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Editorial

Dear IEEJE Readers,

Since March 2020, we have been going through a tough time due to COVID-19 pandemic. Schools and universities had to change their way of arranging instructions and seminars. Faculties and students had to stay away from their campuses for several months. They had to set up alternative solutions for educational activities. Many schools and universities still offer full-time or partial virtual courses. Social distancing is still a vital precaution to protect yourself against the virus.

Researchers had to take a break from their research activities or they had to change their methods.

There is no doubt that COVID-19 has negatively affected our 'free movements', collaboration and socialization and to do so. Also, we have to admit that we have learned a lot. We learned how to find creative solutions in challenging times. Thanks to ICT, we have learned to reach each other and our students through different technologies.

Members of the academic world had to survive as academicians, as researchers and as students.

It seems that we shall continue to do the same in coming days, months and maybe years. There are a lot of things we cannot change as academicians, but we can change ourselves and expand the ways to accomplish our mission.

As IEJEE family, we decided to improve our technical solutions, design and appearance, and have worked hard to improve and accomplish it during the last couple of months. We aim to make a submission, peer-reviewing, commenting, revising, resubmission, publication and indexing processes as convenient as possible for all involved partners. We hope these spectacular changes help us to better serve you.

We hope you find IEJEE's new face and design more reader- and user-friendly.

I am very much obliged to thank all authors, peer-reviewers and technical staff members for their valuable contribution.

Sincerely,

Turan Temur, Ph.D.
Editor-in-Chief

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Determining Language and Inclusion for Deaf-Plus Children

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Abstract

Educators have long argued about the best ways for Deaf children to communicate and how they should be educated. The two notions are inseparable for Deaf students who most often learn language at school. Since the passing of IDEA, most Deaf students have moved from segregated schools to their neighborhood schools where all students might benefit from learning and socializing together—the foundations of inclusion. Might inclusion for Deaf students with multiple disabilities mean something different? In this ethnography, the authors examined the experiences of six families that had school-aged children who were Deaf-Plus and used signed language to communicate. Research questions included: 1) What were the experiences of parents navigating communication and education for their children and 2) What did inclusion mean for their children? Data collection included: Semi-structured interviews, participant observations, and focus groups. The team developed three themes: 1) External Influences on Parent's Decision-Making Regarding Language and Communication, 2) Language and Communication Varies Among Deaf-Plus Children and Their Family Members, and 3) Struggling to Determine and Secure an Inclusive and Productive Learning Environment for Their Deaf-Plus Children. It behooves educators to consider how students' individual characteristics might benefit learning and create improved inclusive experiences.

Keywords:

Parents; Deaf With Disabilities; Inclusion; Language

Introduction

For most parents who have Deaf[1] children, it is likely their first significant encounter with this population. After all, approximately 90% of Deaf children are born to hearing parents (Mitchell & Karchmer, 2004). It is not surprising that, especially during the early years of their children's lives, that parents feel confused and overwhelmed by all the decisions they must make about their Deaf child's communication, technology use, and education (Young, Jones, Starmer, & Sutherland, 2005). They must manage pressures from familial, educational, cultural, and medical sources about these decisions and the messages they receive from these sources often conflict with one another (Mauldin, 2016).

However, parents also may feel a sense of fulfillment and pride over the communication journey they take with their children (Calderon & Greenberg, 2000).

The prevalence of disability in the Deaf population is between 35% and 50% (Mitchell & Karchmer, 2006). Comparatively little is known about the Deaf-Plus[2] population and particularly about the experiences of parents as they navigate the many decisions they must make while determining communication for their children and families or their children's educational placements. These decisions are inextricably linked because language use varies greatly across types of Deaf educational placements and Deaf children most often arrive to school in need of additional language or communication support (Lederberg, Schick, & Spencer, 2013; Schick, Marschark & Spencer, 2006; Svirksy et al., 2000). In this ethnographic study of six families, the authors sought to unearth the unique features of parental decision-making about communication and education for their Deaf children with multiple and complex disabilities. Secondly, the authors wondered how parents conceptualized inclusion and the least restrictive environment (LRE) for their Deaf-Plus children.

Communication Options for Deaf Children

It is common to distinguish between different interpretations of what being Deaf means. The medical model emphasizes the importance of assimilation into the hearing world by using hearing aids, cochlear implants, and speech (Foss, 2014; Lane, 1999). For some Deaf people, the combination of their identity, ASL (American Sign Language) use, and shared experiences with other members of Deaf culture determine an individual's membership status in the Deaf community, rather than the severity of one's hearing loss (Holcomb, 2012; Padden & Humphries, 2005). Therefore, individuals who identify as members of the Deaf community (which includes some hearing individuals) value Deafhood as a shared cultural experience rather than a medical condition.

The topic of Deaf children and their language use is one wrought with contention both regarding how it influences academic achievement and sociocultural engagement (Knoors & Marschark, 2013; Moores, 2011; Spencer & Marschark, 2011). Deaf/Hard-of-Hearing (HOH) children often lag behind their hearing peers in academic achievement (Helfand et al., 2001; Marschark et al., 2004; Szymanski et al., 2013, Thierfelder & Stapleton, 2016). Consequently, most Deaf students leave school with literacy and other academic achievement levels below those of their hearing peers, though scholastic achievement varies greatly due to various factors including educational placement, use of technology and age of access to language (see Antia et al., 2009; Marschark et al., 2015; Qi & Mitchell, 2011; Traxler, 2000). The reasons for these education disparities include late exposure to language (Mason et al., 2010), poor language models (Lederberg et al., 2013; Marschark & Spencer, 2010), teachers who are unprepared to instruct Deaf/HOH students (Sass-Lehrer et al., 2016), and educational assessments that do not consider the unique needs of the population (Cawthon et al., 2007).

Most Deaf/HOH children learn to speak and use hearing aids or cochlear implants. Only 15% of Deaf/HOH children learn ASL and have teachers who instruct them using some form of signed language (U.S. Department of Education, 2016). Deaf/HOH students spend 80% or more of their school day in a general education setting, with only 3.1% of students instructed in separate schools (Gallaudet Research Institute, 2011; U.S. Department of Education, National Center for Education Statistics, 2016). Proponents of Deaf/HOH children learning ASL claim that signing gives children both immediate and reliable access to language as well as aids in the development of their Deaf identities, both of which lead to social and scholastic benefits later in life (Allen et al., 2007; Holcomb, 2012; Marschark & Spencer, 2006; Napoli et al., 2015; Shmick et al., 2004). Proponents of oral/aural education claim that Deaf students develop better reading skills and gain access to improved opportunities in a vastly hearing world (Moog, 2000; Mussleman & Kircaali-Iftar, 1996). However, contemporary Deaf scholars are quick to point out that variations in residual hearing, technology use, family background and involvement, school resources, teacher preparation, peer relationships, age of onset, presence of disabilities, and assessment techniques affect academic and social outcomes so drastically that each Deaf child must be considered individually (Cawthon, 2010; Marschark & Hauser, 2011; NASDSE, 2018; Marschark & Spencer, 2010).

Inclusion and Deaf Education

Since the passing of the Education for All Handicapped Children Act (1975), which later became the Individuals with Disabilities Education Improvement Act (IDEIA, 2004), children with disabilities have moved away from residential or specialized schools and entered mainstream settings. The IDEIA (2004) states that all students with disabilities must be provided free and appropriate public education in the least restrictive environment (LRE). However, Deaf advocates raise questions regarding what LRE really is for Deaf

students. According to the Special Factors section of the 1997 IDEA amendments, an Individualized Education Program (IEP) team must:

> *Consider the communication needs of the child, and in the case of a child who is deaf or hard of hearing, consider the child's language and communication needs, opportunities for direct communication with peers and professional personnel in the child's language and communication mode, academic level, and full range of needs, including opportunities for direct instruction in the child's language and communication mode. (IDEA, Part B, Section 614(d)(3)(B)(iv))*

With this in mind, Deaf students a general education placement may not be the most inclusive, especially if they struggle with communication access, academic content, and forming and maintaining social relationships, because may be more restrictive (Singer & Vroman, 2019). Deaf students who attend public schools may lack confidence in their ability to communicate, feel as though they do not fit in with their hearing peers, and experience difficulty developing their Deaf identity (Kent, 2003; Leigh, 1999). Additionally, for students with complex support needs, schools continue to view more restrictive educational placements as appropriate to meet students' academic and social needs (Sauer & Jorgensen, 2012; Strieker et al., 2001). Therefore, rather than focusing on what environment is least restrictive for Deaf students, Singer & Vroman (2019) suggest to instead consider the environment that is the most supportive, most liberating, and most culturally-sustaining.

Deaf-Plus Children

The conditions that cause deafness in some children may also contribute to the presence of a disability (Das, 1996; Marschark, 2011). In fact, between 40-50% of Deaf children have a disability (Gallaudet Research Institute, 2012). The general and communication related support needs of Deaf-Plus children are different than those of children who are only Deaf, but they are sometimes overlooked (Knoors & Vervloed, 2003; Whicker et al., 2019). In these cases, preferred communication modes vary based on what is most useful for the child. For example, sign language might be an effective means of communication for some Deaf children with Autism (Szymanski & Brice, 2008), but not for all (Jure et al., 1991). In other cases, Deaf children who have difficulties with motor skills or language processing might use modified forms of signed language with or without Augmentative and Alternative Communication (Lee et al., 2013; van Dijk et al., 2012). McCracken and Turner (2012) found that even if not used for language, cochlear implants may benefit Deaf children with additional complex needs because access to environmental sounds may bring them comfort.

For most families with Deaf children, making decisions about communication, locating and accessing resources, and developing communication skills is a long and evolving process. Chapman et al. (2011) found that newborn Deaf children with other disabilities were screened for hearing loss and diagnosed at a significantly later date compared to children who were only Deaf. Furthermore, it is common that for these children, significant health needs will take priority over hearing loss (McCracken & Turner, 2012), leading to delays in making decisions and implementing plans for communication. Deaf-Plus children and their families typically find that they don't quite fit in traditional social support programs developed for Deaf children, because of their unique communication needs and the demands on their time to attend various treatments and therapies (Borders et al., 2018; McCracken & Turner, 2012). Consequently, children may feel isolated and discourse about them becomes unbalanced, focusing primarily on care needs and what they cannot do rather than what they can or want to do (Wiley et al., 2019).

Parents' Decisions about Communication and Education for Their Children

Parents of Deaf/HOH children face difficult decisions regarding language for their child. Many of these decisions are made when parents are still learning how to be parents (Tattersall, 2007). A significant body of scholarship touts the importance of Deaf children accessing some form of complete language (e.g. effective hearing assistive technology or ASL) as early as possible in their lives to support their language learning (Decker et al., 2012; Kushalnagar et al., 2010; Napoli et al., 2015; Young, 2018). During this early time in Deaf children's lives, parents often become overwhelmed when they must evaluate information and possible outcomes regarding technology, communication options, education, and habilitation at a time when they are emotionally vulnerable (DesGeorges, 2003; Kirk et al., 2005; Kurtzer-White & Luterman, 2003). After a diagnosis of hearing loss, which typically occurs very early in a child's life, parents are primarily exposed to medical discourses on how to reduce the effects of that loss (Burke et al., 2011; Hyde & Power 2000). These messages they receive from practitioners are not always substantiated. For example, it is common that parents are told that learning a signed language will impede speech development, which has been frequently debunked (Bailes et al., 2009; Mauldin, 2016).

Another persistent misrepresentation used to promote speaking and listening is that the average Deaf person has a reading ability equivalent to a fourth grade student without mentioning that the average hearing person reads at a 7th grade level and that the moniker Deaf is so broad that these findings may be misleading (see Helfand et al., 2001; Walsh & Volsko, 2008). While parents may receive information about Deaf people and various options for communication and education from social services or medical practitioners, it may be difficult for parents to fairly assess their circumstances given the pervasiveness of oral/aural ideologies in their lives (Gascon-Ramos et al., 2010; Mauldin, 2016). Mauldin (2016) showed that parents reported feeling substantial pressure from the Deaf community to pursue ASL for their children too, suggesting that the discourse parents must negotiate is not one-sided. Furthermore, and understandably, parents often want their children to be similar to them and therefore, make decisions about their communication or cultural affiliations to match this desire (Mauldin, 2016; Napoli et al., 2015; Pitts-Taylor, 2010).

Since 90% of Deaf children are born to hearing parents (Mitchell & Karchmer, 2004), it is unsurprising that these parents tend to have little understanding of ASL or Deaf people. When these parents do choose manual communication to use with their child, it is not long before they realize they are unequipped to supply an ASL-rich environment in which the child could best learn and use the language (Bailes et al., 2009; Napoli et al., 2015). When parents and other members of the family decide to learn a signed language along with their Deaf child, they often struggle to develop fluency because they have limited access to an appropriate language model and learn manually coded English rather than ASL (Weaver & Starner, 2011).

While education and social engagement are important factors in the decisions parents make about how their Deaf children will communicate, they also focus on developing loving and communicative relationships with their children. Young (2003) found that the difficulties parents endured when trying to access vital information after discovering their child was Deaf had significantly affected their parenting experience, including their ability to support their child's development and to adapt to their child's Deafness. When parents are either unable to sign proficiently or the child is not capable of utilizing listening and spoken language, the child and his/her parents may drift apart (Most et al., 2007). However, parent commitment to making a communication plan for the whole family has been found to positively relate to better parental communication exchanges with their children (Calderon et al., 1998; Knoors & Marschark, 2012).

Methods

Research Design

This research sought to document the experiences of parents of Deaf-Plus children. The researchers wished to understand how family members communicated with one another, what influenced their decisions, and educational experiences of their children in relation to their communication choices. Research questions included: 1) What were the experiences of parents navigating communication and education for their children and 2) What did inclusion mean for their children?

To better understand the experiences of parents who had Deaf-Plus children and the influences on their choices for communication for their child, the research team recruited six families for the study. Participant criteria included having a school-aged Deaf-Disabled child who used ASL[3] to communicate. Participant recruitment consisted of social media advertisements and snowball techniques. The team collected data in four forms: 1) 18 hours of semi-structured interviews, 2) 20 hours of participant observation, 3) Over 150 pages of reflexive journals and field notes, and 4) A two-hour focus group.

The team approached data analysis using open inductive coding for qualitative research (Bogdan & Biklin, 2014) and constant comparison (Kolb, 2012; Smulowitz, 2017) to existing Deaf studies and disability studies scholarship about language acquisition, cultural identity development, and educational placements. The four researchers each read the data several times in order to chunk it into broad categories about communication and social influences. The team then compared the various categories they developed, selecting ones that were consistent among researchers and redefining other categories that differed. Continuing to use open inductive coding, the research team refined and reduced the categories until they were able to develop distinct themes.

Theoretical Framework

In this work, the researchers utilized a combination of disability studies and Deaf studies frameworks to examine the data. These lenses of analysis complement one another, though are distinct fields of study. Disability studies challenges the socially constructed notion of normalcy and "recognizes that disability is a key aspect of human experience, and that disability has important political, social, [cultural] and economic implications for society as a whole, including both disabled and nondisabled people" (Ferguson & Nusbaum 2012, p. 71). Ferguson

Table 1. *Participant demographic information*

Participants	Khan Family	Padilla Family	Hill Family	Foss Family	Allen Family	Simmons Family
Household Income and Employment (mother, father)	>$100K Doctor, Doctor	>$100K Store worker, Truck driver	$30K-$100K Social services, Electrician	$30K-$100K Occupational therapist, NA*	>$100,000 Unemployed, Investments	>$100,000 Unemployed, N/A*
Ethnicity	Middle Eastern	South American	American	Eastern European	American	Latino
Parents' ASL (mother, father)	Learner, Learner	Learner, Learner	Proficient, Learner	Learner, N/A*	Proficient, Learner	Learner, N/A*
Languages Used at Home	English, Urdu, ASL	Spanish, English, ASL	English, ASL	English, ASL	English, ASL	English, ASL, Spanish
Deaf Child's Disabilities	CHARGE Syndrome Autism Spectrum Disorder	CHARGE Syndrome, Autism Spectrum Disorder	CHARGE Syndrome	Cerebral Palsy, Polymicrogyria, Global Developmental Delay	Autism Spectrum Disorder	Microcephaly, ADHD
Child Gender, Age	Male, young teen	Male, young teen	Female, grade school	Female, young teen	Male, young teen	Female, preschool

Table 2. *Participant biographical information*

Khan Family	Dr. & Dr. Khan had three children and the youngest one who was Deaf-Plus, was the only male child. The parents immigrated to the US for better opportunities for their family. They are committed to their Muslim faith and community. Meeting with this close-knit family was always a pleasure, because they were welcoming, thoughtful and loving. They were strong supporters of their son, always scaffolding activities to support his learning and understanding. Their son was bright, inquisitive, and sarcastic.
Padilla Family	This family consisted of a mother, father, grandmother, and the younger of two sons was Deaf-Plus. They immigrated to the US for better opportunities for their family. After losing a due process hearing about their son, the family continued their commitment to improving their son's education. This objective was the focus of our interactions. The Padillas were systematic, often taking notes and political. At the same time, they were soft and affectionate. When they looked at their son, their love shone on their faces. Their son was affectionate, curious, and technologically savvy.
Hill Family	This family consisted of a mother, father, two grown sons, and one daughter, who was Deaf-Plus. The family was a strong supporter of the Deaf community. It was casual and enjoyable to work with this all-American family. They were generous and joked often. Their daughter was charismatic, energetic, and had a strong imagination
Foss Family	This family consisted of a mother and her adopted Deaf-Plus daughter. They were very close and loving. Ms. Foss was an enormous advocate for her daughter, knowledgeable, and uncompromising. Her daughter had a strong presence in Special Olympics and other sporting activities. She was affectionate, playful, and good-humored.
Allen Family	This family consisted of a mother, father, and their Deaf-Plus son. They were strong advocates for their son and it was clear that they valued family loyalty. The Allens acted as teachers in their community when they provided ASL resources to important people in their son's life. Their son was involved with many extracurricular activities, including swimming and art.
Simmons Family	This family consisted of a mother and her Deaf-Plus daughter. In order to provide her daughter the best learning environment, the mother made numerous sacrifices, including moving her daughter in with the grandmother in order to be closer to a school for the Deaf. The mother and her family were determined to give the Deaf-Plus child an ASL-rich environment, making choices such as hiring a Deaf nanny.

& Nusbaum (2012) outline that disability studies work must be: social in nature, the study of disability as a foundational human characteristic, interdisciplinary, participatory, and values-based. Therefore, it is inherently political in nature (Annamma et al., 2013). Deaf studies is an interdisciplinary approach to "the study of Deaf individuals, communities, and cultures as they have evolved in a larger context of power and ideology" (Bauman, 2017, p. 210). Like disability studies, Deaf studies doesn't focus on bodily impairment, but on socio-cultural positioning and equity. It also examines the linguistic component of this community. While Deaf studies scholars often distance Deaf people from labels of disability, because Deaf people identify as a cultural-linguistic minority (Lane, 2002), this study centralizes the synchronicity of Deaf and disabled experiences.

Results

External Influences on Parent's Decision-Making Regarding Language and Communication

For all parents in this study, finding the appropriate resources to support their children's language and communication development presented a challenge, especially when parents did not have the experience to make these critical decisions on their own. Consequently, external influences played a significant role in parents' selection of a language and communication mode for their children. For most families, the influence from medical professionals about communication was scant while they focused on their children's early acute medical needs and later presumptive about carrying out cochlear implant surgeries. However, parents explored technology and communication options for their children outside of

the medical field, including family, social media, and the Deaf community sources.

"Doom and gloom" medical discourse

For four of the families, the children's early complex medical needs took priority over their hearing status. The Hills stated: "The deafness at that point was the last thing we were concerned about. We were more concerned with keeping her alive." Doctors told the Hills that their daughter was born with a heart murmur, a single kidney, colobomas, and a missing vestibular system. They felt that everything they heard from medical practitioners was "doom and gloom," which was not only depressing, but prevented them from enjoying their daughter. This type of rhetoric suffused the early years of their children's lives for the Hills, Ms. Simmons, the Padillas and the Khans. Ms. Simmons countered, "We were just glad to have her," which was also how the Khans felt. The Khans described how the doctors had very low expectations for their child: "The doctor told us after surgery, 'He will not be a part of your life and you will be going to the doctor so often for something or other.'" The Hills shared a similar experience when they were told by a doctor that their daughter would never be able to walk. In an early appointment, the doctor said "you need to prepare yourself" and left the room, leaving the parents both overwhelmed and scared for their daughter's future. As the Padilla's son was rushed out of the delivery room to a different hospital for care, doctors "prepared" an exhausted mom and dad for the difficult life upon which they were about to embark--if their son survived.

Parents felt that because their children required substantial medical attention during their early lives, language and communication development were not important topics of discussion among medical and service professionals. The Padillas expressed their frustration in the beginning of their son's life: "Nobody, including early intervention, was concerned about communication and nobody advised me to try a way to communicate with [my son] at all." All the professionals with whom they interacted, focused on what was wrong with their child, paying little attention to what the child could do or might be able to do in the future. The families were not provided the professional support they needed to give their child an effective way to communicate. The Hills also described their frustration with an absence of support from hearing service professionals. They described how at home they "were doing simple signs but felt lost." The Allens felt this way when they had initially selected ASL for their son, but soon realized that professionals did not provide them with the resources to support this decision. They explained: "You wish there was more information presented with less bias. Because you're in a medical situation...it's immediately a medical problem." When audiologists presented information to parents, it was mostly through a lens that defined Deaf as a problem that needed to be fixed--more doom and gloom. When parents were only given information that identified their children's hearing loss as a medical condition, it left little opportunity for dialog about various language and communication options.

For the Allens and the Khans some of the doom and gloom they experienced was in the form of coercion from medical professionals to have their child undergo cochlear implantation. The Khans described their interaction with an ENT surgeon: "So basically, the ENT surgeon was the one who actually forced us. He called and said if it were my child, I would go with the cochlear implant." As parents who had no prior experience with Deaf people, the Khans described that following the doctor's advice seemed like the only option at the time. However, while the doctors had given them the impression that their son would be able to listen and speak with the cochlear implant, it turned out not to be true, which was difficult. The Allens described a similar experience: "The cochlear implant surgeon said to us, 'I'm sorry that I ever told you that [your son] would hear just like everybody else because it may not be possible.'" After being pressured to choose the auditory/oral route for their son, the Allens soon realized that the cochlear implant was not going to serve in the way the doctors had initially believed.

Constructing communication fluency with the support of family, social media, and the Deaf community

Realizing that medical practitioners were not providing them with the tools they desired, several parents turned to resources outside the medical field to support their children's language and communication development. Three families discussed input from their relatives. For Ms. Simmons, extended family played a central role in her daughter's caretaking. She explained, "I think my parents were trying to believe the technology-forward thinking...they kind of dove right in to helping me with her therapies at the time." The Allens, on the other hand, explained that their extended family was not particularly involved or invested in the decision-making process: "They didn't know anything about it." The Hills described that their family were mostly concerned for their daughter's health: "My mom got a little scared 'cause [my daughter] had so many surgeries. Why were we gonna do an elective surgery and do the cochlear implants?" The Hills and Ms. Foss found it more beneficial to connect with other parents of Deaf-Plus

children rather than their family members for support. The Hills stated: "It was so freeing to be able to say 'my mother is not getting this' and for her to go 'I understand, I get it.'" Common experience turned out to be a strong bond.

With the accessibility of social media, parents of Deaf-Plus children have found ways to meet and connect with other parents who share experiences similar to their own. Three families mentioned that they used social media for connecting with other parents, sharing resources, and accessing information about learning ASL. Ms. Foss explained, "I will say Facebook...being on a lot of the Facebook pages and...talking to those parents and being able to say this is what my child does, does your child do this? I find that very helpful." She explained that joining Facebook pages not only for parents of Deaf children but for parents of children with the same disabilities as her daughter was helpful in finding answers to many of her questions. The Khans shared this sentiment: "Even just to get advice, go on the Facebook page and find out." The Hills explained that the use of Internet resources as a way to keep up-to-date on their ASL skills: "I still get Youtube from Bill Vickers. I subscribed to his channel so if something new comes up, I review the video."

Parents rarely discussed seeking advice from the Deaf community. The Hills were the exception. They stated, "So before we even thought about cochlear implants, we got involved in the school for the Deaf. That is where we really started learning to sign." When conversations about cochlear implants began to arise, the Hills valued the opinions of Deaf adults in making their final decision to implant their daughter: "I remember talking to Deaf adults going: 'What would you do? Should I do this? Is she going to be denied her Deaf identity because I am doing this?'" Through their dialog about the medical advice to implant their daughter and their newfound relationship with the Deaf community, the Hills determined they would implant their daughter, but continue to teach their daughter ASL regardless the outcome of cochlear implant surgery.

Language and Communication Varies Among Deaf-Plus Children and Their Family Members

Raising a child with disabilities presented parents with a unique set of challenges. One of these unique experiences was when parents discovered their child was also Deaf and they decided that the family would learn ASL. As expected, learning a new language proved to be a difficult and time-consuming task for all families, but one that had a positive impact on their lives. As the Deaf-Plus children developed ASL skills independent of their families and in some cases, surpassed their parents' ASL skills, the typical role of parent-as-expert started to become blurred. The parent became a learner and the child transformed into a communication expert. At times, the parents and children struggled to use ASL as an effective mode of communication but were successful in managing the wants and needs of their Deaf-Plus child.

Family Members Developing Communication Strategies

ASL quickly became a part of parents' language repertoire. For three of the families, ASL was the third language they used at home. The approach to learning this new and complex language varied among the families. Four of the six families attended classes at ASL-using schools and one family completed multiple online courses from a Deaf university. All families also heavily relied on YouTube.com videos and online resources to enhance their ASL skills, with one family exclusively using these electronic sources. Specifically, most parents cited Bill Vickar's online ASL resource, lifeprint.com, as integral to their learning. Even with several years of practice, few parents reported feeling confident in their ASL skills. Parents often felt that their Deaf-Plus child's skills were more advanced than their own or developing in a different way. Ms. Foss explained that her daughter's ASL skills have surpassed her own so much so that her child was the one teaching her: "A lot of my skills have come from my daughter. I pick things up from her." This is not a concept unique to the Foss family. The Padillas experienced this too: "After a while, [my son] was signing and teaching us!" Ms. Simmons described the difficulty she often experiences when attempting to make sense of what her daughter is communicating to her:

> *I've been trying to match her the best I can, but it's not like you can really look up a sign. You can look up a word and find it in ASL, but I can't describe the sign to Google and figure out what she's saying.*

Ms. Foss described feeling a similar way when she was required to turn to professionals in order to determine what her daughter was signing: "There are times when I will record her and send the video to someone at school because I don't know what she's saying." She further remarked, "I was always fascinated by sign language, but when I had to learn it myself I found out how not easy it was. I was like, wait, it's not just words!" Learning another language in a short amount of time is no easy feat, but parents felt it was imperative. The Allens' encapsulated this necessity, "No one wants to not be able to understand what their child is asking or saying."

An added complexity arose with communication between the Deaf-Plus children and their relatives. While most families attempted to learn some signs, only Ms. Simmons' family expressed that their child could fully communicate with his or her extended family: "My mother, who my daughter lives with during the school year, is actually fluent in sign language. She learned sign language because of my daughter." Immediate family members in the Khan family sign to communicate, but their extended family and cultural-religious family at their mosque did not yet sign. Other parents felt frustrated about the ASL skill levels of members of their families. For example, the Allens stated:

> *Communication with our son is difficult because no one has really taken the time to learn to communicate with him well. We live very close to a few of our family members and they include us in everything; but he always has to have to go between me or my husband for him to interact with other family members, which makes it kind of challenging and frustrating.*
>
> *The Allens were not the only parents whose roles shifted from caretakers to interpreters when interacting with family: "My parents' and families' signing skills are not good...No one really signs with her. I do a lot of interpreting" (Ms. Foss).*

The Allens were not the only parents whose roles shifted from caretakers to interpreters when interacting with family: "My parents' and families' signing skills are not good...No one really signs with her. I do a lot of interpreting" (Ms. Foss).

With various levels of ASL fluency between the Deaf-Plus children and their family members, each family has had to devise a communication method that works best for them. For some, this meant writing messages back and forth (Padillas, Khans), texting one another (Khans), and fingerspelling to their child (Khans, Foss) when their ASL skills were insufficient. In addition to utilizing external sources to support communication clarity among the family members, most of the families reported using Simultaneous Communication (SimCom) rather than consistently using ASL: "Since ASL isn't our first language, we typically speak when we sign, which isn't grammatically correct" (Simmons family). The Fosses, Khans, and Hills explained that communication in their household mirrored that of the Simmons' where SimCom was the primary mode of communication.

Regardless of struggles with communication, all families reported that they knew enough sign language and have developed sufficient strategies to be able to communicate effectively with their Deaf-Plus children. The Padillas stated, "We feel that we know enough sign to make him understand what he has to do or what he cannot do." Still, this foundational level of ASL was sometimes inadequate as their children began to require more advanced communication interactions. Ms. Simmons explained:

> *I don't know sign language enough to be able to teach her how to communicate her emotions or complex sentences and stuff like that. It's not my language or a language I'm very good at. I don't know how to teach her those everyday things like: 'Tell me how you're feeling.'*

Some parents' novice ASL skills became a barrier to assisting their child with schoolwork. Ms. Foss explained, "I'm starting not to be able to help her with homework. I only have the sign to talk about nouns and verbs. I have words. I don't have the signs for this skill level. This isn't my skill level." However, other parents felt this inability to fluently communicate in the language of their Deaf-Plus child had not yet become a significant obstacle to overcome. One family reported that their level of ASL proficiency had complicated their personal relationships with their child. The Khans described:

,

> *Sometimes [my son] can tell if I'm not understanding. I try my best, but sometimes I just don't understand. If I take too much time, he gets a little frustrated, so I try not to. He understands our capacity. He doesn't go beyond what we don't understand. So, if he thinks we don't know a sign, he will spell it for us, he will write it down.*

Negotiating an effective communication system for Deaf-Plus children

ASL was the preferred language of Deaf-Plus children in this study. For the Hills and Khans, ASL was introduced into the home almost immediately after birth. However, the other four families began with an auditory/oral approach due to various influences, with some children not acquiring language until much later in life: "For the first five years, we didn't give him a language" (Padillas family). Ms. Simmons quickly realized that prohibiting the use of ASL, which was a requirement of her daughter's early intervention program at school, did not yield positive results:

> *I started teaching her sign language because I thought she was frustrated. She seemed frustrated all the time. I just wanted some way for her to be able to communicate with me. I taught her about 200 words that way. She picked it up immediately!*

Communication resolving behavior issues became a common theme throughout the interviews with parents. The Allens described, "Over the last few years, [my son] has improved a lot. With the improvements in communication came improvements in behavior."

The Hills' and Khans' children's behavior also improved as frustration about communication diminished.

The Deaf-Plus children's their complex disabilities made using ASL even more difficult. For example, the Padillas explained:

> *Our son communicates in sign language. That's the language he prefers; but at the same time, considering our son is Autistic, it has been difficult for him to learn that language. In sign language, it's more than just moving your hands...it's facial expressions, body language, etc.*

Ms. Simmons explained that ASL skill level and environment was only one consideration in creating effective communication: "[My daughter] tends to get very frustrated and has tantrums. Even though we have her in such a high ASL environment, her other developmental delays keep her from wanting to communicate." For other children, the fine motor skills used while signing proved challenging. For the Allens, Augmentative and Alternative Communication (AAC) was beneficial for easing their child's frustration with communication:

> *[My son] doesn't use the AAC app as much now because he has more language using ASL, but he did benefit from the app. It reduced his anxiety about us not understanding what he was saying because he had difficulty signing clearly. He has differently formed fingers, so sometimes his signs might not be as distinct or clear as you might want.*

It was often the case that, although helpful, AAC was not consistently used by the children because they preferred to sign.

The distinct variations of ASL skills between the Deaf-Plus child and their family members resulted in a shift in the typical familial roles for some of the participants; the child became the expert and the parent became the learner. In some instances, this created a divide between the family and the Deaf-Plus child. The Khans recalled a time when this language barrier was evident:

> *Sometimes if I don't know how to talk to him in ASL I just do it my English way. He understands. So, one time he was supposed to present to me for his ASL class and he didn't do it. We were at a school picnic and I told the teacher, 'I don't know why he didn't want to present to me.' And when the teacher asked him, he said, 'Mom does English sign language and my presentation is supposed to be in ASL.'*

The Allens discussed struggling with ASL grammar themselves, which was not a similar issue for their Deaf-Plus child: "It's interesting because [my son] naturally uses appropriate ASL grammatical structure. That's how he sees things, whereas I really have to think about it, but that's just how he thinks."

Struggling to Determine and Secure an Inclusive and Productive Learning Environment for Their Deaf-Plus Children

It was an ongoing and often difficult process for parents in this study to broker an educational placement for their Deaf-Plus children which served all their children's communication, social, and disability support needs. Parents found that selecting one placement typically meant sacrificing academic goals or their notion of the least restrictive environment (LRE) for their child. Furthermore, parents often found school personnel to be barriers to having agency over the education of their children and that the individuals influencing the education of their children were seemingly unqualified to hold those positions. Some parents successfully negotiated the educational placement they desired for their child, while others did not or are still searching for an appropriate placement.

Early in their children's lives, parents had to make decisions about educational placements for their children. Aside from Ms. Foss, who grew up with a disabled sibling, worked as an occupation therapist, and chose to adopt a Deaf-Plus child, none of the parents had much experience with disabled or Deaf people. They worked hard to learn from friends, educators, and the Internet about special education services so they could make informed decisions. The focus on the children's physical disabilities discussed earlier continued during the school years for the Padillas, Fosses, and Simmons. For these families, the children's need to communicate seemed to be an afterthought, so parents had to become advocates. Ms. Foss recounted:

> *The child study team showed me special schools for children with multiple disabilities...I had to request seeing a Deaf school, because the special schools said they would learn ASL with her and I was like 'but you're supposed to be teaching her!'*

The Padillas also wanted an ASL rich environment for their child, but the head of special education for their district told them "No one on the street signs, so he isn't ever going to have anyone to communicate with." This was a common narrative about how using sign language would cause the children to be isolated from the world. The Khans initially followed this advice and placed their son in a neighborhood school where he floundered, but after he moved to an ASL-using Deaf school they lamented: "I wish he had been there since the beginning. He might have been so much better and he might have learned a lot before." The Simmons shared this sentiment: "No matter how hard I try, I will never be as good [using ASL] as somebody whose spoken it their whole life and had the Deaf experience." Like the Simmons, the Hills quickly resolved that their daughter would

attend a Deaf school because they knew a general education placement with an ASL interpreter wouldn't provide the intensive communication support that she needed. The Allens tried multiple placements for their son: An oral school for the Deaf, an ASL using Deaf school, and finally a segregated special education classroom. It was perplexing for the family, because regardless of where he went, the schools were unable to simultaneously provide the needed communicative, disability related, and social supports for their son. In the end, they selected the segregated classroom with the most intensive supports (e.g. Applied Behavior Analysis: ABA) in hopes that a more restrictive environment would eventually help their son blossom and have access to a richer life. Still early in their evolution as experts about disability, Deafhood, and their own children, the path toward choosing an educational placement was convoluted, but these six families universally chose to prioritize communication in their choices, even when medical and educational professionals did not. They were certain that any conversation about inclusion that did not begin with access to interacting with peers and teachers was not a conversation about inclusion at all.

Struggles with schools complicated parents' resolutions about the best placement for their children. The Allens summed up the constraints they faced: "It's all resource and financially motivated," which the other families echoed. The Padillas faced significant struggles in their attempts to move their son to an ASL using Deaf school. They showed the research team their son's IEP goals. Few of these goals were learning oriented, but instead they were function-based. Furthermore, the school reported for three quarters in a row that their son was not making adequate progress toward his social, emotional, and behavioral goals, but in the fourth quarter, he seemingly magically did for six of seven goals, which his parents knew was untrue. When Mrs. Padilla asked what the percentages of the success were in the earlier quarters, the IEP team could not answer. The documents were invalid and written to support the placement decisions the school made. The Padillas entered due process to fight for his right to be educated in a way that was "more than babysitting him." However, not a single professional who knew anything about hearing loss or language acquisition of Deaf people was involved in the hearing. Ultimately, the Padillas lost the case and due to expense and fatigue had to give up:

> *Our battle was so hard, so stressful, and so depressing and at the end it was weird because they were the ones to decide that they would help my son and then they all just talked so badly about his deficits or how everything was his own fault. We became too tired of fighting.*

This was not the only family who felt that IEPs were flawed, including supposed progress documented on them. The documents became subjective institutional weapons that schools used to wield their power. The Khans described that in the neighborhood school, one teacher documented in the IEP how signed language was an ineffective communication tool for their son, while another teacher showed the Khans just how much potential their son had to use this modality. They didn't fully understand the IEP as a legal document that could work for or against their wishes: "Honestly, I would say I did not understand it [the IEP] and about levels of what he's supposed to be or our rights, but I felt he was treated like a baby by the entire school [hearing school]." Errors in IEPs were not limited to hearing status. Ms. Foss explained that her daughter's IEP referred to her as having Autism and a social communication disorder, when Cerebral Palsy was a neurological disorder. "Other schools refused to teach the Deaf-Plus children ASL, because "it is a crutch that they won't ever get rid of [Ms. Simmons]." Aligning with this statement, parents reported how educators assigned to their children acted as experts but knew so little about Deaf or signed language. The Hills had early intervention to instruct their daughter ASL: "Her IE who was a TOD didn't know how to sign.. once I started to get more fluent, she would always ask me for signs. I am like 'You gotta be kidding me!'" The Padillas experienced this too when they began to receive some communication-based services. A teacher of the Deaf (TOD), who only knew rudimentary sign language, served as their son's interpreter.

Not all families struggled to negotiate the educational placement of their child. The Hills, Ms. Foss, and the Allens reported little resistance from schools when they wished for their child to attend an ASL using school, because it was clear that the home district did not have a remotely appropriate placement for their children. However, once in school, educators equipped to instruct Deaf students were not always prepared to instruct Deaf-Plus students. Ms. Foss' school contacted her claiming that her daughter didn't communicate or only signed single words to which she responded: "I'm like I don't know what child you are talking about because I can't get her to stop." To her, the school simply didn't understand Deaf-Plus children: "The problem is they are expecting output when she doesn't always have output, but the input is absolutely necessary." The Hills faced similar misunderstandings from TODs when their daughter was labeled as stubborn and easily distracted when she began responding to sounds using her cochlear implant and expressing her opinions, which her parents celebrated as successes. For the Allens, it was a struggle to access services. Consistency was important for their son, but

the school was unable to retain paraprofessionals, because they were under-payed. Whether parents struggled to get the placement they wished for their child or struggled having all their children's needs understood and addressed, their relationships with schools were difficult and parents felt they paid too little attention to what the children learned socially and academically.

As parents became experts about their children and their support needs, they became more confident in their visions of what inclusion for their child meant. All parents emphatically agreed that they wished for TODs who had a strong understanding of how to teach Deaf students who have multiple support needs. Parents generally felt ASL using schools were the most inclusive and permitted a better chance for their children to reach their academic potential. For example, the Khans stated: "Since he's been in a Deaf environment, his learning has multiplied 10 or 15-fold... It's where he can interact naturally and his language is a benefit rather than a service." The Padillas also communicated the importance of collectivity to achieve true inclusion for their son: "I don't like that everything is individual like an Individual Educational Plan [sic]. Why not have a plan for the whole class to be inclusive and learn?" Ms. Foss, the Hills, and the Allens had different ideas. The Hills wondered if there ever could be a truly inclusive class for their daughter simply because of her relative uniqueness. Ms. Foss qualified this idea in relation to inclusion meaning where her child was educated: "If you want my daughter to feel like she is really 'in' the community, she has to sometimes be in the middle, to have skills others do not and not always the lowest kid in the classroom." Parents in the focus group nodded in agreement. To them, an important component of being a citizen of the classroom is not only to have something to contribute, but to also feeling efficacious and respected.

Discussion

Consistent with McCracken and Turner (2012), the families talked at length about their feelings of not being supported by medical practitioners and educators to make decisions about communication for their child. Moreover, even when parents chose how their child would communicate, only the child received communication-based services rather than the entire family. Consequently, they had to facilitate their own acquisition of ASL. Instead of receiving support for communication, families felt their lives became full of medical appointments and incessant deficit discourse about their children. For most parents, this did not change when their children went to school. The "doom and gloom" or what the children could not do took center stage, aligning with previous findings (Sunderland, Catalano, & Kendall, 2009; Wiley et al., 2019). These findings also support previous finding about the burden of medical appointments for families with disabled children (George,Vickers, & Barton, 2008). For able-bodied children, access to language is a priority from the first day of their lives (Mayberry, Lock, & Kazmi, 2002), but communication for children with complex support needs is not viewed as integral to brokering a fulfilling life (Hustad & Miles, 2010), because they are seen as incomplete humans (Hazlam, 2006). The parents and researchers alike wondered why it was so difficult for educators to view these Deaf-Plus children as communicators and as valuable humans.

