Comparison of PISA and PIAAC Participants' Reading Habits and Strategies in Terms of Reading Achievement

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Abstract

This study aimed to compare reading strategies and habits regarding reading achievement of selected age-group participants from the Programme for International Student Assessment (PISA) 2009 and the International Assessment of Adult Competencies (PIAAC) 2015 within Turkey. A cohort design was utilized because it was assumed that reading literacy from PISA and PIAAC were comparable, as well as that participants from PISA 2009 would be in the age range of participants at the time of PIAAC in 2015. The participant population selected from PISA 2009 for the current study consisted of 4719 Turkish students (2334 girls, 2385 boys) aged 15 years old. Those chosen from PIAAC 2015 consisted of 308 Turkish individuals (141 men, 167 women) aged 20-22 years old. Data analysis was conducted through latent class analysis based on participants' gender, the number of books in the home, and reading achievement. Results revealed that female participants were more successful than male participants in PISA, whereas male participants outperformed female participants in PIAAC.

Keywords: Gender, PISA, PIAAC, Reading habits, Reading proficiency

Introduction

Reading skills and having a high level of reading comprehension is necessary for success in language arts courses and all other content area subjects (Oz, 2011). Through reading, individuals can increase their vocabulary and logical reasoning skills and improve their thinking (Johnsson-Smaragdi & Jönsson, 2006). Thus, educators are focused on motivating students to read more inside and outside of school. Importantly, reading frequency is a strong predictor of reading achievement (Evans, Kelley, & Sikora, 2014; Guthrie, Wigfield, & Metsala, 1999; Jerrim & Moss, 2019), so most educational reforms and studies have been focused on effective reading instruction. Additionally, this has occurred because reading achievement is one of the main indicators of academic success (McGeown, Duncan, Griffiths, & Stothard, 2015; Neugebauer, 2013).

There have been various studies in terms of gender differences that occur in reading achievement and reading habits (Loh, Sun, & Majid, 2020; Mullis, Martin, Kennedy, & Foy, 2007). In some cases, it is shown that girls have a higher level of proficiency in reading than boys (Loh et al., 2020; Mullis, Martin, Gonzalez, & Kennedy, 2003; Mullis et al., 2007; Zasacka & Bulkowski, 2017). Even though the reasons were not argued or reflected clearly, Logan and Johnston (2010) also highlighted that, on average, female students outperformed their male counterparts on reading comprehension tests. In the Programme for International Student Assessment (PISA) 2009, which was first implemented by the Organisation for Economic Cooperation and Development (OECD) in 2000 as an international study to assess 15-year-old students regarding reading, mathematics, and science skills, a majority of male and female students achieved level three proficiency. Yet, female students from OECD countries scored an average of 39 points higher in reading skills than their male counterparts. The PISA 2009 results from Turkey were similar, with a 43-point difference favouring female students' reading skills (EARGED, 2010). In the Programme for the International Assessment of Adult Competencies (PIAAC) 2015, the reading skills of adults between the ages of 16-65 were also measured. However, according to the PIAAC results, there is no significant difference in most countries between the reading skills of men and women. In Turkey, it was revealed in the PISA 2009 results that girls had higher scores than boys, yet in PIAAC 2015, men scored an average of 11 points higher than women (OECD, 2016a).

Previous literature has shown that gender differences occur in students' reading comprehension and reading motivation (Logan & Johnston, 2009; McGeown et al., 2015). In fact, in other studies, it was shown that gender differences in students' reading achievement and skills were lower than differences in their reading habits and

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motivation to read. A study conducted with primary school students yielded similar results revealing that there was no significant difference between girls' and boys' reading skills, but girls had higher levels of motivation for reading, and gender identity was explained as the reason for these differences (McGeown, Goodwin, Henderson, & Wright, 2012). Similarly, according to McGeown et al. (2015), there is no significant difference in girls' and boys' reading skills, but girls do report a higher motivation towards reading. For example, girls engaged in longer hours of reading fiction books. Thus, determining that individuals' motivation to read is important. As seen in Toste, Didion, Peng, Filderman, and McClelland's (2020) meta-analysis of 132 articles, there were significant relationships between K-12 students' reading motivation and reading achievements. When it comes to the amount of reading, it was highlighted in a variety of research that girls read more often than boys (Johnsson-Smaragdi & Jönsson, 2006; Logan & Johnston, 2009; Loh et al., 2020; Mullis et al., 2007; Zasacka & Bulkowski, 2017). Johnsson-Smaragdi and Jönsson (2006) compared teenage students' reading frequency and determined that girls were more frequent readers than boys. For example, comparing the frequency of book reading over one week revealed that girls read one day more per week than boys on average. On the other hand, it was determined that boys spent more time watching TV and videos than reading. Furthermore, in the report by OECD/UNESCO (2003), it was shown that a higher number of boys acknowledged reading as a waste of time. Additionally, in a study by Loh et al. (2020), a total of 4830 Singaporean adolescents' reading ratio and preferences were investigated. They found that female students read almost every day, every other day, or on weekends compared to males. Additionally, the duration of their reading was different. For example, female students stated that they usually read more than an hour at a time, while male students read less than 15 to 30 minutes each time. Furthermore, in Chen's (2007) study, it was revealed that reading was associated with feminine activities in Western societies. However, in the same study, it was also shown that Taiwanese students had the opposite response. For example, in Chinese culture, reading was a man's job; as a result, male students in Taiwan might read and consider themselves better readers than female students because of the established cultural norm.

