32128.513	31230.023	30516.493	29922.189	29388.321

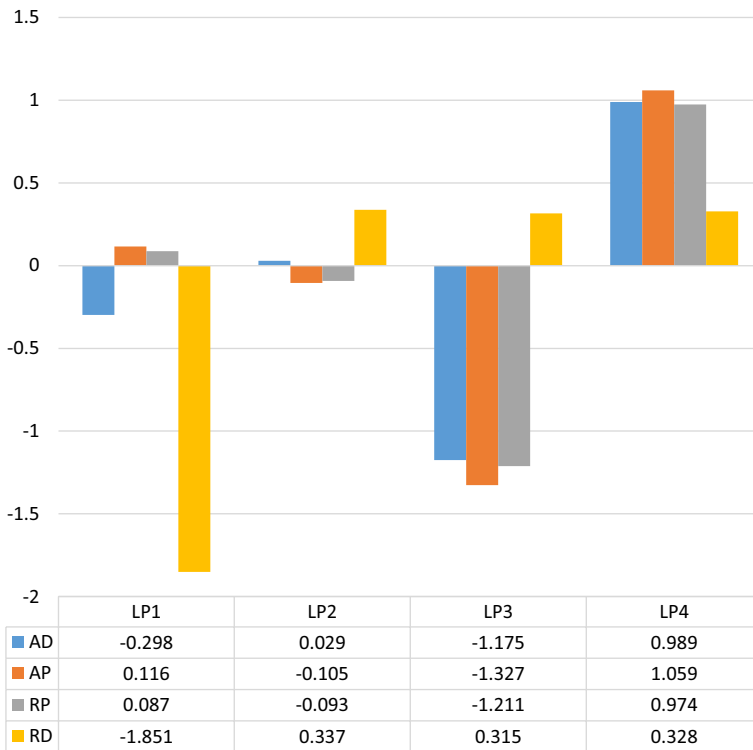|	LP1	LP2	LP3	LP4
AD	-0.298	0.029	-1.175	0.989
AP	0.116	-0.105	-1.327	1.059
RP	0.087	-0.093	-1.211	0.974
RD	-1.851	0.337	0.315	0.328

Fig. 2 4-Class profile solution

each profile relative to one another. LP1, named print preferred readers, was composed of 14.4% of the sample ($n=648$). This profile represents individuals with average levels in both academic (0.116) and recreational prints (0.087), moderately low attitudes in academic digital (-0.298), and very low in recreational digital (-1.851).

Notably, LP2, titled *willing readers*, was the majority group, with 38.9% of the sample ($n=1749$). This profile is characterized by average levels across all the four subscales—suggesting a willingness, but not necessarily an eagerness, to read. A standardized mean score for each subscale in LP2 was 0.029 for AD, -0.105 for AP, -0.093 for RP, and 0.337 for RD, most of which are slightly above or below the standardized mean line.

LP3, referred to as *reluctant readers*, was composed of 19.8% of the sample ($n=889$). This profile represents individuals with the very low levels in three attitude subscales (AD, AP, and RP), except RD. A standardized mean score for each subscale in LP3 was -1.175 for AD, -1.327 for AP, -1.211 for RP, and -0.315 for RD. LP4, labelled as *avid readers*, was composed of 26.8% of the sample ($n=1205$), which is the second majority group and represents individuals with very high levels in three attitude subscales (AD=0.989; AP=1.059; and RP=0.974), except RD (0.328).

We further delineated frequency of each profile by grade and gender and presented it on Table 5. In summary, the profiles created from the four-profile model included print preferred readers (LP1), willing readers (LP2), reluctant readers (LP3) and avid readers (LP4).

Effect of gender and grade on latent profiles

Multinomial logistic regression analyses were used to examine the relations between the predictors (gender and grade) and the likelihood of being a member of each profile. As shown in Table 6, gender indicated significant effects on the profile membership probabilities in all the group comparisons ($r_{12}^{gender} = 0.872, p = 0.000 < 0.001; r_{13}^{gender} = .319,$ $p = 0.0005 < 0.05; r_{14}^{gender} = -1.352, p = 0.000 < 0.001; r_{23}^{gender} = -0.553, p = 0.000$ $< 0.001; r_{24}^{gender} = -0.480, p = 0.000 < 0.001; r_{34}^{gender} = -1.034, p = 0.000 < 0.001$). In particular, the odds of male students over female students in LP1 are 2.392 times more than odds of male students over female students in LP2 and 1.375 times more

