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The effect of digital literacy levels and e-learning attitudes on screen reading self-efficacy: A structural equation modelling

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Highlights

- The hypothesis model established based on the relevant literature was tested and it was seen that the digital literacy levels of the primary school teacher candidates significantly predicted their screen reading self-efficacy perceptions and that there were positive relations between the variables.
- Likewise, it was determined that e-learning attitudes significantly predicted screen reading self-efficacy perceptions, the relationship between the variables was significant and that the direction was positive.
- In addition, it was also found out that digital literacy levels and e-learning attitudes together significantly predicted screen reading self-efficacy perceptions and that there was a positive and significant relationship between the variables.

Article Info: Research Article

Keywords: *Digital literacy, e-learning, screen reading, self-efficacy*

Abstract

In this study, it was aimed to determine the relationships between digital literacy levels, e-learning attitudes and screen reading self-efficacy of primary school teacher candidates through structural equation modeling, and to examine to what extent digital literacy levels and e-learning attitudes predict screen reading self-efficacy perceptions. The study group, which was formed by simple random sampling in the research carried out with the relational screening model, consists of 677 primary school teacher candidates. "Digital Literacy Scale", "Attitude Scale Towards E-learning" and "Screen Reading Self-Efficacy Perception Scale" were used to collect data. The data were analyzed by structural equation modeling and LISREL and MPLUS package programs were used in the analysis of the data. As a result of the research, it has been determined that hypothesis models were valid and that the digital literacy levels and e-learning attitudes of the primary school teacher candidates significantly predict their screen reading self-efficacy perceptions both separately and together, and there are positive relations between the variables. In addition, while e-learning attitudes play a mediating role in the effects of digital literacy on screen reading self-efficacy perceptions of primary school teacher candidates, it is a result that digital literacy levels significantly predict screen reading self-efficacy perceptions and the relationship is positive if e-learning attitudes are considered as mediating variable.

1. Introduction

The 21st century, also known as the digital and technological age, has introduced numerous new terms to nearly every aspect of daily life. In the past, literacy just meant the ability to read, write, speak and listen effectively, but now with the constant progresses in technology, it is possible to talk about many different types of literacy, such as media literacy, health literacy, numerical literacy, financial literacy, digital literacy, visual literacy, data literacy, and so on. One of the new literacies, digital literacy is the ability to use information and communication technologies and the Internet to reach information, evaluate it and assemble knowledge in multiple forms. For such a purpose, a digitally literate individual should some

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personal competencies, knowledge, techniques and attitudes, and having the ability to plan, execute and evaluate digital actions in various life tasks. When it comes to education, the reports of international institutions or organizations and especially the Covid-19 pandemic have underlined the fact that students should have basic digital literacy skills and teachers should develop their digital literacy.

It is possible to say that e-learning and screen reading are very closely related to digital literacy. Ferro, Helbig and Gil-Garcia (2011) point out that if individual have low digital literacy, they are less likely to be effective in e-learning. On the other hand, as Mohammadyari and Singh (2015) state if individuals have high level of digital literacy skills, they will be able to benefit from e-learning and know better how to reach information, then to evaluate that information whether it will respond to their needs and priorities. They will also be skillful digital or screen readers as they will be using their smart phones, tablets or computers to access any information they need. In the context of education, teachers with have high level of digital literacy will take advantage of e-learning without the limitations of time and space, by making use of learning materials suitable for open and flexible learning environments, together with various digital technology features and resources.

The aim of this research is to determine the relationships between the digital literacy levels, e-learning attitudes and screen reading self-efficacy of primary school teacher candidates and to reveal to what extent digital literacy levels and e-learning attitudes predict their screen reading self-efficacy perceptions with structural equation modeling. Depending on this aim, the next part provides a background to the research.

2. Theoretical Background

2.1. Digital Literacy

All the progresses in every field of life in the 21st century have changed or revised the meaning and content of many terms and have also brought new ones into use. As we all know, while the traditional meaning of the term “literacy” is the ability to read and write, now we can make a big list of various literacies in various fields. As the 1990s witnessed the use of hypertexts and multimedia formats, a new literacy appeared to mean the ability to comprehend any information, to decipher images, sounds in those hypertexts and multimedia products (Bawden, 2001). While Richard Lanham uses the term “multimedia literacy”, it was Paul Glister, who first used the term “digital literacy”. According to Gilster (1997), digital literacy is not just an ability to read something but it is to read with a meaning, to comprehend and to be able to use what we get from various digital sources presented us through computers and the Internet. Gilster (1997), mentions that digital literacy does not involve "keystrokes”, but it is the ability to assemble knowledge, search the Internet, hypertext and find resources, evaluate the information in multiple formats. He also states that we should learn and teach people to use the Internet and to be critical.

Since the 1990s, digital literacy has been described by various authors and institutions. For instance, Educational Testing Service [ETS] held an international panel on Information and Communication Technologies [ICT] and published a report titled *Digital Transformation: A Framework for ICT Literacy*. In the report (ETS, 2001), ICT literacy is defined as “using digital technology, communication tools, and/or networks to access, manage, integrate, evaluate and create information in order to function in a knowledge society”. Like ETS, the European Commission [EC] (2003) regards digital literacy as an ability to use ICT and the Internet for creativity, innovation and entrepreneurship. The Commission is also of the opinion that we must have digital literacy skills in order to be the citizens of the 21st century.

Besides the definitions by ETS and EC, Martin (2006a, 2006b) states that individuals can be digital literate on the condition that they have an attitude, awareness and ability to use digital tools for identifying, accessing, managing, evaluating, integrating and synthesizing digital resources and they make use of those digital tools and resources to build up new knowledge, create new media tools to communicate with others. In a report for the DigEuLit Project which aims to develop a European Framework for Digital Literacy, Martin (2006b) also points out that the concept “digital literacy” includes several key elements:

1. Digital literacy is a part of everyday life and we should be able to carry out digital actions in various life situations;

2. Digital literacy varies according to each individual's life situation, and it is also a lifelong process that develops as our life situation evolves;

3. Digital literacy includes elements of other related "literacies" like information literacy, media literacy and visual literacy, which makes it different from ICT;

4. Digital literacy requires having some personal competencies, knowledge, techniques and attitudes, and having the ability to plan, execute and evaluate digital actions in various life tasks.