In Wolters, Denton, York & Francis's (2014) study, adolescent students' opinions of reading were investigated, and it appeared that student age affected the value assigned to reading activities. As discussed in the literature, younger students found reading necessary and important because they believed that reading leads to future academic success (Oz, 2011). Taiwanese elementary school students stated that they spent more time on pleasure reading than university students (Chen, 2007). Similarly, Hopper (2005) investigated more than 700 teenagers between 11 to 15 years olds regarding their reading habits and choices. It was determined that reading frequency decreased when students got older, and girls tended to read more than boys. Also, students preferred to read magazines, newspapers or read from online internet sources outside of school. Furthermore, girls read magazines and nonfiction materials more often than boys. Referring to investigations carried out in Turkey, studies conducted with middle school students showed that students did not spend much time for reading. In their study, Can, Turkyilmaz, and Karadeniz (2010) examined the leisure reading habits of 627 adolescents and stated that the reading frequency of female students was higher than male students and that 8th-grade students read more than 11th and 12th-grade students. However, it can be said that, overall, students' reading frequency was low. Similar results were observed in studies conducted with university students, where almost half of 304 university students (46.1%) declared that the highest number of books they read in a year was five. It was understood that almost half of the students either did not read any books or read at most five books. At the same time, a relationship was found between male and female students in low-level and intermediate reading habits, indicating that boys read less (Odabas, Odabas, & Polat, 2008).

In the literature, differences between boys and girls and among children, teenagers, and adults in terms of selecting materials to read have been revealed (Chen, 2007; Hughes-Hassell & Rodge, 2007; Liu & Huang, 2008; McGeown, 2013). Chen (2007) compared college students' extracurricular reading habits in Taiwan and the United States. Newspapers were the most popular, and magazines were the second most popular reading materials among first-year college students. Also, students' choices from most popular to less popular were bestsellers, comic books, and novels. Nonfiction and poetry books were the least popular books read by these students. It was observed that most middle and high school Turkish students read textbooks, novels, and puzzle magazines. On the other hand, it was seen that stories, comics, children's magazines, and science journals were not preferred for reading (Can et al., 2010). Topping (2015) highlighted that boys preferred reading nonfiction texts while girls liked reading fictional texts. On the other hand, in the study of Loh et al. (2020), it was shown that girls' and boys' preferences for reading fiction versus nonfiction texts were not significantly different. However, their choices in each genre changed between the genders. In terms of fiction, they stated liking stories with humor, adventure, and mysteries, while the girls specifically preferred reading about fairy tales and relationships, the boys preferred reading about mysteries. Both genders stated that they liked books about plants, animals, sports, and hobbies when it came to nonfiction. Also, boys tended to read more books about sports, while girls read more nonfiction books about hobbies and travel.

According to research findings in which reading strategies were examined, there was a significant positive relationship between the frequency of using reading strategies and academic achievement (Demirel, Askin, & Yagci, 2014; Kana, 2014); students with high academic success used more strategies (Kus & Turkyilmaz, 2010; Ozdemir, 2018); and there was a significant and positive relationship between reading frequency and using strategies (Kana, 2014; Kus & Turkyilmaz, 2010). In addition, female students had higher metacognitive awareness of reading strategies than male students (Demirel, Askin, & Yagci, 2014; Kana, 2014; Kus & Turkyilmaz, 2010; Ozdemir, 2018). As age progressed, students' ability to use strategies increased. Research has also shown that improving students' metacognitive awareness improved reading comprehension and understanding. This was important because it naturally increased success.

Liu and Huang (2008) found that Chinese graduate and undergraduate male students preferred reading online materials more often than female students. Additionally, female students stated that they prefer to print out online materials to read, whereas their male friends prefer digitally bookmarking online documents for later reading. On the other hand, in the study of Loh et al. (2020), it was found that adolescent Singaporean girls preferred reading digital texts such as articles, e-books, and newspapers via their smartphones more than adolescent Singaporean boys. In contrast, studies with Turkish students showed that reading on the Internet was less preferred among middle and high school students (Can et al., 2010).