Table 5 Profiles by gender and grade

	Profile 1	Profile 2	Profile 3	Profile 4	Total
6th grade	205	436	197	325	1163
7th grade	215	537	776	1749	1406
8th grade	228	776	409	509	1922
Male	425	786	511	414	2136
Female	223	963	378	791	2355
Total	648	1749	889	1205	4491

Table 6 Multinomial logistic regressions of gender and grade on profile membership

	Coef.	SE	*p* value	OR
Profile 1 versus Profile 2				
Grade	− 0.239	0.060	0.000	0.788
Gender	− 0.872	0.102	0.000	0.418
Profile 1 versus Profile 3				
Grade	− 0.315	0.067	0.000	0.730
Gender	− 0.319	0.114	0.005	0.727
Profile 1 versus Profile 4				
Grade	− 0.162	0.064	0.011	0.851
Gender	− 1.352	0.109	0.000	0.259
Profile 2 versus Profile 3				
Grade	− 0.076	0.060	0.205	0.927
Gender	0.553	0.097	0.000	1.739
Profile 2 versus Profile 4				
Grade	0.077	0.054	0.155	1.080
Gender	− 0.480	0.091	0.000	0.619
Profile 3 versus Profile 4				
Grade	0.153	0.060	0.011	1.165
Gender	− 1.034	0.100	0.000	0.356

The coefficients and ORs reflect the effects of the predictors (gender and grade) on the likelihood of membership in the reference profile relative to the comparison profile

SE standard error of the coefficient (Coef.); *OR* odds ratio

than those in LP3. The regression coefficients indicated that females were associated with a higher likelihood of membership in LP4 (avid readers) relative to all other profiles. In addition, they are more likely to belong to LP2 (willing readers) relative to LP1 (print preferred readers) and LP3 (reluctant readers). Between LP1 and LP3, they showed a higher likelihood of belonging to LP3 (reluctant readers).

Grade was also identified as a significant predictor of the profile membership probabilities $(r_{12}^{grade} = -0.239, p = 0.000 < 0.001; r_{13}^{grade} = -0.315, p = 0.000 < 0.001; r_{14}^{grade} = -0.162, p = 0.011 < 0.05; r_{34}^{grade} = 0.153, p = 0.011 < 0.05)$. However, for comparisons between LP2 and LP3 and LP2 and LP4, no significant effect was identified $r_{23}^{grade} = -0.076, p = 0.205; r_{13}^{grade} = 0.077, p = 0.155)$. Higher grade was associated with a higher likelihood of being in LP2, LP3 and LP4, relative to LP1. However, the older students were more likely to belong to LP3 compared with LP4.

Discussion

Profiles of attitudes toward reading

We identified four major attitudinal profiles of American adolescent readers from a sample of 4491 middle school students: print preferred readers, willing readers, reluctant readers, and avid readers. These profiles provide several important implications for adolescent literacy.

First, this study set out to establish adolescent reader profiles across purposes and modes. Given the ubiquity of digital media, we suspected a significant finding would be a considerable enthusiasm and trend towards reading in digital settings. Interestingly, what we found is that a sizeable portion of readers (14.4%)—identified as LP1 and titled as print preferred readers in this study—continue to favor print reading. In addition, students in LP4 (avid readers) also showed relatively less positive attitudes toward digital reading for recreational purposes (RD) compared with other three attitude subscales. Although this by no means discounts that many also have positive leanings towards digital reading, it does suggest that we should not assume all adolescents will be drawn towards digital reading. Instead, we should leverage this nuanced understanding of readers to advance pedagogies that support differentiation; that is, some students will prefer traditional formats, whereas others will prefer reading on screens.

Second, given that even the reluctant profile (LP3) indicated relatively higher Recreational Digital attitudes compared with other three attitude subscales, researchers may consider reconceptualizing the traditional notion of reading motivation and attitudes. Most instruments that have been frequently used to measure reading motivation (Wigfield & Guthrie, 1997; Malloy, Marinak, Gambrell, & Mazzoni, 2013) and attitudes (McKenna & Kear, 1990) do not include any subscales or items regarding a student's reading activities in digital contexts (see Davis et al., 2018). In this regard, we need to give special attention to some new instruments that were recently developed to measure attitudes toward reading digital texts such as those developed by O'Byrne and McVerry (2009), Putman (2014), and Putman, Wang, and Ki (2015). While those measures address digital texts, some of them lack a strong theoretical foundation or fail to differentiate reading activities performed in-school and out-of-school settings. Still, building on the work they have started, more nuanced investigations would "help educators conceptualize, teach, and assess twenty first-century learner dispositions such as emotional resilience, persistence, social responsibility, and personal productivity" (Coiro, 2012, p. 645).