Besides the key elements of digital literacy, Rodriguez and Igartau (2016) states that digital literacy includes the use of five skills. The first one of them is technological and instrumental skill; that is to say, the ability to use digital technologies effectively. The second is communication skill; the ability to communicate using digital technologies. The third one is accessing the information in digital environments and evaluating the information. The fourth skill is the ability to do critical analysis of the obtained information and the final one is security skill to use interactive communication skill without any risks. Likewise, in a report published in the UK, digital literacy is defined as "the power to use digital tools to solve problems, produce innovative projects, improve communication and prepare for the challenges of the digital world" (The Consultancy, 2021).

Being a part of everyday life, digital literacy has also taken its place in education. Recent processes in technology and various events like Covid-19 have revealed the importance of digital literacy and showed that the partners (teachers, students and parents) of the education should be digitally literate. The importance of digital literacy is also stated in reports and publications by European Union [EU] and Organisation for EconomicCo-operation and Development [OECD]. For instance, in a report by OECD, it is pointed out that the Covid-19 pandemic has made digital technologies the lifeline for education and that due to the school closures during the pandemic, students' learning has taken place mostly through computer and online connection, which has highlighted the need for students' basic digital literacy and developing teachers' digital literacy (OECD, 2021). Similarly, in the reports (EC, 2002a; 2002b; 2003 & 2004) by the European Commission the importance and development of digital literacy is underlined and it is also stated in these reports that students should be digitally literate when they have left school and teachers should be qualified to adapt new digital technologies into their teaching and learning environment and a pan-European digital literacy curriculum should be organized. Besides, in the Digital Education Action Plan (2021-2027) by the European Commission (2020), Action 7 outlines "common guidelines for teachers and educators to foster digital literacy".

When the studies on digital literacy and primary education teachers and/or teacher candidates are examined, the study by Özerbaş and Kuralbayeva (2018) compared the digital literacy levels of primary and secondary education teacher candidates and reached the conclusion that teachers candidates of mathematics and primary education have higher digital literacy level than the ones in other branches and that this result may be due to the fact that most of classes in math and primary education departments are conducted in a computer-based environment. The study by İşçioğlu and Kocakuşak (2012) mentions that teacher candidates have a high level of literacy, but their perceptions of using technology in the field of primary education and also the perceptions they have about using technology are not high. The participants in this study stated that the academic staff do not use technology adequately in their classes. Another study by Aksüt, Keyvanoğlu and Balıkçı (2013) examined the opinions of primary education teacher candidates on information technology and concluded that though certain percent of teacher candidates use computer and the Internet for their studies and for educational purposes, they need more classes on computer and information technology education. Usta and Korkmaz (2010) in their studies found that as the computer proficiency level of teacher candidates increases, their belief in the positive impact of technology used in

education and their positive perception of technology's impact on learning at the university level increase, too. Finally, the study by Korkmaz (2020) aimed to determine the digital literacy proficiency perceptions of 733 primary school teachers in 60 primary schools and compare the perceptions according to some variables such as age, gender, job experience, having a personal computer or not, having a permanent Internet connection, etc. The study concluded that digital literacy levels of the teachers go up as the age decreases, male teachers have higher digital literacy level, those who have post graduate education have higher levels and that those who have personal computer and access to the Internet also have higher digital literacy level. The study also underlines the fact that having an in-service training on digital literacy plays an important role to develop the digital literacy skills of the teachers.

2.2. E-Learning

Though the term "e-learning" was used by Elliot Masie for the first time at the TechLearn Conference in 1999, the history of e-learning dates back to 1960s, which witnessed a classroom equipped with computers (called the PLATO – Programmed Logic For Automatic Teaching Operations-) for students to be able to listen to recorded lectures at University of Illinois in 1960 and the use of computers by some lecturers at Stanford University to teach mathematics and reading in primary schools (Argawal & Padney, 2013; Gutierrez, 2014). This computer-based learning and teaching could be said to be a ground to e-learning. The computer-based learning model at University of Illinois and Stanford University was used by many libraries and in 1983, Electronic University Network offered the first online courses for students by using Dos and Commodore 64 computers (Özer, 2021). In 1989, World Wide Web (www) was invented with a purpose to share information between academic institutions and it began to spread all over the world. 1990s hosted some very important progresses like Computer Assisted Learning Center and CAL Campus and Open University (in the UK), which provided online courses. The fast spread of Internet began to give a form to e-learning at the beginning of 2000s. Not only education institutions but also corporations, business and military institutions used the Internet to access information, communicate and train their stuff. Web 2.0 tools in 2004, YouTube in 2005 and the mobile web in 2008 took their place in our lives and they have been used for educational goals along with many other ones (Bezhovski & Poorani, 2016).

The term e-learning sounds like a kind of electronic learning, but it has been defined in various ways. It is considered either as a continuation of distance education or considered synonymous of web-based learning. For instance, e-learning is defined as an innovative approach that offers well-designed, student-centered, interactive and facilitating learning environments, without the limitations of time and space, by making use of learning materials suitable for open and flexible learning environments, together with various digital technology features and resources (Khan, 2005; Şentürk, 2016; Şentürk & Ciğerci, 2018). Anohina (2005) states that electronic media makes e-learning possible and both online learning and computer-based learning are subsets of e-learning. Carried out in two forms as synchronous and asynchronous and having elements such as technological infrastructure, e-learning platform, content and participants, e-learning has some certain advantages and disadvantages (Agarwal & Pandey, 2013; Bezhovski & Poorani, 2016). Firstly, e-learning is low cost and is flexible (can be carried out anywhere and anytime), etc. On the other hand, higher-up front cost and lack of trainee interaction can be considered as disadvantages, some of which can be compensated with blended or hybrid learning.

In the literature, it is possible to see such studies as e-learning attitudes and readiness of teachers and/or teacher candidates. The study by Demir (2015) aimed to determine e-learning readiness levels of students at faculty of education and academic staff in the faculty. The study found out that university students have the necessary physical infrastructure to be ready for e-learning, the students mostly connect to the internet from their homes, and that they primarily use laptops for this purpose. Furthermore, it was also concluded that while university students have a high level of internet self-efficacy, their motivation towards e-learning is low. Besides this study, there are some other studies concluding that the readiness levels of teacher

candidates may vary according to the department but do not differ according to gender (Bilici & Bağcı, 2020; Kabataş, 2019). Some studies, on the other hand, underline the factor of having a personal computer and access to the Internet. The studies by Kabataş (2019) and Demir (2013) point out that having a personal computer is an important factor for having a higher level of e-learning readiness.