In the study by Wolters et al. (2014), adolescents' reading choices affected their reading skills; for example, reading a continuous text like fiction was more effective than reading short or non-continuous texts. Similar results were shared by other researchers, including Evans et al. (2014), Pfost, Dörfler, & Artelt (2013), and Spear-Swerling, Brucker, & Alfano (2010), who found that reading choices, reading fiction, and the amount of reading affected adolescents' reading comprehension, summarization skills, and text reading speed. The PISA 2009 results also supported that fiction reading was highly correlated with students' reading skills. For example, in PISA 2009, reading comics was not positively correlated, while reading nonfiction, newspapers, and magazines were positively correlated with students' reading literacy (OECD, 2010).

In this context, the related literature revealed that in different countries and at different ages, students' gender appears to be related to differences in their reading habits, reading strategies, and reading achievement. Seeing the trends in students worldwide led researchers to investigate reading proficiency levels, reading habits, and reading strategies of male and female students in Turkey. As a result, in this current study, the aim was to analyze and compare PISA and PIAAC assessments. The PIAAC was included because it can be considered in some respects to be a continuation of PISA. In this context, the research focus of the current study was placed on participants' reading skills, which are a requisite of their remaining academic skills.

Aim

Comparing results from the PISA and PIAAC can provide valuable information regarding the development of academic skills over time because there are similarities in how skills are conceptualized and described in these applications. In this context, the current study aimed to compare reading strategies and reading habits through latent clusters regarding reading achievement, number of books in the home, and gender. The research questions of the study are given below:

For the PISA and PIAAC assessments:
1) What model best fits the data when students are classified into latent classes based on their gender, reading achievement, and the number of books they have at home?
2) What are the properties of latent classes formed according to the most suitable model?
3) Do the reading strategies and reading habits used by students predict the latent classes?

Method

Model of Research, Population, and Sample

This study was a cohort design, which utilized participant data from PISA 2009 to reflect the participant data from PIAAC 2015. The PISA is implemented every three years, and for this current study, the data from PISA 2009 was evaluated because reading skills was the primary study focus of PISA 2009. The second part of the data was obtained from PIAAC 2015 because those who participated in the PISA 2009 when they were 15 years old would make up the 20-22 years-old age group for the PIAAC 2015. Multi-stage sample designs were used for each stage

of the selection process, stratified sampling was also utilized, and participants were chosen from those residing in the country at the time of data collection. The participants selected from PISA 2009 for the current study consisted of 4719 Turkish students (2334 girls, 2385 boys) aged 15 years old, while those chosen from PIAAC 2015 consisted of 308 Turkish individuals (141 men, 167 women) aged 20-22 years old (OECD, 2016b).

Tools for Data Collection

In PISA, reading literacy is defined as "understanding, using, reflecting on, and engaging with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society" (OECD, 2009; p. 23). Similarly, in the PIAAC, literacy is defined as "understanding, evaluating, using, and engaging with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential" (OECD, 2012; p. 20). Even though literacy in PIAAC and reading achievement in PISA have similar features, these two assessments are not the same. Therefore, the researchers in this current study paid special attention to select items and/or measures that addressed similar skills and habits found in both studies (e.g., PISA, PIAAC). In other words, the overlap between the target populations of the age cohorts in the two assessments is not complete (i.e., not all adults included in the PIAAC sample would have been included in the PISA sample as 15-year-olds). Thus, the authors are cautious about making causal inferences from these analyses.

After completing the academic test during the PISA study, students also completed questionnaires at their school that took approximately 30 minutes. The data utilized in this study were obtained from the OECD website (https://www.oecd.org/pisa/data/pisa2009database-downloadabledata.htm). According to OECD (2019), theoretically, there is no certain minimum or maximum score in PISA. However, usually, the normal distribution of means in PISA is approximately 500 points. The scale is divided into competence levels with seven levels of literacy (from below Level 1 – the lowest – to Level 6 – the highest) to help comment on scores.

The data collection for PIAAC 2015 took place between April 2014 to March 2015 (OECD, 2016a). The survey is implemented either in the individual's home or in a location agreed upon between the respondent and interviewer. The time taken by each respondent to complete the questionnaire ranges from 30 to 45 minutes (OECD, 2016a). Data regarding the PIAAC 2015 study were obtained from the OECD's international PIAAC website (https://webfs.oecd.org/piaac/puf-data/). Results from the application are stated on a 500-point scale, and a higher score shows a higher competency level. The scale is divided into competency levels with six levels for literacy (from below Level 1 – the lowest – to Level 5 – the highest) to help comment on scores (OECD, 2016a).