In this research, parents responded to the deprioritization of language and doom and gloom with action. Parents who learn about hearing loss and communication options first from medical practitioners tend not to seek out additional information from other types of sources (Kluwin & Stewart, 2000). This did not hold true with the parents in this study. When unsatisfied with the lack of dialog about communication for their children, they unequivocally demanded that medical practitioners and schools do more to support their families. Whether or not those demands were met, parents looked to their extended families and Internet support groups not only about language, but also to resist the overwhelmingly negative narratives about their children. They formed learning communities around ideas of ASL language and its marginalization, ableism, and parenting as power. This finding adds to the growing body of evidence that online support groups for disabled people and the "wise," Goffman's (1963) notion of those who are sufficiently close enough to a stigmatized individual to truly "get it," are an important component of disability culture (Ellis & Goggin, 2013; Kerr & McIntosh, 2000). That the parents in this study sought out these groups shows them as resourceful and purposeful advocates for their children. While research shows the positive impact of parent involvement in children's education (Lee & Bowen, 2006), it fails to emphasize just how crucial it was for these Deaf-Plus children. Parents described the many errors misinformed educators made about their children, some of them reprehensible and dangerous. Had parents permitted the schools to make educational and communication choices for their children without their input and oversight, the consequences might have been disastrous. Interestingly, only one family discussed connecting with Deaf adults to help them become informed decision-makers. The Deaf community feels that parents of Deaf children need this exposure in

order to counterbalance the overwhelming medical/oral advice parents receive from the moment a Deaf child is born (Young, 1999). Nevertheless, all families ultimately chose ASL as a language for their children and families, which may be partially attributed to the increased visibility of ASL using people in the media. While parents did not discuss why they did not seek the expertise of Deaf adults, it is likely that access to these individuals proved difficult and that parents felt intimidated by Deaf people.

Instead of seeking out Deaf people directly, parents and family members continued to learn about Deaf identity from the Internet, which proved to be an important resource not only for support but also language learning. Learning ASL is difficult and may be especially so for parents who work, have limited incomes, or their child is the only Deaf person they know. Parents in this research talked about lifeprint.com (Vickars, 2019), a longstanding ASL and Deaf cultural resource. Vickars released this free online resource because he recognized the need for access to quality ASL instruction for families of Deaf children. Despite access to this website, other Internet resources, and community ASL classes, the families of the Deaf-Plus children have developed widely varying ASL skills. It was not the researchers' intent to evaluate participants' ASL skill levels, but they often talked about this topic, sometimes bemoaning their stalled learning or comparing the skill levels of various people in the family. Other times, they felt proud of the work they had done. Consistent with research about hearing parents of Deaf children, most of the parents struggled to become fluent in ASL (Vacarri & Marschark, 1997), but felt their skill levels adequately met the needs of their children (Wood, 1991). Much of this scholarship casts parents' communication skills in a negative way without highlighting the innovative ways they find to communicate. Instead of using only ASL, these families used a wide range of communication techniques including, but not limited to: Signing, texting, gesturing, drawing, noises, speech, and some type of inexplicable parent-child thought transference. To diminish the triumph of parents and children creating effective communication systems seems to reinforce the subtheme of persistent "doom and gloom."

Communication between parents and children was complicated by more than hearing status. The Deaf-Plus children experienced motor, information processing, and learning delays as well as difficulties with maintaining attention. Nevertheless, it was clear in the research that all parents and their children constructed a unique communication system, which communicated their love and respect of one another. Here lies a theoretically sticky area. Deaf studies scholarship shows that access and exposure to grammatically correct and conceptually accurate ASL (or full access to spoken language) is critical for appropriate linguistic development (Paul, Wang, & Williams, 2013; Strong & Prince, 2000). Some of the children in this study had no friends, sat segregated in special education classrooms without access to language, and lived a life in and out of hospitals. Most of the time, these Deaf-Plus children primarily interacted with only their families. Given the relative social isolation of their children that the parents discussed, the expeditious development of a system of personally meaningful communication that worked for the family may have trumped ideas of "optimal." Parents and children must first establish basic needs of safety and health, which includes the development of a strong parent-child relationship, before working toward the achievement of the child's potential or self-efficacy (McLoed, 2007). Without securing these, the future linguistic outcomes, which the Deaf studies scholarship references may not come into fruition anyway. Rather than viewing multimodal communication systems and formal ASL use as philosophically opposed, it may be that at least for the time being, the parents wisely chose to meet the immediate needs of their families. However, if families become ambivalent about improving family-wide ASL skills, it may have negative impacts on their child's social and intellectual development (Hall, 2017).

Recognizing and acknowledging the limitations of individual educator's, administrator's, child's, medical practitioner's and parent's knowledge or experience was an overarching barrier to developing inclusive, rigorous, and productive educational placements for these Deaf-Plus children. It is problematic that school personnel were unable to adequately consult parents about Deaf-Plus children's educational placements and yet still represented themselves as experts about the education of these children. This follows a scant amount of literature produced about this hard to access topic (Crawford, 2008, Hansuvadha, 2009). The problem lies not just that personnel are underqualified, but in our expectations and casting of who special educators must be. To illustrate this point, as a culture, we don't expect physicians to be experts about every bodily system, even though they attend postsecondary education for numerous years, but we do expect specialized understanding about communication and learning from special education teachers about all disabilities. The Deaf-Plus children in this study had complex support needs, each complicating the other. Parents explained that special educators seemed to select one or a few of those needs to support based on their own knowledge while neglecting the others. They generally saw the children as multiply disabled and focused on this rather

than a holistic and self-affirming Deaf-Plus identity. Consequently, communication and the development of children's Deaf identity was often under-prioritized. This notion of appropriate "casting" may be applied to parents, medical practitioners, and the Deaf-Plus children as well. It is important for educational teams to understand the nature of all constituents' expertise and consider the contributions that each makes to providing a Deaf-Plus child a quality education.

Finally, these findings raise new ideas about the meaning of inclusion for Deaf-Plus children. Consistent with previous literature regarding inclusion for Deaf students (Kent, 2003; Leigh, 1999; Singer & Vroman, 2019), the parents in this study felt that the most inclusive educational environment for their children was a school that met both their linguistic and social needs. In other words, an ASL using school was more inclusive for their children than a mainstream setting. However, inclusion goes beyond access to language and communication. For these children and their families, inclusion meant not always being the lowest student in the class. Instead, their children should be able to contribute academically to the class and other students should be able to learn from their children. Furthermore, inclusion meant that their Deaf-Plus children were valued members of the school community, rather than treated as lesser than their peers. This encompasses but is not limited to: Having their opinions matter, a right to pursue academics, sports, and life skills, and acting in non-normative ways without consequence. These findings build on previous findings by Singer (2019) in that not only should parents consider educational placements that are most supportive, most liberating, and most culturally-sustaining, but also the most academically empowering for their children. Furthermore, IEP teams should value children's opinions about their own education, which may not always occur, especially if the child is considered "severely disabled." Therefore, for these Deaf-Plus children, true inclusion occurs not only when these students are learning and communicating effectively with their teachers, Deaf peers, and Deaf-Plus peers, but also when they are contributors to their school community at-large.

Conclusions

Being a parent of a Deaf-Plus child comes with innumerable challenges including, but not limited to: Negotiating an effective communication method between and among family members, constantly attempting to be optimistic and hopeful in spite of the negative advice often received from medical practitioners, and navigating the various educational placements in order to find the most appropriate setting for the child. One approach to combat the seemingly endless vat of negativity surrounding parenting a Deaf-Plus child is to communicate with other parents about the joys of parenting their Deaf-Plus children. This type of positive interchange of personal anecdotes and advice could be extremely beneficial for all parties involved. Through communicating with other parents of Deaf-Plus children, whether in person or via an online support group, parents can receive guidance and encouragement from people who have a similar set of experiences rather than from an isolated party such as medical practitioners or biased websites.

While some educators have professional training in teaching Deaf or disabled students, it is the parents who are experts in their individual child and his or her needs. Teachers of the Deaf and special educators should aspire to view the parents as an integral component of the educational team. Parents should be included in any and all discussions regarding the Deaf-Plus child's education, because they know their own child's personality, disabilities, peculiarities, competencies, and potential. In doing so, parents are more likely to feel as though they are part of the team rather than adversaries like they did in this study. This could not only strengthen the relationships between educators and parents, but it can also lead to the Deaf-Plus child receiving more appropriate educational supports. In addition, every member of the IEP team, including parents and children, should recognize their individual strengths and weaknesses. In other words, all IEP team members should have a basic understanding of how they can enhance conversations and where their understandings might be limited. Another implication for school districts and social services that arose from this research is language and communication training provided for families of Deaf-Plus children. Parents desperately want to learn the language their child uses, but often found it hard to attend night classes or effectively engage in online resources. If school districts or social services provide training programs for the parents, more effective communication could occur not only between the parents and their Deaf-Plus child but between the parents and the school district as well.

Medical practitioners should strive to ensure there is a positive and humane dialogue regarding Deaf-Plus children. It is critical that parents receive support and encouragement from their doctors and other medical professionals since they are a significant source of information when parents begin the journey of raising a Deaf-Plus child. Parents often automatically trust the advice given from medical practitioners because they are perceived as the experts, especially early in a Deaf-

Plus child's life. When conversations between doctors and parents tend to be pessimistic. It is difficult to change the nature of this discourse once it has begun. It is imperative that medical professionals transform the apathetic, detached rhetoric surrounding Deaf-Plus children to more humane and encouraging discourse. Another implication of this research for medical practitioners is the inclusion of psychological health of the family and child in the treatment plan. Discovering one's child is Deaf and has additional disabilities can be incredibly challenging for a parent both mentally and emotionally. While this primarily affects the parents in the beginning, the Deaf-Plus child is likely to undergo emotional struggles as he or she develops. Identity development and family acclimation should be a part of a total psychological wellness program that accompanies a Deaf-Plus child's treatment plan. The emotional well-being of the families in this study were generally ignored and their stories suggest that they would have benefitted from embedded services.

Future research could include examining how raising a Deaf-Plus child affects roles in parenting. This study represented parents as a unit, but in reality, parents experienced raising their Deaf-Plus children in different ways. Furthermore, the voices of the Deaf-Plus children were not a central component of this research. Heideggerian hermeneutics posits that various realities occur simultaneously, each contributing to an overarching, multifaceted reality. Using this approach to interviews with each member of the family could unearth unique perspectives, which contribute to a whole and complicated understanding of this complex phenomenon. Beyond the roles of parents in families, the roles of Deaf-Plus people in Deaf culture is an under-investigated topic. Broadening research questions to explore the roles of Deaf-Plus people in various contexts would help us further understand how disability is viewed within the Deaf community.

This research provided parents of Deaf-Plus children an opportunity to share their stories and experiences. Through observations, interviews, and analysis, the researchers were able to determine the extent to which external influences affect parents' decision-making regarding language and communication, various strategies families use to ensure effective communication can ensue regardless of varying levels of fluency in a signed language, and the difficulty of determining and attaining an appropriate, inclusive, and productive learning environment for the Deaf-Plus children. The research has provided data to support improving inclusive educational environments for Deaf-Plus children based on their individual characteristics and experiences.

Footnotes

[1] The authors chose to capitalize Deaf when it referred to any person despite cultural affiliation or language use. The term "deaf" is only used when referring to hearing status or medical conditions. In the United States, culturally Deaf people view themselves as a sociolinguistic minority rather than a category of disability.

[2] Parents in the study referred to their children in various ways, but during the focus group, they collectively decided to use the term Deaf-Plus as the identification we employed in the study.

[3] ASL is a complete language with its own set of grammatical rules. Though the criteria specifically stated "ASL," families and children used a broad range of manually-coded English.

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Development of the Child Neglect and Abuse Awareness Scale for Parents and its Relationship with Various Variables

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Abstract

This study aims to develop the Child Neglect and Abuse Awareness Scale for Parents (CNAASP) as well as examine their awareness of the children who attend preschools according to age, gender, educational status, and income status. First, the validity and reliability studies were conducted with 595 parents through the random sampling method. Then, the validity and reliability of the study were completed by using CNAASP to determine whether there was a difference in parental awareness according to the variables of gender, age, education, and income. In this study carried out with 144 parents determined by convenience sampling method, *t*-test and Analysis of Variance (ANOVA) were used in the analysis according to gender variable; Scheffe Test was performed to determine the source of the differences. It was found that there was a significant difference in the mothers' awareness of child neglect and abuse. As a result of the analysis of the income status of the parents, a difference was found in favor of the parents with high-income status in the emotional abuse subscale. As a result of the analysis of the educational status variable of the parents, it was concluded that there was no statistically significant difference.

Keywords:
Child Abuse, Child Neglect, Parent Awareness, Scale Development, CNAASP

Introduction

As development continues, children encounter difficulties that prepare them for life. These include physical skills such as crawling, walking, running, speaking, and writing, as well as many social experiences such as trust, making friends, and building a positive sense of self. There must be reliable adults around the children who will support them in this journey and guide them for healthy development. However, children who lack this support also lack this guidance (Crasson-Tower, 2005).

Bronfenbrenner (1979) highlighted the components of the ecological environment, such as the interaction of

the individual, family, society, and sociocultural environments, and stated that each of these components is involved with and affects one another. The relationship such as home, school or work of the individual is defined as microsystem. The relationship between microsystems defined as mesosystem. The exosystem is described units which has no direct relationship with the individual but affects the development of the individual indirectly. Macrosystem is defined as the cultural and belief units of society. Changes that occur over time and affect the development of the individual are defined as chronosystems (Bronfenbrenner, 1989). In the microsystem, which is a layer of the ecological system approach, the interaction of the child with their parents is important. Parents play an important role in the development of the child and have a great responsibility to protect them from many adversities.

Child neglect and abuse, which are defined as all kinds of maltreatment towards the child, are a universal problem (Gilbert et al., 2009). Killing, crippling, and abandoning the newborn and other forms of violence date back to ancient times. History is full of children who have been raised by the family without sufficient care and nutrition or who have been sexually abused (Polat, 2007). Thus, groups and associations have been established to protect the child's interests and to provide protection. Unfortunately, child abuse was not considered as an important global issue until 1962. Child neglect and abuse were first mentioned by Kempe (1962) in the literature as the "Battered child syndrome." Kempe highlighted the clinical manifestations of physical abuse of the child. Over the years, the number of studies has increased, and child neglect and abuse have become the focus of various disciplines (WHO, 2002).

The studies that started in 1962 continued in the 1970s with studies based on the parent-child relationship. Then, child neglect and abuse began to be seen as a phenomenon originating from multiple reasons - family, environment, culture, mental disorders, and so on (Polat, 2007). Children receive their first education in the family. For this reason, the family plays a major role in the development of a child with a healthy personality, self-esteem, and self-confidence; it provides proper support for the physical, cognitive, and social-emotional development of the child into a beneficial individual for the society. Parents play a vital role in the development and education of their children. The child's interactions with the parents, the parents' own attitudes and parents' exposure to abuse in their childhood, as well as resorting to violence to solve a problem and so on, point to the fact that family is one of the biggest risk factors for child neglect and abuse at the microsystem level (General Information about Child Neglect and Abuse, 2018; Polat, 2007; Crosson-Tower, 2005). Parents' disciplinary methods and attitudes used in raising their children sometimes overlap with abuse behaviors (Akduman et al., 2005). Therefore, the parents need to know what child neglect and abuse behaviors are in order to protect their children and know how to behave when faced with such a situation.

Child neglect and abuse occur mainly in 4 ways. These are physical abuse, emotional abuse, sexual abuse, and neglect (Polat, 2007). Physical abuse is deliberate behavior that causes or can cause physical damage to a child's healthy life and development; it is the most common and most easily identified type of abuse (WHO, 1999). Topçu (2009) stated that children who are exposed to physical abuse have more aggressive behaviors; they approach their peers and adults with less empathy than children who have not experienced abuse. Emotional abuse, which is also a very common form of abuse, is a serious disorder pattern in the provision of favorable and supportive environmental conditions for the child's development by the parent or caregiver (WHO, 1999). Anxiety and unrealistic fears, sleep problems and nightmares, biting, kicking, finger sucking, substance use, attention deficit, and sudden decline in success are symptoms of emotional abuse (Gilgun, 2003). A child being sexually coerced, forced into prostitution, and used as a sexual object in crimes such as pornography is defined as sexual abuse (WHO, 1999). Children exposed to sexual abuse face psychosocial and physical problems both in childhood and adulthood. Sleep disorders, a decline in academic achievement, loneliness, insecurity, fear of sexuality or excessive sexuality, anorexia neurosis, bulimia neurosis, overeating, obsessive-compulsive disorder, alcohol and substance dependence, depression, suicidal tendency are observed (Göbekçin, 2013; Akbaş & Sanberk, 2011). Child neglect is defined as a pattern of inadequacy in providing a child's needs in different areas such as health, education, nutrition, housing, emotional development (WHO, 1999). Physical, emotional, and cognitive disorders are observed in neglected children (Yalçıntaş-Sezgin, 2018). While symptoms such as depression and regression are observed in childhood, during adolescence, they tend to display risky behaviors such as violence, alcohol and substance use, and being dragged into crime. In adulthood, attachment problems, inappropriate problem-solving behaviors, and psychiatric problems are observed (as cited in Yalçıntaş-Sezgin, 2018). Salzinger et al. (1991) found that not only the children who were exposed to abuse but also the children who were exposed to violence and conflicts in the family exhibited aggressive behaviors and that the children raised in these families were inadequate in their ability to solve problems and adapt.

One out of every ten girls in the world is forced to have sexual intercourse or sexual contact, and one out of three girls who married between the ages of 15-19 is subject to physical, emotional, and sexual violence of their spouses (UNICEF, 2015). Three out of ten adults worldwide believe that physical punishment is the most appropriate way to discipline children (UNICEF, 2015). Approximately 126 million girls aged 15-19 say that husbands have the right to beat their wives in certain situations (UNICEF, 2015). In Turkey, 43% of the children aged between 7-18 years in the last year were exposed to physical abuse, while 51%, 3%, and 25% of the children were subject to emotional abuse, sexual abuse, and neglect, respectively (UNICEF, 2010). For this reason, researchers from different disciplines conducted studies on the subject and brought different perspectives to the field. Efforts to identify as well as prevent neglect and abuse have increased. Today, in order to protect the interests of children, lawyers, doctors, nurses, law enforcement forces, social service staff, psychologists, sociologists, child development specialists, and guidance as well as psychological counselors work together and have interdisciplinary cooperation.

Many studies maintain that the negative effects of abuse on children continue not only at the time they experience abuse but throughout their lives (Banyard & Williams, 2007; Fassler et al., 2005; Griffin & Amodeo, 2010; Bulut, 2007; Bulut, 2008; Pelendecioğlu & Bulut, 2009). Abused children may experience emotional stress-related psychological symptoms such as fear, anxiety, nightmares, phobias, depression, guilt, low self-esteem, anger and hostility, eating disorders and substance abuse, anti-social behaviors, sexual incompatibility, low sympathy and empathy skills, attachment problems, suicidal behavior, periods of amnesia, physical symptoms, somatoform symptoms, and reactions associated with dissociative identity disorder in some cases (Ovayolu et al., 2007). Therefore, to protect their children from abuse, parents need to know what abuse is, its symptoms, and its effects on their children (Adalı, 2007). First of all, it must be determined how aware parents are of what abuse is and how they define it, and families should be guided accordingly. In order to eliminate abuse, it is important to identify families' awareness levels of neglect and abuse. However, to make this identification, a comprehensive, valid, and reliable measurement tool is needed. With the help of a measurement tool, the awareness levels of families about child neglect and abuse, about what should be done to prevent this abuse, what the duties and responsibilities of the related institutions are can easily be determined and, in this way, the development of intervention programs and the planning of training sessions can be facilitated.

This study aims to develop an awareness scale for parents about child neglect and abuse. Children are neglected and abused mostly by their immediate environment. For this reason, the family is particularly important in preventing and identifying abuse (Özer, 2014). When the studies aimed at determining awareness about child neglect and abuse are reviewed in detail, it is seen that although not enough, there are awareness scales especially catered to the occupational groups that play an important role in determining child neglect and abuse such as doctors (Demir, 2013), dentists (Kural-Dıraz, 2014), nurses (Uncu, 2013), social service staff (Osan, 2009), police officers (Sarı, 2010), teachers (Sarıbaş, 2013) and other staff of the school (Akgül, 2015). However, as it is known, families have a very important place in determining child neglect and abuse. Due to the lack of an awareness scale for parents, their awareness levels cannot be determined and thus, counseling and guidance studies for parents cannot be conducted. Therefore, in this study, it is thought that developing a scale that determines child neglect and abuse awareness of parents, examining this awareness in terms of variables, identifying the deficiencies of parents, and organizing education programs and supporting studies to increase the awareness of the parents will contribute to the field. The study aims to develop a child neglect and abuse awareness scale for parents and to examine the awareness of parents of early childhood children according to gender, age, educational level, and income status. Many studies have found relationships between child neglect and abuse and variables such as gender, age, educational status, income status (Uslu et al., 2010; Sari, 2010; Kappa & Chan, 2011); in some studies, it was found out that these characteristics of the parents posed a risk (Polat, 2007; Crosson-Tower, 2005). In this study, it was investigated whether there was a statistically significant difference between the parents' gender, age, educational status, and income status.

Method

This descriptive study was conducted in two stages. In the first stage, a scale was developed to measure the awareness of parents about child neglect and abuse. In the second stage, the scores of parents of early childhood children according to various variables were examined.

Participants

In the scale development phase of the study, the study group consists of 595 children (3-6 years old) who attend preschool education institutions affiliated to the Ministry of National Education (MoNE) in the central districts of Ankara province in the 2016-2017 academic year. The stratified sampling method

was used in the scale development stage. Stratified sampling is a sampling method that enables the sub-groups in the universe to be identified and represented in the sample by their proportions in the universe (Büyüköztürk, 2014).

Ankara was accepted as the population and the central districts with the highest population density were determined as strata. Based on the distribution of preschool children attending schools affiliated to MoNE, districts were collected at the same ratio from all districts. The study was conducted with 595 parents due to the lack of empty or incomplete answers on the returning forms, even though 712 parents had initially agreed to participate in the study.

Table 1. *The Stratify Rates of the Sample of Validity and Reliability Study*

District	Number of Participants	Number of Expected Participants	Percentage *(%)*
Çankaya	126	126	21
Yenimahalle	96	96	16
Etimesgut	86	86	14.4
Sincan	65	65	10.8
Keçiören	117	122	20.3
Mamak	65	65	10.8
Altındağ	40	40	6.7
Total	595	600	100

Table 2. *Demographic Information of the Samples of Validity and Reliability Study*

	Groups	Frequency *(n)*	Percentage *(%)*
Gender	Mother	484	81.3
	Father	111	18.7
	Total	595	100.0
Age	20-25	23	3.9
	26-30	123	20.7
	31-35	248	41.7
	36-40	144	24.2
	40 and over	57	9.6
	Total	595	100.0
Level of Education	Middle School or under	42	7.1
	High school graduate	152	25.5
	Collage Graduate	313	52.6
	Postgraduate	88	14.8
	Total	595	100.0
Income Level	0 - 2.000 TRY	92	15.5
	2.000 TRY - 4.000 TRY	191	32.1
	4.000 TRY – 6.000 TRY	146	24.5
	6.000 TRY - 8.000 TRY	84	14.1
	8.000 TRY and more	82	13.8
	Total	595	100.0

In the second stage of the research, after the validity and reliability study, 350 mothers and fathers of children attending preschool education institutions in Çankaya and Altındağ districts of Ankara province in the 2016-2017 academic year were reached using the convenience sampling method. However, 144 data were collected. Convenience sampling is a method aimed at preventing loss of time, money, and effort (Büyüköztürk, 2014). The forms were sent to the families in envelopes and re-collected with closed envelopes.

Table 3. *Demographic Information of the Samples of the Second Phase of the Research*

	Groups	Frequency *(n)*	Percentage *(%)*
Gender	Mother	98	68.1
	Father	46	31.9
	Total	144	100.0
Age	20-25	9	6.3
	26-30	28	19.4
	31-35	34	23.6
	36-40	59	41.0
	40 and over	14	9.7
	Total	144	100.0
Level of Education	Middle School or under	17	11.8
	High school graduate	42	29.2
	Collage Graduate	73	50.7
	Postgraduate	12	8.3
	Total	144	100.0
Income Level	0 - 2.000 TRY	21	14.6
	2.000 TRY - 4.000 TRY	45	31.3
	4.000 TRY – 6.000 TRY	35	24.3
	6.000 TRY - 8.000 TRY	23	16.0
	8.000 TRY and more	20	13.9
	Total	144	100.0

Data Collection Tool

For data collection, an information form including personal information about the parents was prepared. The other data collection tool, Child Neglect and Abuse Awareness Scale for Parents (CNAASP), was developed by the researcher. There were 31 scale items written as inverse items, which formed in such a way that they were reversed and scored. The scale consists of a 5-point Likert type (1-strongly disagree, 2-disagree, 3-undecided, 4-agree, 5-strongly agree) and includes 45 items. The scale has 5 sub-dimensions namely General Information Sub-Dimension (12 items), Physical Abuse Sub-Dimension (6 items), Emotional Abuse Sub-Dimension (15 items), Sexual Abuse Sub-Dimension (8 items), Neglect Sub-Dimension (4 items). The high total score determined from adding all the sub-dimensions shows that the awareness of child neglect and abuse is high. As the scale is not

standardized, scores are evaluated between 1 and 5. Since this range has a width of 4 points, this width is calculated by dividing it into 5 equal widths.

Table 4. *Participation Level Range and Interpretations*

Participation Level	Range	Interpretation
1	1.00- 1.79	Very Low
2	1.80- 2.59	Low
3	2.60- 3.39	Medium
4	3.40-4.19	High
5	4.20-5.00	Very High

Data Collection Process

Necessary ethical permissions were obtained from the Hacettepe University Ethics Commission and the MoNE. The parents who were willing to participate in the study were sent the forms in a sealed envelope with the help of the teachers, and the forms that were returned a week later were collected. In order to determine the invariance of the scale over time, forms were re-sent to 24 volunteer parents for test-retest analysis at 2-week intervals and analyzed with the data returned. After completing the validity and reliability study of the scale, necessary analyses were performed on the forms sent to the volunteer parents to examine their awareness of child neglect and abuse according to some variables for the other stage of the research.

Data Analysis

In the first stage of the data analysis, construct validity was tested through item analysis, item-total correlation, and exploratory factor analysis (EFA); for content validity, the Content Validity Ratio (CVR) and Content Validity Index (CVI) were used. The reliability was determined by the re-test and internal consistency coefficient. EFA is used to determine whether the underlying factor of the data is sufficient for a hypothesis and to determine the number of factors. Confirmatory factor analysis (CFA) is a model that tests theory rather than a model that produces theory (Doğan et al., 2017). While EFA is used for scale development and structure validation, CFA is used when building the structure with previous experimental and theoretical foundations (Brown, 2006).

In the study, independent samples *t*-test and one-way analysis of variance (ANOVA) were used to determine the relationship between the parental awareness of neglect and abuse with various variables, and the Scheffe test was used to find the source of the differences. In the analysis, the level of significance was accepted as .05.

Results

In this section, first, the findings of the scale development, and then, the findings of whether there is a significant difference in the mean scores of parental awareness obtained from CNAASP depending on some variables are presented.

Validity

During the development of the measurement tool, the literature was reviewed and an item pool was created. While constructing the items, it was taken into account that they did not contain factual expressions; thus, a simple language was used and the items did not contain more than one judgment and two negative expressions (Tezbaşaran, 1996). For content validity, changes were made by consulting a language expert and an assessment and evaluation expert, and then, the opinions of one social service specialist, one psychologist, two guidance and psychological counseling specialists, and five preschool education experts were obtained.

Since number of the experts was 9, minimum value of the CRV was accepted as .75 based on the criteria determined by Veneziano and Hooper (1997). The CVI was then calculated for all items and it was found to be .92. The scale validity was found to be statistically significant as CVI> CVR. Afterward, during the pilot study, the scale was applied to 20 parents whose children were attending pre-schools, and the comprehensibility of the items was confirmed. The final version of the scale included 60 items.

As a result of Bartlett's test (p= .000< .05), it was found that there was a relationship between the variables included in factor analysis, and with the Kaiser-Meyer-Olkin (KMO) calculation (KMO= .82> .60), the sample size was found to be sufficient for factor analysis. The KMO value for each sub-dimension was found to be quite high considering the acceptable limit of .50 (Field, 2013). As a result, the factor loadings of the five factors formed as a result of the factor analysis on the scale varied between .51 and .90. The EFA, which helps to make sense of the items as a whole and to gather the items that serve the same purpose together, is performed for the construct validity of the scale. If there is a cluster of items that has a high level of relationship with a factor, it means that those items measure a concept together (Büyüköztürk, 2002).

In factor analysis, the varimax method was chosen and, in this way, the structure of the relationship between the factors remained the same. Rennie (1997) suggests that the researcher should use the vertical rotation method if they are interested in the

generalizability of the results. It is also recommended the use of vertical rotation as the vertical rotation and oblique rotation results do not make a significant difference between each other and facilitate the interpretation of the vertical rotation results. Although there are 3 types of vertical rotation, the varimax method is recommended because it distinguishes the factors more clearly (Şencan, 2005).

As a result of the factor analysis, it was seen that the variables grouped under 5 factors, which explained 43.04% of the total variance. Considering the items in the scale, the factors were defined as General information (e.g., "Although child abuse and neglect should not be experienced at all, the child may not be right all the time"), Physical Abuse (e.g., "Under no circumstances children should be exposed to violence"), Emotional Abuse (e.g., "Children learn better to behave correctly when they are compared to their peers"), Sexual Abuse (e.g., "The rate of exposure to sexual abuse varies according to the gender of children"), and Neglect (e.g., "Even if they are younger than 12 years of age, children can stay alone in their own homes if necessary").

The factor loadings of the General Information Sub-Scale (12 items) ranged between .55 and .62, while the factor loadings of the Physical Abuse Sub-Scale (6 items) ranged from .50 to .80. The factor loadings of Emotional Abuse Sub-Scale (15 items), the Sexual Abuse Sub-Scale (8 items), and the Neglect Sub-Scale (4 items) ranged from .55 to .81, .59 to .67, and .82 to .89, respectively (Table 5). Büyüköztürk (2007) argued that the factor loadings of 0.45 or higher would be a good measure. It is accepted that it is sufficient if the variance explained in the scale development studies conducted in social sciences is between 40-60% (Tavşancıl, 2014). Bartlett Sphericity test results of factor analysis showed that p= .00 (p< .05), which meant that the data was suitable for factor analysis (Pett et al., 2003).

Reliability

For the reliability of the scale, total item correlation, Cronbach's alpha internal consistency coefficient, and the test-retest reliability coefficient were calculated. Total item correlation shows the internal consistency reliability of the scale as a result of the calculation of the correlation between the total scores of the scale and the scores for each item.

Table 5. *Factor Loadings of CNAASP*

Items	General Information	Physical Abuse	Emotional Abuse	Sexual Abuse	Neglect
M3	.62				
M8	.58				
M9	.57				
M10	.57				
M27	.56				
M28	.62				
M32	.63				
M39	.59				
M46	.55				
M48	.59				
M54	.56				
M56	.55				
M19		.80			
M23		.79			
M30		.77			
M41		.60			
M49		.66			
M55		.50			
M15			.81		
M20			.79		
M24			.73		
M29			.70		
M31			.69		
M33			.60		
M35			.60		
M36			.58		
M37			.55		
M40			.55		
M43			.57		
M44			.61		
M50			.55		
M53			.55		
M59			.59		
M11				.67	
M13				.66	
M18				.65	
M21				.62	
M23				.66	
M45				.61	
M51				.60	
M57				.59	
M22					.89
M26					.89
M42					.86
M52					.82

Table 6. *Total Item Correlation*

	General Information	Physical Abuse	Emotional Abuse	Sexual Abuse	Neglect
Items	Total Item	Correlation			
M3	.70				
M8	.59				
M9	.76				
M10	.79				
M27	.79				
M28	.55				
M32	.61				
M39	.59				
M46	.77				
M48	.72				
M54	.58				
M56	.58				
M19		.95			
M23		.96			
M30		.88			
M41		.89			
M49		.72			
M55		.79			
M15			.53		
M20			.51		
M24			.52		
M29			.79		
M31			.52		
M33			.99		
M35			.97		
M36			.93		
M37			.95		
M40			.89		
M43			.78		
M44			.84		
M50			.84		
M53			.81		
M59			.88		
M11				.67	
M13				.77	
M18				.79	
M21				.66	
M23				.55	
M45				.61	
M51				.80	
M57				.57	
M22					.56
M26					.59
M42					.61
M52					.59

Büyüköztürk (2007) states that items with a total correlation of .30 and higher can accurately differentiate between individuals, whereas Tavşancıl (2014) argues that when this limit is higher than .40, more accurate results are reached. In this context, it was decided that the total item correlation value would be .50 and above because high total item correlation is a sign of better distinguishing the items of the scale, and the scale provides a more robust structure upon request; thus, 15 items were excluded from the scale as their correlation value was lower than .50. As a result, 45 items were included in the final version of the scale. The EFA of the scale was conducted on those 45 items.

As a result of item analysis, it was seen that when the total item correlation value and item factor loadings are considered, the values were compatible with the values in the literature (Tables 5 and 6), meaning that the scale is valid.

For the test-retest reliability study of the scale, 24 parents were identified after the first application and the second application, which was performed 2 weeks later. The time between the two applications should be short enough not to change the measured characteristics of the individuals and long enough not to affect the scores (Büyüköztürk et al., 2009). The Pearson Product Moment Correlation Coefficient was calculated for the obtained data. The test-retest correlation coefficient of the scale was calculated as 0.80, which was expected to be at least .70 (Tavşancıl, 2014). As it was .80, the scale was found to be invariant to time.

Table 7. *Internal Consistency Reliability Coefficients of CNAASP*

	Internal Consistency
General Information	.66
Physical Abuse	.80
Emotional Abuse	.86
Sexual Abuse	.80
Neglect	.90
CNAASP	.80

According to the table, the internal consistency coefficient (Cronbach Alpha) of the 45-item CNAASP was found to be .80. The internal consistency coefficients of the sub-dimensions were found to be .66 for the General Information subscale, .80 for the Physical Abuse sub-dimension, .86 for the Emotional Abuse sub-dimension, .80 for the Sexual Abuse sub-dimension, and .90 for the Neglect sub-dimension ($p<$ .01). As a result of both analyses, reliability coefficients show that the scale is reliable.

Following the findings of the scale development, in the second stage of the study, the findings as to whether the mean scores obtained by the parents of early childhood children ages between 3-6 (*n*= 144) from the scale are affected by some variables are given.

Child neglect and abuse awareness scores of the parents of children in the early childhood period showed statistically significant differences according to their parental status ($t_{(144)}$= -2.1; *p*= .03< .05). The mothers' awareness scores were higher than those of the fathers (Table 8).

The findings as to whether the parents' neglect and abuse awareness scores show a significant difference according to their income level are given below.

The mean emotional abuse awareness scores of the parents who participated in the study were found to be significant according to the family income level (*F*= 2.7; *p*= .03< .05). In order to determine the sources of the differences, the Scheffe Test, one of the complementary post hoc analyses, was performed. The emotional abuse awareness scores of parents with an income level of 6.000 TRY – 8.000 TRY (2.62 ± .36) were found to be higher than that of parents with an income level of 0 – 2.000 TRY (2.3 ± .36). The emotional abuse awareness scores (2.62 ± .33) of those with a family income of TRY 8.000 or more were higher than that of those with a family income of TRY 0 – 2.000 (2.32 ± .36). (Table 9)

The findings as to whether parental awareness of child neglect and abuse differ significantly according to the age of the parents are given below.

The awareness levels of the parents in the study showed a statistically significant difference according to age (*F*= 3.4; *p*= .010< .05). According to the Scheffe Test conducted to determine the sources of the differences, child abuse and neglect awareness level of those aged 36-40 were found to be higher than those aged 26-30. Also, when the sub-dimensions are examined, it is seen that their awareness of emotional abuse and neglect shows a significant difference according to the age variable. It is observed that the emotional abuse awareness level of those aged 20-25 years is higher than other age groups, but as far as the neglect sub-dimension is concerned, those aged 40 and over have a higher level of neglect awareness. (Table 10)

The study revealed no statistically significant difference between parents' education level and child abuse and neglect awareness. (Table 11)

Discussion

Büyüköztürk (2007) maintains that the factor loadings of .45 or higher would be a good measure. Following the total item correlation calculations, it was seen that the factor loadings of the remaining items varied between .50 and .90. As a result of the item analysis, considering the total item correlation and item factor loadings, it was concluded that the scale developed within the scope of the study was valid because the values were in line with the values in the literature.
According to Kalaycı's (2010) Cronbach's Alpha Coefficient value interpretation, the reliability coefficients of the subscales were calculated as .65 (General Information Sub-Scale; fairly reliable), .80 (Physical Abuse Sub-Scale; fairly reliable), .85 (Emotional Abuse Sub-Scale; highly reliable), .80 (Sexual Abuse Sub-Scale; fairly reliable), and .90 (Neglect Sub-Scale; highly reliable). The Cronbach's Alpha reliability coefficient of the 45-item CNAASP was found to be .81, meaning that the scale overall is highly reliable.

When the differences in the awareness scores of the parents were taken into consideration based on gender, it was found that the awareness scores of the mothers were higher than those of the fathers, meaning that there was a significant difference in favor of the mothers. This may be explained by the fact that mothers play a primary role in child care. Studies have argued that healthy mother-child

Table 8. *t-Test Results for CNAASP Scores by Gender*

		n	*M*	*sd*	*t*	*p*
CNAASP	Mother	98	2.82	.22	-2.13	.03*
	Father	46	2.74	.16		
General Information	Mother	98	2.60	.33	-.05	.95
	Father	46	2.61	.26		
Physical Abuse	Mother	98	3.11	.52	-1.98	.03*
	Father	46	2.93	.43		
Emotional Abuse	Mother	98	2.64	.33	5.95	.000*
	Father	46	2.29	.33		
Sexual Abuse	Mother	98	2.94	.39	-2.14	.03*
	Father	46	2.79	.37		
Neglect	Mother	98	3.14	.58	-4.18	.000*
	Father	46	2.72	.48		

*p< .05

Table 9. *One-way ANOVA Test Results for the CNAASP Scores According to Income level*

		n	*M*	*sd*	*F*	*p*	Difference
CNAASP	0 - 2.000 TRY	21	2.73	.23	.40	.80	
	2.000 TRY - 4.000 TRY	45	2.75	.19			
	4.000 TRY - 6.000 TRY	35	2.76	.19			
	6.000 TRY - 8.000 TRY	23	2.80	.21			
	8.000 TRY and more	20	2.78	.24			
General Information	0 - 2.000 TRY	21	2.55	.29	.24	.91	
	2.000 TRY - 4.000 TRY	45	2.60	.26			
	4.000 TRY - 6.000 TRY	35	2.61	.39			
	6.000 TRY - 8.000 TRY	23	2.62	.29			
	8.000 TRY and more	20	2.64	.33			
Physical Abuse	0 - 2.000 TRY	21	3.03	.45	.32	.86	
	2.000 TRY - 4.000 TRY	45	2.93	.51			
	4.000 TRY - 6.000 TRY	35	3.05	.50			
	6.000 TRY - 8.000 TRY	23	2.97	.47			
	8.000 TRY and more	20	2.99	.59			
Emotional Abuse	0 - 2.000 TRY	21	2.32	.36	2.74	.03*	4> 1 5> 1
	2.000 TRY - 4.000 TRY	45	2.50	.38			
	4.000 TRY - 6.000 TRY	35	2.59	.34			
	6.000 TRY - 8.000 TRY	23	2.62	.36			
	8.000 TRY and more	20	2.62	.33			
Sexual Abuse	0 - 2.000 TRY	21	2.85	.36	.38	.82	
	2.000 TRY - 4.000 TRY	45	2.85	.41			
	4.000 TRY - 6.000 TRY	35	2.80	.40			
	6.000 TRY - 8.000 TRY	23	2.90	.34			
	8.000 TRY and more	20	2.76	.42			
Neglect	0 - 2.000 TRY	21	2.91	.58	.31	.86	
	2.000 TRY - 4.000 TRY	45	2.86	.63			
	4.000 TRY - 6.000 TRY	35	2.76	.60			
	6.000 TRY - 8.000 TRY	23	2.90	.57			
	8.000 TRY and more	20	2.88	.49			

*p< .05

interaction and communication can reduce child neglect and abuse. The importance of mothers in their children's lives was supported by these studies as well. Therefore, the mothers' higher levels of awareness of child neglect and abuse compared to those of the fathers can be attributed to this fact.

The study conducted by Sarı (2010) investigated the physical abuse potential of the parents working for the police forces and it was found that the abuse potential was low in this group. In addition, it was concluded that the abuse potential scores of the mothers were lower than the fathers. Based on this, it can be considered that families with low physical abuse potential have a high awareness of physical abuse. The findings of our study are similar to those of Sarı (2010). Furthermore, in their study, Uslu et al. (2010) also found that mothers' emotional abuse awareness was higher than that of fathers. Also, Asla et al. (2011) revealed that the mothers' awareness is higher than that of the fathers when the physical abuse awareness of parents with high potential of abuse is examined. It can be said that these findings are also similar to the findings of our study.