2.3. Screen Reading

Because of their portability and ease of use, tablets, computers and smartphones have become popular for screen reading. Hence, as a new kind of reading, screen reading can be defined as reading any text on smartphone, tablet and computer screens and even on television (Güneş, 2010). Today, many people start and spend their day by reading their e-mails, posts, incoming messages on social media, reading electronic newspapers or magazines. According to a survey held in six countries, it was found out that the participants devote almost same time to reading on printed and digital materials (Gartner Inc, 2011). Screen reading, also expressed as e-reading, digital reading, online reading, multi-reading in the literature, has its own features (Güneş, 2010). Firstly, the layout of the pages and the eye movements of the readers differ from those on printed materials and texts are non-linear. As the pages move from top to bottom on the screen, the reader's eye move in a horizontal direction from left to right. Besides, the pages on digital screens come one after the other constantly; therefore, as reader moves the page, some parts of the page can be seen. Seeing the text in parts on the screen makes it difficult to follow the title and subtitles of a text, to combine the information in the text and get meaning out of it. Another important feature is that besides texts on digital tools, a rich source of information can be presented with hypertexts and audio-visual elements like pictures, sounds. Finally, the reader in digital or screen reading can decide to reach the information in any order as he wishes.

In the literature, it is possible to find studies comparing reading printed material and screen reading. While some studies found out that reading comprehension level showed no difference (Akdemir; 2020; Farinosi, Lim & Roll, 2016; Porion, Aparicio, Megalakaki &Robert, 2016), others found out that those who made screen reading had worse performance on reading comprehension (Hsieh & Dwyer, 2009; Jeong, 2012; Rasmusson & Åberg-Bengtsson, 2015). However, there are some studies stating that screen reading can be influential for developing reading skills (Jastek & Mangelson, 2008; Koçak, 2010, Sidabutar, et al., 2022).

3. The Aim and Significance of the Study

With technological advancements, information has found its place not only in printed materials and written or visual texts but also in electronic devices. It is believed that individuals seeking access to information prefer information in electronic environments due to ease of access and many other reasons. As a result, the concept of literacy has diversified and gained new dimensions (Maden & Maden, 2016). Based on this diversity and dimensions, information is conveyed to individuals through information screens in electronic environments. Therefore, it becomes important to investigate the relationship between an individual's screen reading self-efficacy and the variables that affect it.

Knowing the relationship between the digital literacy levels, e-learning attitudes, and screen reading self-efficacy of prospective classroom teachers, who will educate our children and ensure our future, is important for both organizing their pre-service training within the education system and transferring these skills to the children they will educate. This is because screen reading has become significant due to the integration of Generation Z and Alpha generation individuals, whom prospective classroom teachers will address in their teaching careers, with technological tools and their engagement in reading from screens. This study is important in determining the relationships between the digital literacy levels, e-learning attitudes, and screen reading self-efficacy of prospective classroom teachers, as well as revealing the extent to which digital literacy levels and e-learning attitudes predict their perceptions of screen reading self-efficacy through structural equation modeling.

A review of relevant literature reveals that there are studies conducted on digital literacy related to digital reading tendencies, internet usage levels, digital literacy levels, teachers' perspectives on digital literacy concepts, examination of digital literacy levels based on various variables, and research on digital literacy in Turkish language classes (Bulut & Karasakaloğlu, 2019; Direkçi, Akbulut & Şimşek, 2019; Duran & Özen; 2018; Kuru, 2019; Maden, S., Maden & Banaz, 2018; Onursoy, 2018; Özbay & Özdemir, 2014; Polat, 2018; Sarı, Türker & Coşan, 2019; Sarıkaya, 2019; Yamaç, 2019).

As for screen reading, there are also studies have been conducted on the perspectives of teacher candidates regarding screen reading, types of screen reading, attitudes of middle school and high school students towards screen reading, the importance, characteristics, and effects of screen reading on our minds, screen thinking, screen reading in students, developing screen reading skills, and examining the self-efficacy perceptions of teacher candidates regarding screen reading (Elkatmış, 2018; Güneş, 2010; Maden, 2012; Soyuçok & Akar, 2018; Ulu & Zelzele, 2018; Ulusoy ve Dedeoğlu, 2015; Ulusoy, 2016; Yılmaz, 2014).

Finally, as to e-learning, there are studies conducted on examining teachers' e-learning attitudes from various variables and researching the attitudes of middle school students towards e-learning (Kılcan & Gülbudak, 2019; Şentürk, 2016; Tarım & Uyandıran, 2021). No research has been found in the relevant literature that determines the relationships between digital literacy levels, e-learning attitudes, and screen reading self-efficacy and establishes a model to illustrate these relationships. This study is considered important both in terms of scientifically revealing the relationships between these variables and filling the gap in the relevant literature.

Based on the relevant literature, the concepts of digital literacy, e-learning attitude and screen reading self-efficacy were explained and the conceptual link between these variables was tried to be explained. As a result of the literature review, the effect of digital literacy on the attitude towards e-learning, as well as the perception of screen reading self-efficacy and its sub-dimensions, and the effect of digital literacy on the perception of screen reading self-efficacy, while the attitude towards e-learning is the mediator variable. models are presented in Figure 1 and Figure 2.