All questions from both the PISA and PIAAC studies were reviewed to determine similar questions found in both questionnaires. Then, seven questions (number of books at home and reading habits/reading strategies questions) were chosen for this study. Since the PISA and PIAAC questionnaire items do not match exactly, the researchers examined the items in each questionnaire and matched similar ones. Reading habits consist of reading e-mails, magazines, newspapers, and/or books (fiction or nonfiction). Reading strategies consist of associating newly acquired knowledge with real-life and prior knowledge and seeking additional information if they do not understand the newly acquired information. Additionally, the reading habit variables were generally labelled as "1 - I don't know what it is", "2 - never or almost never", "3 - several times a month", "4 - several times a week", and "5 - several times a day" for reading an e-mail item, and "1 - never or almost never", "2 - a few times a year", "3 - about once a month", "4 - several times a month", and "5 - several times a week" for reading magazines, newspapers, and fiction or nonfiction items. Furthermore, the reading strategy variables were labelled as "1 - almost never", "2 - rarely", "3 - sometimes", "4 - often", and "5 - almost always". Although the options for the questionnaire items are generally consistent in both studies, while interpreting the findings, they were presented following these original options from the questionnaires in Tables 2 and 3 below. For instance, option "2" in PIAAC has no equivalent option in PISA; thus, it is shown as "-" in Table 3 below for reading strategies items.

Data Analysis

In the first stage of the data analysis, the latent class analysis (LCA) was utilized to determine the number of latent clusters based on participants' gender, the number of books in the home, and reading achievement. There are several reasons for using the LCA in the study. First, instead of classifying the data according to a single variable, through LCA, there was the opportunity to determine differences among individuals more accurately by considering the possible variables together and obtaining homogeneous classes from heterogeneous groups. Second, the LCA allows for analyzing categorical and continuous variables together. Consequently, LCA can be utilized for the combined analysis of dependent variables like reading success, gender, and the number of books at home and aid in revealing the relationship between reading habits and reading strategies and these clusters via

a three-step analysis.

In latent class analysis, it is accepted that all observable variables are the cause of an unobservable latent variable (Vermunt & Magidson, 2004). The best way in selecting a model is to determine which model has the minimum latent classes and the least predictive parameters (Vermunt, 2003). The related literature recommends using the Bayesian Information Criterion (BIC) for model selection (Lukočienė, Varriale, & Vermunt, 2010). Also, classification error and Entropy values were the statistics utilized to decide the appropriate class. It is desirable to have a low classification error. Entropy values ranged from 0 to 1, with higher values indicating clearer distinctions among the latent classes. Thus, BIC, classification error, and entropy values were utilized in this current study to determine the most appropriate model. In the second stage, a three-step (3-step) analysis was used to determine the predictive ability of the chosen variables (reading habits and reading strategies) from the individual levels toward the emerging latent classes. The Latent Gold 5.1 program was utilized for data analysis (Vermunt & Magidson, 2013), and in the analyses, the final student weights were used for PISA and PIAAC.

Results

The Best Latent Class that Explains Students' Gender, Reading Achievement, and Number of Books They Own

The first question asked the best model fit into latent class to explain students' gender, reading achievements, and the number of books they owned. In the first step, LCA was conducted, and the log-likelihood (LL) values, BIC, and the numbers of parameters (Npar) are provided in Table 1 below.

Table 1. Fit measures of analysis results for PISA and PIAAC

	Model	LL	BIC (LL)	Npar	Class. Err.	Entropy R^2
PISA	4-Cluster	-5650802.48	11301914.97	23	0.285	0.4775
	5-Cluster	*-5648841.83*	*11298061.06*	*28*	*0.283*	*0.5081*
	6-Cluster	-5648421.20	11297287.19	33	0.313	0.5266
PIAAC	2-Cluster	-36842543.69	53685284.60	13	0.11	0.6191
	3-Cluster	*-26665098.59*	*53330470.25*	*18*	*0.13*	*0.5657*
	4-Cluster	-226666608.42	53333565.75	23	0.20	0.5836

Note: Italic type represents the most compatible model.

The results of this study are provided by first explaining the findings regarding PISA and, secondly, presenting the PIAAC findings. Latent class analyses were conducted based on participants' reading achievement scores, gender, and the number of books owned at home. Considering PISA's latent class analysis results, the BIC estimate decreased dramatically when the number of clusters increased. In addition, according to classification errors, although the number of parameters increased in 5-Clusters, the classification error was low. Considering the entropy values, the best resolution for PISA literacy should be the 5-Cluster model. In other words, latent variables listed above were best fitted in the 5-Cluster model for PISA.