As a result of this study, it was concluded that the awareness scores of the parents with high-income levels and the awareness scores of the parents with low-income levels did not differ. However, when the averages of the scores are examined, it is seen that as income level increases, the mean awareness scores also increase. At the same time, it was observed that in the emotional abuse subscale, there was an increase in the mean awareness scores as the income level increased, and the emotional abuse awareness of the families with an income of 6.000-8.000 TRY and 8.000 TRY and more was found to be higher than those with 0-2.000 TL income level. The reason for this is that as the parents' income level increases, there seems to be more access to information and thus, parents can support their personal development more. The results of our study coincide with those of Uslu et al. (2010), who also stated that families with low income have low awareness of emotional abuse. However, in the study by Cappa and Khan (2011), no statistically significant difference was found when the income levels of the mothers of the children who were and were not exposed to physical abuse were compared. Studies have argued that as the income level of the

Table 10. *One-Way ANOVA Test Results for the CNAASP Level by Age*

		n	*M*	*sd*	*F*	*p*	Difference
CNAASP	20-25	9	2.63	.30	3.4	.01*	4>2
	26-30	28	2.69	.24			
	31-35	34	2.74	.19			
	36-40	59	2.82	.18			
	40 and over	14	2.80	.12			
General Information	20-25	9	2.50	.38	1.38	.24	
	26-30	28	2.56	.39			
	31-35	34	2.54	.31			
	36-40	59	2.66	.26			
	40 and over	14	2.66	.27			
Physical Abuse	20-25	9	2.74	.68	.73	.56	
	26-30	28	2.95	.56			
	31-35	34	3.02	.52			
	36-40	59	3.02	.45			
	40 and over	14	3.04	.38			
Emotional Abuse	20-25	9	2.88	.44	6.07	.000*	1> 5 1> 4 2> 5
	26-30	28	2.69	.28			
	31-35	34	2.53	.37			
	36-40	59	2.46	.35			
	40 and over	14	2.28	.31			
Sexual Abuse	20-25	9	2.75	.12	1.19	.31	
	26-30	28	2.71	.49			
	31-35	34	2.83	.40			
	36-40	59	2.90	.37			
	40 and over	14	2.86	.29			
Neglect	20-25	9	2.27	.52	8.75	.000*	4> 1 5> 1 4> 2 5> 2
	26-30	28	2.55	.55			
	31-35	34	2.76	.57			
	36-40	59	3.06	.53			
	40 and over	14	3.17	.30			

*$p < .05$

family decreases, financial stress increases, which is related to the behavioral problems in children and that such families are more prone to abuse their children (Liu & Merritt, 2018; Maguire-Jack & Negash, 2016; Warren & Font, 2015). Furthermore, Burlaka et al., (2017) concluded that the high-income of the family increases positive parental behavior while reducing the negative behaviors (physical punishment, inconsistent parenting, and poor supervision).

The current study also revealed that the awareness scores of the parents between the ages of 26-30 were lower than that of the parents between the ages of 36-40 and there was a significant difference between them. Given that having a child at an early age increases the potential of child abuse, it is thought that this is the reason for the increase in awareness level as the age increases. However, in the emotional abuse subscale, it was concluded that the emotional abuse awareness scores of the parents between the ages of 20-30 were higher than the others. This means that young parents adopt more democratic parental attitudes than changing parental attitudes and this may be the reason for the difference. The findings of the study are similar to those of Uslu et al.'s (2010) study, which explained that having a child at an early age is one of the reasons for the low awareness of emotional abuse.

Our study also examined whether there was a relationship between the parents' educational status and awareness scores. It was concluded that there was no statistically significant difference. In the Turkish education system, generally, no training is provided on child neglect and abuse, and even if training is given, it is insufficient. Other than families, the teachers spend most of the time with children. However, even in the education faculties of universities, there is no compulsory child neglect and abuse course. The fact that there is no difference in awareness scores based on the educational level can be attributed to the fact that regardless of their educational background, no parents can receive any training for child neglect and abuse. The findings of this study are similar to those of Cappa and Khan (2011), who compared the educational status of mothers of children who were exposed to physical abuse and that of mothers of children who were not exposed to physical abuse,

Table 11. *One-Way ANOVA Test Results for the CNAASP Level by Education*

		n	*M*	*sd*	*F*	*p*
CNAASP	Middle School or under	17	2.73	.23	.80	.49
	High school graduate	42	2.73	.21		
	Collage Graduate	73	2.78	.20		
	Postgraduate	12	2.79	.18		
General Information	Middle School or under	17	2.72	.31	1.30	.27
	High school graduate	42	2.63	.29		
	Collage Graduate	73	2.57	.32		
	Postgraduate	12	2.53	.29		
Physical Abuse	Middle School or under	17	3.00	.45	2.40	.07
	High school graduate	42	2.83	.42		
	Collage Graduate	73	3.05	.55		
	Postgraduate	12	3.18	.37		
Emotional Abuse	Middle School or under	17	2.41	.30	.81	.48
	High school graduate	42	2.57	.41		
	Collage Graduate	73	2.54	.35		
	Postgraduate	12	2.48	.37		
Sexual Abuse	Middle School or under	17	2.74	.46	.49	.68
	High school graduate	42	2.84	.38		
	Collage Graduate	73	2.84	.39		
	Postgraduate	12	2.91	.38		
Neglect	Middle School or under	17	2.77	.64	.62	.60
	High school graduate	42	2.77	.63		
	Collage Graduate	73	2.92	.55		
	Postgraduate	12	2.85	.51		

*p< .05

and found no statistically significant difference between the two groups, arguing that being exposed to physical abuse is not related to the mothers' educational level. After the implementation program they employed, Chavis et al. (2013) concluded that there was no change in the attitudes of parents, who received a university education, toward beating as a disciplinary method and the scores obtained from the scale suggest that they are more prone to physical abuse than the parents who have high school or lower education degrees. In another study, Liel et al. (2019) concluded that the higher educational level of parents decreases the potential for child abuse. Also, Miragoli et al. (2015) emphasized that the fathers, who graduated from a university, had less child abuse potential than fathers with a high school or lower education degree. Burlaka et al. (2017) concluded that the higher education status of parents increases positive parental behavior and reduces negative parental behavior (physical punishment, inconsistent parenting, and poor supervision).

Conclusion

As a result of this study, a scale was developed to measure parental awareness levels about child neglect and abuse. A Likert-type scale form was distributed to the families of children attending preschools, and the validity and reliability studies of the scale were conducted in the light of the collected data. The scale, which was finalized based on expert opinions, was subject to exploratory factor analysis, and the items with equal loadings were removed from the scale. Item analysis and factor analysis were conducted and the items with an item correlation value below 0.50 (a total of 15 items) were removed from the scale.

Bartlett's test (p= .000 < .05) revealed that there was a relationship between the variables, and as the calculated KMO value was .824> .60, it was concluded that the sample size was suitable for factor analysis. As a result of factor analysis, the variance explained was found to be 43.04%, and a total of 5 factors emerged. The Cronbach's alpha reliability coefficient of the 45-item scale was calculated as .81. The reliability coefficients of the subscales were calculated as .65 (General Information Sub-Scale), .80 (Physical Abuse Sub-Scale), .85 (Emotional Abuse Sub-Scale), .80 (Sexual Abuse Sub-Scale), and .90 (Neglect Sub-Scale). In light of this information, it was concluded that CNAASP is a valid and reliable scale.

After the validity and reliability tests of the scale, the awareness of the parents was evaluated based on different variables. The general awareness level of the parents was found to be low-medium. It was examined whether there was a difference in the awareness scores of the parents according to gender and it was concluded that the awareness scores of the mothers were higher than those of the fathers. It was also examined whether there was a difference in

the awareness scores of the parents according to their income status and it was concluded that the mean awareness scores increased as the family income level increased. Whether the age of the parents made a difference in awareness scores was also investigated, and it was seen that the participants in the 36-40 age group had higher levels of awareness than the participants in the 26-30 age group. Furthermore, it was examined whether there was a difference in the awareness scores of the parents according to their educational level, and no significant difference was found between the groups.

Recommendations

This research is limited only to the province of Ankara. The second stage of the study is limited to the small sample group since it is studied with the appropriate sampling method. The generalizability of the CNAASP can be done by collecting data a larger sample from different cities of Turkey. As a result of the literature review, it was found that studies on child neglect and abuse awareness towards parents were insufficient. In order to overcome this deficiency, it is strongly recommended to conduct academic studies on parental awareness. Standardization of CNAASP is recommended to determine whether parental awareness is low or high. Once the scale becomes a standard, the parental awareness level can be more clearly determined. In this study, only parents of preschool children were studied. A validity-reliability study would be appropriate for the sample group of parents who have children ages between 0-18. In this study, the variables of age, gender, education, and income status of the parents were examined; however, different variables can be examined in future studies. The differences between the parental awareness of the variables discussed in this study can be examined in more detail with the qualitative research method and the reasons for these differences can be revealed.

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Sixth-Grade Students' Procedural and Conceptual Understandings of Division Operation in a Real-Life Context

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Abstract

This study aimed to reveal the conceptual and operational conceptions of sixth-grade students in the process of division. The focus of the study included the strategies used in the division process, the students' understanding of the division algorithm, and their ability to interpret the remainder in a real-life context. Being qualitative in nature, the current study adopted the case study methodology. The sample of the study consisted of 64 sixth-grade students studying at two middle schools in the province of Kastamonu, Turkey in the 2018-2019 academic year. The data collection tool was a test consisting of five open-ended questions presented to the students. According to the research findings, while most of the students used the division operation in problem-solving, some students used different strategies, such as multiplication, addition, subtraction, and mental calculation. The majority of the students using the division algorithm were successful in applying the steps of the division operation but had difficulty in interpreting the remainder. In this research, it was also seen that the students had difficulties regarding the use of zero as a placeholder in the division operation. The students also encountered more difficulty in the division problems requiring the use of zeros in the last digits of the quotient than using zeros in other digits of the quotient.

Keywords:
The Concept of Division, Conceptual Knowledge, Interpretation of The Remainder, Operational Knowledge, Problem-Solving

Introduction

Mathematics subjects have a strong sequential structure due to the consecutive and cumulative structure of mathematics (Altun, 2015). Learning new subjects is related to previously acquired skills (Önal & Aydın, 2018). The four operations of consecutive addition, subtraction, multiplication, and division comprise one of the basic skills and are very important in the mathematics learning process (Ev-Çimen & Tat, 2018). Learning this skill without errors affects the future learning experiences of individuals, and therefore it is important to identify and eliminate misconceptions and errors related to this skill at an early stage (Yorulmaz, 2018).

The four operations should be carried out in a specific order (Haskell, Pillay & Steinhorn, 2000). Many students and teachers have difficulty in understanding the concept of division (Horton, 2007). Capps (1962) stated that regardless of which method was used, some arithmetic operations were more difficult to teach to children than other operations, and he emphasized that it was generally accepted that the most difficult of the four basic processes was division. Even if the numbers are small, the division process is more difficult for students (Brown, 1981).

Cornu (1991) suggested that students might have difficulty in understanding the concepts and adopt misconceptions which can be categorized as based on epistemological, psychological, and pedagogical aspects. Epistemological difficulties arise from the nature of the concept itself. From this point of view, the concept of division difficulty is related not only to two different procedures, such as being fragmented on grouped division but also the necessity of multiplication, addition, and subtraction as well as estimation in the process (Anghileri, 2001; Camos & Baumer, 2015). Division is introduced to children as an arithmetic operation based on the prior knowledge of addition, subtraction, and multiplication (Parmar, 2003). Therefore, how well children learned the previous algorithms can affect their performance in division (Robinson, Arbuthnott, Rose, McCarron, Globa, & Phonexay, 2006). When using the division algorithm, students must consider the maximum number that will produce a result equal to or less than the size represented by the corresponding digits in the division, and finding the maximum possible product is almost always an obstacle for children who may not be aware of the virtual product (Leung, Wong, & Pang, 2006). According to Lee (2007), the traditional division algorithm is a known example that students have difficulty in understanding because of their differences in other algorithms. Unlike other processes in this algorithm, the division process starts from the left or the big digit (Fuson, 2003; VanDe Walle, 2001). Besides, even though division and multiplication are inverses, the use of the remainder makes division much more difficult than multiplication (Pope, 2012).

Cornu (1991) referred to pedagogical difficulty commenting on the problems experienced by students which can be caused by the teaching method and the content. Although the division process has been taught in schools since the elementary years, the conceptual aspects of the division process and the mathematical meaning underlying the process is not taught to the students (Silver & Burkett, 1994); thus a student can undertake division correctly without knowing the basic meaning of division (Leung et al., 2006). In general, procedural instruction leaves behind the concepts of digit value in the previous processes (Martin Jr, 2009); therefore, students cannot make sense of the process (Sarwadi & Shahrill, 2014). Kamii and Dominick (1997) emphasized that stereotyped algorithm teaching and overemphasis on this method restricted increasing students' understanding of number relations. Also, Khan (2004) stated that overemphasis on algorithm memorization techniques made it difficult for students to think about the problem and check the appropriateness of their solutions. In his study, Ebby (2005) stated that rote algorithms prevented children from understanding the concept of digit value and more generally the development of the sense of number. When this sense does not develop, the general understanding of numbers and transactions cannot be applied in flexible ways to develop useful strategies (McIntosh, Reys, & Reys, 1992). Many children constantly perform the subtraction and division of numbers throughout the process, but they do not know the reason why they perform subtraction in a certain order (Leung et al., 2006). For example, while they write the remainder of the ones digit in the first step, they move to the tens digit in the second step (Leung et al., 2006). The subtraction in the division process is not complete because the role of the other digits is neglected; thus, this subtraction surprises the students concerning the digit value (Leung et al., 2006).

Knowing what to do with the rest of the questions that require division is also a key element of generating a solution to the problem (Horton, 2007). The correct solution of residual division problems requires not only the correct execution of a division calculation, but also the correct interpretation of the calculation results according to a particular problem situation (Cai & Silver, 1995; Silver, Shapiro, & Deutsch, 1993). Depending on the problem situation, the remainder may need to be expressed as integers, fractions, or decimals (Horton, 2007). One of the biggest problems with division, according to Pope (2012), is to interpret the answer if the calculation result is not an integer. The successful interpretation of the remainder of the process depends on the understanding of the content and the quantities given, and the process for the solution can serve as a computational model for each problem case with different answers. For example, Silver, Mukhopadhyay and Gabriele (1992) identified the following three types of questions that could be solved using the same division process based on the statement: "Mary has 100 cakes to put in containers, each with 40 cakes. (1) How many containers can be filled? (2) How many containers should be used for all cakes? (3) How many cakes remain after filling the container as much as possible?"

Silver et al. (1992) listed the problem situations that could be related to the same division process as follows:

a) augmented-quotient problem situations, where it is necessary to increase the quotient if a remainder occurs in the calculation.

b) Quotient-only problem situations, where the right approach is to ignore the remainder.

c) remainder-only problem situations, where it is necessary to provide only the remainder as the solution, and

d) quotient-part situations, where a portion of the remaining components including factors and conditions is required to provide a single solution. For example, 13.5 (or 13½) structures are given as an answer.

An understanding that has not developed the concepts of the division process sufficiently leads to unrealistic answers; i.e., conceptual obstacles (Greer, 1992; Silver et al., 1993), followed by unquestioning responses (Simon 1993). That is, the meaning in the context of a problem needs to be correctly evaluated and coordinated with the process. In their studies, Silver et al. (1993) reported that a successful solver who encountered a problem condition involving a splitting process returned the result of the transaction to the problem state and problem representation after performing the problem-related process and that the appropriate response to the relevant state and expression could only be generated at the end of this process (Figure 1).

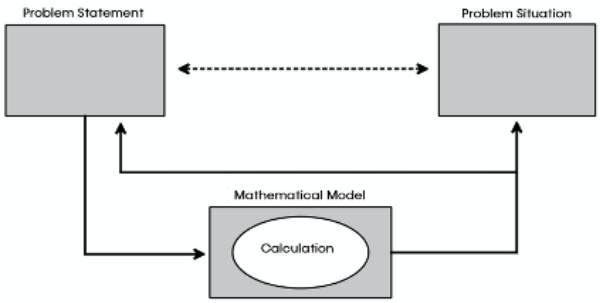


Figure 1. Schematic presentation of the correct solution of the division problem (Silver et al., 1993).

Silver (1988) and Silver et al. (1992) examined the performance of students in the types of division problems (e.g., augmented-quotient problems, remainder-only problems, and quotient-only problems). In particular, it was found that students can successfully be passed from the problem text to a mathematical model (division calculation), made the calculation correctly, but could not return to the problem story. In this respect, the wrong answers were given regarding the problem situations presented. Rodríguez, Lago, Hernández, Jiménez, Guerrero and Caballero (2009) emphasized that when students did not understand the problem, they provided answers that focused on the algorithm or the superficial knowledge of the problem.

Various studies are presenting the strategies used for division operations (Leung et al., 2006; Robinson, Arbuthnott, & Gibbons, 2002; Robinson et al., 2006; Silver et al., 1993), as well as those that are related to the level of procedural-conceptual knowledge and reasoning skills for the concept of division (Ball, 1990; Ev-Çimen & Tat, 2018; Horton, 2007; Kaasila, Pehkonen & Hellinen, 2010; Lamb & Booker 2004; Simon 1993; Yenilmez & Dere, 2018). Horton (2007) propose some strategies for solving division problems including long division, multiplication, and repeated addition/subtraction. Long division is the method used most often to solve basic division problems, especially when dealing with numbers of two digits or more; multiplication reverses the process and requires working backwards towards the solution; the process of repeated subtraction involves beginning with the dividend and subtracting while repeated addition involves repeatedly adding the divisor multiple times until the divided is reached (Horton, 2007, p. 18). Besides using above strategies to attain the solutions in the division problems, the general understanding of division consists of remembering the rules and that few people can give mathematical explanations with the underlying basic principles and meanings (Ball, 1990; Horton, 2007; Kaasila et al., 2010).

In Turkey, studies on procedural and conceptual knowledge and reasoning skills are quite limited (Baki & Bütün, 2009; Baki, 2013; Yenilmez & Dere, 2018; Ev-Çimen & Tat, 2018; Işık, Kar, Işık & Albayrak, 2012; Varol & Kubanç, 2015). The study conducted by Yenilmez and Dere (2018) revealed that the students were inadequate in interpreting their answers and accepted the quotient as an answer by ignoring the remainder in the division process. Besides, in a study by Varol and Kubanç (2015), it was observed that the students started the division process from the right (ones digit) by generalizing the rule applied to addition, subtraction, and multiplication. As with the addition and subtraction processes, it is a common problem for students to generalize the rule of conducting transactions between units and units, tens and tens digit into the division process. In another study, Baki (2013) reported that a significant number of the prospective classroom teachers did not understand the mathematical meaning of the algorithm related to the digit concept of the division process and their instructional explanations were insufficient. In an earlier study conducted by Baki and Bütün (2009) with mathematics teachers, it was found that the teachers did not emphasize the different meanings of the division concept and tried to teach the concept of division by rule and operation axis. The current study is important in terms of revealing the students' operational-conceptual knowledge of the division process, the strategies used, and the reasoning skills of the students. In this respect, it is considered to contribute to the related literature.

Purpose of the Research

The aim of this study was to reveal the conceptual and procedural understanding of sixth-grade students in the

division process. In this context, the study focused on the strategies used in the division process, the students' understanding of the division process, and their ability to interpret the remainder in a real-life context during the division process. For this purpose, the research problems that were investigated are listed below:

1. What strategies did students apply and how did they use them to solve long division problems and to what extent were they successful in interpreting the remainder in real-life situations?

2. What was the students' understanding of the division algorithm and use of zero in the division operation?

Method

Research Model

Being qualitative in nature, this was a case study, in which a researcher examines a situation within its context, limited by time and activity, and collects detailed information (Merriam 1998; Yin 2003). The case that was investigated in the current research involves sixth-grade students' understanding of the concept of division, the mistakes they make when applying the division algorithm, and their ability to establish a relationship between real-life situations and the division process.

Study Group

The participants in this study were the sixth-grade students of two middle schools in Kastamonu province located in the northern part of Turkey. A purposeful (deliberate) sampling method was used to determine the participants (Yıldırım & Şimşek, 2005). The criteria for determining the grade level included the curriculum coverage of the objectives regarding division operations, and in this context, sixth-grade students were used as the targeted population. In determining the schools to be included, the provincial general achievement average was taken into account and two schools with an average level of achievement were included in the study. A total of 64 sixth-grade students (33 boys and 31 girls) volunteered to participate in the research. In the study, no harm occurred to the students.

Data Collection Tools

In the study, a test consisting of open-ended questions requiring division was applied to the sixth-grade students, and their written answers were examined. The questions in the test were prepared by a mathematics education specialist and two mathematics teachers. Before its implementation, the validity of the test was checked by an external mathematics education expert.

Table 1 provides the specifications of the test items. The questions were prepared considering the objectives of "interpreting the remainder in case of problems related to division" and "divide a natural number with a maximum of four digits into a natural number with a maximum of two digits" in the middle school mathematics teaching program. The first three questions required the students to solve a real-life problem involving division with a remainder, and the strategies they used to solve the problems and their interpretation skills were examined. The fourth question involved performing two division operations related to the use of zero in the quotient. This question aimed to investigate the correct use of zeros in the division operation. In the fifth question, the students were presented with two incorrectly executed operations: the first required them to find the maximum quotient that would be taken from the corresponding digit(s) in the dividend, while the second required detecting the correct use of zero in the division operation.

Table 1. *Test items and their specifications*

		Context	Knowledge assessed	Units of analysis
1		Real-life:	Augmented-quotient problem situations (AQ): Increasing quotient if a remainder occurs in the calculation.	• Operation strategies • Procedural fluency • Interpreting remainder
2		Real-life	Quotient-only problem situations (QO): Ignoring remainder, only quotient problem situations	• Operation strategies • Procedural fluency • Interpreting remainder
3		Real-life	Quotient-part situation (QP): Presenting remainder as a single structure within the quotient (e.g. 13.5, or 13½)	• Operation strategies • Procedural fluency • Interpreting remainder
4	a	Pure Mathematics	Placing zeros in ones' digit of the quotient	• Correctness of solution
	b	Pure Mathematics	Placing zeros in the other digits of the quotient	• Correctness of solution
5	a	Pure Mathematics	Taking the maximum group of quotient from the corresponding digit(s) in the dividend	• Noticing the error • Explaining the cause
	b	Pure Mathematics	Detecting correct use of zero in a division operation	• Noticing the error • Explaining the cause

Data Analysis

The content analysis method was used while analyzing the responses of the students. Content analysis is used in cases where information that has not been previously

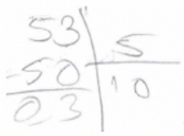
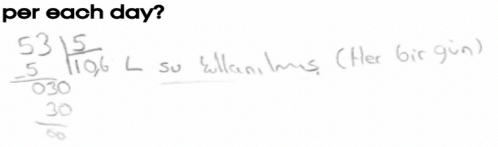
Water into 53 liters tank was finished in 5 days with equal daily usage. **Acoording to this, how many liters of water were used per each day?**	Water into 53 liters tank was finished in 5 days with equal daily usage. **Acoording to this, how many liters of water were used per each day?**
	
Interpretation: 10 liters of water were used.	Interpretation: 10.6 liters of water were used (for each day).
(a) Correct operation, wrong interpretation	(b) Correct operation and interpretation

Figure 2. Sample of the coding

organized for a purpose should be systematized and digitized (Fraenkel & Wallen, 2000). The responses of the students to the open-ended questions were coded by three independent researchers. As a result of the first coding, the reliability coefficient of the researchers was calculated as 84.6% according to the formula of Miles and Huberman (1994). The researchers negotiated and agreed on each item causing the disagreement.

The analysis of the students' answers to the first three problems requiring division with a remainder was carried out in two steps. In the first step, the strategies used by the students were determined as division, multiplication, repeated addition, repeated subtraction, and mental processing. Moreover, the strategies that do not take place in the literature regarding the realization of the division process and produce incorrect solutions are coded as incorrect strategy. Then, the frequency distributions of the students who applied the strategy steps correctly to each problem situation were obtained. In the second step, the student responses were classified according to the interpretation of the remainder in the context of the problem, true or false, and correct or incorrect operation. Then, student distributions for each problem case were determined. Figure 2 presents examples of the coding of the students' responses to the question, "The water in a 53-liter tank was finished in five days with equal amounts of use every day. How many liters of water were used each day?" Figure 2(a) presents a student's solution as the quotient of 10 and the remainder of 3. This response was coded as a correct division process but an incorrect interpretation of the remainder and Figure 2 (b) shows the response of a student operating until there was no remainder (due to the context of the problem), which was coded as achieving the correct procedure and interpretation (Photo 1b).

The analysis of the fourth question related to the use of zero in the division process revealed that the students' responses were classified as correct or wrong, and the frequency and percentage (%) distributions of the classifications were calculated. Finally, in the analysis of the fifth problem, in which incorrect division procedures were presented, the student responses were classified according to whether the errors made in the operations could be noticed and the reason for the error could be explained. The findings were obtained as frequency and percentage (%) distributions.

Results

Findings concerning the strategies used in problem-solving and interpreting the remainder

Table 2 provides the strategies used by students to solve real-life problems involving division with a remainder and the number of the students who performed the selected strategy correctly.

In general, the students performed better in augmented-quotient problems than quotient-part and quotient-only problems. When the student distributions were analyzed according to the strategies, the majority

Table 2. *Distribution of division strategies used in remainder problems*

	Quotient-part		Augmented-quotient		Quotient-only	
Division Strategies	Student preference	Performed correctly	Student preference	Performed correctly	Student preference	Performed correctly
Division	58	29	49	37	49	38
Multiplication			2	2		
Repeated addition			3	3	2	2
Repeated subtraction					1	
Mental processing			4	4	3	2
Incorrect strategy	4		3		5	
No answer	2		4		5	
Total	64	29 (45%)	65	46 (71%)	65	42 (65%)

Note: Some students have utilized more than one strategy during their solution process.

of the students used the division algorithm. However, a small number of students used different strategies, including multiplication (Figure 3a), repeated addition (Figure 3b), mental processing (Figure 3c), and repeated subtraction (Figure 3d). It is noteworthy that students only used the division algorithm in the solution of the first problem, and some students used different strategies in addition to those who used the division algorithm in the solution of the second and third problems.

Besides, some students tried to reach the result by using the division algorithm, but when it was not successful, they reached the result by applying repeated addition (Figure 4a and Figure 4b).

While the majority of the students performed their preferred strategy correctly, some students made mistakes in applying strategies, such as multiplying the divisor with the dividend (Figure 5a), adding both

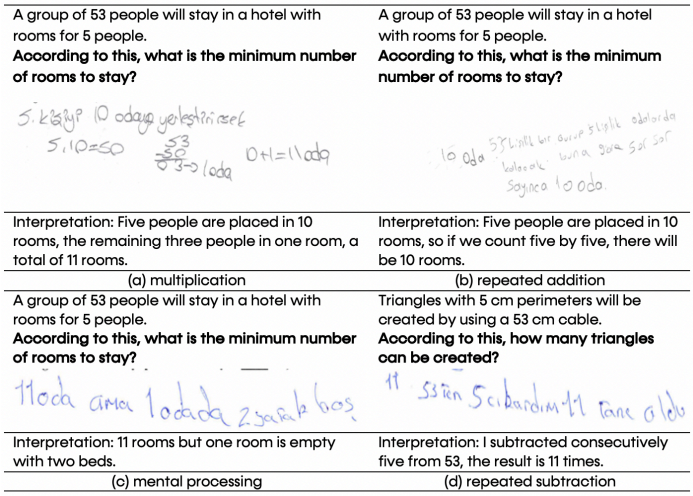


Figure 3. Sample division strategies adopted for the remainder questions

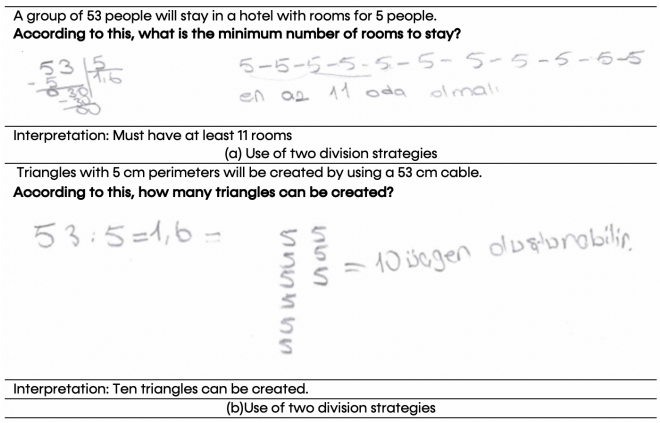


Figure 4. Uses of two different strategies

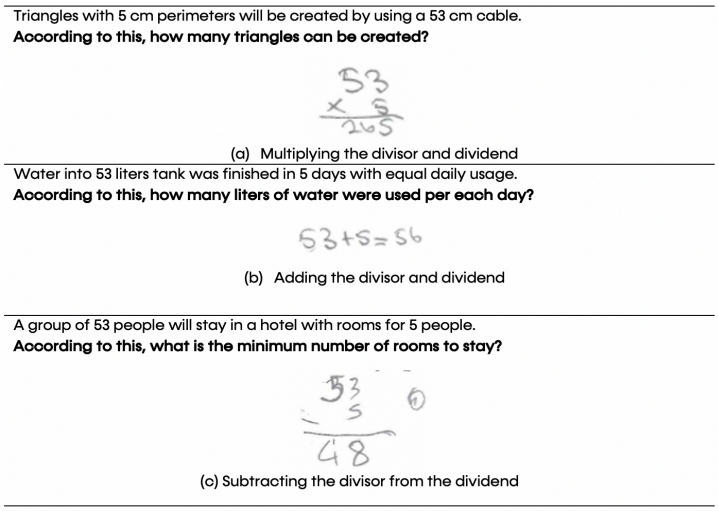


Figure 5. Mistakes in performing division strategies

(Figure 5b), subtracting the divisor from the dividend (Figure 5 c), or taking no action.

When the distribution of the correct use of the division strategies was examined, at least half of the students who used the division algorithm were successful in applying the algorithm of the division process. Moreover, almost all the students who used other strategies were successful in implementing the algorithm in terms of the strategy they chose.

Table 3 presents a comparison of the results regarding students' procedural performance in the division and their interpretation skills of the results. Table 3 reveals that all the students except for one who succeeded in interpreting the remainder of the problem were also those who operated correctly. Moreover, students who were unable to conduct division correctly also could not make correct interpretation (in the context) based on their division result.

Table 3. *Comparison of students' procedural and interpretation accuracy (f)*

		Quotient-part		Augmented-quotient		Quotient-only	
		Interpretation		Interpretation		Interpretation	
		True	False	True	False	True	False
Procedure	True	22	7	28	18	30	12
	False	0	35	1	18	0	23

Findings for the Use of Zero in the Division Process

Table 4 shows the students' awareness of the placeholder of zero as a digit. Approximately 83% of the students performed correctly in the question in which the zeros were placed at the end (digits) of the quotient while 38% of the students performed successfully in the question that required the use of zeros in the middle digits of the quotient.

Table 4. *Comparison of the use of zero in the division algorithm*

	Zeros at the end of the dividend	Zeros in other digits of the quotient
Correct	53 (83)	24 (38)
Wrong	11 (17)	40 (63)

Note: Percentages were provided within parenthesis

Finding and Explaining the Error in Division Operations

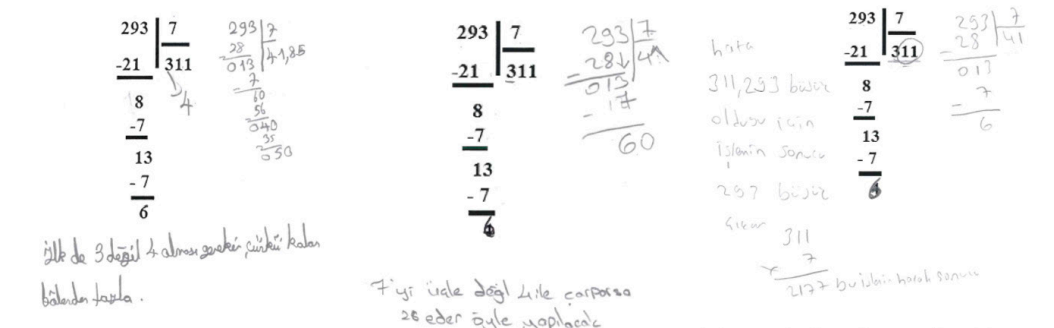
Table 5 presents the students' skills of detecting and explaining errors in the division algorithm including detecting the right value of the quotient taking from the dividend and determining the correct use of zero in the division process.

Most students (69%) answered the question prepared for the correct use of the multiplier value in the division process and realized that the division was done incorrectly. The students' approach to correcting the error in the solutions was to carry out the division process again, to reflect on the correct multiplier value in the division, or to perform the division process again after checking the solution by working backward (Figure 6). Moreover, one student noticed that there was an error in the splitting process by providing the operation, but did not provide an explanation for the cause of the error (Figure 7).

Table 5. *Comparison of the students' skills to notice and explain the error given in the division process*

Using the right value	Unable to explain the error	Successfully explained the error	Total
Not recognizing the error	19	NA	19
Recognizing the error	1	44 (69)	45
Use of zero in the algorithm			
Not recognizing the Error	42	NA	42
Recognizing the error	4	18 (28)	22

Note: Percentages were provided within parenthesis



Interpretation: We should use 4 instead of 3 in the quotient because the remainder is greater than the divider.

Interpretation: If we multiply 7 not with 3 but with 4, the result is 28.

Interpretation: As quotient is bigger than the dividend, the operation is false.

Figure 6. Students' answers explaining the reason for the error

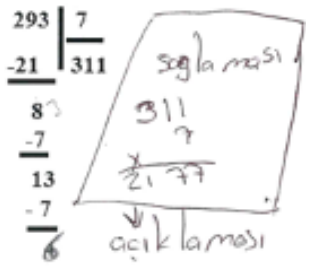


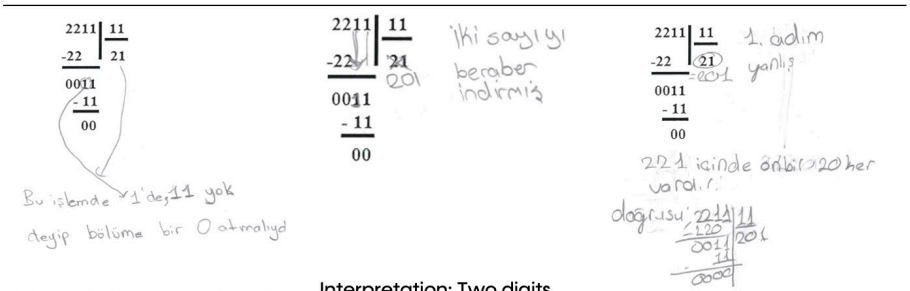
Figure 7. The answer of the student who noticed the error but could not explain it

Less than one-third of the students (28%) realized that the solution given in the question including the use of zero in the division algorithm is incorrect (See Table 5). Students explained the reason for the error with such statements as "Since the amount of the divisor cannot be taken from the dividend number, zero must be written in the quotient. Zero must be placed in the quotient since two numbers from the dividend are taken down at the same time." (Figure 8). Four students realized the error by providing reverse operation or by stating that the quotient value was incorrect, but could not explain the reason for the error (Figure 9).

Discussion and Conclusion

This study was undertaken to reveal the ability of sixth-grade students to interpret the remainder in the division process and their procedural-conceptual knowledge about the division operation. In the study, as in the work of Silver et al. (1993), it was seen that the students who did not use the division process created solutions using alternative methods (repeated addition and repeated subtraction). When the distribution of students was examined according to the strategies used, it was seen that the majority of the students applied the division algorithm. The study by Robinson et al. (2006) on the strategies used in division indicated that the strategies could change in parallel with age; thus, fourth-grade students used repeated addition strategy and fifth to seventh graders primarily used multiplication. The authors compared their results with those of other similar studies in the literature and found that the differences in the results might be caused by the differences in the curriculum.

For the first three questions presented in the current study, the students' ability to associate everyday life and reasoning skills with the problem situation was evaluated. It was seen that even if the students undertook the process correctly, they had difficulty in interpreting the problem situation. In the study by Cain and Silver (1995), it was noted that the students provided an inappropriate solution for the problem situation by rounding quotient to the nearest natural number instead of reasoning the given situation. In Horton's (2007) study, it was indicated that the students who gave an incorrect answer did not pay attention to the expression of the problem or which type of variable was used and how this affected the solution after applying the long division algorithm. Similarly, in the work of Silver et al. (1993), it



Interpretation: When 1 in the dividend is brought down, then nothing remains, and hence we should put a zero in the quotient for this number.

Interpretation: Two digits were brought down.

Interpretation: 11 repeats 20 times in 221.

Figure 8. Student responses to the error and explaining the cause of the error

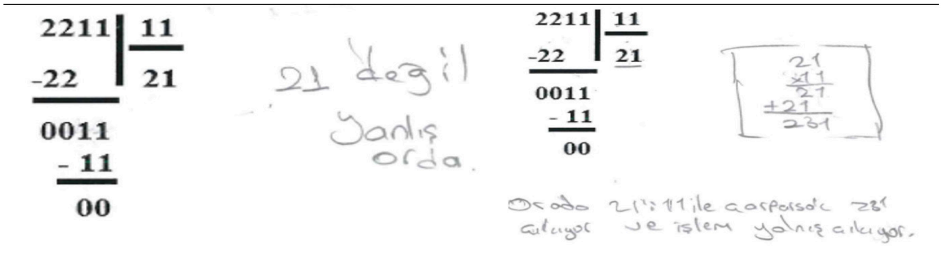


Figure 9. Student responses in failing to recognize the error and explaining the reason for the error

was pointed out that some students did not tend to return to the story situation to comment on the problem in which they correctly performed the mathematical procedures. In the related study, the students tried to solve by considering discontinuous quantities, such as continuous and fissionable; furthermore, the problem situation was not always considered carefully. Simon (1993) examined the relationship between operational and conceptual information, between concepts (e.g., division and extraction) and between an arithmetic operation and a real-world situation, and he indicated that those categories were not discrete. Rodríguez et al. (2009) emphasized that when the students did not understand the problem, they focused on the algorithm or focused on the superficial knowledge of the problem. In general, procedural instruction leaves behind concepts, such as digit value which was placed in previous processes, and the conceptual aspects of the division process and the mathematical meaning underlying the process cannot be taught to the students (Silver & Burkett, 1994; Martin Jr, 2009).

The current study also indicated that the students had difficulties regarding the use of zero in the long division algorithm. Lamb and Booker (2004) stated that the students did not explain why zero was placed in the answer, the placeholder of zero was not properly explained, and the students had limited conceptual knowledge in this sense. Systematic errors result from the consistent application of a faulty method, algorithm, or rule, whereas slips are unsystematic careless errors. One of the widely shared explanations for students' systematic computation errors is their flawed or weak understanding of the place value system. When the procedural aspect of computation is overemphasized without a clear conceptual understanding of the place value system, students tend not to think about the meaning of what they are doing and simply parrot someone else's directions to perform calculations (O'Brien, 1999). The traditional long division algorithm is one familiar example that many students find particularly difficult to perform with understanding. Students have also encountered problems regarding understanding (by determining the default in the solution) the division process. Some students provided explanations without providing a meaningful explanation of the place value, such as bringing down two digits requires adding zeros to the quotient. Unlike other operations, the traditional long division algorithm starts with the left-hand or larger place values, the required estimation skills often generate anxiety, and it is hard for some students to identify the magnitude of the answers that they put in each place (Fuson, 2003; Van DeWalle, 2001). This situation often leads learners or teachers to nonsensical mnemonic phrases, such as "Dirty Monkey Smells Bad" to memorize the sequence of "Divide–Multiply–Subtract–Bring it down." While memorizing these mnemonics might produce correct answers, it has no contribution to the meaningful learning of mathematics. Many educators have asserted that the essence of doing mathematics is the process of "making sense" or "figuring out" (e.g., Schoenfeld, 1991; Skemp, 2012), and 'Dirty Monkeys' alone does not contribute to this process. Unfortunately, it seems that such an approach forges its way into the classroom with little resistance. To overcome these impediments to the meaningful learning of the long division algorithm, students should be provided with the opportunities to engage in conceptually sound activities and appreciate the meaning of algorithms at the early stage, instead of relying on mechanical memorization. We must finally recognize that algorithms are fully conceptual cultural-historical products and should be taught as such (Schmittau, 2004).

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Examining the Effect of Students' Early Numeracy Activities at Home on Later Mathematics Achievement via Early Numeracy Competencies and Self-Efficacy Beliefs

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Abstract

This study aimed to examine the effect of early numeracy activities at home on children's mathematics achievement in fourth grade. It also examined the mediating effects of early numeracy competencies and self-efficacy beliefs in mathematics on this relationship. The study used Trends in International Mathematics and Science Study (TIMSS) 2015 Korean data, selecting nationally representative samples of fourth-grade elementary students (N = 4 669) and their parents. A confirmatory factor analysis (CFA) and structural equation modeling (SEM) were used to analyze the study data. The study findings revealed that students who engage in more early numeracy activities at home are more likely to have high mathematics achievement in fourth grade. Early numeracy competencies and self-efficacy beliefs positively mediate this relationship. Moreover, the findings of the study revealed that sequential mediating effects of early numeracy competencies and self-efficacy beliefs on this relationship. Based on the findings of the study, several implications have been proposed.