Based on the preferable attitudes some profiles (LP2 and LP3) held toward digital texts, classroom teachers are encouraged to incorporate opportunities for multiple digital literacy activities across the disciplines in instruction. This might include not only using various multimedia and technology tools in teaching reading, but also carefully designing online-based instruction in connection with regular off-line classroom instruction to foster adolescents' reading motivation and to reduce their resistance to reading. In addition, traditional independent reading

time, such as sustained silent reading, might be offered with digital reading tools such as laptop computers and tablets to foster their digital reading for recreational purposes.

It is noteworthy that the largest portion (38.3%) of the adolescents analyzed in this study belong to the willing readers (LP 2): scores in this profile hovered around average. Compared with the mean scores of each subscale, this profile corresponds with the profile of moderate levels of all four constructs reported in Rosenzweig and Wigfield (2017) and the moderate quantity profile in Schiefele and Löweke (2018), which showed average levels across different motivational aspects. The print preferred readers (LP 1) in our study are somewhat similar to the ambivalent readers cluster in Guthrie et al. (2009) in that they are intrinsically motivated to read digital texts, but exhibit high avoidance in reading print texts. It should be emphasized that mode of reading (print vs. digital) delineates why adolescent are motivated or not motivated to read in different contexts.

Clearly, reading in digital settings proved to be a favorable activity for many adolescents. For example, even within the overall reluctant reader profile (LP 3: reluctant readers), who had the lowest overall attitude scores, their mean score on the Recreational Digital was above the mean line. These readers are traditionally understood simply as reluctant or resistant readers (Lenters, 2006). Guthrie et al. (2009) would put them into the avoidant profile—low on intrinsic motivation and high on avoidance. However, we believe that these labels would create another deficit-based approach to understanding those students who may have a potential to develop more positive attitudes toward specific reading activities. Our finding is somewhat consistent with that of O'Brien et al. (2007), who reported that even struggling adolescent readers found literacy practices using digital media more engaging than traditional practices. Moving forward, this asserts the importance of including digital items on measures: when we fail to account for the variation in how adolescents feel about reading across different modes, we miss out on opportunities to see some positive attitudes. Written languages and messages are delivered via multiple forms of media beyond traditional printed texts. We believe that a careful understanding of how adolescents develop their attitudes and dispositions toward digital reading is a prerequisite for preparing them for the realities of twenty first-century literacy practice.

Finally, the size of the avid readers profile (LP 4), which includes over a quarter of a sample, suggests that a number of adolescents still harbor quite positive attitudes towards reading, regardless of purpose or medium. This profile relates to the avid reader profile in Guthrie et al. (2009) in that they are "both intrinsically motivated and nonavoidant" to any specific reading activities (p. 341). Although it is well-known that digital media is popular among adolescents (e.g., Alvermann & Hinchman, 2012), some students in this profile still prefer to read print materials. Accordingly, reading teachers may assess their students based on four profiles we reported and differentiate their instruction based on those profiles.

Association between profiles and gender

Our finding suggested that female students are more likely to belong to LP4 (avid readers) and LP2 (willing readers). Male students showed higher likelihood of membership in LP1 (print preferred readers) and LP3 (reluctant readers). Considering that LP3 represents overall relatively negative attitudes toward reading and LP4 represents overall positive attitudes toward reading (compared with the other profiles), this finding may confirm a traditional conceptualization of reluctant boy readers and avid girl readers (McKenna et al., 1995). However, it should be noted that boys showed high likelihood of LP1 (print preferred readers), which showed average attitudes toward print reading for academic (AP) and recreational purposes (RP). In addition, even though LP3 may be categorized as overall resistant readers, they still have relatively positive attitudes toward reading digital texts for recreational purposes (RD).