Concerning PIAAC, the LCA results indicated that the lowest BIC was in the 3-Cluster model. However, there was only one person in the third cluster. The size of the class should also be considered in deciding the number of classes. So, it was decided that the 2-Cluster model was the most suitable according to the BIC results, entropy, and classification errors. Latent class analyses were conducted based on participants' reading achievement scores, gender, and the number of books owned at home. Additionally, these listed latent variables were best fitted in the 2-Cluster model for PIAAC. The class probabilities of the models and the mean for each class of dependent variable according to these models are provided in Table 2 below.

The Characteristics of Determined Latent Clusters

The characteristics of the determined latent clusters were investigated through the second question of this study. The features of clusters for the PISA and PIAAC are provided in Table 2.

Table 2. The class probabilities and mean at each class of dependent variables for 4 and 2-Cluster models

	PISA					PIAAC	
	C-1	C-2	C-3	C-4	C-5	C-1	C-2
Cluster Size	0.21	0.37	0.09	0.29	0.04	0.47	0.53
Mean of reading scores	373.96	454.60	471.19	529.93	599.78	222.58	252.22
0-10 books	0.49	0.29	0.01	0.08	0.01	0.78	0.06
11-25 books	0.32	0.33	0.05	0.20	0.08	0.20	0.28
26-100 books	0.17	0.30	0.24	0.41	0.30	0.02	0.46
101-200 books	0.02	0.06	0.25	0.20	0.26	0.00	0.14
201-500 books	0.00	0.01	0.24	0.09	0.20	0.00	0.04
More than 500 books	0.00	0.00	0.20	0.03	0.13	0.00	0.03
Female	0.21	0.55	0.25	0.63	0.89	0.56	0.39
Male	0.79	0.45	0.75	0.37	0.11	0.44	0.61

Note: C stands for cluster.

As indicated in Table 2, there were two small (Cluster 3 and 5), two medium (Cluster 1 and 4), and one large cluster (Cluster 2) for PISA. The literacy scores of individuals increased from Cluster 1 (below the first level) to Cluster 5 (fourth competence level). It was recognized that most of the participants in Cluster 2, 4, and 5 were female. In contrast, male participants dominated clusters 1 and 3. 21% of the participants were placed in Cluster 1 with the lowest average reading scores (373.69), which placed them at 1a proficiency level. In the least achieving group, 79% of the participants were male, and 21% were female. Almost half of these students (49%) had less than 10 books, while 32% had 11 to 25 books. Only 2% of the participants had 101 to 200 books in this cluster, and no participant had more than 200 books. 37% of the participants were placed in Cluster 2 with average reading achievement scores of 454.60. These students were placed at the second proficiency level. 45% of the participants in this group were male, and the remaining 55% were female. 30% of these students had 26 to 100 books at home, and 33% had 11 to 25 books. Again, only 2% of the participants had 101 to 200 books in this cluster, and none had more than 200 books. Next, 9% of the participants were placed in Cluster 3 with average reading achievement scores of 471.19. These students were also determined to be at the second proficiency level. However, in Cluster 3, males made up 75% of participants, while 25% were female. Surprisingly, this cluster had the highest percentage of students who owned the highest number of books. For example, 44% of the students in Cluster 3 had more than 200 books at home. 29% of participants were placed in Cluster 4 with average reading achievement scores of 529.93. These students were determined to be at the third proficiency level. Most of the participants in this cluster were female (63%), and the remaining 37% were male. More than half of the students (69%) had 100 books or less at home, 9% had 201 to 500, and 3% had more than 500 books. 4% of the participants were placed in Cluster 5 with average reading achievement scores of 599.78. These students were determined to be at the fourth proficiency level. Again, most of the participants in this group were female at 89%, and the remaining 11% were male. Additionally, in Cluster 5, 26% of the participants had 101 to 200 books, and 33% had more than 200 books at home.

Also indicated in Table 2 above, there were two large clusters for PIAAC literacy. In the largest cluster, 53% of the individuals were assigned to Cluster 2 that consisted of individuals at the medium level of proficiency in literacy for PIAAC. In addition, it was also recognized that there were higher numbers of female participants in Cluster 1 and a higher number of male participants in Cluster 2. Cluster 1 consisted of 47% of the participants, and their average reading score was 222.58. This score corresponds to the first proficiency level, and this cluster was comprised of 44% male participants and 56% female. For this cluster, 78% of the participants had 10 books or less, while 20% reported having 11 to 25 books at home; none had more than 101 books. In Cluster 2, 53% of the participants were included, and the average reading score for this group was 252.22. Participants in this cluster were at the second level of proficiency, and the group was comprised of 61% male participants and 39% female. For the number of books at home, 60% of participants reported having between 26 and 200 books, while 7% had 201 or more books. In summary, PIAAC yields a clearer pattern of the association between book ownership and reading achievement than our LCA of PISA does.