Keywords:
Early Numeracy Activity, Early Numeracy Competency, Mathematics Achievement, Self-Efficacy Belief, Structural Equation Modeling

Introduction

When a baby is born, his/her parents often perform various numeracy activities at home. They sing counting songs, read counting books, play with numerical toys, and teach counting and writing numbers. These activities are based on the belief that early numeracy activities at home will positively affect a child's later mathematics achievement in elementary school. However, studies have reported mixed results regarding this relationship. Some inconsistencies have been found in previously conducted studies. Some studies have found a positive effect of early numeracy activities at home on

later mathematics achievement (Casey et al., 2018; Chiu, 2018; Galindo & Sonnenschein, 2015; Huang et al., 2017; LeFevre et al., 2009; Niklas & Schneider, 2017; Zhu & Chiu, 2019), while others have found a mixed or nonsignificant effect (Blevins-Knabe et al., 2000; Missall et al., 2015; Skwarchuk, 2009; Skwarchuk et al., 2014; Zhang et al., 2020). These inconsistent findings might be because previously conducted studies have not properly considered the effect of a student's background and examined small non-representative samples (Zhu & Chiu, 2019). Moreover, these studies did not control the effect of preschool learning experiences on mathematics achievement. Therefore, more studies examining how early numeracy activities at home affect mathematics achievement in elementary school students are needed.

Therefore, this study examined the association between early numeracy activities at home on mathematics achievement of fourth-grade students using data obtained from Trends in International Mathematics and Science Study (TIMSS) 2015 in Korea. Participants were selected from nationally representative samples. Moreover, a structural equation modeling (SEM) was utilized to control other variables affecting students' mathematics achievement, including socioeconomic status (SES) (Salihu & Räsänen, 2018), preschool attendance experience (Anders et al., 2012), and gender (Ganley & Lubienski, 2016). In doing so, early numeracy competencies and self-efficacy beliefs were considered to mediate variables because when students have high numeracy competencies before entering school, they tend to show high mathematics achievement in elementary school (Aunio & Niemivirta, 2010; Duncan et al., 2007; Geary et al., 2018; Jordan et al., 2010; LeFevre et al., 2009). The roles of self-efficacy in this process were also examined because students with higher self-efficacy beliefs in mathematics tend to spend more time studying mathematics, resulting in higher mathematics achievement (Bandura et al., 1999; Cleary & Kitsantas, 2017; Kung & Lee, 2016; Topçu et al., 2016).

Moreover, we examined whether students' early numeracy competencies and self-efficacy beliefs in mathematics have a mutual effect on the relationship. That is, we evaluated the likelihood of early numeracy competencies and self-efficacy beliefs to sequentially mediate the relationship between early numeracy activities at home and mathematics achievement in school (Hayes, 2017). Students' mathematics achievements at an early stage affect their later achievements, college entrance rate, and profession choices (Ganley & Lubienski, 2016). Therefore, determining the effect of early numeracy activities at home on mathematics achievement in elementary school and identifying factors that mediate this relationship may help provide educators with guidance on how to improve a student's mathematics achievement. This study examined two research questions: How do early numeracy activities at home relate to mathematics achievement in fourth grade? How do early numeracy competencies and self-efficacy beliefs in mathematics mediate this relationship?

Literature Review

Early Numeracy Activities, Early Numeracy Competencies, and Mathematics Achievement

Studies have reported that early numeracy competencies acquired before starting elementary school affect students' later mathematics achievement (Aunio & Niemivirta, 2010; Chiu, 2018; Duncan et al., 2007; Galindo & Sonnenschein, 2015; Geary et al., 2018; Jordan et al., 2010; Siegler, 2016; Zhu & Chiu, 2019). Because early numeracy competencies work as the basis for acquiring new mathematical knowledge in school, students with higher school-entry numeracy competencies tend to have higher mathematics achievement in elementary school.

For example, Duncan et al. (2007) conducted a meta-analysis with six longitudinal data sets in the U.S., Canada, and the U.K. and concluded that the relationship between school entry mathematics competencies and later mathematics achievement was positively and statistically significant. More specifically, based on Early Childhood Longitudinal Study data examining 21 260 U.S. children, the authors reported that the regression coefficient of school-entry numeracy competencies on third-grade mathematics achievement was .53. That is, if school-entry numeracy competency is increased by 1 point, the average third-grade mathematics achievement increases by .53 after controlling other variables. Similarly, Jordan et al. (2010) examined the association between numeracy competencies at the beginning of kindergarten and first and third-grade mathematics achievement and found positive associations between them. Additionally, studies on Finland (Aunio & Niemivirta, 2010), Hong Kong (Zhu & Chiu, 2019), and Taiwan (Chiu, 2018) reported similar results.

Studies have reported that, among many factors, early numeracy activities at home significantly affect students' early mathematics competencies (Anders et al., 2012; Casey et al., 2018; Huang et al., 2017; LeFevre et al., 2009; Niklas & Schneider, 2017). Anders et al. (2012) compared the effect of home and preschool learning environments on early numeracy competencies in 532 children in Germany. They found that the association between home learning environments and early numeracy competencies was higher than the

association between preschool learning environments and early numeracy competencies. Parents are critical socializers in the cognitive development of young children, and their involvement in early numeracy activities helps children acquire basic mathematical knowledge. For example, the study of LeFevre et al. (2009) examining 114 children in Canada found that the frequency of children's engagement in playing board games, card games, roleplaying cooking, and shopping at home was positively associated with their mathematical achievement in a test assessing their understanding of numeration, addition, and subtraction.

Furthermore, some studies have found that formal numeracy activities at home predict student numeracy competency (Casey et al., 2018; Huang et al., 2017; Manolitsis et al., 2013). Studies have reported that parents formally teaching numeracy skills, such as identifying the names of written numbers and instructing their children to count different objects and write down numbers, can predict early numeracy competencies. In sum, students' early numeracy activities at home have been found to work as scaffolding for obtaining formal mathematics knowledge and achieving high numeracy competencies, resulting in high mathematics achievement in elementary school. However, other studies have found mixed and nonsignificant relationships between children's early numeracy activities at home and their mathematics achievement (Blevins-Knabe et al., 2000; LeFevre et al., 2009; Missall et al., 2015; Skwarchuk, 2009; Skwarchuk et al., 2014; Zhang et al., 2020). For example, in a study examining 72 children, Missall et al. (2015) reported no significant relationship between parent-reported mathematical activities and children's mathematics achievement. Similarly, Blevins-Knabe et al. (2000), in a study with 64 children, reported that the association between the frequency of numeracy activities at home and student mathematics achievement was not statistically significant. Moreover, Skwarchuk (2009) examined 25 children and found that some numeracy activities had a positive effect on children's mathematics achievement, while others did not. Zhu and Chiu (2019) suggested two plausible reasons for these inconsistent findings: examining small non-representative samples and omitting home environment variables. Because some studies examined small and non-representative samples (e.g., Blevins-Knabe et al., 2000), it is likely that their participants could not accurately report general phenomena in the relationship between children's early numeracy activities at home and their mathematics achievement.

Furthermore, the studies did not consider the effects of students' home environments (Zhu & Chiu, 2019). Given that SES background is related to the quality of parental instruction (Galindo & Sonnenschein, 2015), the outcome of early numeracy activities is likely to differ depending on parents' SES backgrounds. For example, parents with high SES can offer activities with more complex goal structures than parents with low SES (Missall et al., 2015). Consequently, while there is no difference in the range and frequency of numeracy activities offered in families with low and high SES, the complexity of the activities is different (Chiu, 2018).

Early Numeracy Activities, Early Numeracy Competencies, Self-Efficacy Beliefs, and Mathematics Achievement

Self-efficacy beliefs refer to one's beliefs about one's ability to successfully perform a given task (Bandura et al., 1999). Researchers have found that self-efficacy beliefs are critical factors having effect on a student's achievement (Bulut, 2017; Kung & Lee, 2016; Park & Jun, 2017). Because students are likely to spend more time and effort on a certain task in which they feel productive, there are positive associations between self-efficacy beliefs and motivation to learn, resulting in high mathematics achievement. The study of Cleary and Kitsantas (2017) examining 331 students in the United States revealed that student self-efficacy beliefs had significant effects on their mathematics achievement. Studies examining Turkish and Korean students have reported similar findings (e.g., Topçu et al., 2016).

Self-efficacy beliefs are developed through the following four sources: mastery experiences, vicarious experiences, verbal-social persuasion, and physiological and emotional arousal (Bandura et al., 1999). Although these sources are all important for creating of self-efficacy beliefs, Bandura et al. (1999) emphasized that mastery experiences are the most critical of these four.

As personal mastery experiences affect people's judgment of their own abilities, experiences affect the interpretation of the other sources. For example, accomplishment in mathematics tasks positively affects personal emotional arousal (Bandura et al., 1999). Moreover, mastery experiences might lead to positive social persuasion from others. Therefore, early numeracy activities with parents at home are likely to help children accomplish various mathematics tasks and improve their numeracy competencies (Casey et al., 2018). These successful mastery experiences then positively affect students' self-efficacy beliefs in mathematics. Consequently, children's early numeracy activities at home are positively associated with their early numeracy competencies and later mathematics achievement through their self-efficacy beliefs in mathematics (Zhu & Chiu, 2019).

The Current Study

Given the inconsistent findings of previous studies examining the relationship between children's early numeracy activities at home and their mathematics achievement, additional studies are needed. Limitations of previously conducted studies require an examination of large samples and the control of more student-related variables (Zhu & Chiu, 2019). Hence, this study examined the effects of children's early numeracy activities at home on fourth-grade mathematics achievement through their early numeracy competencies and self-efficacy beliefs. TIMSS 2015 Korean student and parent data were used to examine the aforementioned effects. Moreover, students' SES, gender, and preschool learning experience (the period of preschool attendance) were used as control variables to identify the relationships among the study variables clearly. The findings of this study can enhance our understanding of the mechanism through which early numeracy activities at home affect later mathematics achievement in elementary school. Based on the literature review, we developed the following hypotheses. Figure 1 shows the hypothesized path model of the study variables.

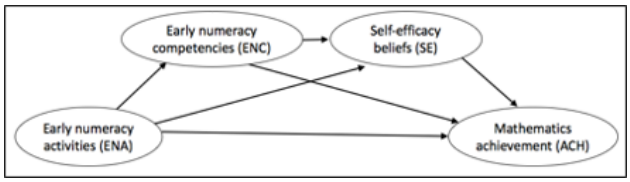


Figure 1. The Hypothesized Path Model of the Study Variables

Hypothesis 1: Children's early numeracy activities at home (ENA) are positively associated with fourth-grade mathematics achievement (ACH): ENA → ACH.

Hypothesis 2: The relationship between children's early numeracy activities at home (ENA) and fourth-grade mathematics achievement (ACH) is mediated by early numeracy competencies (ENC): ENA → ENC → ACH.

Hypothesis 3: The relationship between children's early numeracy activities at home (ENA) and fourth-grade mathematics achievement (ACH) is mediated by self-efficacy beliefs (SE) in fourth grade: ENA → SE → ACH.

Hypothesis 4: The relationship between children's early numeracy activities at home (ENA) and fourth-grade mathematics achievement (ACH) is sequentially mediated by early numeracy competencies (ENC) and self-efficacy beliefs (SE) in fourth grade: ENA → ENC → SE → ACH.

Methods

Participants

The Korean TIMSS 2015 data were used to test the study hypotheses. TIMSS researchers collected data from a nationally representative sample with a two-stage stratified cluster sample design. They selected representative schools in Korea first, and then randomly selected a fourth-grade class from each school. This study examined elementary students' data, which comprise information on 4 669 students (2 411 boys and 2 258 girls) from 149 schools. Their parents also participated in a survey.

Measures

Early numeracy activities at home

Data on early numeracy activities at home were derived from parents' reports on how often they participated in the following five activities with their children before they began elementary school: (a) say counting rhymes or sing counting songs, (b) play with number toys, (c) count different things, (d) play board or card games, and (e) write numbers. Values on this index range from 1 to 3: often, sometimes, and almost never. After the data were collected, the responses were reverse coded. Hence, higher values indicated more frequent early numeracy activities. The Cronbach's alpha coefficient for early numeracy experiences at home was .788.

Early numeracy competencies

Data on students' early numeracy competencies before entering school were derived from parents' reports on how much they agreed with the following two indicators: (a) children can do simple addition, and (b) children can do simple subtraction. The two items were binary: No = 0, Yes = 1. The Cronbach's alpha coefficient for early numeracy competencies was .757.

Self-Efficacy Beliefs

Data on students' self-efficacy beliefs were derived from students' reports on how much they agreed with the following four indicators: (a) usually do well in math, (b) math is harder for me than for others, (c) just not good at math, and (d) learn math quickly. The students responded to each statement on a four-point Likert scale ranging from 1 (agree a lot) to 4 (disagree a lot). The responses to items (a) and (d) were reverse coded for this study. Hence, higher values represented a high level of self-efficacy beliefs. The Cronbach's alpha coefficient for self-efficacy beliefs was .842.

Mathematics achievement

TIMSS 2015 mathematics assessment contained 179 items with 96 numbers, 59 geometric shapes and measures, and 24 data displays. Because students were asked to solve problems in a booklet with 23 to 29 items, TIMSS provided five plausible values for each student to estimate his/her mathematics achievement scores (Mullis et al., 2016). All five plausible values were used in this study. Based on item-response theory scaling, the overall mean score was 500, with a standard deviation (SD) of 100.

Control variables

Based on previous studies, the following three variables were controlled: gender, preschool attendance experiences, and SES (Anders et al., 2012; Chiu, 2018; Salihu & Räsänen, 2018; Zhu & Chiu, 2019). First, as studies have found a relationship between students' gender and their mathematics performance, gender variable was controlled (Ganley & Lubienski, 2016). Gender was self-reported by the students with a code 0 for females and 1 for males. The positive coefficients indicated higher scores for male students. Second, preschool experience was controlled. Students learn various mathematics skills from preschool institutions such as kindergarten, and these acquired skills have positively affected students' mathematics performance (Anders et al., 2012). The preschool attendance experience was derived from parents' responses: How long was your child in preschool programs? It was coded as follows: 1 (did not attend), 2 (less than one year), 3 (one year), 4 (two years), 5 (three years), and 6 (four years or more). Third, SES background was controlled. SES background was measured using the following three indicators: (a) fathers' level of education, (b) mothers' level of education, and (c) number of books at home. Parents' levels of education were measured by the highest level of education. Values on this index were measured using an eight-point Likert scale: 1 (did not go to school), 2 (primary or lower secondary), 3 (lower secondary), 4 (upper secondary), 5 (post-secondary), 6 (short-cycle tertiary), 7 (bachelor), and 8 (post-graduate). The number of books at home was derived from students' responses to the question of how many books they have in their homes. Values on this index ranged from 1 (0–10 books) to 5 (more than 200 books). The Cronbach's alpha coefficient for SES was .71.

Data Analysis

The data at hand were analyzed in two steps. First, a CFA was conducted to examine the fit of the measurement model. Second, an SEM was used to test the hypothesized model of this study (Figure 1). We used Mplus 8.2 for the analyses using a robust maximum likelihood estimation procedure. Moreover, missing values in the dataset were handled using full information maximum likelihood. As indicated above, student achievement data were reported as five plausible values. Hence, separate data analyses were conducted for each value. Then, we aggregated the results to obtain unbiased estimates. The study used the following indices to determine the validity and model fits: chi-square value, Comparative Fit Index (CFI), Tucker Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). As the chi-square value is sensitive to sample size, we focused more on the other indices. The data fit is acceptable when CFI and TLI are higher than .90, and RMSEA is less than .08 (Kline, 2015).

Results

Descriptive Statistics and Correlation Analysis

Table 1 depicts the descriptive statistics of the study, including the mean (M) and SD of all items. Table 2 presents the correlation coefficients between the study variables. The higher the Pearson's r value, the stronger the relationship between two variables (Hayes, 2017). The results revealed that children's early numeracy activities at home had significantly positive relationships with early numeracy competencies, self-efficacy beliefs, SES, and mathematics achievement, ranging from .209 to .279. They did not, however, have a significant relationship with gender and preschool attendance experiences. Early numeracy competencies had a positive relationship with self-efficacy beliefs, SES, preschool attendance experiences, and mathematics achievement, ranging from .041 to .242. Moreover, there was a positive relationship between self-efficacy beliefs and mathematics achievement, with the largest score among all associations ($r = .686$, $p < .001$). These results indicate that children's early numeracy activities at home can contribute to the development of high early numeracy competency, self-efficacy beliefs, and mathematics achievement of the students.

Measurement Model Fit

We implemented CFA to examine the construct validity of the study variables. The CFA results showed an acceptable fit to the data (x^2= 942.607, *df*= 77, *p*< .01, RMSEA= .049, CFI= .941, and TLI= .930). All the factor loadings of the latent variables were significant, ranging from .401 to .840. These results indicated that the construct validity of the scales was acceptable, and all the latent variables were represented well by the indicators.

Structural Model Fit

We tested the structural model of this study to examine the direct and indirect relationships between study variables. The results indicated an acceptable fit between the study data and the hypothesized model (x^2= 946.067, *df*= 113, *p*< .01, RMSEA= .040, CFI= .952, and TLI = .942). The direct, indirect, and total effects results are shown in Table 3 and Figure 2. The standardized path coefficient (β) indicates how the outcome change was associated with one SD change in the predictor (Hayes, 2017). For example, a significant coefficient value of .209 (ENA → ENC, β= .209) indicates that if there is a unit change in early numeracy activities at home, there is a .209 standard-deviation change in early numeracy competency, with all other variables held constant at their mean.

Regarding direct effects, higher rates of early numeracy activities at home were significantly related to higher mathematics achievement in fourth grade (ENA → ACH; β= 0.058, *p*< .001). Thus, Hypothesis 1 was supported by the dataset. Early numeracy activities at home were significantly associated with early mathematics competencies (ENA → ENC; β= 0.207, *p*< .001) and self-efficacy beliefs in fourth grade (ENA → SE; β= 0.204, *p*< .001). Moreover, the findings of the study revealed that there were significant positive associations between children's early numeracy competencies and self-efficacy beliefs (ENC → SE; β= .135, *p*< .001), and between children's early numeracy competencies and mathematics achievement (ENC → ACH; β= .105, *p*< .001). The findings on the association between self-efficacy beliefs and mathematics achievement revealed that it had the highest score, which means the strongest association, among all variables (SE → ACH; β= .566, *p*< .01).

Table 1. *Descriptive Statistics of All Observed Variables*

Variable	Item	Short description	*M*	*SD*	Cronbach's alpha coefficient
1. ENA[a]	ENA1	Say counting rhymes or sing counting songs	2.304	.672	.788
	ENA2	Play with the number of toys	2.299	.661	
	ENA3	Count different things	2.539	.587	
	ENA4	Play board or card games	2.156	.681	
	ENA5	Write numbers	2.493	.597	
2. ENC[b]	ENC1	Do a simple addition	.95	.219	.757
	ENC2	Do simple subtraction	.896	.305	
3. SE[c]	SE1	Usually, do well in math	2.821	.807	.842
	SE2	Harder for me than for others	3.087	.823	
	SE3	Just not good at math	2.607	.838	
	SE4	Learn math quickly	2.839	.841	
4. Sex	SEX	Sex of student	.517	.500	None
5. SES	SES1	Father's level of education	5.939	1.493	.710
	SES2	Mother's level of education	5.665	1.444	
	SES3	Number of books at home	3.391	1.322	
6. PRESC[d]	PRESC	How long the child was in preschool programs	5.22	.841	None
7. ACH[e]	ACH1	First plausible values	607.951	67.859	Scores based on item response theory
	ACH2	Second plausible values	608.855	67.438	
	ACH3	Third plausible values	608.146	66.667	
	ACH4	Fourth plausible values	608.501	68.282	
	ACH5	Fifth plausible values	606.721	66.692	

[a]ENA: early numeracy activities at home, [b]ENC: early numeracy competencies, [c]SE: self-efficacy beliefs, [d]PRESC: preschool attendance experience, [e]ACH: mathematics achievement.

Table 2. *Correlation Coefficients Between Study Variables*

	ENA	ENC	SE	SEX	SES	PRESC	ACH
ENA	1						
ENC	.209***	1					
SE	.234***	.178***	1				
SEX	-.017	.001	.101***	1			
SES	.231***	.068***	.296***	.019	1		
PRESC	.049	.041*	.031	.01	-.021	1	
ACH	.279***	.242***	.686***	.059***	.488***	.051**	1

**p< .05, **p< .01, ***p< .001*

As for indirect effects, the analysis demonstrated that all mediating effects were statistically significant (see Table 4). More specifically, early numeracy activities at home were indirectly and positively related to greater mathematics achievement in fourth grade through early numeracy competencies (Hypothesis 2, ENA → ENC → ACH; β= .021, *p*< .001) and self-efficacy beliefs in fourth grade (Hypothesis 3, ENA → SE → ACH; β= .114, *p*< .001). Furthermore, there were statistically significant sequential mediating effects of early numeracy competencies and self-efficacy beliefs on the relationship between early numeracy activities at home and mathematics achievement (Hypothesis 4, ENA → ENC → SE → ACH; β= .016, *p*< .001). The total indirect effect, the sum of all indirect effects, was statistically significant (β= .151, *p*< .001). Moreover, the total effect of early numeracy activities at home on mathematics achievement in fourth grade was statistically significant (β= .209, *p*< .001). That is, when a unit changed in early numeracy activities at home, there was a .209 standard-deviation change in mathematics achievement through early numeracy competencies and self-efficacy beliefs.

Table 3. *Standardized Path Coefficients and Standard Errors of Direct, Total Indirect, and Total Effects*

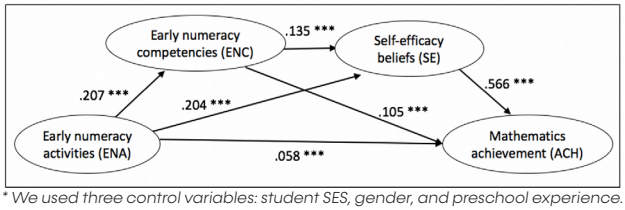
Path	Total effect	Direct effect	Total indirect effect
Mathematics achievement			
ENA → ACH	.209 (.018)***	.058 (.016)***	.151 (.010)***
ENC → ACH	.180 (.021)***	.105 (.018)***	.075 (.013)***
SE → ACH	.566 (.015)***	.566 (.015)***	None
PRESC → ACH	.033 (.017)	.033 (.017)	None
SEX → ACH	.006 (.014)	.006 (.014)	None
SES → ACH	.311 (.026)***	.311 (.026)***	None
Self-efficacy			
ENA → SE	.232 (.017)***	.204 (.017)***	.028 (.005)***
ENC → SE	.135 (.023)***	.135 (.023)***	None
Early numeracy competencies			
ENA → ENC	.207 (.021)***	.207 (.021)***	None

****p* < .001

Table 4. *Standardized Path Coefficients and Standard Errors of Indirect Effects*

Path	Indirect Effect	Path	Indirect Effect
ENA→ENC→ ACH	.021 (.004)***	ENA→ENC→SE→ ACH	.016 (.003)***
ENA→SE→ACH	.006 (.014)	Total indirect effect	.151 (.010)***

****p* < .001



* *We used three control variables: student SES, gender, and preschool experience.*

****p* < .001

Figure 2. The Standardized Direct Relationships Between Study Variables

Discussion

Studies have reported mixed results regarding the relationship between children's early numeracy activities at home and mathematics achievement. Therefore, the primary objectives of this study were to examine the relationship between children's early numeracy activities at home and their mathematics achievement in fourth grade and understand it using two mediating variables better: early numeracy competencies and self-efficacy beliefs in mathematics. The significance of this study is threefold. First, the findings of the study revealed that children's early numeracy activities at home are associated with their later mathematics achievement in elementary school. When children acquire mathematical knowledge through their early numeracy activities at home, they can easily learn new mathematical concepts and procedures that build upon their prior mathematical knowledge. That is, experiencing early numeracy activities at home facilitates the effectiveness of later mathematics learning. This, in turn, results in high mathematics achievement (Galindo & Sonnenschein, 2015; LeFevre et al., 2009). The results of this study are consistent with studies examining students in the U.S. (Jordan et al., 2010), Canada (LeFevre et al., 2009), Hong Kong (Zhu & Chiu, 2019), and Taiwan (Chiu, 2018). Moreover, this study expanded existing studies on early numeracy activities by controlling the effects of preschool attendance experiences, which have been neglected in previous studies.

Second, this study evaluated the roles of students' early numeracy competencies and self-efficacy beliefs as mediators in the relationship between their early numeracy activities at home and later mathematics achievement. The study revealed that students' early numeracy activities at home have a positive effect on their early numeracy competencies (i.e., addition and subtraction competencies), and thereby enhance their later mathematics achievement. As students with higher mathematics competency tend to have higher readiness to study mathematics, they can learn advanced mathematical concepts more easily than students with low mathematics competency (Jordan et al., 2010). Moreover, the positive mediating effect of self-efficacy beliefs indicates that early numeracy activities yield high student self-efficacy beliefs in learning mathematics. This may help students continue to study mathematics, resulting in high mathematics achievement (Cleary & Kitsantas, 2017). Third, this study demonstrated that students' early numeracy competencies and self-efficacy beliefs sequentially mediate the relationship between their early numeracy activities at home and mathematics achievement. This finding is important because previous studies have shown

that students' early numeracy competencies and self-efficacy beliefs are related and have important implications for understanding student achievement, but no researchers, except Zhu and Chiu (2019), have yet considered how the two function together in a model. Because student mathematical knowledge has cumulative power (i.e., the more they know, the more they can acquire), their early numeracy activities work as the basis for developing early numeracy competencies and positive self-efficacy beliefs in mathematics, and for high mathematics achievement. We extended previous studies by showing that students' early numeracy activities at home are associated with their later mathematics achievement through the mutual effects of their early numeracy competencies and self-efficacy beliefs.

Recommendations

This study provides valuable insights for educators and parents, aiming to enhance student mathematics achievement. This research shows that students' early numeracy activities at home can have positive effects on their later mathematics achievement because they may help students develop high numeracy competencies and self-efficacy beliefs in mathematics. Therefore, it is important to make parents aware of the value of early numeracy activities at home. Educational programs for parents are effective because they help increase the likelihood that parents will spend more time with their children doing numeracy activities. Such programs may introduce various numeracy activities and teach how to implement them. Moreover, from the educational policy perspective, the government can distribute educational materials (e.g., workbooks, toys, educational tools, and books) to homes with young children. These can help parents easily implement various numeracy activities at home and achieve educational equity because they provide equal learning opportunities for young children regardless of their backgrounds.

Furthermore, educators should help students enhance their self-efficacy beliefs in learning mathematics. The study findings reveal that the association between students' self-efficacy beliefs and their mathematics achievement is the strongest compared to other variables. Teachers can provide students with additional educational materials to support them in developing their self-efficacy beliefs. Furthermore, teachers should ensure that all students experience successful mastery experiences in the mathematics classroom. These endeavors may eventually increase students' commitment to studying mathematics, which may lead to increased mathematics achievement.

Limitations and Future Research

First, this study relied on self-reported survey data. Although this methodological approach is prevalent in quantitative research, participants may deliberately manipulate the survey and attempt to make a good impression in their responses, such as by depicting themselves as good parents or good students. To overcome this limitation, future research might use other types of data (e.g., observation or video recordings) to validate the findings.

Second, some questions asked for some information from more than four years prior. The adult participants of the TIMSS study were parents of fourth graders, but the TIMSS researchers asked them to respond with information about early numeracy activities at home and early mathematics competence from before their children started elementary school. Previous studies examining a large sample also used the same method (e.g., Chiu, 2018; Zhu & Chiu, 2019), but these findings may have reliability issues because parents may not remember the information accurately. Hence, a longitudinal study should be conducted to examine the associations more accurately. Third, this study examined only a few study variables. Several factors affect students' mathematic achievement, but this study only examined the effects of students' early numeracy activities at home, early numeracy competencies, and self-efficacy beliefs on their mathematics achievement. Future studies should consider other variables that may contribute to mathematics achievement (e.g., school and teacher variables).

Conclusion

The findings of this study support the idea that students' early numeracy activities at home increase their later mathematics achievement in elementary school. The study has made a great contribution to the literature examining this relationship by controlling the variables of student gender, SES, and preschool attendance experiences. We also determined that students' early numeracy competencies and self-efficacy beliefs are critical factors in mediating the relationship. Moreover, we found sequential mediating effects of students' early mathematics competencies and self-efficacy beliefs. In sum, students who participate in more early numeracy activities at home are more likely to have high early numeracy competencies and high self-efficacy beliefs, which in turn lead to high mathematics achievement. The study findings shed light on the relationship between students' early numeracy activities at home with parents and their later mathematics achievement through early numeracy competencies and self-efficacy beliefs in mathematics.

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Scaling Problems in the System of Transition from Elementary to Secondary Education in Turkey with the Rank-Order Method*

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Abstract

The purpose of this study was to examine the significance level of problems experienced in the transition from elementary to secondary education by using the rank-order scaling method. The study was conducted using a mixed-methods design. Forty-two eighth-and ninth-grade students from different types of public schools and 15 teachers were selected as the sample for the qualitative phase. The sample for the quantitative phase constituted consisted of 336 eighth- and 397 ninth-grade students, with 130 eighth- and 139 ninth-grade teachers. An essay instruction and semi-structured interviews were used to collect qualitative data. Then, scaling forms for students and teachers were developed in accordance with the qualitative data. The qualitative data were analyzed with the content analysis technique. "Thurstone's law of comparative judgments" and "the composite standard" solutions were utilized to analyze the ranked data. The stimulus of "constant and rapid changes in the transition system to secondary education" was scaled as the most significant problem by eighth-grade students and teachers. "Not allocating time for leisure time activities" stimulus was evaluated as the most crucial problem by ninth-grade students. In terms of the independent variables, rankings of the stimuli were more consistent in eighth graders' judgments. However, ninth-grade students' judgments revealed that there was less similarity in rankings for both gender and school type variables. Besides, according to the judgments of teachers, rankings descriptively differed in terms of the branch and seniority level variables.

Keywords:
Rank-Order Method, Scaling, The Composite Standard Method, Thurstone's Law of Comparative Judgments, The Transition From Elementary to Secondary Education

Introduction

Development theories have a determining role in defining the structure of formal education systems. In this context, formal education is constituted of certain stages, such as preschool education, elementary education, secondary education, and higher education. However, the gradual structure of education systems brings along a necessity to regulate student transitions through stages.

Even though the transition from preschool education to elementary education is relatively less complex, there are well-defined, more systematic and sophisticated implementations in the transition to secondary schools. For instance, in the Republic of China, an entrance exam, Zhongkao, is administered to decide whether students graduate from elementary school and the same exam is used to select and place students in secondary schools (Hannum, An, & Cherng, 2011). Moreover, Finland's education system is different from the Republic of China's system and requires every student to receive a "basic education certificate" to get admission from secondary education institutions. Throughout primary education, national examinations are not allowed and the whole measurement and assessment process are administered by teachers. The secondary schools take into consideration of the grade point average for theoretical subjects in the certificate. Besides, some institutions may administer their entrance exams or students' extracurricular activities are assessed as a criterion. In France, as in Finland, there are no examinations at the elementary level. However, students are directed to secondary schools through decisions of a local committee (académie), teachers council in primary school, and parents. Furthermore, in the Netherlands, an educational report on student performance is prepared by the school committee to determine which secondary school students should enroll. Additionally, at the end of primary school, students take a test that measures their level of understanding and knowledge (Eurydice, 2020). As for Turkey, nationwide examinations are administered, even in different systems for transition to secondary education. These systems were called OÖKÖSYS between 1998 and 2005; OKS between 2005 and 2007; OGES between 2007 and 2013, and TEOG between 2013 and 2018. It has been called central and regional placement since 2018. Regarding the dominant use of central examinations, the general structure of the system in Turkey is similar to the Republic of China's system. However, considering the grade point average, OGES and TEOG systems overlap with Finland's procedure.

Furthermore, in OKS, teachers' suggestions were taken into consideration to select the students for particular types of schools, such as Anatolian teacher high schools (Ministry of National Education [MoNE], 2005). Thus, this implementation was in parallel with France's. However, the system in Turkey is more compatible with the Netherlands system because both countries reckon among multiple criteria. Besides, considering system regulations in Turkey, it was explicitly stated that there are several problems (e.g., high levels of anxiety, low levels of attendance to extracurricular activities, and predominance of summative assessment rather than process) exist in the process of transition to secondary schools (MoNE, 2007). Although these problems have caused a system shift, they persistently appear at different levels in the new systems. Therefore, the rationales for creating a new system and extinguishing the old one have resembled each other (MoNE, 2007; MoNE, 2010; MoNE, 2013). As a consequence, the transition to secondary education has become a tedious educational problem to solve. One of the problems in the transition system to secondary education in Turkey is increasing need for out-of-school resources such as cram and private schools (MoNE, 2010; Turkish Education Association [TED], 2010; Şad & Şahiner, 2016). Another problem is the negative consequences of entrance examinations on students' psychology such as distress and anxiety (Koçak, Doğan-Gül, Gül, & Çokluk-Bökeoğlu, 2017; Duban & Arısoy, 2016; Karadeniz, Er, & Tangülü, 2014; MoNE, 2010). Moreover, many teachers feel increased pressure and under risk, while trying to increase students' success (Atila & Özeken, 2015; Buyruk, 2014). Studies also showed that students' participation in extracurricular social or leisure time activities such as arts or sports activities is negatively affected (MoNE 2010, Şahin, Uz-Baş, Sucuoğlu, & Şahin-Fırat, 2012), as well as communication between students and their parents (Şahin et al., 2012; TED, 2010; Zayimoğlu-Öztürk & Aksoy, 2014). Besides, due to an instructional perspective, in schools, emphasis is given to particular subjects that are subtests of entrance exams such as mathematics, science, or reading. Still, other subject areas, in other words, non-tested branches, may be ignored. Therefore, exams shaped teachers' teaching methods and measurement and assessment techniques (MoNE, 2010b, TEA, 2010). These problems encountered in Turkey can also be seen in other countries as a result of the high-stakes testing (Berliner, 2011; Brown, Akos, & Galassi, 2004; Madaus, 1988; Madaus, Russel, & Higgins, 2009; Mora, 2011; Saito, 2006; Shepard, 2002; Smith & Rottenberg, 1991; Stecher, 2002; Winstead, 2011).

The literature review showed that there are several qualitative research (Bakırcı & Kırıcı, 2018; Barksdale-Ladd & Thomas, 2000; Dinç, Dere & Koluman, 2014; Kahraman, 2014; Kılıçkaya, 2016; Yılmaz & Altınkurt, 2011), quantitative research (Bıçak & Çevik, 2010; Kutlu & Kumandaş, 2012; Özer-Özkan & Acar-Güvendir, 2018) and mixed-methods design (Kumandaş & Kutlu, 2014) that investigate experienced problems during transition through educational stages. Although problems in the transition to secondary schools have been explored through these studies, the positions of the problems among other problems or what is the most critical issue are still uncertain.

Hence, these studies were limited to determine the significance level of these problems. Therefore, using a convenient scaling approach to determine the experienced problems with a psychological continuum has become the main consideration of

this research. Dunn-Rankin, Knezek, Wallace, and Zhang (2004) listed the following four tasks to assess individuals' judgments about psychological objects: ordering, categorical ratings, similarity judgments, and free clustering. The selection of ordering tasks would be the most appropriate one to determine the best, next best, and the worst. Thus, the methods meeting the ordering task are the unidimensional scaling techniques based on the stimulus-centered approach. In this context, using the rank-ordering method in scaling the problems experienced in the transition to secondary education could contribute to the literature. Because the rank-order scaling method enables to present stimuli as a whole (Ip, Kwan, & Chiu, 2007), prevents circular triads (Turgut & Baykul, 1992), and allows a wide range of stimuli to be used together (Guildford, 1954).

This study aimed to determine the problems in the transition system from elementary to secondary education, considering the perceptions of eighth and ninth-grade students and their teachers, then examine the significance level of these problems using the rank-order scaling method. Teachers and students were selected as judges because they were the most affected stakeholders of any change in the transition system. Hence, their scaled judgments in the psychological continuum might be used as data-based evidence to make regulations and find solutions to the problems in the transition policies. Moreover, several studies have examined the differences between groups (Bal, 2011; Koğar & Gelbal, 2015; Yalçın & Şengül-Avşar, 2014). Hence, various demographic variables such as gender, age, school type, or educational background may be related to the scale values. In this context, the study examined the following research questions:

1. According to students and teachers, what are the problems experienced in the context of the transition system from elementary to secondary education?

2. According to students and teachers, what are the scale values of the problems in the transition from elementary to secondary school?

3. Do the scale values differ descriptively by students' genders and type of their schools, teachers' branches, and seniority?

Method

Research Design

This study was conducted using a mixed-methods design. Mixed methods design is a research approach that requires the collection of qualitative and quantitative data in the process of investigating research questions and the integration of these different data set forms while interpreting them. Exploratory sequential mixed design is one of the types of mixed methods design. In this design, the study begins with exploring and analyzing the qualitative data, and the findings can be used to develop a measurement tool. The quantitative data is then obtained as a second phase to support or generalize qualitative findings (Creswell, 2014). Thus, in this study, qualitative data were initially obtained to identify the stimuli in scaling forms, and then scale values were computed as a second phase.

Study Sample

A maximum variation sampling, which is a non-probability-based sampling method, was used in the qualitative phase of the study. The purpose of maximum variation sampling is to capture and reflect diverse characteristics of individuals (Patton, 2002). Accordingly, in the 2017–2018 academic year, the essay writing exercises were conducted with 27 eighth- grade students from middle schools and Imam hatip middle school, and 42 ninth-grade students from Anatolian high school, Imam hatip high school, and social sciences high school in Kütahya city center, Turkey. Besides, interviews were conducted simultaneously, with 15 teachers from the same schools. These schools varied in terms of academic achievement, school size, and family socioeconomic status (SES). While 10 (66.67%) teachers were working at elementary schools, five (33.33%) of them were working at secondary schools. Eleven of the 15 teachers were men, and only four of them were women. As for their branches, four teachers (26.67%) were in the field of mathematics, two (13.33%) were in the field of social studies, and similarly, two of them (13.33%) were in the field of counseling. One teacher from the following each branch participated in interviews: Turkish, literature, technology and design, religious culture and moral knowledge, geography, and science. Also, seven (46.67%) of the teachers had one to 10 years of working experience, whereas others' (53.33%) had experience between 11 and 20 years.

A stratified random sampling method was used in the quantitative phase. In stratified sampling, the population is divided into specific subgroups by key characteristics of individuals in the population. Every subgroup is randomly selected to represent the same proportion in the population (Fraenkel & Wallen, 2006; Robson & McCartan, 2016). Then, the types of middle and high schools are identified as the subgroups of this study. MoNE (2018) statistics revealed that in the 2017 and 2018 academic year, there were 3,466 eighth-grade students and 3,675 ninth- grade students who enrolled in middle and high schools in the city center of Kütahya.

Additionally, the number of teachers working at middle schools was 746, while 816 teachers were working at high schools. As Cochran (1953) stated, for a 95% confidence level to represent a population as large as 1000, the sample size should be at least 320, and to represent a population that is 4000, the sample size then should be approximately 354. Therefore, the quantitative phase of the study constituted of 336 eighth- and 397 ninth-grade students, and 130 eighth- and 139 ninth-grade teachers additionally. Table 1 shows detailed information about the sample of students.

Table 1. *Distribution of the Sample in terms of the Grade, School Type, and Gender Variables*

Grade	School type	Gender				Total	
		Girl		Boy			
		n	%	*n*	%	*n*	%
Eight grade	Middle school	127	17.33	122	16.64	249	33.97
	İmam hatip middle school	51	6.96	36	4.91	87	11.87
	Total	178	24.29	158	21.55	336	45.84
Ninth grade	Science high school	17	2.32	10	1.36	27	6.80
	Anatolian high school	65	8.87	72	9.82	137	34.51
	Social sciences high school	18	2.46	8	1.09	26	6.55
	Vocational high school	47	6.41	97	13.23	144	36.27
	Imam hatip high school	0	0.00	41	5.59	41	10.33
	Fine arts sigh school	14	1.91	8	1.09	22	5.54
	Total	161	21.97	236	32.19	397	54.16
	General total	339	46.26	394	53.74	733	100

As Table 1 depicts, 1, the number of students from middle schools is almost three times greater than the number of students from İmam hatip middle schools. The numbers of students in the ninth-grade level are close to each other in Anatolian high schools and vocational high schools while science high school, fine arts high school, and social science high school have the lowest number of students in the distribution. As the preparation of data set for the analysis, it was noticed that there were 22 missing data in the scaling forms. In 16 of these forms, different stimuli were ranked with the same values. Five of them were ranked with a value that out of the ranking e.g., eight or nine, and one form was left unfinished. These forms were excluded from the data set, and analyses were conducted with 711 data. The sample of the teachers is presented in Table 2.

According to Table 2, in both of the eighth- and ninth-grade teacher groups, the percentage of the teachers with 21 years and more working experience is the lowest. The branches with the highest number of teachers were English (18.96%), and mathematics (14.87%). The findings on the data set revealed that there are several mistakes (e.g., incomplete ranking or using the same rank more than once) in six forms that belong to eighth-grade teachers, and in the nine forms that belong to ninth-grade teachers. Hence, these forms were not included in the data set and 124 eighth-grade teacher forms with 130 ninth-grade teacher forms were analyzed.