   Another notable finding is that LP1 participants included a significantly higher number of males. LP1 represents the most unique attitudinal profile in that it shows preference for printed texts for both academic and recreational purposes. This finding is contrary to findings from prior research that reported female students prefer to read print texts more than digital texts (Crook & Harrison, 2008; Loh & Sun, 2019). Given that the three items for RD (instant messaging or emailing friends, texting friends, and being on social websites like Facebook and Twitter) reflects a social nature of digital reading, this finding aligns with Scholes (2019), which reported girls enjoyed social aspects of reading than boys. This finding further supports the idea that classroom teachers might consider differentiating their instruction by providing different modes of texts. When students are provided with an opportunity to choose the modality of texts that they like, they are likely to be more significantly motivated to read text (Gambrell, 2011).

Effects of grade on each profile

The significant effects of grade were identified among multiple comparisons. The fact that students in higher grades are more likely to belong to LP3(reluctant readers) than LP4 (avid readers) supports evidence from previous research showing reading attitudes worsens gradually as students become older (e.g., Ley et al., 1994; McKenna et al., 1995). However, higher graders' low likelihood of membership in LP1 (print preferred readers) suggests that adolescents may develop a stronger digital reader profile as they grow older. This finding is aligned with previous research indicating that adolescents' motivation in digital literacy practice is influenced by how often they have been exposed to digital media and texts (Moran, Ferdig, Pearson, & Wardrop, 2008).

Limitations

Although this study contributes to our understanding of adolescent reading motivation of adolescents, we acknowledge that there are some clear limitations. First and foremost, we acknowledge the limitation of using self-report data (Fulmer & Frijters, 2009) and a singular measure (Bong, 1996). Moreover, the quality and/or generalizability of any survey data depends on the representativeness of data and the validity of analytic procedures. Also, it should be noted that the digital reading experiences of adolescents may have evolved since the data were collected between 2010 and 2011, Finally, additional factors—including race, SES and geographical locations (urban vs. rural)—were not considered in identifying the profile membership. Future researchers should address how technology has evolved as well as these demographic variables to create more nuanced attitudinal profiles.

Implications for future research

One potential future investigation would be to examine the relationship among the four attitudinal profiles, reading comprehension, and actual amount of reading. Recently, Lupo et al., (2017) reported that adolescents' attitudes toward reading digital texts for recreational purposes was not related to their reading comprehension of print text. A further study could assess reading comprehension of digital texts using Online Reading Comprehension Assessment (Leu et al., 2013) and amount of digital reading and delineates the relationships among attitudes toward, amount of, and comprehension of digital texts. Given that we have established four distinct profiles, we may advance our understanding by examining how different types of reading attitudes interact with reading comprehension of print and digital texts and actual amount of reading to shape unique reader profiles.

In addition, it would be valuable to see whether these four profiles are consistent across different ethnic groups of readers (e.g., African American, Asian, and Hispanic). Unrau and Schlackman (2006) reported that intrinsic motivation for reading of Hispanic middle school students did not significantly predict their reading achievement. This finding suggests that students with ethnically diverse backgrounds may develop reading motivation in different ways from their Caucasian peers. Unfortunately, these differences in motivational aspects of reading across different ethnic groups have not been widely investigated compared to gender and grade.

Another potential group to investigate would be English learners or bilingual learners. Bilingual readers may develop their reading attitudes in different ways compared to monolingual readers. For example, Protacio & Jang (2016) suggested that bilingual students want to read texts written in a target language so they can acquire knowledge of the new culture and be able to speak the target language more like their native-speaking friends. This unique type of motivation is often understood as integrative motivation (Gardner & Lambert, 1972). Identifying attitudinal

profiles of bilingual learners would contribute to understanding how they develop attitudes toward reading different types of texts in a more comprehensive manner.

Implications for instructional practice and policy

Many classroom teachers are concerned about their students' overall negative attitudes toward and disengagement in reading. We suggest that teachers administer the Survey of Adolescent Reading Attitudes employed in this study to understand and analyze the students' attitudinal profiles. Other ways to assess their reading attitudes would be to interview or observe students' reading practices. Based on their students' attitudinal profiles, teachers can differentiate their reading instruction in multiple ways. Presenting students with multiple digital texts and apps would allow them to choose a text to read based on their interests and background knowledge (Jang & Henretty, 2019). Reading different texts on their tablets and the Internet, for recreational purposes, may help both male and female readers not only to strengthen their attitudes toward reading digital texts, but also to develop their overall positive attitudes toward reading over time. Additional ideas regarding classroom applications can be found in a recently published article using the same data (see Jang & Henretty, 2019).