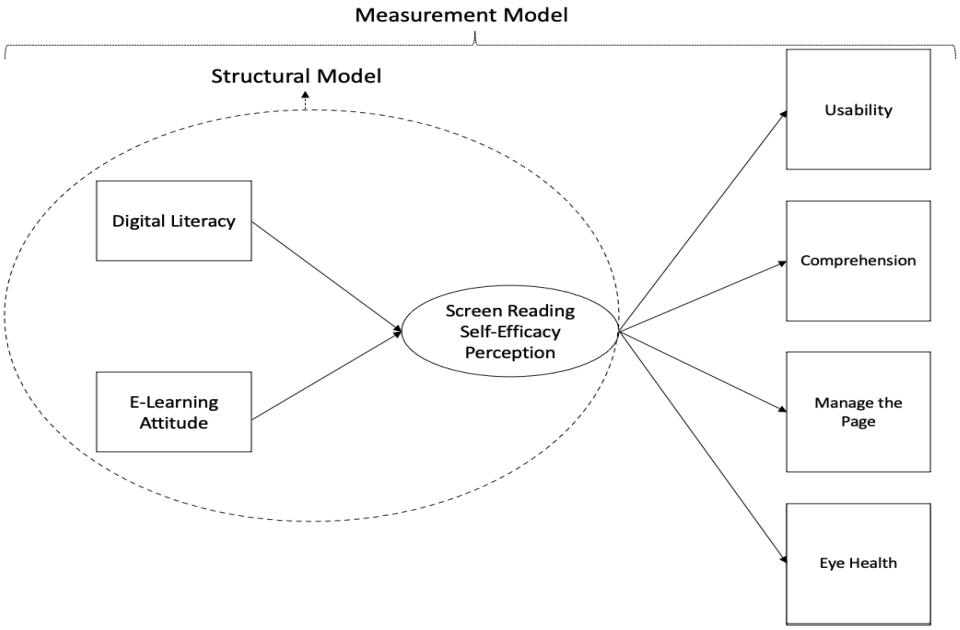

Figure 1. Model of the effect of digital literacy on attitudes towards e-learning and screen reading self-efficacy perception and its sub-dimensions

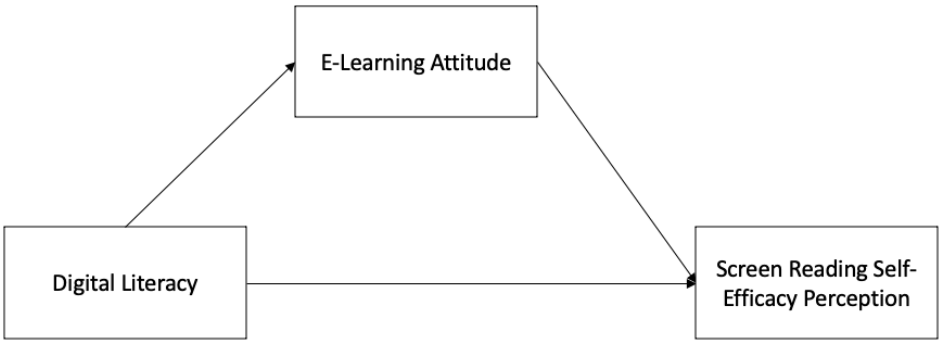

Figure 2. Model of the effect of digital literacy on perception of screen reading self-efficacy when attitude towards e-learning is the mediator variable

Within the framework of the research models above, the aim of this research is to determine the relationships between the digital literacy levels, e-learning attitudes and screen reading self-efficacy of primary school teacher candidates and to reveal to what extent digital literacy levels and e-learning attitudes predict their screen reading self-efficacy perceptions with structural equation modeling. The hypotheses proposed to be tested within the framework of this purpose are presented below.

H_1: The digital literacy levels of primary school teacher candidates affect their screen reading self-efficacy perceptions and sub-dimensions positively and significantly.

H_2: Attitudes of primary school teacher candidates towards e-learning affect their screen reading self-efficacy perceptions and sub-dimensions positively and significantly.

H_3: The digital literacy levels of primary school teacher candidates, along with their attitudes towards e-learning, affect their screen reading self-efficacy perceptions positively and significantly.

H_4: The digital literacy levels of primary school teacher candidates, along with their attitudes towards e-learning, affect their screen reading self-efficacy perceptions positively and significantly.

4. Methodology

4.1. Research Design

This research, which aims to determine the relationships between primary school teacher candidates' digital literacy levels, e-learning attitudes and screen reading self-efficacy, and to determine to what extent their digital literacy levels and e-learning attitudes predict their screen reading self-efficacy perceptions, was carried out in the relational screening model, one of the screening models. In this model, it is aimed to reveal the relationships between two or more variables without manipulating the variables or to make predictions based on the relationship between the variables (Fraenkel, Wallen & Hyun, 2012). The theoretical models (Figure 1 and Figure 2) explained based on the relevant literature and the relationships between the variables in the models were tested with Structural Equation Modeling (SEM). Structural Equation Modeling is defined as a powerful statistical analysis method used for the purpose of developing theory by examining the relationships between multiple variables by testing the causality relationships between observed and latent variables (Byrne, 2010).

4.2. The Study Group

In line with the purpose of the research, the study group was selected from the students of the primary school teaching undergraduate program studying at the education faculties of different universities in Turkiye. Universities in the study group and primary school teaching undergraduate program students studying at these universities were determined by simple random sampling method, and the participants consisted of 677 students studying in the 1st, 2nd, 3rd and 4th grades of the university in the 2020-2021 academic year. Simple random sampling is a method in which the selected units are sampled, giving each sample selection an equal probability of being selected (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2022). By choosing the sampling method specified within the scope of the research, all units in the universe were given an equal and independent chance to be selected as a sample. Some demographic characteristics of the study group are explained in Table 1.

Table 1.

Demographic Characteristics of The Working Group

Demographic Information	Variable	n
Gender	Woman	522
	Man	155
Grade	1st	99
	2nd	237
	3rd	187
	4th	154
University	Anadolu University	5
	Yozgat Bozok University	32
	Burdur Mehmet Akif Ersoy University	5
	Erzincan Binali Yıldırım University	6
	Eskisehir Osmangazi University	21
	Fırat University	10
	Gaziantep University	20
	Hacettepe University	77
	Nevsehir Hacı Bektasi Veli University	17
	Harran University	197
	Inönü University	195
	Kahramanmaraş Sütçü İmam University	32
	Karamanoğlu Mehmetbey University	17
	Niğde Ömer Halisdemir University	25
	Hasan Kalyoncu University	5
	Van Yüzüncü Yıl University	13
Total		677

4.3. Data Collection Tools

"Digital Literacy Scale", "Attitude Scale Towards E-Learning" and "Screen Reading Self-Efficacy Perception Scale" scale were used as data collection tools in the research. Confirmatory factor analyzes were applied to the Digital Literacy Scale, the Attitudes towards E-Learning Scale and the Screen Reading Self-Efficacy Perception Scale through the data collected from 677 people in total, and the structures determined by EFA in the relevant scales were tried to be verified.