Table 2. *Distribution of the Sample in Terms of the Gender, Seniority, and Branch Variables*

Independent variables		Eighth-grade		Ninth-grade		Total	
		n	%	*n*	%	*n*	%
Gender	Woman	78	29.00	80	29.74	158	58.74
	Man	52	19.33	59	21.93	111	41.26
	Total	130	48.33	139	51.67	269	100
Seniority	1-10 years	41	15.24	47	17.47	88	32.71
	11-20 years	67	24.91	58	21.56	125	46.47
	21 years and more	22	8.18	34	12.64	56	20.82
	Total	130	48.33	139	51.67	269	100
Branch	Turkish	24	8.92	-	-	24	8.92
	Technology and design	4	1.49	-	-	4	1.49
	Science	17	6.32	-	-	17	6.32
	Revolution history and Kemalism	12	4.46	-	-	12	4.46
	Physical Education	11	4.09	3	1.12	14	5.20
	Religious culture and moral knowledge	7	2.60	6	2.23	13	4.83
	Visual arts	6	2.23	4	1.49	10	3.72
	English	23	8.55	28	10.41	51	18.96
	Mathematics	21	7.81	19	7.06	40	14.87
	Counseling	2	.74	3	1.12	5	1.86
	Music	3	1.12	3	1.12	6	2.23
	German	-	-	3	1.12	3	1.12
	History	-	-	9	3.35	9	3.35
	Philosophy	-	-	1	.37	1	.37
	Biology	-	-	9	3.35	9	3.35
	Physics	-	-	5	1.86	5	1.86
	Chemistry	-	-	3	1.12	3	1.12
	Health education	-	-	2	.74	2	.74
	Technical courses	-	-	9	3.35	9	3.35
	Geography	-	-	7	2.60	7	2.60
	Computer science	-	-	4	1.49	4	1.49
	Turkish Language and Literature	-	-	21	7.81	21	7.81
	Total	130	48.33	139	51.67	269	100

Research Instruments and Procedures

The quantitative data were obtained using "Student and Teacher Scaling Forms" developed by the researchers. The "essay instruction" and an "interview form" were used to obtain the qualitative data set during the process of developing the scaling forms. As Erkuş (2012) stated, while identifying the construct to be measured, the literature can be supported by methods such as essay writing exercises or observations.

To define the stimuli of the Student Scaling Form, the students were instructed to write an essay about their experiences during the transition to secondary education. This instruction was reviewed by two measurement and evaluation experts and two language experts. The essay practice was performed with seven students as a preliminary. Then, revisions about readability and accuracy of the final version of the instruction were made. As the essay data showed, eighth-grade and ninth-grade students' perceptions showed similarity. Thereby, a scale form was developed for two groups of students.

Initially, the Student Scaling Form had six stimuli. "My family's financial struggles because of costly out-of-school resources such as private tuition, textbooks" was a sub-example of the stimulus of "the problems that I had experienced with my parents.". However, this sub-example was decided to be an independent stimulus, according to the experts' review. Thus, the number of stimuli increased to seven. After the final version of the form was designed, preliminary administration was conducted with 10 students.

The student scaling form consisted of two parts and an instruction explaining how the form should be filled. In the first part, there are two demographic questions, gender and school type. The second part of the scaling form included a ranking of the problems. In this part, the problems considered as stimuli were listed as a table on one page and arranged randomly. Sub-examples were given to understand each stimulus better. A "ranking column" was added next to the list of stimuli. The judges (students) were asked to rank the stimuli from the most important (1) to the least important (7).

The stimuli of the Teacher Scaling Form were identified through semi-structured interviews with four main questions and probes. Thus, 11 stimuli were determined by evaluating the qualitative data and the body of the literature together. Teacher Scaling Form was reviewed by the same experts in the Student Scaling Form. Following the reviews, the sub-examples of stimuli were elaborated. The form was tested with four teachers. After revisions, the final form consisted of two parts and one instruction, similar to the student form. Nevertheless, as distinct from it, the demographic information part was expanded with branch and seniority questions. Furthermore, teachers were asked to rank 11 stimuli from the most important (1) to the least important (11).

Data Analysis

A content analysis was used to examine the qualitative data. The purpose of the content analysis is to produce valid and replicable inferences from texts to contexts of their use (Krippendorff, 2004). In this regard, the data obtained from essays and interviews were analyzed inductively in the following five stages: coding, constructing sub-themes, constructing themes, sorting of themes, and reporting findings (Merriam & Tisdell, 2016). During the coding process, identifier numbers (e.g., S1 for the first student, T2 for the second teacher were used) were assigned to students and teachers. Eventually, seven themes were constructed according to the student essays, and four themes were emerged according to teachers' views. Codes were checked by a qualified subject matter expert. Then, inter-rater reliability was not examined as the codes were agreed on.

A scaling method of rank-order based on the stimulus-centered approach was used to analyze the ranked data. In this scaling method, judges rank the defined stimuli from smallest to biggest, or vice versa, according to their particular characteristics. Then, they assign an ordinal number to these stimuli (Turgut & Baykul, 1992). The scale values can be computed with various techniques in the rank-order scaling method. One of these solutions is "Thurstone's law of comparative judgment" claiming that ranked data can be transformed into the proportions of the law of comparative judgments by creating the row frequency matrices (F) that represent how many times a stimulus is placed in each rank (Thurstone, 1931). According to Guilford (1954), this solution is based upon the safest logical grounds. However, the number of judges should be at least 100. Therefore, to use this technique, integrations were made in some groups where the number of judges is relatively small. In this way, science high school, social high school, and Anatolian high schools were treated as one group (First group), and vocational high schools, imam hatip high schools, and fine arts high school were combined as the second group. In the same manner, eighth-grade teachers' branches were scaled in two groups as tested and non-tested branches in national exams. Each of the scaling analysis was conducted on complete data (Edwards, 1957). Computation steps for the solution of the law of comparative judgment can be summarized as follows:

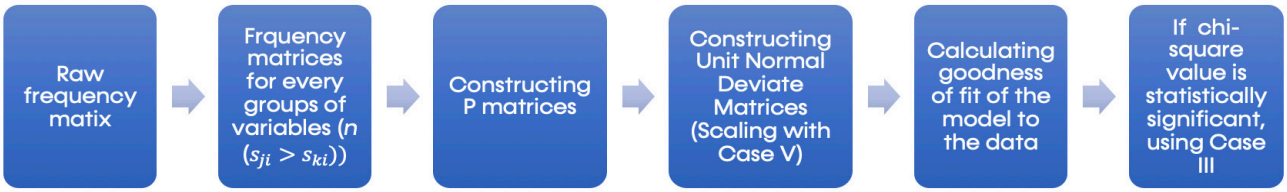

Figure 1. Process of Solution of Law of Comparative Judgment in Method of Rank-Order

A raw frequency matrix was created for each group of independent variables. Then, the number of how many times each stimulus was judged greater than another stimulus was calculated with the following equation of *n(Sji> Ski)= fji.(fk<i+(1/2).fki)*, in separate matrices.

Later, the proportion of times stimulus j was greater than stimulus k was constructed in the P matrix. Moreover, unit normal deviation values corresponding to P elements were shown in the X matrix. To obtain scale values, the mean values of X were calculated by dividing sums of the columns of the X matrix by the number of stimuli. However, to see the position of the stimuli on the psychological continuum, the zero point was arbitrarily placed at the lowest mean value of X as the origin. This value was then added to other mean values of X (Guilford, 1954; Torgerson, 1958). Furthermore, the goodness of fit of the model to the data was examined to determine whether the assumption of analysis was met. Accordingly, average absolute deviations between observed and fitted proportions, in other words, error terms were obtained, and a chi-square test was utilized to examine the significance of these values. Table 3 depicts the results of the analysis.

According to Table 3, the discrepancies between observed and fitted values are not statistically significant at the alpha level of α= .05. Therefore, the scale values obtained from Case V were interpreted in the findings section. Another solution for rank-order scaling is "the composite standard method," which is accepted as the second best technique by Guilford (1954). The underlying assumption of this technique is that the stimuli group is a composite standard (CS) in which each stimulus is compared. However, the CS technique can be used when the multiplication of the number of stimuli and the number of judges is greater than 200 (Guilford, 1954). Hence, in cases where the number of judgments for Thurstone's solution was inadequate, the CS method was used in this study (these situations are as follows: seniority of the teachers, branches of the ninth-grade teachers, non-tested branch group among eighth-grade teachers, and İmam-hatip middle school as school type).

Ninth-grade teachers' branches were examined into four groups to ensure that the number of teachers was close to each other. Hence, the first group was called language (German and English), the second group was called social sciences (geography, literature, philosophy, religious culture and morality, and history), the third group was called mathematics and science (physics, chemistry, biology, and mathematics) and lastly, the fourth group was called other (physical education, computer education, visual arts, music, counseling, health education, and technical courses). Similarly, scale values for seniority variable were calculated for three different groups; One to 10 years, 11 to 20 years, and 21 and more years. Initially, the raw frequency matrix was generated in

Table 3. *Average Discrepancy and Chi-square Values for the Solution of Law of Comparative Judgments*

	Groups	n	Average discrepancy	Chi-square	Df	Table value
Eighth grade	All students	326	.014	10.27		
	Girls	171	.021	12.79		
	Boys	155	.009	2.45		
	General middle school	241	.014	7.57		
Ninth grade	All students	385	.009	7.27	15	24.996
	Girls	158	,011	4.74		
	Boys	227	.007	3.38		
	1st group (Science/social sciences/Anatolian high school)	181	.015	7.83		
	2nd Group (Vocational/imam hatip/Fine arts high school)	204	.009	2.95		
Eighth grade	All teachers	124	.011	8.44		
	Tested branches	102	.011	6.30	45	61.6562
Ninth grade	All teachers	130	.009	5.89		

the CS method. Owing to this matrix, the probability of each stimulus greater than the CS was calculated using the following equation: $p_{j(p_j>p_{cs})} = \sum_{i=1}^{K} \frac{(f_{ji}.r_i - 0.5.N)}{K.N}$ (Guilford, 1954; Turgut & Baykul, 1992). As the next step, the deviations correspond to those proportions were computed ($X_{j>cs}$). Turgut and Baykul (1992) claimed that the sum of X values should be as small as possible and close to zero.

In this study, the sum of the X values ranged within the range of -.002 and .11, not far from zero. Consequently, the number of judges and data set was found to be convenient for this technique. Lastly, to make all X values positive, the zero point was arbitrarily placed at the lowest X value. Furthermore, Kendall's Tau correlation coefficient was used to compare rank orders in addition to descriptive findings.

Findings

Qualitative Findings

Students' perceptions. Eight- and ninth grade students' perceptions revealed that the problems experienced in the transition to secondary education were constructed in seven themes. The most frequently mentioned theme was "anxiety and stress experienced during the transition to secondary education" (f= 43). While the total frequency of eighth-grade students was f_8= 17, the total frequency of ninth-grade students was f_9= 26. Experiencing exam stress, feeling physically ill, being afraid of not being successful in exams, or disappointing others were the sub-themes that explain this theme. A student (S34) highlighted the stress he experienced by writing, "when TEOG exams have come, many of us could not succeed due to studying hard and feeling stressed. As if we are not taking an exam, we are taking stress." S25, who worried about being unsuccessful, stated, "If I cannot be successful, it will be tough to recover myself. This is what terrifies me the most. Even the thought of not being successful is enough to fill my eyes with tears. If I had one wish, I just wanted to pass the exam."

Moreover, S11 wrote that "...I am curious about my parents' reactions and I am really scared. I do not want to disappoint them...and I do not want to break their hearts." S61, who suffered health problems, remarked, "I was also physically harmed. I lost eight kilos in a year." The second theme was defined as "the problems arise from the system" (f_8= 25, f_9= 6). The main argument of this theme was the rapid changes in the system of transition to secondary education. Also, uncertainty about how the measurement and assessment process will operate, and not adapting to a new system were also considered as crucial problems. About this theme, S24 wrote, "...the most challenging thing for us was definitely the change of the system. When the system suddenly changed, we were in a quandary." Following this statement, S64 expressed, "students who faced with system changing do not know what to do and fell psychologically bad." The third theme was "the problems between students and their parents" (f_8= 7, f_9= 20). The sub-themes of this theme are parent pressure on the student to study, comparison of student performance with others, negative reactions to exam results, and the conflict between students and parents when determining future goals. Student opinions regarding these problems are as follows:

> *"Our parents want us to enroll in a good high school and have a profession, but when they say study, we feel pressured. I mean, I feel like this (S3). "My parents acted differently because of my low exam score" (S28). "My parents' expectations about my future, on the other hand, my dreams and plans for my future made me to fall into a dilemma" (S29). "It makes me feel awful when my family and the people I care about compare me with others" (S19).*

Another theme was determined as "not allocating time for leisure time activities" (f_8= 7, f_9= 8). Student opinions revealed that students spent most of their time studying, even out of school during the transition process. S65 made a statement for this theme writing, "I locked myself home, and was constantly studying or doing homework. I almost isolated myself from the outside world." The fifth theme was called "the problems between students and their teachers". S23 gave an example of opinion on this theme, "our teachers put pressure on us to get good results from exams, and they sometimes shout at us to do a nonstop test." On the other side, students in the eighth- and ninth-grades said that the time they spend in school increases, including weekends; however, this time was allocated to studying or taking the tests. These statements were identified as the sixth theme as "excessive exam-oriented preparations in schools" (f_8= 6, f_9= 7). S23 wrote, "it has been a tough period of my life since I attended after-school and weekend courses." Furthermore, S47 stated, "...but I want to explain a method that we used. With this method that was started two months before TEOG, we did the test from 7 p.m. to 9 p.m."

The least mentioned theme among seven themes was the "financial struggles of the families" (f_8= 2, f_9= 3). This theme can be exemplified by costly out-of-school resources such as new textbooks, books, and private lessons. Student views supporting this theme were "my family enrolled me in a cram school; however, they had to stint themselves. They made many sacrifices" (S1). Moreover, S30 identified the problem as "The expenses that my family made for me to study in a high school was overmuch."

Teachers' Perceptions. According to the teachers' perceptions, four main themes emerged. The first theme was "the problems arise from the system" (f_8= 29, f_9= 6). Some teachers (f_8= 8, f_9= 1) remarked the continuous and rapid changes in the transition system to secondary education with the following statement, "my wish is the stability in the system. Change happens within a day or two, but the new system takes a year to digest. For example, the system may change again next year, and it will be disconcerting for children" (T3). A few teachers (f_8= 7 f_9= 1) highlighted that these changes may cause uncertainty about how to administer the new implementations. Furthermore, teachers (f_8= 5, f_9= 1) perceived that the transition system to secondary education fails to bring students abilities and interests to the forefront. For example, T4 expressed, "unfortunately, the placement of students to high schools is completely exam-oriented. Neither the ability of children nor what they think are not taken into consideration, the last decision depends on the exam results." Some teachers (f_8= 3, f_9= 1) also criticized the subtests in nationwide exams as they are not good enough to assess higher-order thinking skills as much as PISA.

Moreover, teachers (f_8= 3, f_9= 1) had a negative view that the new system would be a solution for out-of-school resources, as emphasized in the following statements: "the new system will raise the importance of cram schools or private lesson" (T8), "people whit money will eventually access to the extra resources so that the gap will increase more" (T7). Besides, the use of the criteria for academic achievement in placing students to secondary education schools is identified as a problem by a few teachers (f_8= 1, f_9= 1). T15's following statement could exemplify the aforementioned problem: "...I think the views of teachers and school administration must be used as a criterion for students' placement because they work with students and know them very well. Some European countries use these criteria." Two teachers expressed that their opinions are not taken during the change in the system of transition to secondary education, and defined it as a problem. T7's opinions summarize this problem: "As a suggestion, I can say that I believe that the ministry of education does not appreciate my ideas in this system, where I am the practitioner, is nonsense. There are about a million teachers in which they play a major role in the Turkish education system, but unfortunately, I am the one whose ideas are taken least. I know very-well educated people at the ministry, yet I believe that they do not care that my ideas can give them a perspective."

The second theme was about the harmful effects of the transition system to secondary education on teachers (f_8= 18, f_9= 9). Sub-themes of this theme were restriction of teachers' teaching and measurement-assessment methods (f_8= 12, f_9= 5), increased in stress due to the use of exam results to make comparative interpretations (f_8= 4, f_9= 2), and consideration of non-tested subject areas as worthless by students (f_8= 2, f_9= 2). Teachers' views on this theme are as follows:

> *T5: "While I am preparing items for the exam, I pay attention to.... rather than considering which item measures the learning outcomes best, then I cannot transfer my dreams into practice. I mean, I use tests, open-ended items, or items that out of spec when needed. However, I know that I am accounted for these." T4 said, "...normally, I can use many activities such as games or puzzles, according to my branch. Nevertheless, unfortunately, we are compelled to teach test or cover a topic due to our exam-oriented system and restricted lesson hours. Also, like students, teachers are compared as a racer like this teacher's students got lower grades, while others' students got higher grades." Lastly, T14 stated, "teachers of non-test branches are considered in an unnecessary position. Students do not care about these subjects since they thought these subjects are not useful for them. Thus, the teachers get upset and take a hard line with students. Even technology and design teachers intentionally give students low grades due to this situation."*

Teachers also expressed their opinions about the unintended consequences of the transition system to secondary education on students (f_8= 3, f_9= 7). These views were investigated in the theme of "problems that students experienced." One sub-theme was associated with the limitation of the students' development to cognitive skills only. T14 said, "... children try to improve themselves only in Turkish or mathematics, but they miss many other goals such as social and emotional development." Some teachers stated that the parents hold down students to study. For example, T13 said, "Especially some parents bore children by saying, you have to solve 300-400 questions per day. Children study like a racer."

The fourth theme with the lowest frequency was the "problems of the families" (f_8= 1, f_9= 1). According to the teachers, even though the cram schools were closed down, families still pay for extra resources such as private lesson institutions that are similar to cram schools. A teacher's (T4) view explains this problem as follows: "If we look from the family's viewpoint, it is a very troublesome situation. Why? Because they are responsible for a great financial expense. They spend money on school for food and textbooks; they maybe hire a teacher for a private lesson. Although the cram schools closed down, they do not give up private lesson institutions that can also be excepted as under the counter. So, families become more stresses to meet these expenses."

Quantitative Findings

Scaling Findings Obtained from Students' Judgments. Table 4 depicts the level of importance considered as a problem in the transition system to secondary education, according to eighth-grade and ninth-grade students.

Table 4. *Scale Values and Ranks Obtained from Students' Judgments*

	Eighth-grade		Ninth-grade	
Stimuli	Scale value	Rank	Scale value	Rank
A-Not allocating time for leisure time activities	.982	4	.992	1
B-Excessive exam-oriented preparations in my school	.850	5	.970	2
C- Problems between my parents and me	.999	3	.808	4
D-Feeling pressure to study from my teachers	.799	6	.618	6
E-Continuous and rapidly changing in the transition system to secondary education	1.644	1	.784	5
F-Anxiety and stress that I have experienced	1.309	2	.952	3
G-Financial struggles of my family because of costly out-of-school resources such as private tuition, textbooks	.000	7	.000	7

As Table 4 depicts, the vast majority of the significance levels regarded the problems that differ among the student groups experiencing different systems for transition to secondary education. Coherently, the Kendall's tau (r_t) correlation coefficient was found to be .24 but it was not significant (p> .05). This value illustrates that students' rankings at different grade levels are not similar. Only, stimuli D and G went through a similar discriminal process because both were scaled on the last ranks. The most distinct discrepancy between the two groups was observed in stimuli A and E. The scale values on a straight line are shown in Figure 2.

In Figure 2, the most significant problems had the highest scale values, while the least problems had the lowest scale values. According to eighth-grade students' judgments, the stimuli that were ranked on the fifth and sixth order, and on third and fourth order were more clustered. However, the stimulus on the second rank was located more independently by scaling almost in the middle of the stimuli C and E. For ninth graders' judgments, the range of the scale values of stimuli A, B, and F is narrow. Moreover, the stimuli that scaled on fourth and fifth orders were grouped by diverging from that triad.

Scaling Findings Obtained from Teachers' Judgments. Table 5 presents the significance level of the problems in the transitions system to secondary education by teachers.

Table 5. *Scale Values and Ranks Obtained from Teachers' Judgments*

	Eighth-grade		Ninth-grade	
Stimuli	Scale value	Rank	Scale value	Rank
A- Financial struggles of the families because of costly out-of-school resources such as private tuition, textbooks.	.000	11	.099	10
B-Consideration of non-tested subjects as worthless by students	.358	8	.678	4
C-Increase in the necessity for out-of-school resources	.201	9	.296	9
D-Restriction of teachers' teaching methods	.628	5	.501	7
E-Experiencing stress because of the use of exam results to make comparative interpretations about teacher and school	.686	4	.552	5
F-Not taking teachers 'opinions while changing the transition system to secondary education or making decisions about it	1.274	2	.961	2
G-Parent pressure on students	.092	10	.000	11
H-Limitation of the students' development with only cognitive skills rather than soft skills	.475	7	.403	8
I-The use of criteria only related to academic achievement in placing students to secondary education schools	.730	3	.802	3
J-Falling short of the national exams while assessing higher-order thinking skills	.491	6	.548	6
K- Continuous and rapid changes in the transition system to s econdary education	1.455	1	1.128	1

As illustrated in Table 5, despite the scale values of stimuli K, F, and I differentiated, they were assigned to

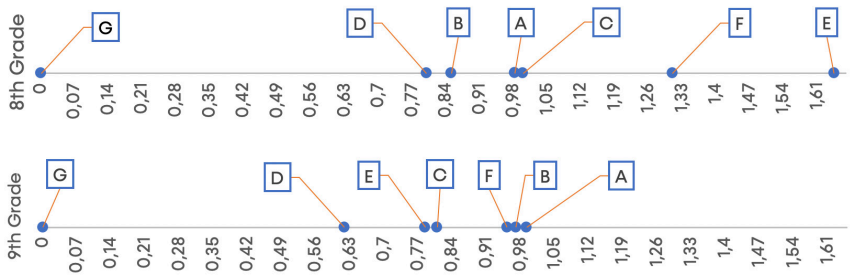

Figure 2. Representation of the Scale Values on a Line

the top three ranks for both groups. Similarly, stimuli J and C that is ranked sixth and ninth order, respectively. For the rest of the stimuli, there were no significant differences between rankings which is proved with correlation analysis (r_t= .78, p< .05). Exceptionally, stimulus B was judged as highly significant by ninth-grade teachers, whereas it was evaluated as less significant by eighth-grade teachers. The scale values on a straight line are illustrated in Figure 3.

In judgments of the eighth-grade teachers, the significance level of two stimuli that on sixth and seventh ranks was almost equal. Stimuli D, E, and I seemed a group because they located tightly. However, the two most significant stimuli located explicitly far away from the rest of the stimuli. Most of the differences between the scale values of ninth-grade teachers' judgments were ranged between .09 and .17. Still, the significance level of stimuli on the fifth and sixth ranking was barely discriminated against with the value of .004 difference.

Scaling Findings in Terms of Gender and School Type Variables. According to students' judgments in terms of gender variable, the scale values were evaluated comparatively for both grade-level and presented in Figures 4 and 5.

According to students' judgments in terms of gender variable, the scale values were evaluated comparatively for both grade-level and presented in Figures 4 and 5.

According to girls and boys in eighth-grade, the ranking only differed for the stimuli on the third and fourth order. Hence the correlation between rankings showed that boys' and girls' judgments were statistically similar (r_t= .91, p< .05). Also, it was observed that there are descriptive differences in scale values. For instance, despite the most significant problem was stimulus E for boys and girls, there was a .47 difference between the two groups. This difference was observed in each of stimulus, except for the least significant stimulus. In the same rankings for girls and

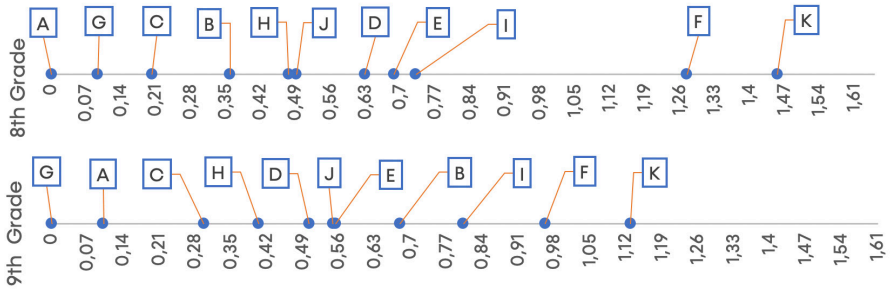

Figure 3. Representation of the Scale Values on a Line

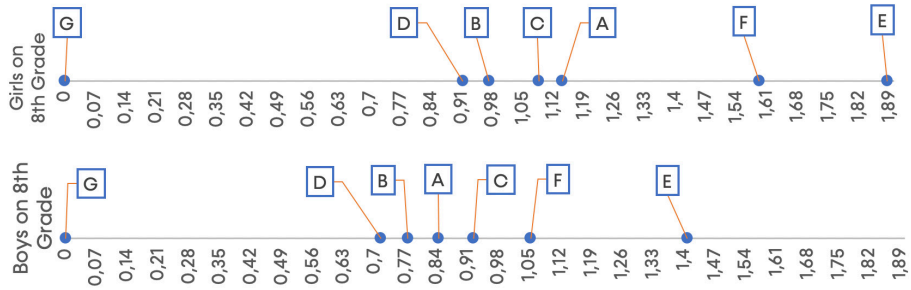

Figure 4. Scale Values on Line for Girls and Boys on Eight-Grade

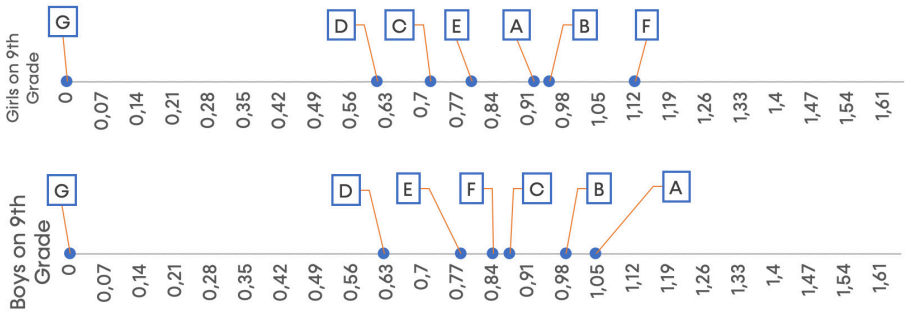

Figure 5. Scale Values on Line for Girls and Boys on Ninth Grade

boys, there were differences with the values of .54, .20, and .20, respectively. Each difference was in favor of girls. While the scale value of stimulus D on sixth rank was .91, this value scarcely corresponded to third rank in the group of boys.

Figure 5 provides that four stimuli were scaled on different ranks, except for the stimuli on second, sixth, and seventh rankings. However, rankings in different gender groups were not similar (r_t= .52, p> .05). While the most significant problem for girls was judged to be moderately significant by boys, the most significant problem for boys was placed on third order by girls. Even though the stimuli were scaled on different ranks, no significant changes in scale values were observed. Most of the scale values were in favor of boys, yet the scale values of first and third stimulus were in favor of girls. The scale values obtained from the judgments of students from different school types are demonstrated in Figures 6 and 7.

As Figure 6 depicts, stimuli E, F, and G had the same rankings in different groups. However, compared to students' judgments in imam hatip middle schools, students in middle schools evaluated stimulus C as highly significant by ranking it three points more. Stimulus A was scaled moderately important in both different school types, and its location differed only one rank. Stimuli B and D were considered more important for imam hatip middle school students. These different rankings indicated that eighth-grade students from different school types do not share similar judgments (r_t= .52, p> .05). Furthermore, in the solution of the law of comparative judgment, stimulus on third and fourth with fifth and sixth ranks seemed like a group. The scale values of the CS method were clustered, particularly at the third, fourth, fifth, and sixth ranks.

As Figure 7 shows, the essential problems devoted by groups differed. Consistently, the relationship between rankings was not significant (r_t= .52, p> .05). As the most important for the second group, stimulus B was ranked third by the first group. And stimulus F was seen moderately significant by the second group, while it was seen as the most important one by the first group. Also, the scale values of the second group are lower than that of the first group. The highest scale value of the second group was almost equal to the scale value of the stimulus on the fourth rank. As the top six stimuli were close to each other in both groups, stimuli G was not seen explicitly important by locating far away from others.

Scaling Findings in Terms of Seniority and Branch Variables. Figure 8 and 9 show scale values calculated from the judgments of eighth-grade and ninth-grade teachers according to seniority variable.

Figure 8 depicts that no stimulus was scaled on the same rank by three different groups. However, most of the stimuli were changed only one or two ranks

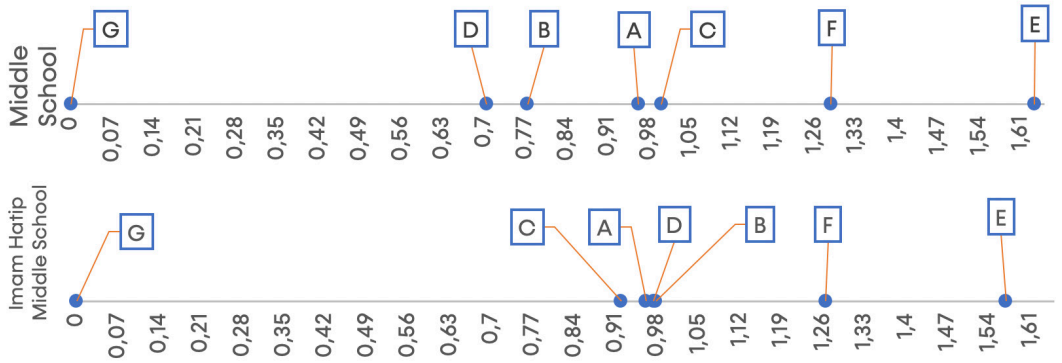

Figure 6. Representation of the Scale Values of Eighth Grade Students' Judgments

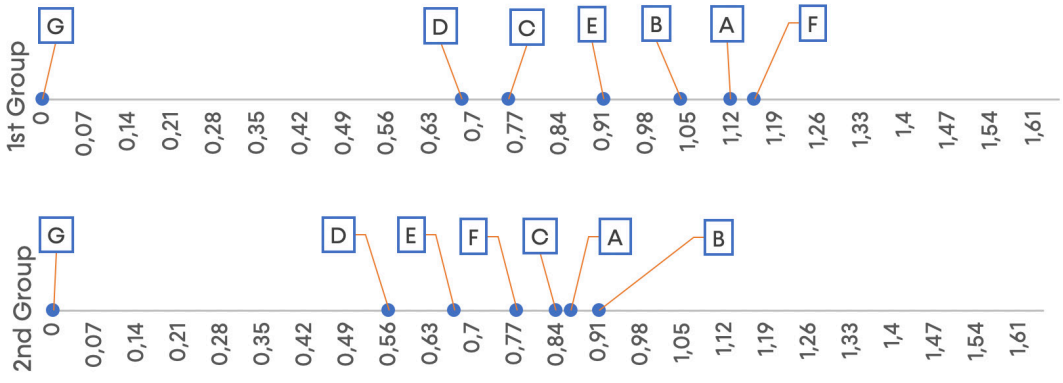

Figure 7. Representation of the Scale Values of Ninth-Grade Students' Judgments

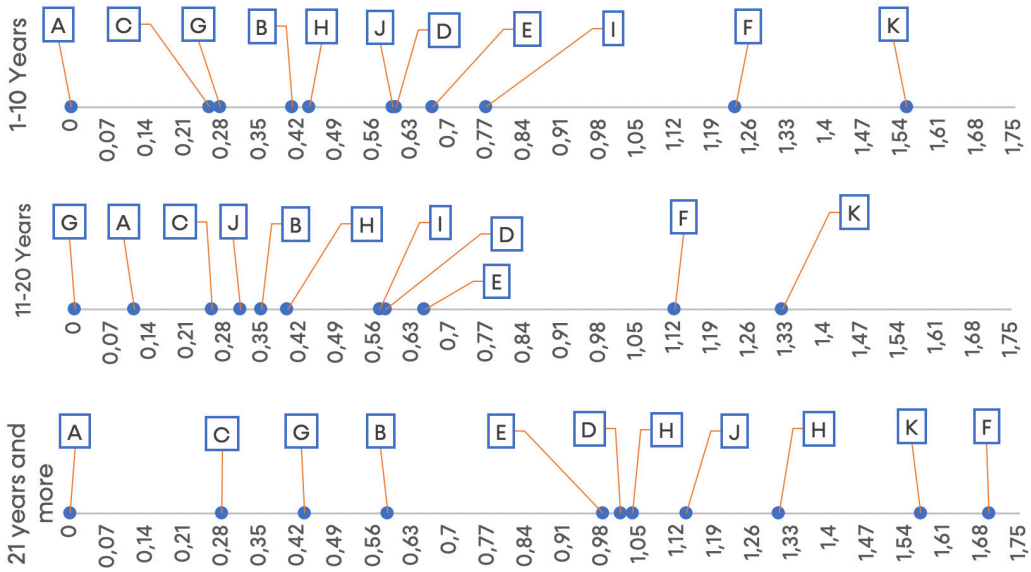

Figure 8. Representation of the Scale Values of Eighth-Grade Teachers' Judgments

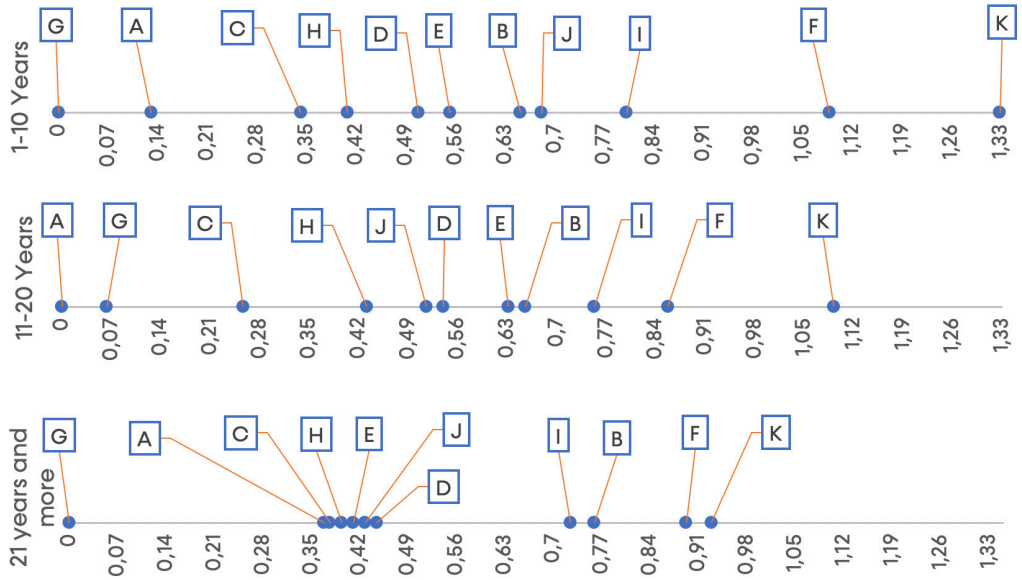

Figure 9. Representation of the Scale Values of Ninth-Grade Teachers' Judgments

among the groups, so the correlation coefficient among rankings varied between .56 and .78, $p < .05$. According to descriptive results, teachers in first and second groups decided that the stimulus K is the most significant problem. However, this stimulus was seen as less important than the stimulus F by the teachers with 21 years and more experience. Contrary to the fact that stimulus A was scaled by the first and third group on the last rank; stimulus G was judged as the least significant problem by the teachers with 11- and 20-year experience. In the first group, stimuli that scaled on fifth and sixth, seventh, and eighth, with ninth and tenth rank; in the second group stimuli scaled on fourth and fifth rank created a pairwise. In the last group, there was a triad that included stimuli E, D, and H.

Based on Figure 9, the number of stimuli agreed on by the groups is four in eleven. Even though stimuli B, E, D, and J were scaled in different locations, the ranking differences were not more than three. Overall, the correlation coefficient between rankings was found rt= .86, p< .05 for each comparison, which means the judgments of different groups were congruent. The highest scale values of stimuli K and F were in the group of teachers with one to 10 years of seniority. In the last group, stimuli on fifth, sixth, seventh, eighth, ninth, and tenth ranks were clustered between .35 and .42 values. Figures 10 and 11 explain whether the scale values differed or not in terms of the branch variable.

According to the representation of the scale values on a line, stimuli A, B, F, and K were scaled on the same

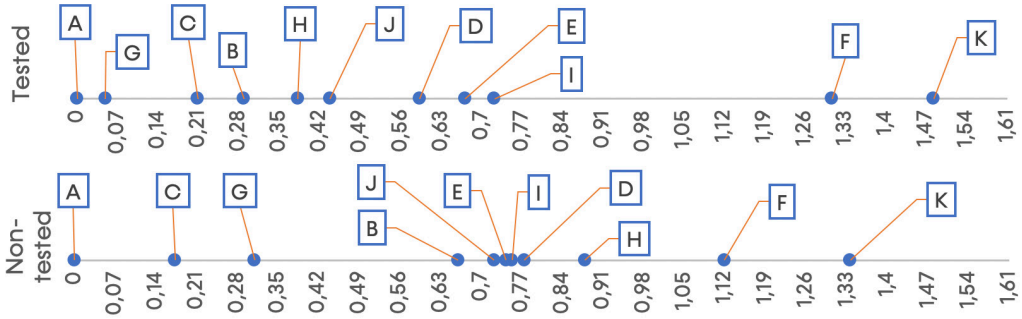

Figure 10. Representation of the Scale Values of Eighth-Grade Teachers' Judgments

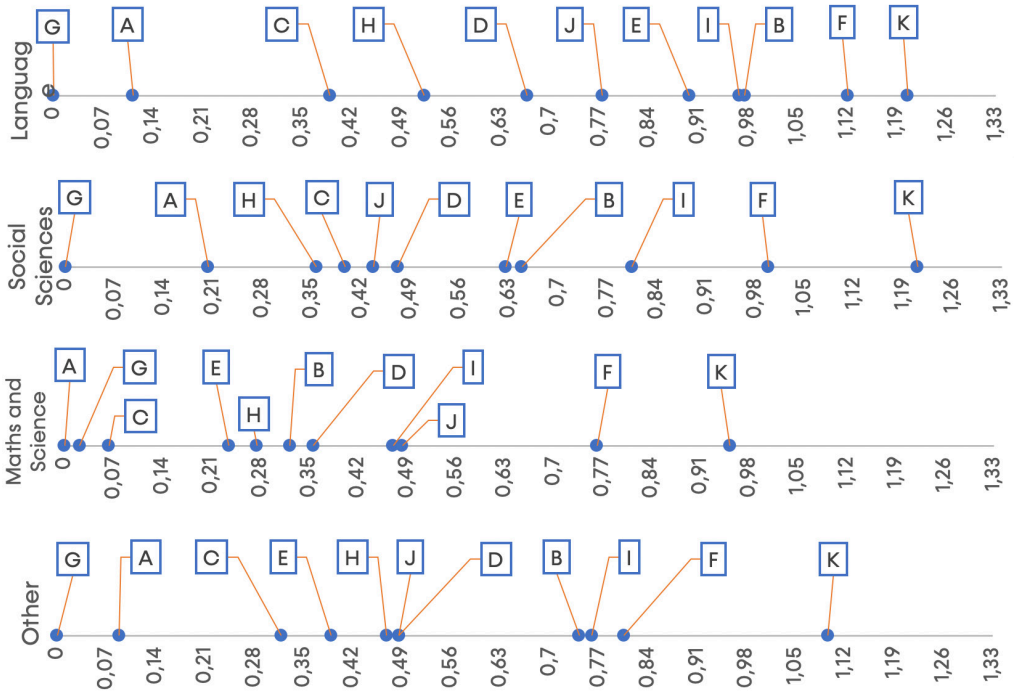

Figure 11. Representation of the Scale Values of Ninth-Grade Teachers' Judgments

rank, and rankings were consistent among these groups r_t= .745, p< .05. However, while the stimulus H was considered as highly crucial for the first group, the non-tested branch group judged the same stimuli closer to the last of the ranking. Stimuli F and K, which were on the same ranks for both groups, had higher scale values in the solution of Thurstone's law of comparative judgment. Nevertheless, stimulus B had a higher scale value in the CS method. In the first group, stimuli fall into the last nine ranks were more distributed more tightly, yet the top two stimuli distinctly discriminated. Additionally, in the non-tested branch group, stimuli H to B were condensed between .65 and .75 values.

As Figure 11 depicts, most of the stimuli' ranks were changed one or two orders, although there are only two stimuli were judged at the same significance level by four branch groups. Thus, the correlation between teachers' judgments was found to be significantly similar, and the correlation coefficients among rankings varied between .67 and .89, p< .05. Nevertheless, stimulus B was judged to be moderately significant by the third group, while other groups chose this stimulus as highly significant. Also, stimulus E was seen as more important by the language and social sciences branch groups. Besides, some stimuli were clustered and constituted of pairwise and triad groups such as; stimuli B and I in the first group; stimuli E and B with stimuli D, J, C, and H in the second group; stimuli I and J, B, and D with A and G in the third group. Finally, the scale values of F, I, and B with D and J were close to each other in the last group. Even, the scale values of stimulus J and D were equal; it means two stimuli were not distinguished.

Discussion, Conclusion, and Recommendations

Analysis of essays indicated that the students' experiences constituted seven main problem areas.

All of them were in line with previous studies (Özerman, 2007; Satio, 2006; TED, 2010; Şahin et al., 2012; Zayimoğlu-Öztürk & Aksoy, 2014; Stecher, 2002). However, unlike previous research, this study has illustrated that the problems between students and their families went beyond pressure and conflict issues. Parents' negative attitudes toward exam results have become a part of the existing problems and had negative effects on students. Besides, the findings of the study revealed that the relationship between teachers and students has become more exam-oriented, and the success of central examinations has become the only tool for promoting student motivation.