Conclusion

In this study, we classified four latent profiles based on four subscales of attitude toward reading. In order to help shape students' positive attitudes toward reading and eventually improve their reading performance, these classifications could prove useful. These findings can be used to inform differentiation techniques and to tailor teachers' specific pedagogical practices. This study extends previous research on motivational profiles by including unique motivational interactions among different purposes for and modes—print and digital—of reading. As a result, these more comprehensive profiles of adolescent readers could provide insightful implications for policy makers, researchers, and educators.

References

Ajzen, I., & Fishbein, M. (2005). The influence of attitudes on behavior. In D. Albarracín, B. T. Johnson, & M. P. Zanna (Eds.), *The handbook of attitudes* (pp. 173–221). Mahwah, NJ: Erlbaum.

Alexander, P. A., & Fox, E. (2013). A historical perspective on reading research and practice, redux. In D. E. Alvermann, N. J. Unrau, & R. B. Ruddell (Eds.), *Theoretical models and processes of reading* (6th ed., pp. 3–46). Newark, DE: International Reading Association.

Alvermann, D. E., & Hinchman, K. A. (2012). *Reconceptualizing the literacies in adolescents' lives* (3rd ed.). Mahwah, NJ: Erlbaum.

Asparouhov, T., & Muthén, B. (2014). Auxiliary variables in mixture modeling: Three-step approaches using M plus. *Structural Equation Modeling: A Multidisciplinary Journal, 21,* 329–341.

Bolck, A., Croon, M., & Hagenaars, J. (2004). Estimating latent structure models with categorical variables: One-step versus three-step estimators. *Political Analysis*, *12*(1), 3–27.

Bong, M. (1996). Problems in academic motivation research and advantages and disadvantages of their solutions. *Contemporary Educational Psychology, 21*(2), 149–165.

Bråten, I., & Samuelstuen, M. S. (2004). Does the influence of reading purpose on reports of strategic text processing depend on students' topic knowledge? *Journal of Educational Psychology, 96*(2), 324–336.

Bussert-Webb, K., & Zhang, Z. (2016). Reading attitudes of Texas high school students. *Reading Psychology, 37*(3), 424–448.

Cantrell, S. C., Pennington, J., Rintamaa, M., Osborne, M., Parker, C., & Rudd, M. (2017). Supplemental literacy instruction in high school: What students say matters for reading engagement. *Reading and Writing Quarterly, 33*(1), 54–70.

Coiro, J. (2012). Understanding dispositions toward reading on the Internet. *Journal of Adolescent and Adult Literacy, 55*(7), 645–648.

Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (Eds.). (2008a). *Handbook of research in new literacies*. Mahwah, NJ: Lawrence Erlbaum Associates.

Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (2008b). Central issues in new literacies and new literacies research. In J. Coiro, M. Knobel, C. Lankshear, & D. J. Leu (Eds.), *The handbook of research on new literacies* (pp. 1–22). Mahwah, NJ: Lawrence Erlbaum Associates.

Conradi, K., Jang, B. G., Lawrence, C., Craft, A., & McKenna, M. C. (2013). Measuring adolescents' attitudes toward reading: A classroom survey. *Journal of Adolescent and Adult Literacy*, *56*, 565–576.

Conradi, K., Jang, B. G., & McKenna, M. C. (2014). Motivation terminology in reading research: A conceptual review. *Educational Psychology Review*, *26*, 127–164.

Crook, C. and Harrison, C. (2008). *Web 2.0 technologies for learning at Key Stages 3 and 4: Summary report*. Coventry, UK: Becta. https://dera.ioe.ac.uk/1480/1/becta_2008_web2_summary.pdf

Croon, M. (2002). Using predicted latent scores in general latent structure models. In G. A. Marcoulides & I. Moustaki (Eds.), *Latent variable and latent structure models* (pp. 195–223). Mahwah, NJ: Lawrence Erlbaum.

Cuevas, J. A., Russell, R. L., & Irving, M. A. (2012). An examination of the effect of customized reading modules on diverse secondary students' reading comprehension and motivation. *Educational Technology Research and Development*, *60*(3), 445–467.

Davis, M. H., Tonks, S. M., Hock, M., Wang, W., & Rodriguez, A. (2018). A review of reading motivation scales. *Reading Psychology, 39*(2), 121–187.

de Brabander, C. J., & Martens, R. L. (2014). Towards a unified theory of task-specific motivation. *Educational Research Review, 11*, 27–44.