The descriptive information about the scales used as data collection tools is as follows:

The “Digital Literacy Scale”, adapted into Turkish by Hamutoğlu, Güngören, Uyanık, and Erdoğan (2017), is a 17-item 4-factor scale and consists of 5 options ranging from “strongly agree” to “strongly disagree”.

“Attitude Scale Towards E-Learning” adapted into Turkish by Biçer and Korucu (2020) has a 4-factor structure consisting of 23 items. The scale consists of 4 options ranging from "strongly agree" to "strongly disagree".

The "Screen Reading Self-Efficacy Perception Scale" developed by Ulu (2018) has a 4-factor structure consisting of 16 items and consists of 5 options ranging from "not at all suitable for me" to "completely suitable for me".

Within the scope of confirmatory factor analysis, the path diagram for the Digital Literacy Scale is in Figure 3, the path diagram for the E-Learning Attitude Scale is in Figure 4, and the path diagram for the Screen Reading Self-Efficacy Perception Scale is given in Figure 5.

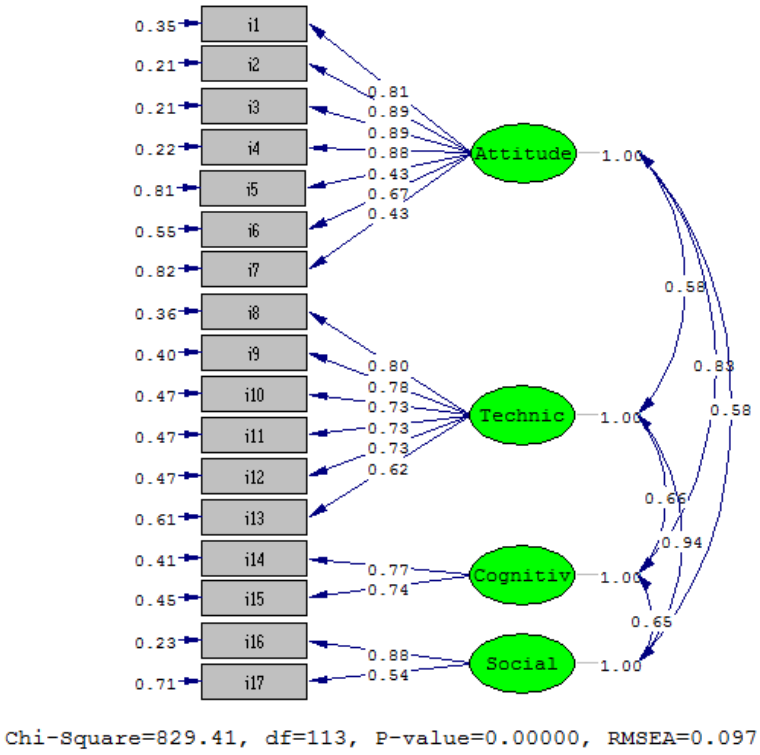

Figure 3. Path diagram in the scope of DFA for the digital literacy scale

When the path diagram of the Digital Literacy Scale is examined, the factor loads for the standardized model are between “.43 - .89” and error variances were found to vary between “.21 - .81”.

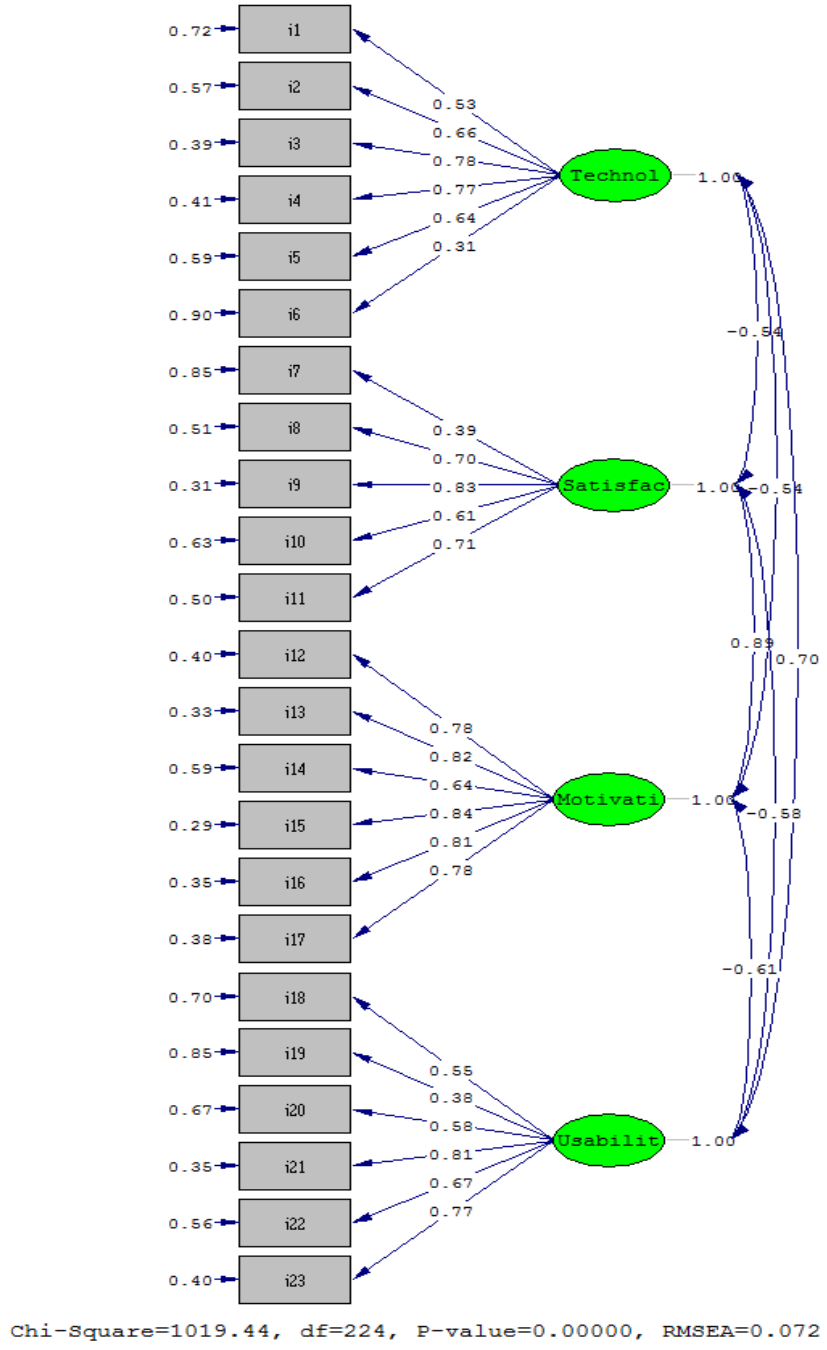

Figure 4. Path diagram in the scope of DFA for attitudes towards e-learning scale

For the standardized model presented in the path diagram of the Attitudes towards E-Learning Scale, the factor loads were between ".31 - .84"; it was determined that the error variances ranged between ".29 - .90".