The Relationships among Students' Reading Strategies, Reading Habits, and Latent Clusters

The third research question in this current study was focused on investigating whether students reading strategies and reading habits predicted their latent clusters. After determining the clusters obtained from the models of PISA (5-Clusters) and PIAAC (2-Clusters), a three-step analysis of the data was conducted. Table 3 below provides the probabilities and parameters from the three-step model for all the reading strategy and reading habit variables

regarding literacy.

Table 3. The probabilities and parameters of the three-step model for all reading strategy and reading habit variables

		PISA-3step						PIAAC-3step		
		C-1	C-2	C-3	C-4	C-5	R²	C-1	C-2	R²
Size		0.21	0.37	0.09	0.29	0.04		0.47		0.53
Reading e-mail	1	0.12	0.09	0.01	0.04	0.03	0.08	0.51	0.11	0.32
	2	0.30	0.26	0.07	0.17	0.14		0.27	0.14	
	3	0.22	0.21	0.13	0.19	0.18		0.10	0.14	
	4	0.24	0.27	0.33	0.32	0.33		0.09	0.30	
	5	0.13	0.17	0.46	0.28	0.32		0.03	0.31	
Reading magazines or newspapers	1	0.01	0.01	0.02	0.01	0.00	0.01	0.32	0.09	0.16
	2	0.01	0.02	0.02	0.02	0.01		0.28	0.14	
	3	0.05	0.08	0.09	0.07	0.04		0.10	0.09	
	4	0.16	0.18	0.19	0.18	0.15		0.16	0.25	
	5	0.77	0.71	0.68	0.72	0.80		0.15	0.42	
Reading books (fiction or non-fiction)	1	0.04	0.04	0.03	0.03	0.03	0.00	0.51	0.32	0.06
	2	0.11	0.11	0.10	0.09	0.09		0.31	0.30	
	3	0.24	0.24	0.23	0.22	0.22		0.08	0.11	
	4	0.36	0.36	0.36	0.37	0.36		0.05	0.12	
	5	0.26	0.26	0.28	0.30	0.29		0.04	0.15	
Associating with real life	1	0.10	0.07	0.08	0.07	0.07	0.00	0.03	0.01	0.11
	2*	-	-	-	-	-		0.31	0.11	
	3	0.41	0.37	0.39	0.37	0.36		0.35	0.28	
	4	0.35	0.38	0.37	0.38	0.38		0.28	0.47	
	5	0.14	0.19	0.17	0.18	0.19		0.03	0.12	
Associating prior knowledge	1	0.11	0.05	0.07	0.03	0.02	0.07	0.02	0	0.08
	2*	-	-	-	-	-		0.20	0.07	
	3	0.42	0.29	0.35	0.21	0.21		0.31	0.20	
	4	0.35	0.42	0.40	0.42	0.42		0.38	0.49	
	5	0.12	0.24	0.18	0.34	0.34		0.10	0.24	
Seek additional information	1	0.09	0.04	0.08	0.03	0.02	0.04	0.04	0.01	0.10
	2*	-	-	-	-	-		0.22	0.07	
	3	0.38	0.28	0.37	0.24	0.18		0.24	0.16	
	4	0.35	0.39	0.36	0.39	0.38		0.42	0.57	
	5	0.17	0.29	0.19	0.34	0.42		0.07	0.19	

Note: C stands for cluster. *The option "2" in PIAAC has no equivalent in PISA, so it is shown as "-" in the Table.

As shown in Table 3 above, all of the chosen variables predicted latent class membership significantly except the "reading fiction or nonfiction books" item for PISA literacy clusters due to the 3-step analysis. Moreover, the R2 results, calculated for each variable, show that individuals' reading habit items (reading e-mails, letters) had the greatest effect on their latent clusters classification for PISA and PIAAC. Concerning "reading e-mails", those who stated: "I don't know what it is" was at 12% probability and the 1a proficiency level. Those at 63% probability were at the second proficiency. And those who replied: "I check them once or twice a day" were at 28% probability and third proficiency level. When we come to "reading magazines or newspapers", those who said "never or almost never" with a probability of 1% belonged to the 1a proficiency level, and those who stated "I read them several times during the week" belonged at the second proficiency level with a probability of 71% and 68%. In all clusters, the percentage of reading newspapers or magazines once or twice a week was over 68%. However, the highest proportion was seen in Cluster 5 at 80%. In addition, "reading fiction and nonfiction books" did not significantly affect the reading success of different individuals.