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*(4), 1006–1021.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum Press.

Fulmer, S. M., & Frijters, J. C. (2009). A review of self-report and alternative approaches in the measurement of student motivation. *Educational Psychology Review, 21*(3), 219–246.

Gambrell, L. B. (2011). Seven rules of engagement: What's most important to know about motivation to read. *The Reading Teacher, 65*(3), 172–178.

Gardner, R. C., & Lambert, W. E. (1972). *Attitudes and motivation in second-language learning*. Rowley, MA: Newbury House.

Gibson, W. A. (1959). Three multivariate models: Factor analysis, latent structure analysis, and latent profile analysis. *Psychometrika, 24*, 229–252.

Guthrie, J. T., Coddington, C. S., & Wigfield, A. (2009). Profiles of reading motivation among African American and Caucasian students. *Journal of Literacy Research, 41*(3), 317–353.

Hill, A. L., Degnan, K. A., Calkins, S. D., & Keane, S. P. (2006). Profiles of externalizing behavior problems for boys and girls across preschool: The roles of emotion regulation and inattention. *Developmental Psychology, 42*(5), 913–928.

Ivey, G. (1999). A multicase study in the middle school: Complexities among young adolescent readers. *Reading Research Quarterly*, *34*(2), 172–192.

Jang, B. G., & Henretty, D. (2019). Understanding multiple profiles of reading attitudes. *Middle School Journal, 50*(3), 26–35.

Jedidi, K., Ramaswamy, V., & DeSarbo, W. S. (1993). A maximum likelihood method for latent class regression involving a censored dependent variable. *Psychometrika*, *58*(3), 375–394.

Klauda, S. L. (2009). The role of parents in adolescents' reading motivation and activity. *Educational Psychology Review, 21*(4), 325–363.

Kong, Y., Seo, Y. S., & Zhai, L. (2018). Comparison of reading performance on screen and on paper: A meta-analysis. *Computers and Education, 123,* 138–149.

Lankshear, C., & Knobel, M. (2011). *New literacies: Everyday practices and social learning* (3rd ed.). New York, NY: Open University Press.

Lee, Y. H., & Wu, J. Y. (2012). The effect of individual differences in the inner and outer states of ICT on engagement in online reading activities and PISA 2009 reading literacy: Exploring the relationship between the old and new reading literacy. *Learning and Individual Differences, 22*(3), 336–342.

Lenters, K. (2006). Resistance, struggle, and the adolescent reader. *Journal of Adolescent and Adult Literacy, 50*(2), 136–146.

Lesaux, N. K., & Kieffer, M. J. (2010). Exploring sources of reading comprehension difficulties among language minority learners and their classmates in early adolescence. *American Educational Research Journal, 47*(3), 596–632.

Leu, D. J., Jr., Kinzer, C. K., Coiro, J., & Cammack, D. (2004). Toward a theory of new literacies emerging from the internet and other information and communication technologies. In R. B. Ruddell & N. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed., pp. 1568–1611). Newark, DE: International Reading Association.

Leu, D. J., Kinzer, C. K., Coiro, J., Castek, J., & Henry, L. A. (2013). New literacies: A dual-level theory of the changing nature of literacy instruction and assessment. In D. E. Alvermann, R. B. Ruddell, & N. Unrau (Eds.), *Theoretical models and processes of reading* (6th ed., pp. 1150–1181). Newark, DE: International Reading Association.

Ley, T. C., Schaer, B. B., & Dismukes, B. W. (1994). Longitudinal study of the reading attitudes and behaviors of middle school students. *Reading Psychology, 15*(1), 11–38.

Logan, S., & Johnston, R. (2009). Gender differences in reading ability and attitudes: Examining where these differences lie. *Journal of Research in Reading, 32,* 199–214.

Logan, J. A. R., & Pentimonti, J. M. (2016). Introduction to latent class analysis for reading fluency research. In K. D. Cummings & Y. Petscher (Eds.), *The fluency construct* (pp. 309–332). New York, NY: Springer.

Loh, C. E., & Sun, B. (2019). "I'd still prefer to read the hard copy": Adolescents' print and digital reading habits. *Journal of Adolescent and Adult Literacy, 62*(6), 663–672.