According to qualitative data, teachers' perceptions were grouped under four themes. Similarly, the study of Özer-Özkan and Acar Güvendir (2018) aimed to develop a scale about the effects of national examinations on teachers and identified four factors. Three of these factors are as follows; (i) instructional effects, (ii) morale and motivation, (iii) anxiety, and stress were consistent with the themes. Qualitative data indicated that teachers' teaching strategies were restricted by exam preparation, as well. Chapman and Snyder Jr (2000) claimed that during national high-stakes test adopting new teaching approaches consistently seemed to be risky by teachers. Additionally, many teachers reported that they had become teachers who teach test (Barksdale-Ladd & Thomas, 2000; Kahraman, 2014; Kılıçkaya, 2016).

During interviews, teachers stated that students consider non-tested branches worthless, which was also emphasized by previous studies (Stecher, 2002; TEA, 2010; Winstead, 2011). However, this study revealed that the ratings of non-tested branch teachers can be biased due to reaction to students, while evaluating student performance.

Thus, it can be concluded that the exams administrated in the transition to secondary education had adverse outcomes for the measurement and assessment process. Another problem highlighted by teachers was the constant changes during the transition process to secondary education. Studies have revealed that this problem became a current issue, particularly as system has been changing (Ocak, Yıldız, & Akgül, 2010; Uzoğlu, Cengiz, & Taşdemir, 2013). Besides, teachers expressed their stressful feelings because of the usage exam results were used as comparative judgments. Several studies confirmed this finding by revealing stress and pressure experienced by teachers (Buyruk, 2014; Brown et al., 2004; Kılıçkaya, 2016). Furthermore, in a study conducted by Barksdale- Ladd and Thomas (2000), teachers expressed that they can transfer their anxiety and stress to students. Therefore, this finding can explain why teachers put pressure on students to study more. Lastly, a few studies that examining the items of national exams (Altun & Doğan, 2018; Başol et al., 2016; İncikabı, Pektaş, & Süle, 2016) supported teachers' criticism about assessing higher-order thinking skills.

The findings of scaling revealed that the most important problems differed descriptively among eighth-grade and ninth-grade students. As the fact that eighth-grade students experienced the system changing can be considered as the reason for "continuous and rapid change in the system of transition to secondary education," stimulus was judged as the most crucial problem by them. Moreover, the study of Lee and Larson (2000) examined students who prepared for university entrance exams and found that allocating time for leisure activities is negatively correlated with depression. Thus, "not allocating time for leisure time activities" stimulus was assessed as the most significant problem experienced by ninth-grade students was an expected result, as their mental health may have been negatively affected. However, the "anxiety and stress that I experienced" stimulus was scaled as significant by all of the students. Some metaphorical research (Duban & Arısoy, 2016; Karadeniz et al., 2014; Koçak et al., 2017) showed that students' perceptions about secondary school entrance exams were mostly associated with stress, anxiety, hopeless, and death. Even though these studies did not reveal the significance level of this problem, they can be evaluated as the explanator of students' judgments about this stimulus. According to collective judgment among students, "the financial struggles of families" was the least significant problem. Scaling values of this problem were consistent with the frequencies in essays. Comparing the scale and frequency rankings of other stimuli, they showed consistency in eighth-graders' judgments.

Though, qualitative data and scaling findings differed in the judgments of the ninth-graders. For instance, "not allocating time for leisure activities" and "excessive test preparation in schools" were on the moderate level in terms of frequency, but they scaled in the top two ranks. Despite the "anxiety and stress that experienced" was the most mentioned problem in the essays, scaling results revealed that its actual position of it on the psychological continuum was different.

Just as judgments of eighth-grade students, the most significant problem for teachers was "continuous and rapid changes in the system of transition to secondary education." However, eighth-and ninth-grade teachers' judgments about the least significant problem did not correspond to the same stimuli. "Financial struggles of families" stimulus was not considered as important by eighth-grade teachers, whereas "parent pressure on student" was seen the least significant one by ninth-grade teachers. Besides,

scaling rankings were not in line with the qualitative phase of this study. Although the "restriction of the teaching methods" problem was frequently stated during interviews, it did not have the highest scale values. Moreover, "not taking teachers' opinions while changing the transition system to secondary education" was one of the least mentioned problems by teachers. However, when several stimuli were represented together, the same problem was assigned to second order on the psychological continuum.

In this study, scale values were also examined in terms of independent variables. The findings of the study revealed that eighth-grade students' rankings were showed similarity among gender variables. Some studies showed that girls in eighth-grade experienced test preparation anxiety (Özerman, 2007), and test anxiety more (Hanımoğlu, 2010). Conversely, the significance level devoted to "anxiety and stress that students experienced" stimulus did not differ between girls and boys in eighth-grade. As for ninth-grade students, rankings were more inconsistent in terms of independent variables, because the essential problems varied by gender and school type. When considered seniority and branch variables, more similar distributions on psychological continuum were produced in one-and 10-years seniority with 21 years and more seniority groups. However, the rankings in 11-and 20-years seniority groups were more distinctive. Furthermore, there was no variation in the location of "consideration of non-tested subjects as worthless by students" stimulus between tested and non-tested branch groups, which was an unexpected result. An explanation for such a result is that there are few teachers in the non-tested group.

Besides, scaling of 11 stimuli produced average discrepancy values ranged between .009 and .011, while these values ranged between .007 and .021 in the scaling analysis with seven stimuli. Thurstone (1931) reported that when the number of stimuli in the method of rank-order is greater than 10, the approximation of proportions reaches a satisfactory level. Hence, the findings of the study supported Thurstone's (1931) argument.

According to the findings of this research, some suggestions can be made. First, the transition to secondary education should be planned in a systematic, scientific, and rational way. Thus, the continuity can be ensured. Teachers' ideas also can also be considered as an expert opinion in structuring this system. Second, students should be directed to extracurricular activities, and teachers should be encouraged to use different instructional strategies. Future studies can extend their scope by considering to study with different samples or variables. For example, parents and school administrators can be selected as judges. It may also be worthwhile to use different methods to identify stimuli, such as Delphi technique or focus group interviews. Moreover, further studies can explore other unidimensional scaling techniques and compare their consistency.

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Critical Discourse Analysis of Elementary School Teachers' Writership Identities*

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Abstract

This study aimed to identify elementary school teachers' perceptions of their writing experiences and examine the factors forming their writership identities by analyzing their perceptions. This study is a phenomenological study conducted with six elementary school teachers. Data were collected through a semi-structured interview form. The data were analyzed based on Gee's (2010) theory of discourse. The results showed that the teachers described writing as an essential skill used for transferring emotions and thoughts. They stated that language skills were interrelated and that there was a need to have a certain set of skills to be able to write. The development of technology had reduced the need for classical writing, and social prejudices had reduced the teachers' willingness to write. The teachers consider themselves neither very successful nor very unsuccessful writers but a medium level in general. They were happy when writing, even though they did not like expressing their feelings. They thought that writing successfully had a profound effect on academic achievement and that the largest share in educating individuals to be good writers was in teachers' hands.

Keywords:
Writing, Writership Identity, Elementary School Teachers, Critical Discourse Analysis

Introduction

Writing and Identity

Identity, in general, is a concept that explains how people perceive themselves and the world in which they live, describing how an individual shapes his/her relationship (Bourne, 2002; Young, 1996). Identity is, at the same time, an individual's awareness level about his/her abilities and the recognition of these abilities that can be used in the future (Ivanič, 1998; Norton, 1997).

Identity has an impact on many aspects of human life, as well as the development of literacy through individuals' cultural structures and social dynamics (Norton & Toohey, 2004). Messages that a person sees, hears, reads, and transfers written or verbally in his/her environment affect the person; he/she determines his/her own lifestyle through

the inferences he/she gets from these messages (Bakhtin, 2010). According to Collier (2010), identity is associated with literacy, listening and speaking skills that combine to establish communication.

If an individual is defined as a whole formed by a combination of his/her socio-cultural environment and experiences, the lifestyle, which is called identity, also shapes his/her opinions about writing (Kauffman, 2006). According to Collier (2010), the reflections of an individual's identity to social life and the way he/she transfers his/her messages in his/her writings have a strong mutual relationship that cannot be distinguished from each other.

The act of writing should not be considered merely transferring feelings, thoughts, and dreams of an individual to other individuals, because the act of writing also gives clues about how one sees and represents himself/herself. Writing has social, cultural, and individual dynamics that affect individuals' writing as a whole and give the writing an identity pertinent to an individual (Hyland, 2002). According to Young (1996), individuals' identities as writers are formed by how they make sense of writing, their proficiency in writing activities, their perceptions of writing capacities, the value they give to the act of writing, and their past writing activities. The beliefs and thoughts that an individual begins possessing in all these areas at an early age shape the basis of the individual's writer identity (Seban & Tavşanlı, 2015).

Writer Identities of Teachers

Research in the last two decades, emphasized that professional development of teachers and their identity structures are shaped by their culture and environment in which they are raised (Sachs, 2003; Troman, 2008). How teachers express themselves in writing is also a grab-attention issue for researchers about teacher identities reflecting the perceptions of teachers about their professional development and what type of teacher they are (Danielewicz, 2014). It is especially important that elementary school teachers should have more basic and structured writer identities, because they help their students practice their first literacy experience and the literacy studies conducted by elementary school teachers involve processes that students will experience writing for the first time (Bourne, 2002, Sulak, 2018).

It is known that literacy guidance provided to students at this stage is of great importance in the formation students' social and writer identities (McCarthey, 2001). Classroom environment, peers, family, and the environment, in which the students live and interact, are of great importance in the period when students perform their first writing activities (Otto, 2016). However, in this context, it is safe to say that teachers are one step ahead of the others because they manage writing process in person.

Background for the Study

When teachers dominate instructional streaming while teaching language, they indeed demonstrate their writer identities (Ivanič, 1994). When this is the case, it shapes students' thoughts on writing and serves as a basic structure for the creation of their writer identities (Pittam, Elander, Lusher, Fox & Payne, 2009). It is also necessary to analyze and know teachers' writing experiences in educational planning and recognize the values about writership, and learn their opinions on how to help to students to be effective writers (Johnson, 2007; Parr & Campbell, 2011). This is because teachers' writer identities and attitudes and perceptions about writing play an important role in the selection of instructional/pedagogical methods and approaches they use to improve students writings. It is known that the methods preferred in the curriculum and writing instruction have a significant effect on students' writing development (Freedman, 1994). For example, techniques such as peer feedback, self-assessment, self-correcting, self-revising, and sharing are highlighted in the process-based writing approach (Calkins 1986; Culham, 2010; Graves, 1983; Johnson, 2008; Tompkins, 2005; Tompkins, 2010) and they create differences in the way students evaluate, modify, and share writer identities. Similarly, the writer workshop arrangement highlights teamwork and collaborative/collective action approaches. Thus, it is assumed that such activities positively contributes to students' writer identities in terms of collective action, sharing, and taking responsibility (Bulut, 2017).

The Purpose of the Study

This study aimed to obtain the discourses, thoughts and reflections of elementary school teachers on their writing experiences, analyze these discourses, and examine the formation of the writers' identity by the following parameters.

- How does the teachers' situated meaning affect a his or her identity?
- How do cultural models affects teachers' writer identities?
- How do individuals' figure words affect their writer identities?
- How does language as a social practice affects the identity of teachers as a writer?
- How the teachers' situated identities affect their writer identities?

In this way, it will be revealed what factors shape the teachers' writer identities. Besides, reflections on language (discourses) used as a social practice on writer identity will be examined.

Method

Research Approach

This study was carried out within the frame of descriptive phenomenology. Phenomenological studies generally aimed to reveal the perceptions, perspectives and reflections of the individuals on the given phenomenon thus their experiences are important (Creswell, 2012, Merriam, 2009; Reiners, 2012, Sloan & Bowe, 2014).

By doing this it will be possible to examine the teachers' writer identities to determine which conditions formed these identities and whether individuals had a conscious awareness pertaining to them. Thus, the reflection process of the elements shaping an individual's writer identity was described.

Participants

Phenomenological studies are usually based on the involvement of the participant's as a group who have experience and knowledge about phenomenon under consideration (Merriam, 2009). Hence, the criterion-sampling method, one of the purposive sampling methods, was utilized by the study. The criterion-sampling method requires individuals to meet certain criteria to be included in a study (Christensen, Johnson & Turner, 2015). Preliminary interviews were made with 20 people among over roughly 1000 elementary school teachers who have working still as a teacher in a big city of Turkey. The following criteria have been checked to include or exclude an individual from the participant pool.

- Having at least two years of teaching experience.
- Keeping a diary at any point in their lives.
- Actively performing act of writing in their lives:
  - -to solve a problem
  - -as a means of relaxation
  - -to share information
  - -to attain an academic task, and so forth
- Considering the extracurricular activities with students in writing classes.
- Using diverse writing tools actively (e.g., internet-based applications, communication tools on smartphones, social media accounts, and letters).

Six teachers were included in the study according to this criteria. Table 1 shows the demographic features of the participants.

Table 1. *Demographic Characteristics of Participants*

.	Experience			How teachers see themselves as a writer		
Participant	2–10 years	11–19 years	20 and over	Good Writer	Medium Level	Novice
Ayla	X			X		
Banu	X				X	
Cemile			X	X		
Derya	X				X	
Esra	X				X	
Feride		X			X	

As Table 1 depicts, all study participants are female. Four participants had working experience of two and 10 years, one had 11–19 years, and one had 20 years and more working experience. Learning their professional expertise was important to determine how long they have been writing with their students. Teachers working in a city center are considered to be advantageous in using different writing tools specified in the criteria, because the use of technology-based writing tools in city centers are more common due to infrastructures and socio-cultural natures of city centers.

As shown in the Table 1 two of the teachers defined themselves as good writers, while four of them defined as medium-level writers. At this point, the teachers' definition of themselves as good writers and medium-level was considered an important indicator of the active use of writing in their lives. Thus one can expected their writership may have some impact on their writing classes. The names of the teachers are made anonymous by using names given to the participants instead of using fictive names.

Data Collection Tools

Data were collected through semi-structured interview. The main and probing questions were formulated by taking the existing theories into account. In addition, three elementary school teachers and two academicians were consulted to ensure the quality of the questions. The first form of theory-driven semi-structured interview protocol was finalized by taking suggestions of the field experts and classroom teachers interviewed.

The initial version of the interview guide has 17 questions. After the consultation we reduced number of the questions to 14 (see appendix).

The interviews were conducted in a comfortable environment with voice recording at appropriate times for the researcher and teachers. One participant was interviewed per day. Each interview was transcribed before interviewing with another participant.

Voice recordings and the transcription process were completed within six days. Voice recordings lasted 195 minutes with 55 pages transcriptions. After this we have read all transcripts in the process of creating sub-themes, and these discourses classified according to Gee's (2010) discourse theory.

Reliability and Validity

Even though the collected data were limited, other techniques were incorporated to meet the standards of validity for a naturalistic investigation. First, a methodological triangulation was utilized (Huberman & Miles, 1994) in which both an in-depth qualitative and an enumerative quantitative analysis were conducted for the same qualitative data to triangulate the analysis methods (Patton 1980). Second, the author discussed ongoing research with colleagues during the structuring of the interview protocol and data analysis. These interactions with colleagues served as peer debriefing (Lincoln & Guba, 1985). Third, a member check was conducted with the informant through phone calls (informal) and emails to revalidate the built-in codes, themes, and the constructed model.

Data Analysis

This study used a critical discourse analysis method to understand the meanings of the conversations in the context in which they were used. The analysis was used to reveal the underlying relationships in teachers' expressions. Critical discourse analysis is an approach involving different models and methods (Rogers, 2011). The analyses in the study were conducted based on Gee's (2010) theory of discourse. According to Gee (2010), language is an undeniable component of social life. It constitutes one of the important dimensions of social studies. When individuals communicate, they do so by reflecting on their points of view, experiences, knowledge, opinions, values, and beliefs. Therefore, it is expected that the statements that a person articulates give significant clues about the person's way of life, culture, social beliefs, and values related to given topic.

Gee (2011) has stated that discourse must be categorically examined to investigate how the language is used by people. This view advocates that the interview questions should be in accordance with the relevant categories, and the answers given to the related categories should be searched within the discourse. In this study, the categories to be searched in the discourse were as follows:

Situated Meanings: This category was determined as the category explaining the meaning of the concepts and statements in the conversations and what was expressed in each statement at a certain moment.

Cultural Models: The purpose of this category was to explain (1) the assumptions and beliefs stated in the interviews, (2) the kind of a cultural model used throughout a conversation, (3) the schemes and mental models used to understand and (4) the conversations that take place in a culture.

Figure Words: The purpose of this category was to reflect an individual's general feelings, thoughts, and ideas on a subject.

Social Languages: The purpose of this category was to explain the function of language and the use of grammar as a social practice.

Situated Identities: The aim of this category was to determine (1) conversations types generated by the talking person, (2) how she/he sees herself/himself or what she/he wants to be, and (3) the people and institutions generating such conversations.

Findings

The face-to-face interview with the teachers was transcribed verbatim and Gee's critical discourse analysis approach was used to analyze the interview records. The study examined the following topics: General perspectives about writership and writing studies (figure words), the way the teachers use the language in their conversations about writership and writing (social languages), the extent to which their writing processes and writership identities are affected by models (cultural models), how they consider themselves as writers and their justifications for that (situated identities), and what their writing concepts and statements mean for them (situated meanings). In the following sections we will present the findings related to the common discourses and differentiated discourses of the teachers related to a figure words social languages, cultural models, situated identities and situated meanings.

Figure Words

This section explored the teachers' overall figure words about writership and writing studies.

Common discourses

According to their statements, the teachers considered writing a transfer of their feelings and thoughts. They believe that writing skills are related to other language skills and an important skill that should be used in many areas of life. To be able to write, one must have a certain set of skills. On the side of the writers, writing may promote meaningful learning and overall learning retention. Additionally, well developed writing skills writing skills should be considered necessary for teachers. For example:

> *"When it comes to writing, the use of paper and pen to express my thoughts comes to my mind." (Banu)*

> *"In my opinion, writing is transferring someone's thoughts and feelings about a topic to a paper or copying what is written in a piece of printed text on a paper." (Derya)*

> *"They all complement each other in the first place. If one of them is missing, I think that it will cause that foot to limp. Writing is of equal importance among them. But you cannot write without knowing anything." (Esra)*

Differentiated discourses

In these statements, the teachers mentioned that writing was a more difficult skill to use than other language skills, and usually used in more formal settings. It was also stated that writing is related to the educational attainment of a person as well. Some examples of these statements are as follows:

> *"As I said, we can express ourselves well while speaking, but expressing yourself through writing is a more difficult skill." (Banu)*

> *"To me, being able to write well and express yourself well are signs of an individual's educational attainment." (Cemile)*

Cultural Models

How and to what extent elementary school teachers' writing processes and their writer identities are affected by cultural models are presented below:

Common discourses

In these statements, the elementary school teachers' writing processes were given and the extent to which their writer identities were affected by cultural models. The participants believed that with the advancement of technology, the need for classical writing (paper and notebook writing) has been reduced in terms of frequency of its use. They also think that social judgments affected writership identities, and writing in our society was considered a symbol of permanence. For example:

> *"I do not think this is just my case. Here, in the developing world, it comes with tablets easily. And they think they will not need it anymore." (Cemile)*

> *"No, when we look at today's technology — whether it is a computer, tablet, or a variety of materials — technology makes it less important to write on a notebook or take notes." (Derya)*

> *"Of course, criticism would improve my writings. Considering that our society has many people who tend to criticize others for the sake of criticism, this may discourage my enthusiasm. Hence, I do not share my writings due to society's prejudice." (Derya)*

Differentiated discourses

With some unique statements, the teachers expressed their writing processes and the extent to which their writership identities were affected by cultural models. These statements revealed that technology intensified the need for writing and writing was not amply preferred in our society. Some examples of these statements are as follows:

> *"I always need to write in my daily life. I think the need to write with the phones has become even prevalent. We always use writing when sending messages or writing something on social media." (Esra)*

> *"Writing is sometimes used less frequently. I mean, frankly, our society likes verbal communication more than written communication . You know, for a long time, stories, memories, and the like have been conveyed verbally in our society. I think its reflections are in effect." (Cemile)*

Social Languages

Some statements were about writership and writing, considering the ways teachers use language.

Common discourses

Some statements were about writership and writing reflected the ways the elementary school teachers use language. These statements revealed that the teachers mostly used language for persuasion. For example:

> *"Always, of course. So, we use it very often, for example, from taking notes to writing notes. It is something we always use in daily life. I do this ... it is also something indispensable in my professional life. Writing is something we use at every moment in every lesson." (Cemile)*

> *"Very Important. After all, it is very important because we, as elementary school teachers, teach writing, or, we write to a student to explain something. It is also very important in this regard." (Derya)*

> *"Certainly, I was just going to tell you. I think it certainly improves success. Why? Because, one can hear — I say it verbally and he/she hears. That is auditory. One can write, as well. That is visual. When he/she writes, he/she repeats by himself/herself, too. And, success is definitely getting better." (Feride)*

Apart from the persuasion theme, it was seen that the elementary school teachers used the language to emphasize important points. For example:

> *"I believe that writing is important. So, I attach great importance to its readability — of course, it is very important that it makes sense, but it is especially important to be readable. Yeah, yeah. But, that's important to me." (Feride)*

> *"It is absolutely important. When there are some important shortcomings that I have to write at certain points, I get a lot of punishment for this. I would say so, frankly. Let me give you an example. There can be places to take notes. They're instant. But I don't have a paper notebook or a pen. But if I don't, I'll forget. So, I'm very uncomfortable in such situations" (Ayla)*

Differentiated discourses

Certain differentiated statements attracted attention and reflected the way the teachers used the language in their statements about writership and writing. In such statements, the teachers used the language to reflect particular attitudes such as confession, acceptance, and awareness. For example:

> *"Frankly, we do nothing about it. For example, teachers ask students to write the text in book sections (that says "write your ideas") on the blackboard. I, sometimes, leave it to them, let them write on their own. That is just because I personally like. If you ask what you are doing, we do nothing other than that. But something must be done." (Ayla)*

> *"There is nothing else. As I said, I use it at every stage of my life, but I'm not sufficient; Will I try to be sufficient? No. Because, no matter what I did, it did not work. This is always a shortcoming for me. It's also too painful for me." (Ayla)*

Situated Identities

There are some statements that the teachers talked about how they considered themselves as writers and how they justified it.

Three of the teachers described themselves as medium-level writers and one described as a good writer. However, it appears that there was a contradiction between the statements of two teachers. It was observed that these two teachers described themselves as good writers in certain flows of the interview. In contrast, they qualified themselves as medium-level or novice writers in other parts. For example:

> *"I write very often. I email my students' parents every evening via WhatsApp. Or, again, I assign homework by writing. I have to explain. I usually do this in writing, not verbally. So, it's important to me that my writing skills are good. I think I'm good at this." (Banu)*

> *"I consider myself as an inadequate writer. I think my past experiences may have had an effect on this." (Banu)*

The statements that the teachers talked about how they considered themselves as writers and how they justified it were examined in two parts as common and differentiated discourses as presented below.

Common discourses

Some common statements in which the teachers expressed how and why (justify) they perceive themselves as better writers. As the teacher emphasized, they feel happier when writing. For example:

> *"My feelings about writing are very good. I feel very happy. Although I like to talk a lot, I think that I express myself more comfortably when writing. That is, writing is a superior skill for me." (Cemile)*

Some teachers stated that they did not have a successful writing history. It is important to note that these statements were expressed by the teachers who considered themselves as medium-level writers. As a matter of fact, the teachers indeed stated this as the reason for not being good writers. For example:

> *"Until this period of my educational life, there is nothing given to me as an incentive to write. We were preparing a memory book in elementary school. As for writing skills, we were supposed to write what teacher instructed. For example, we can call it dictation or direct text. We were writing the text on a textbook. It was not much. It was limited. I can, therefore, say that I am not very good at that." (Derya)*

It seems that teachers did not consider themselves as good writers, because they did not want to express their feelings in written form. For example:

> *"They usually say I write very straight. However, I think I am good at writing official texts, because they do not contain feelings. However, I am not very good at writing, when I have to emphasize my emotions in writing. That is, I cannot write. I listen to music that suits my mood, I watch movies, but I never sat down to write. I may have written to someone to explain something but, to tell you the truth, I have never sat down and written my feelings." (Ayla)*

Some teachers expressed that the current situation of their writership skills is based on their readings and "reading" was one of the most important requirements for writing. For example:

> *"Because, such opportunities were given at a very early age. We also read some books. This is very effective, for example, on the fact that I write well." (Cemile)*

One of the important points about how participants considered themselves as writers was about how they enabled transmitting their backgrounds about their writing competencies. In this part, the teachers stated that they were striving to train their students as individuals considerably eager for writing. For example:

> *"I conducted writing studies by connecting with their daily experiences, connecting from their past experiences, or offering them unique opportunities — i.e., giving them a chance to be creative. As teachers, we have to be able to do more to turn them into good writers." (Cemile)*

Differentiated discourses

The teachers externalized individually diverse discourses incorporating verbal insights about their writership and inherent justifications. For example, one teacher implemented writing studies with his/her students; however, he/she did not know whether these studies were scientific. That teacher's statement was as follows:

> *"I do not do the work I do very consciously. I just think about it myself at home and what I can do more and get very good feedback. However, I have doubts about how scientific it is." (Banu)*

For another teacher, experiencing a version of success during writing can be considered the most important element in the sense of writing ability.

> *"Under the guidance of the school, my poems were even published in a small local newspaper. And, wow, I can do this. My desire to write has risen up like this. And that's how it has improved." (Cemile)*

In another discourse, the expressions were attention-grabbing as the teachers' statements revealed that they held negative experiences with their teachers.

> *"Yes, for example, one day, I was taking "religious culture" exam. I started to take the exam with excitement. I forgot to write my name on the exam paper. The teacher hit my head, for example, and told me that "Why did you not write your name?" This is the first thing that I remember about writing. I mean, maybe this is not exactly a reason, but perhaps I could write better if I had no such experience."(Esra)*

These excerpts revealed that the teachers may considerably affect the enhancement of the student-led writing capabilities and capacities.

Situated Meanings

There were some statements explaining the meaning of what the teachers are talking about writing and writership at that moment, in the relevant context.

Common discourses

Some statements had sub-themes. First of all, it was stated that writing skills were effective in students' academic success. It was also stated that writing skills were used for communicative purposes, and feedback was essential in writing. For example:

> *"Certainly, I was just going to tell you. I think it definitely improves success. Why? Because, one can hear — I say it verbally, he/she hears. That is auditory. One can also write, that is visual. When he/she writes, he/she repeats by himself/herself, too. And, success is definitely getting better." (Feride)*

> *"Other than the school, I can leave a note for my child, for example, when I go somewhere. I used to write several letters for communication."(Feride)*

One of the sub-themes, which was abstracted from the participants' predicates, was the part where the characteristics of a good writer were explained. The teachers described better writers as a better observer, reader, and researcher. They described a good writer as someone who holds an extensive vocabulary, a strong ability to externalize emotions, and a better understanding of what he/she writes, as well as a versatile person, and a good listener. For example:

> *"I think someone should be a good observer to be a good writer." (Ayla)*

> *"If someone has good writing skills, that means he/she is a good observer and a good reader. He/she has extensive vocabulary. He/she can express his/her feelings with appropriate words." (Ayla)*

Another sub-theme derived from the teachers' statements was that a teacher should guide students in their writing works. It was emphasized that elementary school teachers were important for the development of students' writing skills, students should be guided correctly, and teachers should encourage students to write. For example:

> *"My students think that I also write regularly and keep a diary. If they did not think so, they would not have done it. At this point, we need to be guides for our students."(Banu)*

> *"One day, I wrote a very beautiful composition in the Turkish course. We had just survived the 1999 earthquake back then. I drafted a composition on that topic. In the class, my teacher and my classmates liked it very much. They encouraged me to keep writing. Every week, I did my essay assignment perfectly." (Esra)*

The last common sub-theme derived from the elementary school teachers' perceptions was to explain the differences between written and verbal communication. Under this sub-theme, it was seen that elementary school teachers mainly discussed the reasons for the prevalence of oral communication. According to the teachers' perceptions, oral communication included a more instant, easier, practical, widespread, personal, and passive process, compared to written communication. The teachers consider the aforementioned situations advantages using verbal communication in general. For example:

> *"I certainly do not feel any pressure on me. I express my own feelings. Nobody is messing with them while I am writing. They might mess with them when evaluating, but that moment is mine, that article is mine, I am the one writing." (Esra)*

> *"When we think of the writing ability as self-expression in the first place, we use verbal expression more frequently. But, as a way of expressing ourselves, we do not use the verbal skills when writing a petition, of course. We use them by writing, but it is more verbal in terms of expressing ourselves." (Banu)*

Differentiated discourses

Many differentiated discourses were found describing what the teacher statements about writing and writership meant at that moment in the relevant context. One of the teachers, for example, stated that she wrote a story to cope with her boredom in her leisure time, and then she holds a passion for writing. The teacher's statement was as follows:

> *"We had a higher education examination (THEE) last month. I was a proctor in the THEE exam. I thought the time was not passing. So, I got a piece of paper and a pen right away and jotted down quickly. Then, when I went home, I made a fair copy of what I wrote, and felt happy when I was writing. So, I was not worried and it was beautiful. After that, writing has become a habit like a passion." (Banu)*

As you can see, even teachers sometimes come too late to realize their interests. For this reason, it is necessary to conduct writing studies with students from early ages and draw their attention to these studies.

Amongst others, a teacher expressed that writing was a type of skill that should be taught latter than other preliminary skills. For example:

> *"Yes, of course, after all, we invented writing later on. People first communicated using body language and later by talking." (Derya)*

Another noteworthy statement of the teachers was that the examination system in Turkey was not supporting the writing achievement. For example:

> *"There was a test ahead of us. We answered it. It was always like this. We passed the student selection exam. We passed many tests, including the secondary education institutions student selection and placement exam. There were not many factors that would help improve writing this way." (Derya)*

Generally speaking, it was found that the teachers described writing as an important skill used in transferring of emotions and thoughts. They stated that language skills were interrelated, and one needs a set of specified toolkits to write. The teachers noted that the development of technology has been reducing the need for traditional writing, and social prejudices have diminished the willingness of participating teachers to write.

When the teachers' language use was examined, it was determined that they were mainly interested in persuading other people and emphasizing the points they liked. It was found that the teachers perceived themselves as neither very successful writer nor very unsuccessful (medium) writers in general. They stated that they were happy when writing, even if they did not like to express their feelings. The teachers stated that writing success had a profound effect on academic achievement and that the largest share in educating individuals to be good writers was in the hands of teachers. It was also expressed that in order to be a good writer, one needed to be a good observer, reader, listener, and researcher. Finally, it was stated that verbal communication was more instantaneous, common, practical, and easier than written communication.

Discussion

When students are engaged in literacy activities, they do not only participate in these activities but also enter an identity creation process to become literate (Seban & Tavşanlı, 2015). Literacy practices and the context in which these practices take place are vital for students' literacy development. The most important task in achieving these practices and providing appropriate literacy experiences for students has been seen under the control and guidance of teachers (Johnston, Woodside-Jiron & Day, 2001). Therefore, teachers' literacy identities are of great importance to students' literacy development and identity building.

The findings of the study showed that the teachers defined writing as an important type of skill used to transfer feelings and thoughts. Seban and Tavsanli (2015) reported that teachers consider the act of writing important because of the necessity to transfer ideas. Graves (1983) described writing studies as a process of developing literacy background for students and training/educating individuals who are able to express themselves better while writing. In this respect, writing is considered to be used for communication purposes more frequently.

The teachers stated that language skills should be developed interrelatedly. This common-sense reinforces a prevailing fact highlighted in the literature. This is because studies and discussions reveal that language skills are interrelated and that all language skills must be used in coordination as a requisite to the develop language skills (Graves, 1983; McCarthey, 2001; McKnight, 2010). At this point, it is an obvious fallacy to focus on a single skill only while doing literacy work with students.

Another result of the study is that the creation of a written product requires a certain set of language related skills and background knowledge. This result becomes more important when combined with the fact that language skills are interrelated. Because, in writing processes, the set of language related skills that must be possessed to create a text can be more easily obtained using reading, listening, and writing skills (Aram, 2005; Sharples, 2003). For example, as McKnight (2010) argued, the student's vocabulary knowledge should be enriched to enable them to express themselves in a better manner. It is necessary to expand the students' breadth and depth vocabulary as an important factor can improve their writing skills through reading and listening.

One of the conclusions reached in the category of figure words was that writing can be more important for teachers than people working in many other sectors. The participant teachers expressed that they use their writing competencies to conduct more effective in-class teaching, act as a social role model for writing, and improve themselves as professionals. From this perspective students' gaining self-efficacy in literacy is one of the most important steps to take, and the most serious responsibility in this regard belongs to the teachers (Margolis & McCabe, 2006). Because observation has an important role on the formation of self-efficacy (Ülper, Yaylı, & Karakaya, 2013). As Bandura (1982) mentioned performing a task successfully depends on the self-efficacy of the student. "Students who feel efficacious for learning or performing a task participate more readily, work harder, persist longer when they encounter difficulties, and achieve at a higher level. Hence interventions designed to improve students' acquisition of literacy skills must also address their self-efficacy for learning to influence their learning and motivation" (Schunk, 2003, pp.161-162). The results of the researches show that teachers affect the literacy identities of students (Dyson, 2001; McKay & Kendrick, 2001). At this point, the role of the teacher as a role model that encourages and motivates students is essential to make the students qualified literates (Corkery, 2005).

Another point explored in this study was how cultural models reflected teachers' writership identities. It is quite clear that cultural models were associated with the use of technology and the development of technology had implications for literacy studies. The teachers stated that students were more reluctant to use new technologies in writing compared to their earlier attitudes to writing. At this point, it is thought that it will be beneficial for students to continue their writing studies without being discouraged from the ever-developing technologies. It is a fact that literacy studies have now shifted toward digital literacy, and literacy studies should be conducted with this reality in mind (Alvermann et al., 2012). Today, it is considered important to use new types of literacies emerging with the development of technology; these literacies are to follow the changing world, access the information quickly, and diversify reading resources (Burnett & Merchant, 2011).

Another point here is that social prejudice and criticism kept teachers from writing. It should be remembered that the human being is a social being and the sociocultural practices and experiences in their daily life affects a person understanding of literacy as well as his/her body and soul. The society in which the individuals live, their education, cultural values and beliefs, live conditions, and the degree of their access to technical possesses affect them in many different ways (Corkery, 2005). The findings also show that negative expectations and criticisms of people are discouraging factors for the teachers' writership.

Our time necessitate encouragement of students to continuously their writing skills and digital literacy, starting from preschool education (Bindman, Skibbe, Hindman, Aram & Morrison, 2014; McKnight, 2010). In this process, the teachers can play an important role. It is desirable that the teachers create supportive environment in which their students be encouraged and motivated through strengthening self-efficacy to create writing and develop writing skills (Corkery, 2005). At the same time, students should also be given opportunities to gain a culture of criticism and experience practices that will enable them not to be afraid of constructive criticism.

The findings also indicate the teachers' motives of languages mainly to persuade people and emphasize points that they liked.

Teachers are seen as one of the most influential factor with regard to communication in the classroom. Therefore, the quality of communication in educational environments is directly proportional to teachers' communication skills. At this point, it becomes essential for what purpose teachers use the language and how effectively they use it. Research conducted in Turkey shows that overall communication skills of teachers in educational settings are high (Çetinkaya, 2011; Yılmaz & Çimen, 2008). Our study explored that the teachers outside educational context in the schools use written language mainly to persuade and emphasize the points that they consider important.

Another point examined in the study was the teachers' situated identities about writership. The teachers consider themselves as neither very successful nor unsuccessful users of the written language in general; they instead consider themselves medium level writers. They like writing, even though they do not like to express their feelings. It is not a very positive situation for teachers to consider themselves medium-level writers. Teachers are expected to become competent and self-confident individuals with high level of 'self-efficacy' with regard to their writing skills. This is important because their thoughts, beliefs about themselves and their skills have impact on their performances as teachers and consequently for learning outcomes of their students.

Furthermore the findings of this study show that the teachers consider verbal communication more instantaneous, common, practical, and easier than written communication. It is known that writing requires the use of high-level skills cognitively and effectively. This is a challenging task and one of the explanations for why people prefer verbal communication over written communication. On the other hand, our time necessitates high-level written skills in educational and professional settings.

The findings of this study revealed that the teachers' writership identities have been shaped starting from their early experiences in the school-settings.

For this reason, it is of utmost importance for the development of the writing skills of students that we can create conditions to their continuously improvement of their writing skills along with all other language skills and their 'self-efficacy' in preschool age. At this point, teachers have a significant responsibility and opportunity.

They can create supportive and collaborative teaching-learning environment in which they can demonstrate their 'writership' as role models. By doing so, they can pave the way for their students. In collaborative and supportive educational settings it is easier to create a learning community in which the students can improve their language skills, background knowledge, vocabulary and 'self-efficacy' as the necessary foundation for their writership as 'today's students' and 'tomorrow's adults' in different sectors of the society, including 'teaching profession.

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Appendix

Semi-Structured Interview Form

1. What comes into your mind when you hear the term "writing"?

2. When do you need to use your writing skills?

3. What do you think about the place of writing skills in our lives if you compare it with other language skills we have?

4. Is it important for you to be able to write good? How does one's ability to write good or bad influence his or her life?

5. Would you describe someone with good writing skills?

6. How do you see yourself as an writer? (adequate, i.e. successful; medium-level; inadequate, i.e. unsuccessful). What is the reason for this, and why do you see yourself as a ... writer?

7. Would you share your experiences and knowledge about writing?

8. Do you write about any topic?

9. What are your feelings about writing? How do you feel when you are writing?

10. What do you think about sharing what you write? (Do you share your writings, or just write for yourself).

11. What do you do as a teacher to improve the writing skills of students?

12. Would you please talk about what you do to help students love writing and make it an activity that they can love doing in their lives?

13. Are there any additional activities that you do besides the activities in the curriculum so that your students are active in writing and sufficient in written expression? Would you please talk about these?

14. Is there anything else you want to add about writing and seeing yourself as an writer?

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A Study on Science Teaching Efficacy Beliefs During Pre-Service Elementary Training

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Abstract

Two science teaching workshops for students of the elementary teacher education degree course at the University of Palermo, Italy are discussed, one based on inquiry-based methods and the other on "traditional" teaching methods. A questionnaire aimed to understand the teaching styles preferred by students, their reasons for learning/teaching science, and their beliefs about the difficulties a teacher faces when planning and trying out science teaching activities in the class were completed by the students before the first workshop, at its end, and the end of the second workshop. The answers given by the students were studied using cluster analysis methods. The results of the analysis of answers given to initial and intermediate questionnaires indicate that the students recognize the importance of teaching scientific subjects in elementary school. However, the self-perception of their abilities to effectively teach science is negative, both before and after attending the "traditional" type teaching workshop. After doing the inquiry-based teaching workshop and holding several days of a science fair, most of the students' negative beliefs have changed into positive ones. A better general understanding of the fundamental role played by the teacher in encouraging the natural curiosity of children and offering scientific activities based on everyday life experiences was observed.

Keywords:
Cluster Analysis, Elementary School Teacher Education, Science Teaching In Elementary School, Teacher Belief About Teaching

Introduction

In recent years, the results of many national and international research projects and scientific reports by the European Commission (e.g., Rocard et al., 2007) and other organizations (AAAS, 2002; NRC, 2012) have shown that the unsatisfactory results often attained by pupils learning scientific subjects in schools may partly be due to the way that these subjects are taught. "Traditional" science teaching is, in fact, often based on approaches only involving the transfer of pre-determined and already established content, with no reference to everyday life situations or previous knowledge that the students already

possess. In this context, students take on a passive role in learning and rarely have the opportunity to follow the procedures that are typical of scientific methods. Such a way of teaching science may wrongly shape students' ideas and beliefs (Schoen & LaVenia, 2019; Irez, 2007) about science and its nature, by making them convinced that scientific knowledge is mainly based on a mere description of results presented as "true" and "precise" because obtained using "the Scientific Method" and that science subjects are "too difficult" to be taught at lower school levels, such as at elementary or middle school.

Unfortunately, this can be true also at the university level, even in degree courses aimed at pre-service teacher education. Besides coming to the courses with various levels of content understanding (e.g., Gupta & Lee, 2020), the trainee teachers are too often exposed to a teaching approach based on a lecture format and a few laboratory activities restricted to a mere verification of some physical laws. In some cases, they are also asked to seamlessly apply the theoretical concepts learned in Pedagogy courses to plan science teaching units, leaving them the endeavor to "didactically reconstruction" the science contents to be taught. It has been shown that teachers exposed to this kind of pre-service education often resort to the traditional practices of content-focused instruction in science, merely transferring to their students the perceived didactical methods and learned contents (Sperandeo-Mineo et al., 2006), without any effective adaptation to the specific teaching context. Moreover, this is often done by simplifying the approaches learned at University and basing them on transmissive teaching models found in textbooks (e.g., Sprinthall, Reiman, & Thies-Sprinthall, 1996).

The experience that these students had with studying science (both during their school years and pre-service teacher education) may lead them also to develop low levels of science teaching efficacy beliefs, and, in turn, guide how they plan for their future classroom activities and practices and shape teachers' behavior during classes (Samuel, 2017; Samuel & Ogunkola, 2015; Lumpe et al., 2012; Marshal et al., 2009; Calderhead, 1995; Pajares, 1992).