The participants who responded "almost never" to the statement, "While I am studying, I understand how the information corresponds to real-life events", belonged at the 1a proficiency level with 10% probability. Whereas those who stated "almost always" belonged in the second proficiency level with 36% probability. Furthermore, those who responded as "almost never", "I try to engage the new information with the previously acquired knowledge", belonged at the 1a level with 11% probability. Those who said "almost always" belonged in the second level of proficiency with 42% probability. Those at the third level of proficiency had 34% probability, and

the fourth level of proficiency had 34% probability. Finally, the respondents at the third proficiency level were at 34%, and the fourth proficiency level was at 42% probability.

When all items were evaluated together for PISA, the proportion of students at the level of 1a who said: "never or almost never", "several times a year", or "sometimes" was higher. The rate generally declined concerning the students who stated, "once or twice a day", "several times a week", and "almost always", except for the item reading magazines or newspapers. The opposite applied to students who were at the third level of proficiency. For example, as the level moved from "never or almost never" to "almost always or always", the percentage of individuals at that level also increased.

It can be seen in Table 3 for PIAAC that the conditional probability for Cluster 2 (medium achievement) individuals who responded to the first cell in Table 3 was 0.51, which indicated 51% of the participants from Cluster 1 (very low achievement rates) who replied, "not at all" to "reading letters, information notices, or e-mails". Those who responded "never" to this question mainly belonged in the first proficiency level with a 51% probability. In comparison, those who responded with "every day" belonged at the second proficiency level with a 31% probability rate. In addition, those who replied "never" to "reading news bulletins, newspapers, or magazines" belonged at the first level with a probability of 32%, while those who responded with "every day" belonged at the second level with a 42% probability. Next, those who said "never" to "reading fiction or nonfiction novels" belonged to the first level with a 51% probability, and those who stated "every day" belonged to the second level of proficiency with a 15% probability.

The respondents who replied to the statement "When I read about a new idea or new information, I try to relate it to reality" with "never" belonged at the first proficiency level with a 3% probability, while those who said "I often do that" were in the second proficiency level with a probability of 47%. While those who said "never" to the statement, "If I don't understand something, I look for more accessible information to understand it better", belonged in the first proficiency level at 4% probability. Those who stated "I often do it" belonged in the second level with a 57% probability.

When all of the items were evaluated together for PIAAC, the proportion of participants who were at the first proficiency level with responses of "never" or "not at all" was above 50%, and this proportion generally decreased toward participants who stated "always" or "mainly". The opposite applied to participants at the secondary qualification level, where the percentage of individuals at the level of "never" or "sometimes" increased to "often" or "almost always".

Discussion and Conclusions

When the PISA and PIAAC findings were compared, in the PISA 2009 findings, 15-year-old students were divided into five groups. In comparison, in PIAAC 2015, the individuals aged between 20 and 22 were divided into two groups. This disparity in the number of groups was believed to result from fewer people in the PIAAC age group. These participants were not the same individuals, but due to the separation in age groups and the dates of the studies, PISA in 2009 and PIAAC in 2015, it was assumed that the participants' reading literacy was comparable. When students' proficiency levels and their genders were compared among clusters, it was seen that female students were more successful than male students for PISA. As posited by Mullis et al. (2007) and Loh et al. (2020), girls tend to read more often than boys. Although the number of books students owned in the 4th and 5th clusters was higher than the first clusters, the proportion was still low. It has been determined that the number of books owned by children is an effective factor in increasing their reading habits and attitudes towards reading (Durualp, Cicekoglu, & Durualp, 2013). According to the classification results of PISA data, it was observed that the number of books in the homes of low-reading groups was low, and as the number of books in the home increased, reading success also increased. Evans et al. (2014) found that books in the home positively impacted individuals' test scores in both poor and rich countries.

Students in these clusters at the third and fourth proficiency level generally read e-mails several times a week or each day and read magazines a couple of times a week. In a study with similar findings to the current study, Scales and Rhee (2001) compared the reading habits of 115 Caucasian and Asian-American adults. They determined that most participants read magazines often or very often. On the other hand, students in the least successful groups generally related information in the text to real-life situations and sometimes related new information to previous knowledge and tended to seek out additional information to make subjects clearer and more understandable. The importance of strategy teaching was emphasized in increasing students' reading comprehension skills.