Lupo, S., Jang, B. G., & McKenna, M. C. (2017). The relationship between comprehension and attitudes toward print and digital texts in adolescent readers. *Literacy Research: Theory, Method, and Practice*, 66, 264–278.

Malloy, J. A., Marinak, B. A., Gambrell, L. B., & Mazzoni, S. A. (2013). Assessing motivation to read. *The Reading Teacher, 67*(4), 273–282.

McGeown, S., Goodwin, H., Henderson, N., & Wright, P. (2012). Gender differences in reading motivation: Does sex or gender identity provide a better account? *Journal of Research in Reading, 35*(3), 328–336.

McKenna, M. C. (1994). Toward a model of reading attitude acquisition. In E. H. Cramer & M. Castle (Eds.), *Fostering the love of reading: The affective domain in reading education* (pp. 18–40). Newark, DE: International Reading Association.

McKenna, M. C. (2001). Development of reading attitudes. In L. Verhoeven & C. Snow (Eds.), *Literacy and motivation: Reading engagement in individuals and groups* (pp. 135–158). Mahwah, NJ: Erlbaum.

McKenna, M. C., & Kear, D. J. (1990). Measuring attitude toward reading: A new tool for teachers. *The Reading Teacher*, 43(9), 626–639.

McKenna, M. C., Kear, D. J., & Ellsworth, R. A. (1995). Children's attitudes toward reading: A national survey. *Reading Research Quarterly, 30*(4), 934–956.

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.

McQuillan, J. (2013). Urban middle and high school students' reading attitudes and beliefs: A large sample survey. *Global Journal of Human Social Science Linguistics and Education, 13*(7), 30–49.

Merga, M. K. (2015). Are avid adolescent readers social networking about books? *New Review of Children's Literature and Librarianship, 21*(1), 1–16.

Mitchell, T. L., & Ley, T. C. (1996). The reading attitudes and behaviors of high school students. *Reading Psychology, 17*(1), 65–92.

Moje, E. B. (2006). Motivating texts, motivating contexts, motivating adolescents: An examination of the role of motivation in adolescent literacy practices and development. *Perspectives, 32*(3), 10–14.

Moore, D. W., Alvermann, D. E., & Hinchman, K. A. (2007). Literacies in and out of school: A survey of U.S. youth. *The Reading Matrix, 7*(3), 170–190.

Moran, J., Ferdig, R. E., Pearson, P. D., & Wardrop, J. (2008). Technology and reading performance in the middle-school grades: A meta-analysis with recommendations for policy and practice. *Journal of Literacy Research, 40*(1), 6–58.

Morgan, P. L., & Fuchs, D. (2007). Is there a bidirectional relationship between children's reading skills and reading motivation? *Exceptional Children, 73*(2), 165–183.

Moustaki, I. (1996). A latent trait and a latent class model for mixed observed variables. *British Journal of Mathematical and Statistical Psychology, 49,* 313–334.

Murphy, P. K., & Alexander, P. A. (2000). A motivated exploration of motivation terminology. *Contemporary Educational Psychology, 25*(1), 3–53.

Murphy, P. K., Long, J. F., Holleran, T. A., & Esterly, E. (2003). Persuasion online or on paper: A new take on an old issue. *Learning and Instruction, 13*(5), 511–532.

National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction* (NIH Publication No. 00-4769). Washington, DC: U.S. Government Printing Office.

Nolen, S. B., Horn, I. S., & Ward, C. J. (2015). Situating motivation. *Educational Psychologist, 50*(3), 234–247.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York, NY: McGraw-Hill.

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal, 14*(4), 535–569.

Nylund-Gibson, K., & Choi, A. Y. (2018). Ten frequently asked questions about latent class analysis. *Translational Issues in Psychological Science, 4*(4), 440–461.

O'Brien, D. G., Beach, R., & Scharber, C. (2007). "Struggling" middle schoolers: Engagement and literate competence in a reading-writing intervention class. *Reading Psychology, 28*(1), 51–73.

O'Byrne, W. I., & McVerry, J. G. (2009). Measuring the dispositions of online reading comprehension: A preliminary validation study. In J. Worthy, B. Maloch, J. V. Hoffman, D. L. Schallert, & C. M. Fairbanks (Eds.), *57th yearbook of the national reading conference* (pp. 362–375). Oak Creek, WI: National Reading Conference.

OECD. (2011). *PISA 2009 results: Students on line: Digital technologies and performance (Volume VI).* Retrieved from http://doi.org/10.1787/9789264112995-en.