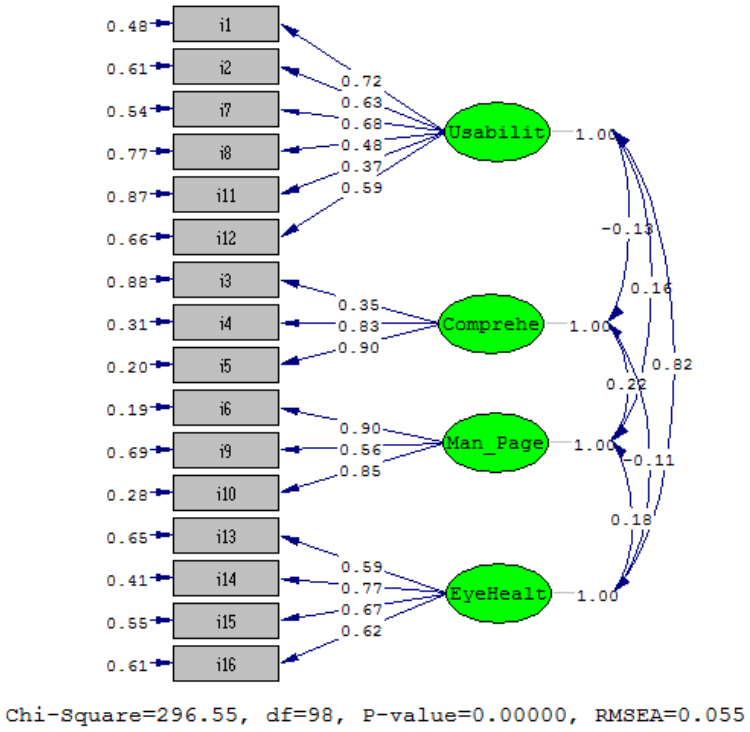

Figure 5. Path diagram in the scope of CFA for screen reading self-efficacy perception scale

When the path diagram of the Screen Reading Self-Efficacy Perception Scale is examined, the factor loads for the standardized model are between ".35 - .90" and error variances were found to vary between ".19 - .88".

It is important to examine some fit indices along with the findings presented in the path diagrams of the three scales used as data collection tools, and in this context, the fit indices obtained from the DFA for the Digital Literacy Scale, the Attitudes towards E-Learning Scale and the Screen Reading Self-Efficacy Perception Scale are given in Table 2. The fit criteria are considered within the framework of the values presented in the table as good fit and adequate fit.

Table 2.

Compliance Statistics on Data Collection Tools

Fit Index	Compliance Criteria			Digital Literacy Scale		Attitudes towards E-Learning Scale		Screen Reading Self-Efficacy Perception Scale	
	Good	Acceptable	Reference	Value	Decision	Value	Decision	Value	Decision
X^2/df	≤ 3	≤ 5	(Kline, 2005)	7.33	Poor	4.55	Acceptable	3.02	Acceptable
RMSEA	≤.05	≤.10	(Kline, 2005)	.097	Acceptable	.072	Acceptable	.055	Acceptable
SRMR	≤.05	≤.10	(Byrne, 2010)	.092	Acceptable	.054	Acceptable	.042	Good
CFI	≥.95	≥.90	(Hu & Bentler, 1999)	.96	Good	.97	Good	.96	Good

GFI	≥.90	≥.85	(Schermelleh-Engel et. al., 2003)	.87	Acceptable	.88	Acceptable	.95	Good
NFI	≥.95	≥.90	(Tabachnick ve Fidell, 2007)	.95	Good	.96	Good	.94	Acceptable

In this context, when the table is examined, X^2/df value indicates poor fit, RMSEA, SRMR and GFI values indicate adequate fit, and CFI and NFI values indicate good fit for the Digital Literacy Scale; for the e-Learning Attitude Scale, X^2/df, RMSEA, SRMR and GFI values were adequate; CFI and NFI values were good agreement; for the Screen Reading Self-Efficacy Perception Scale, X^2/df, RMSEA and NFI values showed sufficient agreement, and SRMR, CFI and GFI values showed good agreement. In this case, it was seen that the structures determined by the EFA result of all three scales were confirmed as a result of CFA. It was seen that all fit indexes were good or acceptable, except for the X^2/df value, which showed poor fit for the Digital Literacy Scale. In the evaluation of model-data fit in structural equation models, it is recommended that fit indices other than X^2/df, which shows a monotonous increase depending on the sample size, should be accepted as criteria (Sayın & Gelbal, 2016). In cases where the X^2/df value showed a poor fit, other fit indices were taken into account.

At the last stage, the Cronbach's alpha internal consistency coefficients for the reliability analyzes of the data collection tools used in the research were calculated and presented in Table 3.

Table 3.

Reliability Analysis for Data Collection Tools

1-Digital Literacy Scale	Cronbach's Alpha	2-Attitude Scale Towards E-Learning	Cronbach's Alpha	3-Screen Reading Self-Efficacy Perception Scale	Cronbach's Alpha
Attitude	.87	Techn. Usage Tendency	.78	Usability	.73
Technical	.87	Satisfaction	.79	Comprehension	.80
Cognitive	.73	Motivation	.90	Managing Page	.75
Social	.63	Usability	.80	Eye Health	.69
Whole Scale	.93	Whole Scale	.63	Whole Scale	.75

Within the scope of the reliability analysis carried out for the data collection tools, the Cronbach alpha coefficients for the factors of the Digital Literacy Scale ranged from .63 to .87, while it was determined as .93 for the whole scale. Cronbach's alpha values for Attitude Scale Towards E-Learning factors were between .78 and .90, and .63 for the whole scale. Finally, Cronbach's alpha coefficients on the basis of factors for Screen Reading Self-Efficacy Perception Scale ranged between .69 and .80, while this coefficient was determined as .75 for the whole scale.