Many research studies (e.g., Siswono et al., 2019; Purnomo et al., 2017; Teng, 2016; Kırkgöz, 2016; Buczynski & Bobbi Hansen, 2010; McDermott & DeWater, 2000) have focused on the impact of teacher professional development programs on teacher belief systems (Di Martino & Sabena, 2011; Zan & Di Martino, 2020), teaching practices and student learning, and on the advantages of programs based on developing scientific investigation and discovery processes (inquiry-based science education, IBSE (e.g., Bybee, 1993)). Such processes are widely considered a way of shaping future teachers' beliefs about science and improving understanding of the sciences and their working methods. Moreover, many researchers have trialed questionnaires designed to measure teachers' beliefs about teaching and learning during teaching practice. Most of the items ask teachers to report on their subject-neutral beliefs about teaching and learning, and some specifically ask teachers about their beliefs about teaching and learning (e.g., Clark et al., 2014; Peterson et al., 1989; Schoen, & LaVenia, 2019). Therefore, training programs for teachers, like the ones included in elementary teacher education degree courses, must be rethought to allow trainee teachers to get to grips with approaches to teaching planning like the inquiry-based (IB) one, which are specifically aimed at allowing students to construct scientific knowledge actively. With these approaches, the teaching methods studied during the theoretical courses on didactics and pedagogy of the degree course must be put in use in the specific context of science to encourage an authentic "educational reconstruction" of the scientific content to be taught (e.g., Duit et al., 2012). Furthermore, the trainee teachers must be explicitly invited to put their scientific knowledge to the test, and possibly improve it, by trying out the learning pathways themselves, and sharing, discussing, and bringing the activities they have planned into the classroom, and possibly to science fairs. This may encourage a careful reflection on pupils' learning difficulties based on the activation of reflection/metareflection processes (Karamarski, 2017; Simons, 1996; Schön, 1988) in the trainee teachers. The final aim is to trigger the construction of particular forms of knowledge, like the well-known "Pedagogical Content Knowledge" (Shulman 1986, 1987), which Zeidler in 2002 summarized as the ability of a teacher to convey the essential information in a way that is clear, engaging and accessible to students.

In recent years experimental educational researches focused on the effect on trainee teachers' epistemological beliefs and beliefs about the teaching of reforms of training programs have been discussed in the literature (e.g., Hsu, 2005). Many of them use descriptive statistics, analysis of the variance/covariance (Anova/Ancova), correlation analysis, etc., for analyzing the related data.

In this paper, we describe a research study performed with students from the fourth year of the elementary teacher education degree course (from now on, trainee teachers) at the University of Palermo, Italy during the academic year 2018-19. The research was focused on the effects of two physics teaching workshops on trainee teachers' beliefs about science teaching. One of the workshops was based on "traditional" methods, which are commonly used in teaching workshops on the degree course they are

attending, and the other was explicitly inquiry-based. Particularly, we discuss here the results of a quantitative analysis of the answers given by the trainee teachers to a questionnaire, inspired by other questionnaires used in Seventh Framework Program (FP7) projects financed by the EU and focused on IB education, and adapted for the specific context of the research. The analysis was done by using a novel methodology for educational research based on cluster analysis (ClA) (e.g., Everitt et al., 2011), that allowed us to classify the trainee teachers in different groups or clusters and build trainee teachers profiles without any prior knowledge of what forms those groups take (unsupervised classification, (Sathya & Abraham, 2013; Dayan, 1999)). The clusters were, therefore, analyzed to deduct their distinctive characteristics and to point out similarities and differences between them.

The questionnaire was given to trainee teachers to complete before, during, and after the two workshops. Its purpose was to get insights on possible effects the two different methods used in the workshops may have on the preferences expressed by the trainee teachers about how to teach science to children, on their ideas about the difficulties an elementary school teacher encounters when planning and carrying out science teaching activities in class, and more generally on the trainee teachers' motivation for learning and teaching science.

Inquiry-Based Teaching and The Need for Adequate Teacher Training

IBSE is today as one of the most popular topics in projects aimed to reform the way science subjects are taught at all schooling levels. Various FP7 and Horizon 2020 projects in the area of science and mathematics[1] have promoted the development of IB teaching methods and encouraged experimenting with their use, and continue to do so. These projects support the actual implementation of teaching practices based on a scientific investigation through the parallel development of scientific content and processes of active construction of knowledge by learners, using innovative teaching methods (Battaglia et al., 2019a; Battaglia et al., 2017; Pizzolato et al, 2014; Bolte et al., 2012).

On the other hand, educational research has shown that in many cases, the meaning of IBSE is not entirely clear even to teachers with proven experience, who, according to the National Guidelines, should be responsible for implementing methods based on a scientific investigation in their teaching practice (see National Guidelines of many countries and also NRC, 2012). For example, in some teacher resources a definition of IBSE can be found merely as: "the application of scientific methods to teaching". During their university studies, many teachers learned that scientific investigation could be reduced to an almost "mechanical" application of a well-defined number of "steps" to be followed, which invariably lead to the description and explanation of an observed phenomenon.

The idea that science, and even worse, learning about science, can be reduced to a simple linear step-by-step procedure does not take into account other aspects that are typical of scientific investigation. The creativity of the researcher, which is fundamental in the process of constructing knowledge, and the centrality of sharing the results obtained with peers, are relevant. IBSE also sets ambitious objectives for the students, and this makes the role of the teacher even harder if that is possible (Marx et al., 1997; Roehrig and Luft, 2004). However, many teachers were trained in university courses based on traditional forms of teaching, which are merely aimed to transfer content about the subject being taught (Windschitl, 2003).

Research aimed explicitly at implementing IB approaches to teaching has shown that teachers, especially trainee teachers, often do not fully succeed in passing from a "transfer of knowledge-type" of teaching to an IB one if this type of teaching is simply described to them (Pintò, 2004). They need complete training based on the new theoretical models referred to. These include models that underline the usefulness of a shared process of constructing knowledge, sharing it again in different contexts, thinking about developing new teaching practices, and new support materials for the students. These models require careful planning of the training activities, during which the roles of different learning materials, the conceptual knots of the subject, the problems that arise from the introduction of new teaching methods, the teacher conceptions on the teaching processes (Fazio & Spagnolo, 2008) and, more generally, the ideas of the teachers on their role in the learning process are discussed and made clear.

Research Problem

Based on the considerations described above, this study seeks to investigate ideas and beliefs of trainee elementary school teachers about science and their ability to teach scientific subjects effectively, and the possible effects of "traditional" and inquiry-based workshops of the modifications of these ideas and beliefs.

Research Hypothesis

Trainee teachers of the Physics for Elementary School course at the University of Plaermo, Italy generally have low levels of science teaching efficacy beliefs,

which are reflected in the scarce perception of the relevance of science in real-life and low attitude to teaching scientific subjects at school.

Research Questions

- To what extent can a teaching workshop based on the application of methods and concepts learned by the trainee teachers in their introductory university courses on didactics and pedagogy be useful in modifying their ideas about teaching science at Elementary School and their science teaching efficacy beliefs?

- To what extent can a teaching workshop based on implementing IB methods and sharing results with peers be useful in modifying trainee teachers' ideas about teaching science at Elementary School and their science teaching efficacy beliefs?

Context and Participants

The research was carried out during the 2018-19 academic year at the Elementary Teacher Education Degree Course at the University of Palermo, Italy, and it involved 150 trainee teachers from the fourth year of the Degree Course, mainly females, who were attending the Physics for Elementary School course, which is taught by one of the authors. Many of them attended secondary schools where physics is usually taught by following a traditional, teacher-centered approach, and where physics teaching is mainly based on the transmission of general concepts to students. In some cases, the lessons are integrated with laboratory activities, but these are often performed by the teachers themselves, who follow a confirmatory/ demonstrative approach. During the first years of the degree course, the trainee teachers attended several theoretical courses of Pedagogy, Didactics, and Psychology of Education.

Methodology

The research was divided into the following stages:

- The trainee teachers were given a pre-instruction questionnaire to test their initial ideas about teaching science in elementary schools. It was based on questions from questionnaires used in some of the FP7 projects mentioned before, modified and validated by specific content and face validation (e.g., Lawshe, 1975; Anastasi, 1988) in order to adapt them to the specific context of the research being carried out; Particularly, the face validation of the questionnaire was done by involving seven trainee teachers of the Physics for Elementary School course that, for various reasons, did not participate to the research. They were asked to answer the questionnaire, highlighting sentences or whole questions that were unclear to them, and suggesting modifications that would improve the understandability of the questions. A face-to-face interview with each student participating in the questionnaire validation completed the procedure.

- A "traditional" teaching workshop was carried out, based on the Italian National Guidelines for Elementary School and the application of concepts learned by the trainee teachers in their introductory university courses on Pedagogy and Didactics. The focus was on planning science teaching pathways for elementary school children under the supervision of experienced Elementary School teachers. Working in groups, producing and discussing working material based on teaching methods learned during previous courses were fundamental aspects of the workshop;

- At the end of the traditional workshop, the trainee teachers completed the same questionnaire again, as an intermediate test;

- A teaching workshop based on an IB approach, on groups work, on a peer-to-peer sharing of the group results was carried out, and a science exhibition event for elementary school children was planned and carried out;

- At the end of the science exhibition event, the trainee teachers completed the questionnaire for the last time.

As well as being asked to complete the questionnaire repeatedly, some trainee teachers were also interviewed before, during, and after the teaching activities, and the work materials they produced were analyzed (Heath et al., 2010).

The activities of the "traditional" teaching laboratory were carried out in four sessions, each four hours long. The 150 trainee teachers participating in the traditional teaching workshop were divided into six groups of twenty-five people, each coordinated by an experienced Elementary School teacher.

During the first session, the trainee teachers participated in a focus group to study their ideas about how a teaching workshop should be organized. Moreover, they analyzed the National Guidelines for Elementary Schools in detail, discussing in small groups, sharing their opinions, and producing written reports of their group discussions.

During the second session, the trainee teachers were asked to plan some teaching pathways for physics content, based on knowledge and teaching methods they were exposed to when they were at school, and during their university career. This entailed putting into practice the teaching methods learned during the introductory university courses, applying them to science subjects. However, no explicit reference to a

specific educational reconstruction of the content to be taught was requested.

The third session was spent preparing mind maps, posters, and other teaching tools for the selected pathways, as learned during the introductory university courses on Didactics and Teaching Methodology.

In the fourth session, the pathways were presented to the experienced teachers supervising the groups and discussed with the other students.

The IB teaching workshop took place about one month after the end of the traditional one. It was not compulsory, but the trainee teachers were advised to attend it. It was made up of four sessions, each of which lasted four hours, and 109 of the 150 trainee teachers involved in the first workshop participated in it. Based on the general introduction to IB teaching approaches, given by the lecturer of the Physics for Elementary Schools Course as part of the curricular activities, the trainee teachers planned some teaching activities that focused on scientific investigation and discovery.

They planned and carried out the simple experiments involved in their teaching activities, focusing on specific issues they considered relevant for teaching. Particularly, they tried to analyze and "use" the difficulties they had when studying the subjects and doing the experiments, as well as the problems they had related to learning, to construct didactic activities that were centered on the children and active learning. These phases were essential for the trainee teachers, also because they allowed them to focus on metareflection as the key to getting them to learn with greater understanding. For metareflection, we mean the activation of those procedures that direct the information processing-flow of learning to make them explicit, recognizable, and reproducible (Simons, 1996). More specifically, we mean the meta-learning development of Schön's (1988) reflective practice. In his classic study, Schön argued that all aspects of teaching-practice supervision should be characterized by the fundamentals of 'coaching' where:

> *through advice, criticism, description, demonstration, and questioning, one person helps another to learn practice reflective teaching in the context of doing. And one does so through a Hall-of-Mirrors: demonstrating reflective teaching in the very process of trying to help the other learn to do it.*

Schön defines the learning activities as the processes of making sense of complexity or reflection-in-action. Notably, he introduces a second reflective domain relevant to the objective of learning to teach: the reflection-on-action, i.e., the thought used to review the complex teaching/learning interaction by making sense of it.

During the IB teaching workshop, the trainee teachers focused on the conceptual knots of the topics chosen, employing repeated in-group discussions. The lecturer provided 40 experiment kits for the groups of trainee teachers. Each kit was made up of "simple" materials that are easy to obtain, with a total cost of a couple of hundred euros. The planning and carrying out phase of the scientific experiments turned out to be very stimulating for the trainee teachers, many of whom had never worked on the actual construction of scientific experiments or the interpretation of their results. The lecturer provided the trainee teachers with a "workshop exercise book" containing questions and suggestions aimed at encouraging full use of the "5Es" in the IBSE teaching approach (e.g., Bybee et al., 2006). During the activities, the trainee teachers came up with simple but engaging activities for themselves and for their future pupils, found in books and browsing the Internet for resources (YouTube was the favorite one, as it allowed students to see how the experimental apparatuses should be built and used). Finally, they used the results to construct their teaching plans. They then planned a five-day science fair during which they were the facilitators of the activities for elementary school children, specially invited to the event. The science fair took place in the first days of June 2019 at the Department of Physics and Chemistry at the University of Palermo, Italy. Around 500 children participated, accompanied by their teachers and many parents.

Methods

Data Collection and Analysis

Data were collected utilizing the previously mentioned questionnaire and interviews. The typical answers given by the trainee teachers to each question during the three tests are shown in the Appendix. Because the number of trainee teachers that could be classified in the final test was 102, the same number was also used for the initial and intermediate tests.

Data from the trainee teachers' answers to the three tests (pre-instruction, intermediate, and post-instruction) were quantitatively analyzed by ClA. In this study, we used a non-hierarchical clustering method, called k-means (MacQueen, 1967). It allows the researcher to individuate clusters that are also easily represented in Cartesian graphical form. It also allows the researcher to highlight profiles that can characterize the cluster, describing the trainee teachers sample without any prior knowledge of what forms those clusters should take (unsupervised classification).

Classification of student answers to the questionnaire

Due to the open nature of the questions (reported in the Appendix), a procedure described in the literature (Battaglia et al., 2019b) aimed at coding trainee teachers' answers to open-ended questions was followed. At the end of it, a shared list of 63 typical answers[2] given by the trainee teachers when tackling the pre-instruction questions was obtained. This list was supplemented by some other typical answers given in the post-instruction test. It was used, in its final form of 65 typical answers, for the coding of answers in all the three tests[3] , taking into account the full spectrum of different trainee teachers' answers.

Once the typical answers have been shared and agreed among the researchers, each researcher reread the trainee teachers' records and assigned each answer to a given question to a specific typical answer. Given the inevitable differences among the researchers' interpretations, the three lists were compared and contrasted in order to get to a single agreed list. No answer was discarded at the end of this phase. Discordances between researcher lists were usually a consequence of different researchers' interpretations of trainee teachers' statements. This happened 40 times when comparing tables of researchers 1 and 2, 17 times for researchers 1 and 3, and 29 times for researchers 2 and 3. Hence we obtained excellent percentages of accordance between the analysis tables of each researcher pair.

Trainee teachers' answers to pre-, intermediate, and post-instruction questionnaires were coded by using a binary scheme[4]. Each trainee teacher, i, was identified in the three tests by arrays a_i, a'_i and a''_i, composed of 65 components 1 and 0, respectively, resuming the answers given by him/her in the questionnaire.

Cluster Analysis

ClA methods are commonly used to generate groupings of a sample of elements (in our case, trainee teachers) by partitioning it and producing a smaller set of q non-overlapping clusters. Among the currently used algorithms, we applied the k-means one, which was proposed by MacQueen in 1967. The metric we used is Gower's one (1966), as it appears to be well fitted to the use in Educational Research (Battaglia et al., 2019b). All the clustering calculations on the data coming from the submission of the questionnaires to trainee teachers were performed using custom software, written in C language. The graphical representations of clusters were obtained using the well-known MATLAB software (2015).

To define the number q of clusters that best partitions our samples in all the three tests, the mean value of the Silhouette function (Rouseeuw, 1987), $<S(q)>$ was calculated for different numbers of clusters. We found that the best partitions of our samples were achieved by choosing q= 4 clusters in the pre-, intermediate, and post-instruction tests ($<S(4)>$= 0.78 (C.I.= 0.74-0.81), 0.77 (C.I.= 0.73-0.80), and 0.79 (C.I.= 0.75-0.82), respectively)[5]. The obtained values were all higher than 0.6, indicating that reasonable cluster structures have been found (Struyf et al., 1997).

Once the appropriate partition of data has been found, each cluster was characterized in terms of trainee teachers' behavior. To do this, we took into account the typical answers most frequently used by the cluster trainee teachers, which, according to Springuel et al. (2007), can be called the "prominent" answers.

Like all the other cluster elements (the trainee teachers), each cluster centroid, C_k(k= 1,2,3,4), can be represented by an array composed of 65 0 and 1 components. It is worth noting that C_k has a remarkable feature: $\bar{a}_k$ contains 1 values right in correspondence of the typical answers most frequently used by the cluster trainee teachers (Battaglia et al., 2019b). This feature allowed us to give meaning to the cluster centroid as the element that characterizes the cluster in the sense we discussed above.

Therefore, in each test, the four clusters Cl_1, Cl_2, Cl_3, Cl_4 could be characterized by their related centroids, Cl_1, Cl_2, Cl_3, Cl_4, respectively (see Tables 1-3. The codes used in the tables refer to the typical answers used by the trainee teachers , as described in the Appendix).

Qualitative Analysis of Other Data

More data were collected using semi-structured interviews with some of the trainee teachers before and after they participated in the IB workshop and to the science fair. The teaching plans made by the trainee teachers during the traditional teaching workshop activity were also used as a source of data. The interview protocols were pre-designed by the researchers, and the interviews were conducted by one of them in a face to face set-up with the trainee teacher being interviewed. In line with semi-structured interview methodology, questions not in the interview protocol were also asked to clarify better specific situations emerging during the discussion.

In this paper, we will report some preliminary analysis of the data we collected to give some more fine-grain detail about the results obtained using the cluster analysis of trainee teachers' answers to the questionnaire. A more in-depth analysis of the qualitative data is in progress and will be discussed in a forthcoming paper.

Results

The results of CIA of the answers given to the questions in the pre-test by the trainee teachers in our sample are shown in Figure 1, where four clusters, and the related centroids (circles), are recognizable.

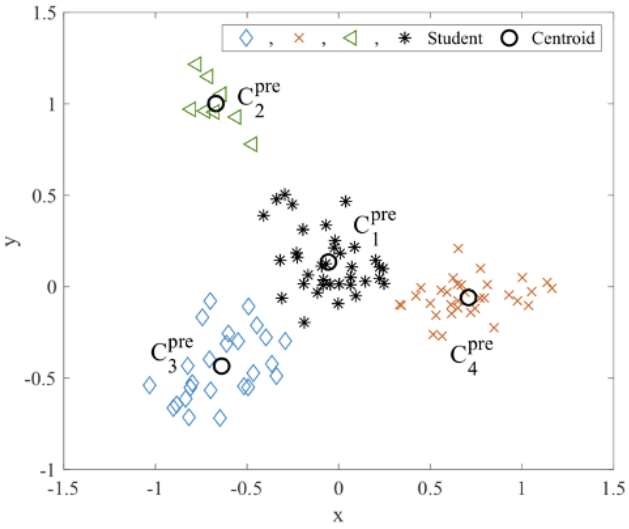

Figure 1. The results of the clusters analysis of the answers to the initial questionnaire represented in a Voronoi diagram. The Cartesian axes simply show the values necessary to identify the position of the various points based on their mutual distance

Each point in Figure 1 represents a trainee teacher, and it is placed on the diagram based on the "distance" from each other trainee teacher. The distance between one trainee teacher and another is calculated using the relative coefficient of correlation between the two, calculated based on the answers given by them to the questions in the questionnaire (Battaglia, et al., 2019b). The Cartesian axes simply show the values necessary to identify the position of the various points (the trainee teachers in the sample) based on their mutual distance[6].

Table 1 summarizes the answers most frequently given by the trainee teachers in each cluster (i.e., the components of the related centroids). It follows the coding used in the Appendix. The number of trainee teachers in the clusters, and other quantities relevant for the cluster solution, are also shown. Particularly, the average values of the Silhouette function for each cluster show to what extent the cluster elements are tightly arranged in the cluster and are distinct from elements of the other clusters (Rouseeuw, 1987). The reliability coefficient value can give information on how well a centroid characterizes its cluster. This value increases when the cluster elements decrease and when the cluster average silhouette value increases. In our case, the higher the reliability coefficient of a cluster, the more trainee teachers in the cluster give answers to the questionnaire not much differentiated from each other and from those of the centroid. More detail can be found in Battaglia et al. (2019b)

Table 1. *Typical answers that are most frequently given by the trainee teachers during the initial test, and other quantities for each cluster. The typical answers are shown using the coding reported in the Appendix*

Cluster centroid	C1	C2	C3	C4
Most frequently given answers	1.f, 2.a, 3.f, 4.b, 5.a, 6.a, 7.a, 8.a, 9.e, 10.c	1.b, 2.e, 3.f, 4.b, 5.a, 6.a, 7.a, 8.a, 9.e, 10.c	1.e, 2.e, 3.b, 4.b, 5.a, 6.a, 7.c, 8.e, 9.c, 10.c	1.b, 2.c, 3c, 4.d, 5.b, 6.b, 7.e, 8.c, 9.f, 10.a
Number of trainee teachers	36	8	25	33
Silhouette average value	0.72	0.94	0.76	0.81
Reliability coefficient	0.07	1.95	0.12	0.13

A first result emerging from the first three components of all the four cluster arrays in Table 1 shows that our sample is quite aware of the importance of teaching science in elementary school and developing thinking and reasoning processes. They also mainly think that children must be aware of the aspects of science that relate to everyday life. However, the majority of trainee teachers in clusters 1, 2, and 3 think that teachers are not always able to encourage pupils to discuss scientific topics related to everyday life because they feel to be not adequately prepared. Moreover, they think that elementary school children do not ask themselves questions about the world because they are too young.

Specific tendencies in each cluster are identifiable, as can be seen from the answers to questions 7 to 10. Notably, trainee teachers in clusters 1 and 2:

- think that teachers can easily run science workshops with their pupils only if they are well prepared and motivated;
- think that it is not easy to ask pupils questions aimed at improving their thinking skills;
- are not very convinced about their preparation to plan a scientific activity for their pupils;
- think it is not possible to choose a topic to study with children because they are too young;

trainee teachers in cluster 3:

- think that teachers cannot easily run science workshops with their pupils because schools often lack resources;
- think that it is possible to ask pupils questions aimed at improving their thinking skills if the everyday experience is at first referenced;

• do not like the idea of planning a scientific activity in class as they do not like science.

• think it is not possible to choose a topic to study with children because they are too young;

trainee teachers in cluster 4:

• think that teachers cannot easily run science workshops with their pupils because it is necessary to find suitable activities;

• only a competent teacher can easily ask pupils questions aimed at improving their thinking skills;

• like the idea to plan a scientific activity in class because this can be a way to put what they have studied into practice;

• think it is not possible to choose a topic to study with children, but it is possible to guide their choices.

Figure 2 shows the results obtained from the analysis of the trainee teachers' answers to the questionnaire given to them after the completion of the "traditional" type teaching workshop.

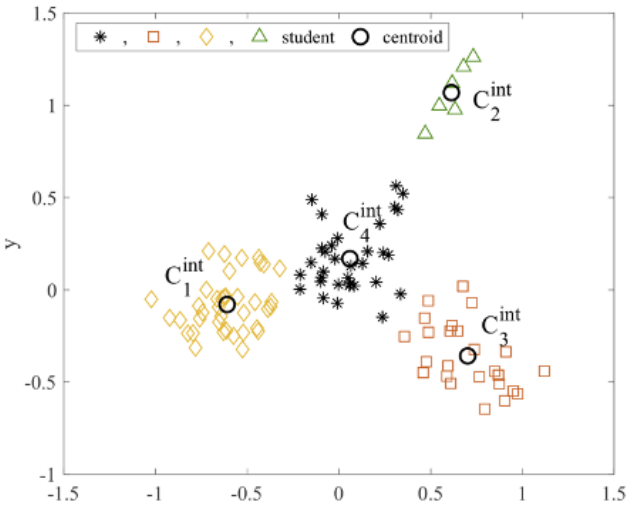

Figure 2. The results of the clusters analysis of the answers to the intermediate questionnaire, represented in a Voronoi diagram.

Again, the *k*-means algorithm identifies 4 clusters as the best partition of the 102 trainee teachers, and Table 2 summarizes the answers most frequently given by the trainee teachers in each cluster and the number of trainee teachers in the clusters.

A comparison between the clusters formed as a result of the analysis of initial and intermediate tests shows that they have a different form and, in some cases, different numbers of elements. However, the answers most frequently given in the intermediate test are still substantially the same as before. This means that the trainee teachers' ideas regarding the importance of teaching science subjects and their self-perceived skills and difficulties in planning science lessons and deal with scientific subjects during a lesson did not change much between the two sessions of the questionnaire.

Table 2. *Typical answers that are most frequently given by the trainee teachers during the intermediate test, and other quantities for each cluster*

Cluster centroid	C1	C2	C3	C4
Most frequently given answers	1.b, 2.c, 3.c, 4.d, 5.b, 6.b, 7.e, 8.c, 9.e-f, 10.a	1.b, 2.e, 3.f, 4.b, 5.a, 6.a, 7.a, 8.a, 9.e, 10.c	1.e, 2.e, 3.b, 4.b, 5.a, 6.a, 7.c, 8.e, 9.c, 10.c	1.f, 2.a, 3.f, 4.b, 5.a, 6.a, 7.a, 8.a, 9.e, 10.c
Number of trainee teachers	38	6	25	33
Silhouette average value	0.80	0.94	0.77	0.69
Reliability coefficient	0.11	2.45	0.14	0.07

Finally, Figure 3 shows the results obtained from the analysis of the trainee teachers' answers to the questionnaire given to them after completion of the IB-type teaching workshop.

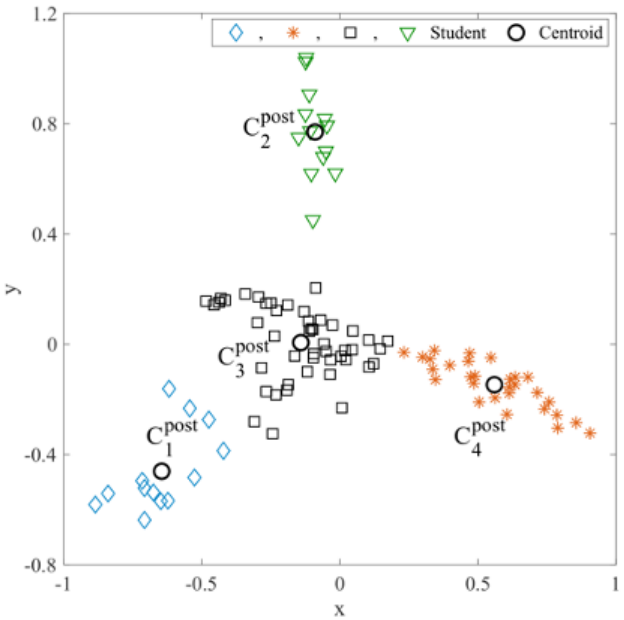

Figure 3. The results of the clusters analysis of the answers to the final test, represented in a Voronoi diagram

Once again, the k-means algorithm identifies 4 clusters as the best partition of the 102 trainee teachers. Table 3 summarizes the answers most frequently given by the trainee teachers in each cluster and the number of trainee teachers in the clusters

Table 3. *Typical answers that are most frequently given by the trainee teachers during the final test, and other quantities for each cluster. Note that trainee teachers in cluster 2 never answered question*

Cluster centroid	C1	C2	C3	C4
Most frequently given answers	1.c, 2.d, 3.d, 4.g, 5.f, 6.c, 7.f, 8.e, 9.f, 10.f	1.g, 2.a, 3.h, 4.a, 5.d, 6.d, 7.g, 8.-, 9.e, 10.b	1.c, 2.b, 3.d, 4.g, 5.a, 6.c, 7.f, 8.d, 9.h, 10.f	1.b, 2.b, 3.d, 4.b, 5.e, 6.a, 7.a, 8.a, 9.f, 10.d
Number of trainee teachers	13	13	47	29
Silhouette average value	0.80	0.89	0.74	0.82
Reliability coefficient	0.31	0.61	0.06	0.16

The results of the analysis are now considerably different from the ones obtained during the two previous tests. Opinions about the importance of teaching science at elementary school are still very positive, but now:

trainee teachers in cluster 1:

- think that it is possible to encourage pupils to discuss scientific topics to promote active learning;
- think that children must be aware of science in their everyday life to improve active learning;
- acknowledge that pupils are curious by nature;
- think that it is not difficult to run a science workshop;
- believe that in asking scientific questions is always necessary to start from everyday experience
- feel that planning a scientific activity for pupils can allow them to put what they studied into practice;
- acknowledge that choosing a topic to study with pupils can allow them to have an active role in their learning;

trainee teachers in cluster 2:

- think that it is possible to encourage pupils to discuss scientific topics to foster the sharing of information
- think that children must be aware of science in their everyday life to answer their questions;
- think that it is possible to run a science workshop because pupils learn by doing;
- still do not feel to be adequately prepared to plan a scientific activity for pupils effectively;
- believe that it is the teacher that must conduct the teaching/learning processes;

trainee teachers in cluster 3:

- think that it is possible to encourage pupils to discuss scientific topics to promote active learning;
- think that to be aware of science in everyday life can improve pupils' general knowledge;
- acknowledge that pupils are curious by nature;
- think that it is not difficult to run a science workshop, as a few materials are required;
- believe that it is natural for children to ask many questions about everyday phenomena;
- now understand they can do planning for science subjects, and like it;
- acknowledge that choosing a topic to study with pupils can allow them to have an active role in their learning;

trainee teachers in cluster 4:

- still think that teachers are often not adequately prepared to encourage scientific discussion in class;
- think that to be aware of science in everyday life can improve pupils' reasoning;
- believe that pupils are too young to ask themselves questions about the world;
- believe that to run a science workshop, teachers must be well prepared and motivated;
- think that children do not reflect too much, as they are too young;
- like to plan a scientific activity to put what they have studied into practice;
- think that it is possible to choose with pupils some topic to study;

Most trainee teachers have noticeably changed their ideas about their abilities and the possibility of teaching science using a workshop approach. However, some of the trainee teachers in cluster 2 still do not feel to be adequately prepared to effectively plan a scientific activity for pupils and think that a lesson should be mainly the responsibility of the teacher. Moreover, some of the trainee teachers in cluster 4 still have concerns about the teacher preparation and motivation to run scientific activities and children's disposition to ask questions about the world and reflect.

More information can be gained by means of a preliminary qualitative analysis of interviews conducted with some of the trainee teachers before they participated in the IB workshop and to the science

fair. These interviews confirm that after the traditional workshop, many of the trainee teachers involved in the research were perplexed about their own ability to plan laboratory activities for science teaching in a school setting (e.g., "I am not theoretically prepared to teach physics"; "I never did physics laboratory during my school years"; "A well-equipped laboratory is necessary, and our schools very often do not have even simple laboratories"; "Very rarely there is money available in schools to buy complex equipment"). This is significantly related to the presumed complexity of carrying out "real scientific experiments", as well as the need for adequate space and considerable funds to carry out the lab activities properly, something very often lacking in Italian elementary schools.

A preliminary analysis was also made of the teaching plans made by the trainee teachers during the "traditional" teaching workshop activity. It demonstrates that the trainee teachers often refer to a "workshop method" with explicit reference to what they have studied in their university courses in teaching. In fact, during their theoretical studies of pedagogy and didactics, the trainee teachers have been taught that a workshop is a "mental place or space" where children not only acquire knowledge and abilities but also specific skills (e.g., "Laboratory should not be a physical place, but a mental habit"; "The workshop method is a way to actively involve pupils in their learning, preferably by using objects we find around us"; "During workshop activities, pupils can do things, discuss, be involved in reflecting and developing their skills"). Cognitive involvement is often mentioned as one of the possibilities offered by a workshop. However, then the actual teaching plans often leave little space for dialogue, discussion, suggesting theories and solutions or metacognition. This often leads to planning in which workshops are too attached to operational and tangible aspects and have little to do with the reflective and cognitive spheres. This betrays the deeper meaning of the idea behind teaching workshops in schools, which is to promote active and authentic learning of pupils.

The results of the preliminary qualitative analysis of the data we gathered after the IB activities and the science fair (interviews and plans for the science fair) show that actively attending an IB teaching workshop, sharing the results with peers, and exhibiting the workshop products in a didactic environment with real children, seems to give trainee teachers faith in their possibility to teach science subjects and an "in the field" understanding of the importance of meta-thinking in workshops. (e.g., "The possibility I had to build simple experiments, reflect on their meaning, discuss them with my classmates and to use them during the science fair convinced me that I can plan a science workshop"; "Searching on the internet for possible experiments, looking for simple material to build them and discussing with my mates was great for my understanding of the subjects"; "I was amazed by the questions raised by children during the science fair days, and by the many ideas they gave us about improving the experiments we proposed them"). The IB teaching workshop also provides trainee teachers with planning models that they can apply, reflecting on their understanding and their learning about the science topics in their teaching plans. The trainee teachers who were interviewed clearly stated that the inquiry approach, which is well known for motivating pupils in schools, was also significant for them. They reckon that it improved their planning abilities and helped them to plan teaching activities based on the natural learning phases of a human being (i.e., the "learning by discovery" concept, that was repeatedly proposed to them during their theoretical lessons in pedagogy, but they were seldom able to experiment on the building of their knowledge and of pupils' one), without neglecting either the operational aspect or the thinking aspect typical of problem-solving activities.

After the IB activities, many trainee teachers also recognized, sometimes with amazement, that it is possible to do scientific experiments in spaces that are not specifically equipped for the purpose, with inexpensive everyday materials (e.g. "From this experience I learned that I can arrange an experiment on a complex topic like friction forces by just using sheets of various materials, a plastic bag and other objects found in real life"; "Now I know that a complete physics laboratory is not needed at all! All I need is low-cost objects that pupils can also find in their homes"). The prejudice demonstrated before, about the difficulty of carrying out science workshop activities in schools, because of a lack of equipment and funds and the absence of a real science laboratory, was now much less frequent.

However, some trainee teachers still held onto the idea that setting up an investigative science workshop was a complicated task and that very formal and "serious" skills (knowledge of mathematics and science superior to that which they possessed) were essential (e.g., "I still need to know mathematics to teach science subjects effectively"; "My overall understanding of physical laws is incomplete. I need to improve it to organize a science workshop effectively"). They still believed that without these skills, it would be difficult to organize significant science workshop activities, regardless of the spaces, funds, and equipment available in the school.

Discussion

This study investigated the hypothesis that trainee teachers of the Physics for Elementary School course at the University of Plaermo, Italy have low levels of science teaching efficacy beliefs, which are reflected in the poor perception of the relevance of science in real-life and low attitude to teaching scientific subjects at the elementary level.

The results of the cluster analysis of the answers given by the trainee teachers to the questions in the initial questionnaire and the preliminary qualitative analysis of interviews conducted with some of them confirm the research hypothesis. The trainee teachers admit the importance of teaching scientific subjects in elementary school and preschool, but the beliefs about their ability to effectively teach science are quite negative.

There is consensus among researchers that highly self-efficacious teachers are more prone to be innovative with their teaching strategies (Marshal, 2009; Deemer, 2004). Moreover, they tend to reflect more on planning their science lessons and finding suitable materials for constructing didactic activities that can be meaningful for students (Deemer, 2004). Therefore, a low level of science teaching efficacy beliefs should be a concern to educators, and particularly to lecturers of pre-service teacher education degree courses.

To tackle such a situation, it is important to identify reasons for the low science teaching efficacy beliefs of so many trainee teachers. A possible one is found in considering that many of them attended secondary schools where physics is usually taught by following a traditional, teacher-centered approach, and where physics teaching is mainly based on the transmission of general concepts to students. This experience of secondary school science might not have encouraged the development of positive attitudes to scientific subjects and science teaching. In 2007 Bleichner confirmed that the low science conceptual understanding of pre-service elementary teachers contributes to the development of low science teaching efficacy beliefs. According to Samuel (2017), traditional teaching practices at secondary schools are responsible for students portraying science subjects as difficult and unappealing.

The data we collected after the traditional workshop clearly show that the low level of trainee teachers' beliefs about their ability to teach science effectively is not much changed after that kind of instruction. As we have seen, many of the trainee teachers still believe that science workshop activities are challenging to put into practice, both for objective reasons beyond teachers' control (i.e., lack of resources and support from the school management) and their lack of skills and that of schoolteachers in general. There is also an evident lack of faith that children will be able to understand and carry out activities considered difficult because related to Physics. On the positive side, they think that simple topics suitable for scientific discovery and investigation activities can still be proposed.

Based on these results, we can answer our first research question. A teaching workshop based on traditional methods is not sensibly effective in modifying trainee teachers' ideas about their science teaching efficacy beliefs, and, more generally, about teaching science at elementary school, even if experienced elementary school teachers tutored the trainee teachers. This is a result documented in the literature, where traditional teacher training is credited to make often trainee students feel a disconnection between the theories they study in their university courses and the practice the experienced teachers ask them to apply in their didactic projects (Assadi et al., 2019). Yue & Liu (2019) pointed out that teachers trained traditionally may feel that such kind of training is not effective or targeted, or show difficulty in scientifically tackling real-life situations (Ernest, 1989). More generally, Ginns and Walters (1998) showed that teacher education programs based on a traditional approach hardly result in improvements in teachers' science teaching efficacy beliefs.

The cluster analysis of the answers given to the questionnaire after doing the IB teaching workshop and holding several days of science fairs and the qualitative data gathered show, on the other hand, that most of the trainee teachers' negative beliefs about teaching science seem to have changed into positive ones. This result allows us to answer to our second research question, highlighting some benefits of an approach to teacher education based on inquiry and discovery, on sharing results with peers, planning and attending a science fair, and on metareflection on learning processes. Particularly, it appears that such a structured approach favors a better general understanding of the fundamental role played by the teacher in encouraging the natural curiosity of children, and offering scientific activities based on everyday life experiences was observed. Moreover, the "alibi" of the lack of resources in schools, which was initially given as an obstacle to teaching based on scientific workshops, is also put into perspective. Finally, faith that children can ask themselves questions about the world around them, and learn to reason and think, increases considerably.

Several researchers noted that involvement in active teacher training activities, where pedagogy content is strictly related to the specific didactical context, in sharing results with peers and other people, and in

meta-reflecting on learning processes might have a positive effect in developing positive attitudes toward teaching. Hechter (2011) showed that integrating subject matter content and contextualized pedagogic methods in courses results in improved perceptions of science teaching efficacy. Mbowane et al. (2017) showed that teacher participation in science fairs can contribute to the building of pedagogical knowledge, content knowledge (both procedural and declarative or factual knowledge), and pedagogical content knowledge. Moreover, according to these authors, planning and participating in a science fair can improve self-efficacy beliefs, develop strengthened, positive attitudes towards science, and strategies of inquiry-based learning and effective methodological instruction, which can contribute to the participants' school-based teaching. Finally, Plourde (2002) argued that engaging trainee teachers in teaching experiences in which they are encouraged to reflect on their conceptual understanding, and then compare and contrast with peers their beliefs about science and teaching science may be a winning solution for the development of positive beliefs about science teaching. Plourde's argumentations are well related to the idea of meta-learning development of Schön's (1988) reflective practice we cited above.

Conclusions

Our findings, mainly based on cluster analysis of the answers given by the students to a questionnaire submitted to them before a "traditional" teaching workshop, immediately after it, and again after an IB workshop and a science fair, confirm, first of all, the hypothesis that the trainee teachers of the Physics for Elementary School course at the University of Palermo, Italy generally have low levels of science teaching efficacy beliefs. This result is probably expected, given the poor science background of the majority of the trainee teachers, mainly shaped by years of traditional, teacher-centered didactic activities, where physics and, more generally, science teaching is mainly based on the transmission of general concepts to students.

A comparison between the clusters obtained after the first administration of the questionnaire to the trainee teachers, and the intermediate one, also show that a teaching workshop based on the mere application of methods and concepts that the trainee teachers are supposed to have learned in their introductory university courses on didactics and pedagogy has not practical effects in modifying trainee teachers' ideas about science teaching efficacy beliefs and, more generally, about the possibility to teach science at Elementary School effectively. Notably, many trainee teachers: i. find it difficult to discuss the physics/science behind real-life situations, mainly because they feel not to be adequately confident with such subjects; ii. think that children attending the first years of elementary school are too young to be able to ask themselves questions about the world; iii. feel that it is not easy to run science workshops with their future pupils because schools often lack adequate laboratory resources; iv. do not like the idea to plan a scientific activity in class as they do not like science; v. find difficult choosing a topic to study with pupils because they are "too young".

On the other hand, after attending the IB workshop and organizing a science fair, the trainee teachers highlight positive evolution of their science teaching efficacy beliefs and also more faith in the capabilities of young pupils to approach science subjects at elementary school. Particularly, many of them: i. think that it is not so difficult to run a science workshop, mostly because expensive laboratory tools are not at all needed to organize them; ii. acknowledge that choosing a topic to study with pupils may allow them to have an active role in their learning; iii. Feel confident in their capability to plan and run science activities, recognizing that, yes, they also like them; iv. feel that planning a scientific activity for pupils can allow them to put what they studied into practice, especially concerning the theoretical contents regarding general pedagogy and didactics.

Not all the trainee teachers show such a straightforward modification in their ideas and beliefs about science and teaching it. Some are still dubious about their real preparation with scientific subjects and think they must deepen their science understanding to teach. However, the general science teaching efficacy beliefs are indeed at a higher level than before IB instruction.