When the classification results of PIAAC data were evaluated, almost all participants at the first proficiency level had very few books in their homes. Most of these participants did not read articles, information notes, e-mails, newspapers, magazines, newsletters, and/or fiction/nonfiction books, and if they did, read them only once a month. The participants in the second group were at the second proficiency level, and the proportion of male participants was higher than the percentage of female participants. An evaluation of the study's findings revealed that female participants were more successful than male participants in PISA 2009, whereas male participants outperformed the female participants in PIAAC 2015. Differences in participants' reading success in PISA and PIAAC may be due to structural differences (Solheim & Lundetræ, 2018). In the research by Solheim and Lundetræ (2018), which took place in four Nordic countries, it was stated that PIAAC is a more male-friendly survey while PISA has a more female-friendly design. By comparing PISA and PIAAC in four Nordic countries (Danish, Finnish, Norwegian and Swedish) found that individuals at the first proficiency level had very few books in their homes. This result highlighted the importance that literature had in the development and maintenance of reading skills. As a result, one can argue that an important reason for students being in a low achieving group is that they do not spend enough time reading inside or outside of school. Reading is important because frequent reading and being a successful reader ultimately increases individuals' reading achievement (Evans et al., 2014; Jerrim & Moss, 2019).

According to the results of the PISA 2009 study's questionnaire, students spent quite a lot of time reading online. It was seen in other related literature (Alvermann, 2001; Spence, 2009) that students liked to engage with technology and tended to spend a lot of their time in front of a screen or a computer. These students' online reading was primarily focused on reading e-mails, chatting online with friends, reading news, searching nonfiction resources, and participating in online discussion forums (OECD, 2010). Similarly, Jackson et al. (2006) argued that online reading activities positively affected students' reading achievement.

Reading e-mails was the most effective variable to explain the reading success of both the Turkish 15-year-old PISA and 20-22 years-old PIAAC age groups in our LCA analyses. In both studies, individuals at the first proficiency level did not or rarely read e-mails. It is thought that the socio-economic level of individuals in this situation may be low. For example, students with internet access in 2009 and who use e-mail can be considered at a high socio-economic level (SEL). The finding that SEL plays an important role in student success was also found in several other studies (Finch & Marchant, 2013; Wolfram, 2005; Yalcin, 2017).

In our study, the second variable that explained the reading achievement of students in the 15-year-old age group at the highest proficiency level was the skill of relating new learning with previous knowledge. In contrast, the reading achievement of students aged 20-22 at the highest proficiency level was explained by their second variable of reading newspapers, magazines, and the news. Spear-Swerling et al. (2010) showed that in comparison to reading other materials, reading fiction was more associated with reading skills such as increasing vocabulary and reading comprehension. Similarly, in the study of Jerrim and Moss (2019) and Pfost et al. (2013), it was found that reading fiction books positively affected the development of reading achievement. Also, another study argued that reading narrative texts was associated with higher-level reading comprehension, whereas reading newspapers, magazines, comics, and nonfiction books was not significantly related to reading achievement and vocabulary development (Maximilian, Tobias, & Cordula, 2013). According to the OECD (2010) report for PISA 2009, reading nonfiction, magazines, and newspapers was less positively related to reading literacy. In this current study, similar findings were obtained regarding PISA 2009; however, reading newspapers, magazines, and the news was highly related to students' reading achievement for PIAAC 2015.

Based on the findings of the study, some recommendations can be given to both researchers and practitioners. While investigating 16-year-olds or older adults' reading skills, Sabatini (2012) stated four domains: visual word recognition, reading fluency, reading comprehension, and metacognitive processes. According to the author, an educator should pay attention to all these domains to understand what underlying cognitive features a skilled reader has. Thus, reading education should implement activities and strategies to increase student's vocabulary and comprehension skills, including reviewing images, underlining important lines, identifying unrecognized parts, separating the text into small units to understand better, finding the main idea of the text, finding the supporting details, inferencing, establishing links between the pre-information and the information they read, using analogies, doing classification, sorting, association, inquiring, summarizing the text, arranging the information with a concept map, etc. Additionally, educators should be aware that teenagers and young adults nowadays are highly engaged in technology and do most of their reading activities online, especially for networking, searching, mailing, and reading for resources (Clark, 2011; Pitcher et al., 2007). Findings on the related literature (Alvermann, 2001; Spence, 2009) showed that students tended to spend more time in front of screens and computers and liked engaging with technology. Thus, educators should find ways to incorporate technology into their educational curriculum in which students can find reasons and motivation to read more.

Since the curriculum is heavy in Turkey, students spend most of their time after school completing their homework. For this reason, their newspaper, magazines, and fiction reading habits for pleasure can be undeveloped. However, further research can interview these age group students to better understand underlying reasons for their not being able to or not preferring to do pleasure reading.

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