4.4. Data Analysis

LISREL and MPLUS package programs were used in the analysis of the research data. No missing data was found in the data set, and analyzes were carried out on the data obtained from the remaining 677 pre-service teachers after extreme value analysis and normality analysis. For DFA, χ2/sd, RMSEA, SRMR, CFI, GFI and NFI values were checked.

5. Findings

In the study findings, firstly, the effects of digital literacy levels and e-learning attitudes (as independent observed variables) of primary school teacher candidates on their screen reading self-efficacy perceptions (as a dependent latent variable) and sub-dimensions were examined, and the path analysis carried out in this context is shown in Figure 6.

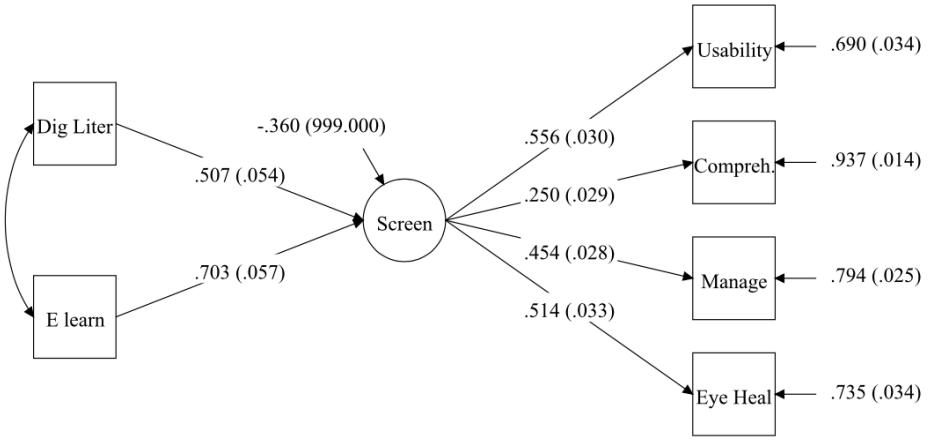

Figure 6. Path analysis of the effects of digital literacy levels and e-learning attitudes on screen reading self-efficacy perceptions and sub-dimensions

When Figure 6 is examined, while the percentage of explaining the variability of the digital literacy level in the perception of screen reading self-efficacy is 50.7, the percentage of explaining this variability of e-learning was determined as 70.3. On the other hand, the findings point out that the level of the pre-service classroom teachers' screen reading self-efficacy explains 55.6% of the variability in the usability dimension, 25% of the variability in the comprehension dimension, 45.4% of the variability in the management of the page and 51.4% of the variability in the eye health dimension.

In line with the path analysis presented in Figure 6, the regression coefficients between the variables and the decisions regarding hypotheses 1, 2 and 3 are presented in Table 4.

Table 4.

Regression Analysis Values in The Scope of The First Measurement Model of The Research

Hypothesis and Relationships	B	SE	P	R^2	Decision
H_1: Digital Literacy → Screen Reading Self Efficacy Perception	.507	.054	.000*	.257	Accept
H_2: E-Learning Attitude → Screen Reading Self Efficacy Perception	.703	.057	.000*	.494	Accept
H_3: Digital Literacy + E-Learning Attitude → Screen Reading Self Efficacy Perception	.695	.018	.000*	.483	Accept

*p<.001

Based on this finding, the first hypothesis of the study was confirmed. The level of predicting the screen reading self-efficacy perceptions of the digital literacy levels of the primary school teacher candidates was determined as .257 and it was determined that the relationship was significant and its direction was positive (β=.507; p<.001). Based on this finding, the first hypothesis of the study was confirmed.

According to the second finding presented in the table, the predictive level of the e-learning attitudes of the primary school teacher candidates for their screen reading self-efficacy perceptions was determined as .494

and it was determined that the relationship between the variables was significant and the direction was positive (β=.703; p<.001). In line with this finding, the second hypothesis of the study was confirmed.

In the analysis carried out for the third hypothesis in Table 4, the predictive level of digital literacy levels and e-learning attitudes of primary school teacher candidates together with their screen reading self-efficacy perceptions was determined as .483, and a significant positive relationship was detected (β=.695; p<. 001). In this context, the third hypothesis of the research was also confirmed.

Another measurement model within structural equation is presented in Figure 7. This model explains the role of e-learning attitudes of teacher candidates on determining the effect of their digital literacy level on screen reading self-efficacy perceptions.

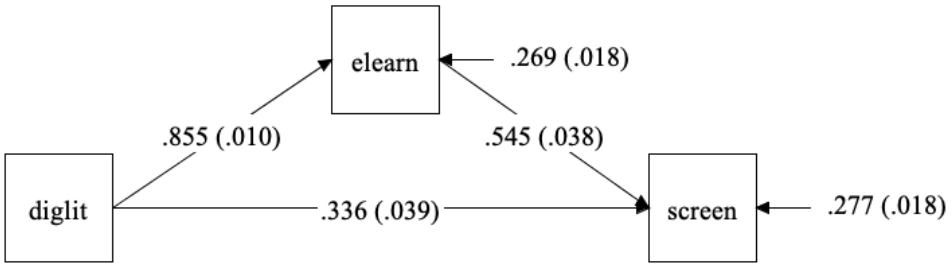

Figure 7. Path analysis of the effect of digital literacy levels on screen reading self-efficacy perceptions while e-learning attitudes act as a mediator variable

According to the results of the path analysis carried out for the second measurement model of the research, the percentage of primary school teacher candidates' digital literacy levels explaining their screen reading self-efficacy perceptions is 33.6. In the regression analysis presented in Table 5, when e-learning attitudes were considered as a mediator variable, the percentage of the change in screen reading self-efficacy perceptions was determined as 67.9%.

Table 5.

Regression Analysis Values in The Scope of The Second Measurement Model of The Research

Hypothesis and Relationships	B	SE	P	R^2	Decision
H_4: Digital Literacy*0.34+Elearning Attitude*0.55 → Screen Reading Self Efficacy Perception	.824	.203	.001*	.679	Accept

*p<.001

According to Table 5, when e-learning attitudes are considered as a mediator variable, it was determined that digital literacy significantly predicted screen reading self-efficacy perceptions and the relationship was positive.