Organisation for Economic Co-operation and Development (OECD). (2015). Students, computers and learning: Making the connection, PISA. Retrieved from https://www.oecd-ilibrary.org/docserver/9789264239555-en.pdf?expires=1525111196&id=id&accname=ocid53018421&checksum=110DC0A47412EC65D76DA4BE026C4161.

Petscher, Y. (2010). A meta-analysis of the relationship between student attitudes towards reading and achievement in reading. *Journal of Research in Reading, 33,* 335–355.

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 and Adult Literacy, 50*(5), 378–396.

Protacio, S. M., & Jang, B. G. (2016). Teachers' perceptions of English learners' reading motivation. *Literacy Research: Theory, Method, and Practice*, *65,* 166–181.

Putman, S. M. (2014). Exploring dispositions toward online reading: Analyzing the survey of online reading attitudes and behaviors. *Reading Psychology, 35*(1), 1–31.

Putman, S. M., Wang, C., & Ki, S. (2015). Assessing the validity of the cross-cultural survey of online reading attitudes and behaviors with American and South Korean fifth-and sixth-grade students. *Journal of Psychoeducational Assessment, 33*(5), 403–418.

Putro, N. H. P. S., & Lee, J. (2017). Reading interest in a digital age. *Reading Psychology, 38*(8), 778–807.

Rosenzweig, E. Q., & Wigfield, A. (2017). What if reading is easy but unimportant? How students' patterns of affirming and undermining motivation for reading information texts predict different reading outcomes. *Contemporary Educational Psychology, 48,* 133–148.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *The American Psychologist, 55,* 68–78.

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.

Scholes, L. (2019). Differences in attitudes towards reading and other school-related activities among boys and girls. *Journal of Research in Reading, 42*(3–4), 485–503.

Schwarz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics*, *6*(2), 461–464.

Singer, L. M., & Alexander, P. A. (2017). Reading on paper and digitally: What the past decades of empirical research reveal. *Review of Educational Research, 87*(6), 1007–1041.

Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children committee on the prevention of reading difficulties in young children*. Washington, DC: National Research Council.

Stanley, L., Kellermanns, F. W., & Zellweger, T. M. (2017). Latent profile analysis: Understanding family firm profiles. *Family Business Review, 30*(1), 84–102.

Swalander, L., & Taube, K. (2007). Influences of family based prerequisites, reading attitude, and self-regulation on reading ability. *Contemporary Educational Psychology, 32*(2), 206–230.

Toste, J. R., Didion, L., Peng, P., Filderman, M. J., & McClelland, A. M. (2020). A meta-analytic review of the relations between motivation and reading achievement for K-12 students. *Review of Educational Research, 90*(3), 420–456.

Unrau, N., & Schlackman, J. (2006). Motivation and its relationship with reading achievement in an urban middle school. *The Journal of Educational Research, 100*(2), 81–101.

Vansteelandt, I., Mol, S. E., Caelen, D., Landuyt, I., & Mommaerts, M. (2017). Attitude profiles explain differences in pre-service teachers' reading behavior and competence beliefs. *Learning and Individual Differences, 54,* 109–115.

Vermunt, J. K., & Magidson, J. (2002). Latent class cluster analysis. In J. A. Hagenaars & A. L. McCutcheon (Eds.), *Applied latent class analysis* (pp. 89–106). Cambridge: Cambridge University Press.

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology, 25,* 68–81.

Wigfield, A., & Guthrie, J. T. (1997). Relations of children's motivation for reading to the amount and breadth or their reading. *Journal of Educational Psychology, 89*(3), 420–432.

Williams, G. A., & Kibowski, F. (2016). Latent class analysis and latent profile analysis. In L. A. Jason & D. S. Glenwick (Eds.), *Handbook of methodological approaches to community-based research: Qualitative, quantitative, and mixed methods* (pp. 143–152). Oxford: Oxford University Press.

Worthy, J., Moorman, M., & Turner, M. (1999). What Johnny likes to read is hard to find in school. *Reading Research Quarterly, 34*(1), 12–27.

Wu, J. Y., & Peng, Y. C. (2017). The modality effect on reading literacy: Perspectives from students' online reading habits, cognitive and metacognitive strategies, and web navigation skills across regions. *Interactive Learning Environments*, *25*(7), 859–876.