6. Conclusion, Discussion and Recommendations

The hypotheses created in this study, which examined the effects of digital literacy levels and e-learning attitudes of primary school teacher candidates on their screen reading self-efficacy, were tested through structural equation modeling. As a result of the research, the hypothesis model established based on the

relevant literature was tested and it was seen that the digital literacy levels of the primary school teacher candidates significantly predicted their screen reading self-efficacy perceptions and that there were positive relations between the variables. Likewise, it was determined that e-learning attitudes significantly predicted screen reading self-efficacy perceptions, the relationship between the variables was significant and that the direction was positive. In addition, it was also found out that digital literacy levels and e-learning attitudes together significantly predicted screen reading self-efficacy perceptions and that there was a positive and significant relationship between the variables. It has been determined that the Cronbach's alpha values obtained as a result of the reliability analyzes for the data collection tools are within acceptable ranges according to the relevant literature and are compatible with the Cronbach's alpha values obtained by the researchers who developed the data collection tools. The results of Cronbach's alpha values show that the data obtained within the scope of the research are reliable.

According to the results obtained within the scope of the research, it can be said that as the level of digital literacy and attitude towards e-learning increase positively, the perception of screen reading self-efficacy will increase, too. With these results, it can be stated that when the level of digital literacy and attitude towards e-learning increase together, the perception of screen reading self-efficacy may also increase. Baron (2019) states that digital literacy is a mandatory skill to be an active member of the internet-oriented world. Digital literacy requires individuals to have the ability to use information and communication technologies, mobile applications, social media tools (Ng, 202). Therefore, one of the important variables that will shape the use of technology by primary school teachers and teacher candidates is digital literacy skills (Ng, 2012). In the Internet-oriented world, the attitude towards e-learning is as important as digital literacy, because a positive attitude towards e-learning can be the driving force for the use of digital technologies and using digital technologies will enable the development of digital literacy skills. In the related literature, there are studies conducted in different disciplines and levels that there is a significant relationship between digital literacy and attitude towards e-learning (Adıyaman, 2017; Alenezi, Abdul Karim & Veloo, 2010; Aşkan ve Usta; 2022; Kılıç, 2022; Thongsri, Shen & Bao, 2020). The significant relationship between digital literacy skills and attitude towards e-learning supports the results obtained in this research and digital literacy skills and attitudes towards e-learning significantly predict screen reading self-efficacy perceptions both separately and together. In the study conducted by Hu and Yu (2022), it was determined that online interactive lessons have positive effects on screen reading. When the literature on the relationship between attitude towards e-learning and academic performance is examined, it is seen that the attitude towards e-learning has an effect on academic performance (Akman, 2021; Lumadi, 2013; Özer Şanal, 2023; Puška, Ejubović, Đalić & Puška, 2021). However, in the study conducted by Elkıran (2021), it was determined that there was a weak, positive and statistically significant relationship between the perception of live lesson interaction level and screen reading self-efficacy. In addition, it was concluded that the time spent on the Internet was effective on the perception of screen reading self-efficacy. In a study conducted by Kesik and Bas (2022) with primary school students, it was determined that literacy teaching practices based on digital technologies were effective on screen reading skills and that literacy e-portfolio scores significantly predicted screen reading speeds. Both the results obtained in the current research and the results of the researches in the related literature reveal that the perception of screen reading self-efficacy is not independent of the attitude towards e-learning, for the attitude towards e-learning is an important variable that increases screen reading self-efficacy perceptions both alone and together with digital literacy skills. For this reason, the use of e-learning environments, which has been seen as an interesting approach for both learners and teachers in recent years, will be able to develop by influencing each other in the context of developing digital literacy skills and attitude towards e-learning. In addition, both separately and together, there may be variables that can increase self-efficacy of screen reading, which is one of the important skills of the digital age.

Another result obtained within the scope of the current research is that while e-learning attitudes play a mediating variable in the effects of digital literacy on screen reading self-efficacy perceptions of primary

school teacher candidates, digital literacy levels significantly predict screen reading self-efficacy perceptions and the relationship is positive if e-learning attitudes are considered as mediating variable. Similarly, in the study conducted by Etlioğlu and Tekin (2020), in which the relationship between student curiosity and anxiety, student attitude and academic achievement was examined with mediating variables, it was determined that students' attitudes had a positive, high and significant effect on e-course success. Akman's (2021) study, on the other hand, found that university students' attitudes towards online learning had a mediating effect on the relationship between their digital literacy and their academic willingness. It is seen that the research results in the related literature support the results obtained in the current research. This result shows that primary school teacher candidates' digital literacy skills positively affect their attitudes towards e-learning and increase their screen reading self-efficacy perceptions. Thus, digital literacy skills, which are effective on the screen reading self-efficacy perceptions of primary school teacher candidates, are realized through the attitude towards e-learning. This result supports the fourth hypothesis of the study. With this hypothesis, it has been revealed that screen reading self-efficacy perceptions cannot be handled independently of the attitude towards e-learning, which is a part of digital literacy.

As a result, it has been determined that the digital literacy skills and e-learning attitudes of prospective classroom teachers significantly predict their screen reading self-efficacy, and there are positive relationships between these variables. Additionally, it has been observed that e-learning attitude serves as a mediating variable in the prediction of screen reading self-efficacy by digital literacy skills. Based on the obtained results, the following recommendations are proposed:

- New models can be developed and tested by identifying different variables that can predict self-efficacy perception towards screen reading.
- The study can be replicated with different educational levels and age groups.
- The reasons behind the low rates observed in the tested models can be investigated.
- The digital literacy skills, e-learning attitudes, and screen reading self-efficacy of individuals can be examined using qualitative methods and compared with the existing research findings.
- The screen reading self-efficacy, digital literacy skills, and e-learning attitudes can be examined for various age groups at regular intervals to observe changes over the years.

Declarations

Data availability

Quantitative data generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of interest

Not applicable.

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Research and Publication Ethics Statement

Hereby, we as the authors consciously assure that for the manuscript “

” the following is fulfilled:

- This material is the authors' own original work, which has not been previously published elsewhere.
- The paper reflects the authors' own research and analysis in a truthful and complete manner.

- The results are appropriately placed in the context of prior and existing research.
- All sources used are properly disclosed.

Contribution Rates of Authors to the Article

The authors provide equal contribution to this work.

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