These findings show that an approach to pre-service elementary teacher education based on active learning, on metareflection, and on sharing results, even planning science fairs, can have sensible effects on how trainee teachers plan for their future classroom activities and practices and shape their behavior during classes. A pre-service elementary teacher education program based on developing scientific investigation and discovery processes, and focused on metareflection may be a way to redirect trainee teachers' beliefs about science and science teaching, improving understanding of the sciences and their working methods

This study has some limitations. The first and more evident is the relatively low number of trainee teachers involved in the IB teaching workshop (about 2/3 of the ones involved in the traditional workshop). Another limitation of this study is strictly related to the cluster analysis method. It is well suited to make emerging typical characteristics of a group (the trainee teachers

profiles defined by the centroids) but is not able to give precise detail on the behavior of each single trainee teachers. To overcome this limitation, accurate analysis of the answers given by each trainee teacher to the questionnaires is necessary, adding a qualitative analysis of the interviews taken with some of the trainee teachers. Particularly, it could be interesting to perform a more in-depth study on the trainee teachers that after the IB workshop did not highlight sensible changes in their beliefs about science and teaching science, to try to understand what can be the reasons for those results. We hypothesize that the short duration of the workshop could be one of those reasons, as a more extensive training program than that which was possible during the study described here could have led more trainee teachers to activate a "conceptual change" (e.g., Vosniadou (Ed.), 2008) with respect their beliefs about science and science teaching.

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Appendix

Questions in the questionnaire and typical answers given by the students

1. Do you think it is important to deal with topics of a scientific nature with elementary school children? Explain your answer.

a. Yes, because it can be done using simple experiments.
b. Yes, in order to create a solid base for future studies.
c. Yes, to promote cognitive abilities.
d. Yes, because they are very curious at that age.
e. Yes, so that they understand the world around them.
f. Yes, even if they are very young.
g. Yes, to encourage scientific language.

2. Do you think it is important to develop thinking and reasoning processes in elementary school children? Explain your answer.

a. Yes, because they are difficult processes and children need to learn them from a young age.
b. Yes, to develop cognitive abilities.
c. Yes, because children of this age are not used to thinking.
d. Yes, so that they understand the world around them.
e. Yes, for their future cognitive development.
f. Yes, because children are used to thinking and asking themselves thousands of questions

3. Do you think good teachers use pupils' questions to guide their teaching of science subjects? Explain your answer.

a. Yes, to allow them to construct their knowledge actively.
b. Yes, but not all of them do it.
c. Yes, because if their curiosity is the starting point, they are motivated to learn.
d. Yes, to promote the transition from common knowledge to a more scientific knowledge, starting from well-known topics.
e. Yes, so that the knowledge is meaningful and useful.
f. Yes, to get them used to ask questions and thinking.
g. Yes, so that the teachers can answer their questions adequately.
h. Yes, to find out their prerequisites and start from those.

4. Do you think good teachers encourage students to discuss scientific topics related to everyday life? Explain your answer.

a. Yes, to encourage the sharing of information.
b. No, because teachers are often not adequately prepared to do it.
c. Yes, to start from practical knowledge and reach an understanding of the theory.
d. Yes, to stimulate the abilities of thinking, problem-posing and problem-solving.

e. Yes, to move easily from theory to practice.
f. Yes, because science is the study of what happens in the world.
g. Yes, to improve active learning (only used in the post-instruction test)

5. Do you think it is important for children to be aware of the aspects of science that relate to everyday life? Explain your answer.

a. Yes, to improve their general knowledge.
b. Yes, because that way they can understand the world around them.
c. Yes, to be able to appreciate the science that they will study in a school in the future.
d. Yes, to answer the questions they ask themselves about the world.
e. Yes, to develop reasoning processes.
f. Yes, because in this way they can actively learn (only used in the post-instruction test)

6. Do you think elementary school children ask themselves questions about the world?

a. No, because they are young and often prefer to play
b. Yes, they try to understand the world around
c. Yes, because they are curious by nature.
d. Yes, mainly when they are stimulated by external input

7. How difficult do you think it is for teachers to run science workshops with their pupils? Explain your answer.

a. It depends on how well prepared and motivated the teachers are.
b. Not very difficult if the teacher has adequate class management abilities.
c. Very/quite difficult, because schools often lack resources.
d. Very/quite difficult. It depends on the classroom context.
e. Very/quite difficult, because it is necessary to find activities suitable for their age.
f. Not very difficult, few materials are required.
g. Not very difficult, because pupils learn by doing.
h. Very/quite difficult. The teacher needs to be prepared.

8. Do you think it is easy to ask questions that can improve elementary school children's ability to think? Explain your answer.

a. No. Children do not reflect too much at that age.
b. No. It depends on the abilities of the teacher.
c. If the teacher is competent, it is easy.
d. Yes. Children naturally ask many questions. They are curious.
e. Yes. It is just necessary to start from everyday experience.

9. Do you like the idea of planning a scientific activity for your pupils? Explain your answer.

a. Yes, to help the pupils understand that science is important because it relates to the world around us.
b. Yes, to test myself.
c. No, I do not like science.
d. Yes, because it can lead them to theory through practice, starting from the material world.
e. No, I do not feel well enough prepared
f. Yes, that way I can finally put what I have studied into practice.
g. Yes, so that they can understand that science is not difficult and therefore become enthusiastic about it.
h. Yes, because I now understand I can do planning for science subjects, and I like it.

10. Do you think it is possible to choose the topics to study together with the children in elementary school? Explain your answer.

a. No, but it is possible to guide their choices.
b. No. It is the teacher that has to have an active role in the teaching-learning process.
c. No. They are too young.
d. Yes, it is possible to decide on some topics together.
e. Yes, because you need to understand what interests them, and know their prerequisites.
f. Yes. Pupils need to have an active role in the teaching-learning process.

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A Comparison of Turkish and South Korean Preschool Children's Gender Self-Concepts*

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Abstract

The aim of this study is to examine the self-concepts of preschool-age children in Turkish and South Korean cultures regarding gender identity and gender roles. The study was designed by a qualitative method, namely by a phenomenological research pattern. It was conducted with 80 preschool children who are between 36-72 months old, including 40 Turkish children and 40 South Korean children. As data collection tool, an interview form consisting of 11 semi-structured questions was used. Data were analyzed by using descriptive analysis technique. Results were divided up into two main themes, including "gender constancy" and "perceptions related to one's own and opposite gender". It was found that the gender consistency of Turkish and South Korean children is at different levels. In both Turkish and South Korean cultures, more boys than girls and older children than younger children showed more rigidity of stereotypes related to their perception of what their own and opposite gender can and cannot do. Most of the children within this study saw themselves foremost as their gender, described in comparison to opposite gender, rather than as children, described in comparison to adults. It could be argued that the responses of children to the questions may lie in the patriarchal nature of Turkish and South Korean society.

Keywords:
Cross-Cultural Study; Gender Continuity; Gender Stereotypes; Preschool; Self-Concept

Introduction

Sex is defined as all the physical characteristics comprised the anatomical and physiological characteristics that provide ability to distinguish the members of the species of most of the living things as male and female (San Bayhan & Artan, 2011; Charlesworth, 2011). Gender is how a person is perceived by society because of her sex; it is made of all the components that define how a men or women to look, think, feel, dress, act and how he or she must perceive the world (Helman, 1990). Therefore, the behaviors, attitudes, rights, duties, and obligations expected from men and women by the society can be defined as "gender roles" (Dökmen, 2010). Gender is one of the most influential factors within a society that affects children's development (Bem, 1993). Children use gender cues provided by society to develop

personal standards for behavior. Children internalize lens of their larger culture for viewing gender and this process becomes the basis for a network of unchanged, rigid, and internalized knowledge, which Bem (1993) terms as gender schema. Piaget (1952) also stated that, like any other cognitive schema, gender schemas develop at early ages. They are derived from cultural values and prevalent way for children to develop gender schemes is through socialization.

The gender schema formed during early childhood can develop into gender stereotypes held by older men and women in relation to gender roles (Beal, 1994). Gender stereotypes are well developed by the age of 5 and are fairly rigid between the ages of 5 and 7 (Martin & Ruble, 2004). According to Trautner et al. (2005), gender stereotyping shows a developmental pattern that occurs in three ordered phases. First, children start to learn gender-related characteristics; this usually takes place in toddler and preschool years. Secondly, children reinforce their newly acquired gender knowledge and its rigidity reaches the peak between 5 to 7 years. Third and finally, after reaching the peak of rigidity, the phase of relative flexibility follows. In other words, as children get older, gender stereotypes become more flexible than their younger ages. However, even though these children have the cognitive ability to understand the flexible nature of gender roles and stereotypes, they still remain attached to these schemas –stereotypes- and this emerges as a spontaneous process (Banse et al., 2010).

There are two broad theories of gender that direct research on gender in the early years: Sex-role socialization theory and relational theory. While sex-role socialization theory defines gender as socially learnt, relational theory defines gender as socially constructed. To examine the gender self-concepts of Turkish and Korean preschool children in the present study, the conceptual framework used consisted of Bussey and Bandura's (1999) social cognitive theory of gender role development. Bussey and Bandura (1999) proposed that children develop concepts of gender from interactions with environmental influences. Children interact with people, institutions and objects that have effect on formation of their self-concept. These interactions have a crucial role on gender self-concept of the children. Sex-role socialization researchers including Bussey and Bandura identify four key agents in sex-role socialization: family, peer group, media and school (or early childhood setting). The messages they have received from these agents play a role in children's gender self-concept. They put forward that through imitation, observation and modeling, children learn how to behave in ways appropriate to their sex roles (Bussey & Bandura, 1999; McNaughton, 2000).

In this context, according to Bussey and Bandura (1999), gender is equated with a cultural rather than biological origin, supporting the role of environmental influence in its formation. On the other hand, Kohlberg (1966) suggested that gender identity did not stem solely from either biology or culture, but rather the product of the child's cognition regarding both. Kohlberg proposed three stages of children's gender identity process. Kohlberg's (1966) first stage, identity, was expected of children between the ages of 2 to 3 years and involved a child self-labeling as a girl or a boy. The second stage, stability, was expected of children between the ages of 4 to 5 years and involved anticipating identity in youth to predict that for adulthood, such as a girl expecting to grow up to be a woman. The final stage, constancy, was expected of children between the ages of 5 to 7 years and involved a child's ability to self-perceive oneself as female even if a strict adherence to gender roles was not demonstrated. According to Kohlberg's perspective, acquisition of gender consistency is crucial for children's development for gender identity (Green, Bigler & Catherwood, 2004). After they understand that gender is fixed regardless of the time, appearance and conditions, children focus their interests on behaviors, objects, activities, roles and characteristics that meet their cultural gender stereotypes with an increasing motivation (Arthur, Bigler & Ruble, 2009).

Social Watch Organization ranks the countries in "Gender Equity Index" considering three basic criteria of "education", "economic activity" and "empowerment". According to this index, Turkey was 139th among 170 countries in 2008 (Sosyal-İş Union, 2010). Literature indicates that gender perception in Turkey is "stereotypical" and "traditional". It is more stereotypical especially for lower socioeconomic and sociocultural levels of population (Altuntaş & Altınova, 2015; Aktaş, 2011; Arıcı, 2011; Öztürk, 2012). According to the Gender Empowerment Measure (United Nations, 2002), Korea placed 61st and Turkey placed 63rd out of 66 countries in women's empowerment. In 2002, in South Korea, women occupied only 5.9% of positions in Parliament while in Turkey it was 4.2%. In addition, both countries are regarded as collectivistic, emphasizing deference to social norms and authority (Lobel, Bar-David, Gruber, Lau & Bar-Tal, 2000; Oyserman, Coon & Kemmelmeier, 2002; Gedikli, 2014).

Both Turkish society and South Korean society continues to place limits upon women that have served to restrict access and choices. Preschool children develop self-concept about their identity, and they acquire gender perceptions in preschool period. It is vital to scrutinize how the children who grown in a world full of gender definitions evaluate

themselves. The main purpose of current study was to better understand the self-concepts of preschool-age children in Turkish and South Korean cultures, between the ages of 3 to 6 years, regarding gender identity and gender roles. In this way, the study examined whether preschool children's self-concepts regarding gender is similar in Korea and Turkey since both countries are conservative in regard to gender norms. Age and cultural differences in children's gender expectations and gender role development were explored.

Method

Research Model

This research was designed by a qualitative method, namely by a phenomenological research pattern, to collect in-depth information on thoughts and perceptions of preschool children about gender identities. One of the main contributions of the phenomenological approach in qualitative research is that it reveals how the individuals perceive and interpret the world and their own experiences (Yıldırım & Şimşek, 2011).

Study Group

Data sources in phenomenological researches are the individuals or groups who have experienced the phenomenon that the research is focused on and so can express or reflect it (Yıldırım & Şimşek, 2011). Typical case sampling method, one of the purposeful sampling methods, was used for study group selection. The characteristics of the sampling is that it is formed with typical one of many situations in the universe related to the research problem (Büyüköztürk, Çakmak Kılıç, Akgün, Karadeniz, & Demirel, 2011).

This research was conducted with 80 preschool children who are between 36-72 months old, including 40 Turkish children and 40 South Korean children. Participants were evenly divided among two age groups (36-53 months old and 54-72 months old) and between male and female children within both countries. For each age group, 20 Turkish and South Korean children (10 female and 10 male) were included.

All children in the study were typically developing children from families of a middle class, urban community in Istanbul (Turkey) and Seoul (South Korea). While determining the participants, permission was obtained firstly from children's families, then from themselves. In both countries, children were recruited by sending home information about the study through their schools. Children whose parents signed and returned the consent forms were interviewed.

Data Collection

Semi-structured interview as a qualitative data collection method was used in this research. The participants answered a total of 11 questions. Four questions of the interview are open-ended while remaining 7 are close ended. Open-ended ones are related to children's thoughts about themselves, their likes and dislikes as girls or boys and things that they think a boy, or a girl cannot do. Questions generated to prepare and invite children for talking about themselves create a proper atmosphere to examine their gender-related self-perceptions.

Close-ended questions were adopted from the questions of Slaby & Frey (1975)'s Gender Constancy Interview that intend to measure gender constancy levels of the children. This inventory which contains highly structured binary and semi-structured reasoning questions was created to measure children's levels of Kohlberg's (1966) proposed stage of gender identity formation. The original inventory was designed to assess young children's notions of gender labeling, stability, and constancy (Kohlberg, 1966) regarding themselves and others. In the present study, only the second portion of the inventory comprised of 7 questions was used.

Data Analysis

Descriptive analysis technique was used for analyzing the data obtained from interviews. With this technique, obtained data were summarized and interpreted according to previously determined themes (Yıldırım & Şimşek, 2011). Interviews were recorded and transcribed. Findings were organized and defined in line with the previously determined themes, including "gender constancy" and of "perceptions related to one's own and opposite gender". The data were examined carefully considering the similarities and differences of the participants by the themes.

First, for "gender constancy" theme, children's answers to 7 close-ended questions were coded according to three levels of gender constancy, including gender identity, gender stability and gender constancy. Children who labeled their own gender correctly were accepted as they acquired the "gender identity level". For "gender stability level", children were asked whether they were same gender when they were babies and whether they would be same gender when they would become adults. If their gender labels were stable through time, they were accepted as they acquired the "gender stability level". For "gender constancy level", children were asked if they wear another friend's dress who is of opposite sex, his or her gender would be changed. If their gender labels were

stable through situations, they were accepted as they acquired the "gender constancy level".

Second, for "perceptions related to one's own and opposite gender" theme, children's answers to 4 open-ended questions were evaluated. When children were asked the things that they do not like since they are boys or girls, the things that they think their gender cannot do and the things that they think opposite gender cannot do, their answers fell into four categories. First, some children considered themselves as boys or girls at first before being a child and they compared themselves with the opposite gender. Second, some children considered themselves as children at first and they compared themselves with adults regardless of their gender. Third, some children did not make any comparison and they only talked about themselves in general and gave examples from daily life. Fourth, some children thought there is nothing children of the same or opposite gender cannot do.

Validity and Reliability

Aiming to increase validity and reliability of the research, researchers spent two hours a-day in the classroom of participant children for children to feel confident with the researchers. Obtained data were analyzed by two researchers. Miles and Huberman (1994) formula [Reliability = Consensus / (Consensus + Dissidence) x100] was applied to the two researcher's encodings. The concordance between the researchers was calculated as 92%. 70% or above scores are accepted as sufficient for reliability claims.

Procedure

Firstly, a "family consent form" was sent to the families of the children who will participate to the study through their teachers. In the family consent form, the purpose of the research and the interview process were expressed. In the week before the interviews, the researchers went to the schools and played a game with the children in their classrooms. Before the interviews, the researcher took verbal consent from children to get a conversation with them.

In both countries, children were interviewed individually at their schools in a private room. Interviews ranged from 15 to 20 minutes for each child. All interviews were audio-recorded for transcription. Children in Turkey were interviewed by the researchers. Children in Korea were interviewed by a native researcher, who is fluent in both Turkish and Korean. Interviews were coded by both authors. The data from the Korean sample was translated into Turkish by same South Korean researcher. Descriptive analysis was conducted on the data. Turkish children were named as T1, T2 and so on, while South Korean children were named as K1, K2 and so on.

Findings

In this section, the responses obtained from Turkish and South Korean preschool children were presented under four groups, of girls and boys 36-53 months old (as young children) and 54-72 months old (as older children). Findings were categorized under two themes of "gender constancy" and of "perceptions related to one's own and opposite gender".

Findings on "Gender Constancy" Theme

Table 1 shows the frequencies, by age and sex, of the responses of Turkish and South Korean preschool children to the questions asked in order to determine their gender constancy levels.

According to Table 1, two of young Turkish girls are in gender identity level while 8 of them are in gender stability level. In addition, eight of older girls are in gender stability level while 2 are in gender constancy level. Moreover, one of young boys is in gender identity level, while eight are in gender stability level and one in gender constancy level. Furthermore, eight of older boys are in gender stability level while two are in gender constancy level.

In addition, according to Table 1, one of young South Korean girls are in gender identity level while 3 of them are in gender stability level. In addition, all older South Korean girls are in gender constancy level. Moreover, two of young boys is in gender identity level, while two are in gender stability level and six in gender constancy level. Furthermore, two of older boys are in gender stability level while eight are in gender constancy level.

Table 1. *Frequency Distributions of Participant Boys and Girls by Gender Constancy Levels*

	Turkish Children				South Korean Children			
Levels	Girls 36-53	Girls 54-72	Boys 36-53	Boys 54-72	Girls 36-53	Girls 54-72	Boys 36-53	Boys 54-72
Gender Identity Level	2	--	1	--	1	-	2	-
Gender Stability Level	8	8	8	8	3	-	2	2
Gender Constancy Level	--	2	1	2	6	10	6	8

Table 2. *Frequency Distribution of Things Participant Boys and Girls Don't Like Since They Are Boys or Girls*

	Turkish Children				South Korean Children			
Category	Girls 36-53	Girls 54-72	Boys 36-53	Boys 54-72	Girls 36-53	Girls 54-72	Boys 36-53	Boys 54-72
Giving examples of things that he or she thinks that the children of the opposite gender do	--	5	4	4	4	5	7	8
Giving examples of things that he or she does not like in daily life	5	2	4	2	4	2	1	1
There is nothing he or she does not like	5	3	2	4	2	3	2	1

Table 3. *Frequency Distributions of Things that Participant Boys and Girls Have Though that Children of Same Gender Cannot Do*

	Turkish Children				South Korean Children			
Category	Girls 36-53	Girls 54-72	Boys 36-53	Boys 54-72	Girls 36-53	Girls 54-72	Boys 36-53	Boys 54-72
Comparing girls and boys	--	6	2	5	6	10	9	9
Comparing children and adults	7	3	6	1	2	-	-	-
Giving examples from daily life	1	--	1	--	2	-	-	-
There is nothing he or she thinks that the children of the same gender cannot do	2	1	1	4	-	-	1	1

Table 4. *Frequency Distributions of Things that Participant Boys and Girls Have Though that Children of Opposite Gender Cannot Do*

	Turkish Children				South Korean Children			
Category	Girls 36-53	Girls 54-72	Boys 36-53	Boys 54-72	Girls 36-53	Girls 54-72	Boys 36-53	Boys 54-72
Comparing girls and boys	4	7	3	8	10	10	10	10
Comparing children and adults	5	2	5	1	-	-	-	-
Giving examples from daily life	1	--	1	1	-	-	-	-
There is nothing he or she thinks that the children of opposite gender cannot do	--	1	1	--	-	-	-	-

Findings on "Perceptions Related to One's Own and Opposite Gender" Theme

Frequencies by age and sex of Turkish and South Korean children's responses to questions related to things that the boys and the girls do not like since they are boys or girls, things that boys and girls think that children of the same and opposite gender cannot be able to do are shown in Table 2, 3 and 4.

As shown in Table 2, when Turkish and South Korean children were asked the things that they do not like since they are boys or girls, in total more South Korean children (*n*= 24) gave examples of things that they think the children of opposite gender do than Turkish children did (*n*= 13). Also, more Turkish children (*n*= 13) gave examples of things they do not like in daily life than South Korean children did (*n*= 8). Moreover, more Turkish children (*n*= 14) stated that there is nothing they do not like since they are girls or boys than South Korean children did (*n*= 8). In addition, in both Turkish and South Korean cultures, older children (9 Turkish and 13 South Korean children from older age group) than younger children (4 Turkish and 11 South Korean children from young age group) gave examples of things that they think the children of opposite gender do when asked the things that they do not like since they are boys or girls.

As shown in Table 3, when Turkish and South Korean children were asked the things that they think their gender cannot do, in total more South Korean children (n=34) considered themselves as boys or girls before being a child and compared the things boys and girls can or cannot do than Turkish children did (*n*= 13). In addition, more Turkish children (*n*= 17) considered themselves as children before being a boy or a girl and compared the things that children cannot do and the things that adults can do than South Korean children did (*n*= 2). Also, 2 Turkish children and 2 South Korean children gave examples of things they do not like in daily life. Moreover, more Turkish children (*n*= 8) stated that there is nothing they do not like since they are girls or boys than South Korean children did (*n*= 2). In addition, older children in both cultures (11 Turkish and 19 South Korean children) than younger children (2 Turkish and 15 South Korean children) compared girls and boys when asked the things that they think their gender cannot do.

As shown in Table 4, when Turkish and South Korean children were asked the things that they think opposite gender cannot do, all South Korean children (*n*= 40) considered themselves as boys or girls before being a child and compared the things boys and girls can or cannot do, while 22 Turkish children in total did that. In addition, 16 of Turkish children considered themselves

as children before being a boy or a girl and 2 of Turkish children stated that there is nothing, he or she thinks that the children of opposite gender cannot do.

Discussion and Conclusion

When Turkish and South Korean preschool children were asked whether they are girl or boy, they all express their gender correctly and state that they are pleased to define themselves as a boy or a girl. Their labeling their gender correctly is an expected result. Because, Kohlberg (1966) stated that labeling one's own gender correctly is a developmental phenomenon that takes place in early ages, it can be concluded that these children have reliable gender labeling. In other words, all the children have acquired the gender identity level.

On the other hand, children have shown a stability varying due to their ages and cultures on perception of being a girl or a boy. This constitutes the second level, namely the gender stability level of gender identity development which takes place about the ages of 4-5 according to Kohlberg (1966). While 8 of Turkish boys and girls from each age group are in gender stability level, 3 young South Korean girls and 2 young and 2 older South Korean boys are in gender stability. Gender labels of these children are stable through time but not stable through situations. Because these children thought that if they wear another friend's dress who is of opposite sex, his or her gender would be changed. There is only one young Turkish boy and 2 boys and 2 girls from older age group who have thought that their gender will not change, that is, who are in gender constancy level. On the other hand, 6 South Korean girls and boys from young age group and all girls and 8 of the boys from older age group are in gender constancy level. Therefore, the gender consistency of Turkish and South Korean children is at different levels. The last stage, according to Kohlberg (1966) takes place at the ages of 5-7, while recent studies show that children acquire the gender constancy notion developmentally at the ages of 4-5 (Bee & Boyd, 2007). Most of South Korean children participated to this research have fully acquired the gender constancy notion, while Turkish children have not yet. It seems that South Korean preschool children in this study comprehend better that gender is independent from physical appearance.

When participants were asked questions related to the things they do not like since they are boys or girls, and the things they think boys and girls cannot do, it was found that more South Korean children than Turkish children considered themselves as boys or girls before being a child and compared boys and girls. In addition, it was also found that in both Turkish and South Korean cultures, more boys than girls and older children than younger children considered themselves as boys or girls before being a child. The results indicate that although in both cultures children have gender stereotypes regarding gender expectations and gender roles, more South Korean children in this study perceive themselves according to not their age but to the gender stereotypes.

In explaining perceptions of what girls and boys could not do, the most of the children within this study saw themselves foremost as their gender, described in comparison to opposite gender, rather than as children, described in comparison to adults. This result points to self-concepts not defined by a variety of personal experiences of childhood, but rather, defined by gender roles. The participants' self-descriptions suggest that the children within this study may be controlled by gender stereotypes. It can be suggested that in pursuing their interests, the children did perceive blockades associated with gender roles. It could be argued that the responses of children to the questions may lie in the patriarchal nature of Turkish and South Korean society. Both Turkey and South Korea have been found to have strict social norms (Oyserman, Coon & Kemmelmeier, 2002), especially about women's roles (United Nations, 2002). Regarding gender roles in the family, the traditional tendencies are still continuing in both South Korea and Turkey (Chin & Chung, 2010; Eun & Lee, 2005; Gedikli, 2014; Dedeoglu, 2010). Turkey can be argued to be still under the influence of patriarchal ideologies and traditional values are operating to the detriment of women and, eventually, of the whole society (Gedikli, 2014). While the policies aiming at the emancipation of women generated a small group of highly educated and economically active women in the urban areas of the country, they did not impact on rural women`s lives to the same extent (Gündüz-Hoşgör & Smits, 2008). Although some rapid social changes have also occurred in South Korea, its traditional gender roles structure has been maintained (Baek, 2009).

Self-concept of children is related to their experience, and gender is a socially constructed notion (Bandura, 1969; Bandura & Bussey, 1999). Gender identity develops as a result of learning process through observing the persons accepted as role models in gender-related areas. Learning through observation conveys information on gender. This information guides children to develop self-efficacy beliefs, which will help to orient their gender-related behaviors (Bandura & Bussey, 2004). Therefore, the children in this study

are influenced to a great extent by their environment in internalizing gender. If an environment transmits positive or negative messages about being a girl or a boy, children receive and interpret these messages. A research conducted by Ambady, Shih, Kim & Pittinsky (2001) shows that even 5-year-old girls can internalize the negative stereotypes about being a girl. Another research conducted by Epstein & Ward (2011) shows that children's gender stereotypes have great similarities with their parents' ones. Recent research has focused on parents' perceptions and expectations of gender roles in children, and indicates that children's gender typing is related to that which is expressed by their parents (Turner & Gervai, 1995; Heyman & Legare, 2004; Adams, Coltrane & Parke, 2007). In addition, classroom environments and teachers' expectations and feedback may further reinforce gender stereotypic beliefs and perceptions (Meece, Glienke & Burg, 2006). Children participated to this research are from families with middle socioeconomic status. It was also observed in the study of Dilek (1997) that despite their high economic status and education level, most of the parents convey their children to acquire a gender identity.

Results also conclude that the gender stereotypes increase by age in both Turkish and South Korean cultures. Similar to this finding, many studies find that children's gender stereotypes increase between the ages of three and five (Halim, Ruble, Tamis-LeMonda & Shrout, 2013; Ruble, Lurye & Zosuls, 2007, Trautner et al., 2005). In other studies (Çelebi Öncü & Ünlüer, 2012; Yağan Güder & Alabay, 2016), it was also found that gender stereotypes increase by age. Awareness or knowledge of gender norms increases with age through the preschool years (Blakemore, 2003). At the same time, the researches examining the differentiation of activity choices of children by time conclude that children's preference of gendered activities increase or remain constant by the age at early childhood (Golombok et al., 2008; Martin & Fabes, 2001; Martin & Ruble, 2009).

It is important to attend to the concepts preschool children incorporate into their self-perceptions for gender identity. The purpose of this research is not to generalize the findings. Being qualitative with relatively small number of participants who are homogeneous prevent making any generalizations. It can be expected that further research with the children from the families of different cultural, economic and education levels will give different results. Hence, more knowledge can be produced on how their environment influence children's gender identity acquisition. While a certain knowledge accumulation exists abroad, the research on this issue in Turkey is limited. It is needed additional qualitative and quantitative researches. Further studies should aim greater number of participants and heterogeneous groups. They can also examine how the parents perceive gender-related expectations of the society. They can create a wider perspective through comparing gender role perceptions of children with gender identity expectations of parents. Moreover, in today's world where the social pressure of technology increases, the effect of messages transmitted by media on children's gender roles can be examined.

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Academic Boredom: An Underestimated Challenge in Schools

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Abstract

Academic boredom is a complex and underestimated problem in schools in many countries. The research on this phebomenen is mostly from Germany and Northern America. During the last two-three decades several studies have highlighted some aspects of academic boredom and its relationship to motivation and school-based learning behavior and outcomes. This paper addresses and trys to clarify academic boredom as an important concept from several angles and highlights new and promising improvements in the field. A special emphasis is laid on preseting the extend and indentifying features, signs and antecedants. Furhermore the paper discusses academic boredom as a negative deactivating goal achievement emotion, and illuminate academic boredom as an antecedent and concequence.

Keywords:

Boredom, Academic Boredom, Concequences of Academic Boredom, Goal Achievement Emotions, Academic Emotions, Control-Value Theory

Introduction

Boredom is a well-known word and a natural part of our everyday language. Depending on our previous life experiences, the concept of boredom evokes different associations. For many of us it is specially associated with teaching-learning settings in school. Based on the research in the field, academic boredom appears to be a complex phenomenon. As we look closer, it culminates in a key question: What is really academic boredom?

Academic boredom is a relatively new concept, but nevertheless a relevant and growing phenomenon in an educational context. Despite limited research in the field, several researchers claim that boredom in school can be seen as the "plague" of modern society (Daschmann, Goetz & Stupnisky, 2014; Pekrun et al., 2010). Studies reveal that there is a high incidence of boredom in elementary school-age children in school settings (Larson & Richards, 1991, Sørlie & Nordahl, 1998; Øia, 2011; Daschmann, Goets & Stupnisky, 2011; Price et al., 2012; Fullan, 2014). The research show that different degrees of boredom can lead to different forms of learning-behavior, and learning-outcomes in school.

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Awarenes of and knowledge about academic boredom is particularly important for teachers, school leaders, and educational psychologist. This is due to the fact that it can help the professionals to better understand students' behavior patterns in the classroom, and initiate preventive measures. In addition their knowledge can support students in developing their own strategies to overcome boredom in a beneficial way.

The Purpose of the Article

The purpose of this article is to highlight the concepts of 'boredom' and 'academic boredom', and discuss the extend, feauters, signs, antecedents and precusors. Furthermore it attempts to clarify boredom as a consequence of teaching-learning and subject matter related factors.

In this article, academic boredom is treated as an environmental-related phenomenon. Thus 'trait boredom' (general boredom tendency), which is seen as a predisposed personality trait (Eastwood et al., 2012; Vogel-Walcutt et al., 2012) will not be addressed. Moreover, the main focus will be on academic boredom among students in elementary and secondary schools.

The Extend of Academic Boredom

In their comprehensive meta-analysis of studies of the relationship between boredom and academic outcomes Tze and her colleagues (2016) claim that the experience of academic boredom amoung students may be universal. Studies in 90s such as Larson and Richards (1991) found that about 36% of middle school students experienced their classwork time as boring. Aspecially for 5th to 8th graders, there was an increasing trend for boredom. With regard to homework time, 40% of the students reported it as boring. In a study of boredom among 3rd to 5th graders Patrick, Skinner and Connell (1993) found that boredom has negative impact on the students' behavior.

One of the earlier studies on academic boredom in Norway was conducted by Sørlie & Nordahl (1998) among approximately 1000 middle school students (13-16-year olds). The result of this study revealed that around 60% of the students experienced the school as monotonous and boring. They describe boredom as passivity, lack of interest and a form of introverted resistance to the teaching conditions by the students. Furthermore they consider boredom as an emotional form of reaction. It is obvious that this makes it difficult for the school to accomplish its goals in terms of communicating values, attitudes, and creating optimal conditions for learning of knowledge and skills. The teachers experience that the students' boredom implies a mental absence in the teaching-learning settings. They consider this as a bigger problem than externalizing and challenging behavior they experience in the class.

In an another study among approximately 2000 Norwegian middle school students Thuen & Bru (1999) found that every fourth student experienced schoolwork as uninteresting, boring and meaningless.

Some empirical studies among young school children during the last two decades focuses on the relationship between academic boredom and the students' motivation, learning strategies, and achievement. At the same time they address the relationship between academic boredom and the features of the subject matter. Stavrova and Urhahne (2010) studied relationship between boredom and motivation among 96 middle school students and found that the higher levels of boredom is associated with lower levels of intrinsic motivation to learn. According to Fritea and Fritea (2013) academic boredom is caused by teaching-learing situations and has negative impact on the elementary school children's learning outcomes.

In a study among approximately 4000 Norwegian middle school students, Øia (2011) found that 25% of the students are bored at school. This study suggests that this may be a consequens of too much theorethical subject matter in the schools. A study by Goetz, Frenzel & Pekrun (2007 referd in Daschmann et al. 2011) in Germany, claimes that students get bored about 50% of the time in each subject hour. In their sample there were 350 000 students between 11 and 18-year of age. Another German study by Daschmann et al., (2011) found that up to 43% of the students in math classes felt bored. Price et al. (2012) found that approximately 98% of students experience boredom in some part of their school time. Approximately 33% of the students felt that they were bored every day, 50% of the students had skipped school and 1 in 5 had considered opting out of school. Fullan (2014) reports from the Canadian context that two thirds of happy and committed kindergarten children will be bored at school before they start in 9th grade. These are high numbers and they tell us that the incidence of boredom in school is high and that academic boredom can lead to negative consequences for students.

There are however some ambiguities in these studies due to the fact that they do not explain clearly what they mean by 'academic boredom', they lack a common understanding of the feauters, signs, antecedents and precusors of academic boredom. In addition, they focus on partly or fully different factors

embedded in the school subjects, teaching-learning settings, and students behavior and students feelings in their study/measurement of academic boredom.
During the last two decades, several researchers have tried to explain academic boredom from different approaches. They address several features of academic boredom, especially student behaviors and feelings associated with it. However in earlier studies, the concept of academic boredom, is not systematically and clearly discussed by all researchers in its breadth. In the following sections, these approaches will be presented and elaborated. The aim is to contribute to the improvement of common understanding of academic boredom.

Academic Boredom-One of Many School-Related Emotions

Recent research in educational psychology has begun to focus more on the diversity of emotions students experience in the classroom. Several studies by Pekrun et al. (2007, 2014, 2018) show that students experience a wide range of positive and negative emotions in the school situation. They call them academic achievement emotions. In our daily speech, we label these emotions as joy, hope, pride, anxiety, anger, frustration, well-being, helplessness and last but not least boredom. Pekrun et al. (2007) separate these emotions into four categories:

1) positive activating,

2) positive deactivating,

3) negative activating and

4) negative deactivating emotions.

The achievement emotion of academic boredom falls into the last category of 'negative deactivating emotions'. The reason is that academic boredom is perceived as unpleasant, and involves a reduction in physiological activation (Pekrun et al. 2010).

It may seem like school-based achievement emotions, apart from anxiety, have been neglected, despite their strong presence in the classroom and relation to students' school-based learning and performance, development, health, and well-being (Pekrun et al., 2002, 2014, 2018). One possible reason for this may be that boredom is an invisible and 'quiet' emotion compared to, for example, a more manifested affective state such as anger. From teacher's perspective, it may seem that boredom lacks the interrupting character which anger brings with it in a classroom situation. On the other hand, it can be seen from a clinical perspective where it may appear that boredom lacks a psychopathological relevance, compared to e.g. anxiety (Pekrun et al., 2010). However, this does not mean that boredom is less harmful than other negative emotions. Even if students who experience boredom do not have disruptive behavior during class, or while working with their school subjects in the short run, we cannot overlook the negative impact boredom can have in the long run.

Boredom encompasses reduced motivation and lack of use of suitable learning strategies that weaken students' ability to achieve academic goals (Daniels et al., 2008; Tze, Klassen & Daniels, 2014). Students, who are bored, cannot realize their cognitive and metacognitive potential, and thus there is a higher risk of many negative consequences, both for their academic and psychosocial development, such as low grades, school absenteeism and dropout (Robinson, 1975; Daschmann et al., 2014; Pekrun et al., 2014). This tells us something about the fact that we must take this phenomenon seriously. Research shows us that students get bored far more often than they worry (Goetz et al., 2006; Nett, Goetz & Hall, 2011). This negative deactivating emotion turns out to be quite common among students in school-settings. This necessitates a closer look at the phenomenon. Therefor it is of utmost importance to know what one has to look at and what kind of student behaviors and student feelings one can relate to academic boredom.

Signs of Academic Boredom

When students complain about boredom, they do not necessarily have to talk about the same thing. We can look at boredom as a puzzle with different components. We can look at the following six components as signs of boredom (Pekrun et al., 2010):

a) a state of unpleasant feelings

b) lack of stimulation

c) low physiological activation

d) prolonged subjective experience of time

e) tendencies to escape from the situation thru thought migration

f) slow monotonous voice use.

Such an experience profile means that boredom consists of affective, cognitive and motivational components, and in addition expressive components. The affective components mean that students who are bored are feeling an inner discomfort. The cognitive components are expressed when the students´ subjective sense of time becomes slower. The motivational components of boredom are expressed as the students´ desire to escape from the situation.

The expressive components are the ones that make the boredom visible. It is shown by facial and body expressions.
This complex composition of boredom makes it difficult to find an universal definition. From his psychoanalytical perspective Greenson (1953) expresses the complexity of the phenomenon of boredom as something:

> *...which is easier to describe than to define. The uniqueness of the feeling of being bored seems to depend upon the coexistence of the following components: a state of longing and inability to designate what is longed for; a sense of emptiness; a passive, expectant attitude with the hope that external world will supply satisfaction; a distorted sense of time in which time seems to stand still (p.7).*

There are several researchers, like Greenson, who have expressed how demanding it is to define boredom. It can often seem easier to explain it than to define it. One of the reasons for this may be the fact that boredom is not always directly observable (Daschmann et al., 2011; Götz et al., 2013). In educational and psychological research, it is not uncommon to try to investigate and figure out something that is not directly observable. It may therefor be an important contribution to the field to highlight the emerging approaches to academic boredom.

Daschmann and her collegues (2011) present the following eight 'precursors of academic boredom' or 'antecedents of boredom':

a) Monotony

b) Lack og meaning

c) Opportunity costs

d) Being over-challanged

e) Being under-challanged

f) Lack of involvement

g) Teacher dislike

h) Generalized boredom (p. 427)

Like the aforementioned well defined six components as signs of boredom presented by Pekrun et al. (2010), these eight antecedents of boredom presented by Daschmann et al. (2011) make it easy to use them in reseach with stronger concept validity with identificable and comparable features.

During the last decade, several researchers have tried to find a comprehensive definition of 'academic boredom' by discussing nuances embedded in the psychological spectrum of emotions that characterize boredom.

Academic Boredom as a Feeling of Deficiency

Based on the above discussion of boredom, we can say that students' experience of boredom at school is often seen as an affective condition in the classroom that consists of a number of visible and invisible factors. Pekrun et al. (2010), for example, describe boredom as a "... affective state composed of unpleasent feelings, lack of stimulation, and low physiological arousal" (p. 532). The affective, cognitive, motivational and expressive components of boredom make it different from other negative goal achievement emotions, such as anger, anxiety or shame. In the seemingly hopeless boredom, there is a desire to engage in an activity. But how one can engage herself/himself, and in which activity one wants to engage in, is very difficult to find out. Some researchers describe this condition as: "... wanting to, but not being able to engage in satisfying activity" (Eastwood et al. 2012, p. 483). This conception of the phenomenon is also supported by other researchers who define boredom as "... the unfulfilled desire for satisfying activity ... (Gerritsen et al., 2013, p. 27). All of the descriptions above tell us something about the psychological needs that boredom creates in humans, but the reason for this is unknown. This may be the reason why not one definition manage to capture the breadth of the learning-related emotion, academic boredom.

Academic Boredom as a Consequence

We can also approach academic boredom from a developmental perspective. Some researchers argue that school-based boredom leads to a limited commitment to academic learning activities that lack personal value (Pekrun et al. 2014; Daschmann et al., 2011). This is an explanation of why some students direct their attention to more personal rewarding activities. This is in line with the approach of other researchers who consider boredom as a "... state ranging from mild to severe unpleasantness, which people describe as a feeling of tedium, meaninglessness, emptiness, wearisomeness, and lack of interest or connection with the current environment " (Sundberg et al., 1991, p. 210). Other researchers claim that boredom can be seen as the opposite of a number of emotional states such as interest, enthusiasm, involvement, commitment, flow and optimal stimulation (Acee et al. 2010). In this view boredom is a negative and deactivating emotion that occurs when students experience a lack of control over school-based activities, due to either being too difficult or too easy, and / or when they do not see the value in the task they are to perform (Goetz et al. 2006; Pekrun et al., 2007; Tze et al., 2014, Pekrun et. al, 2018).

In this discussion, some researchers argue that boredom most likely can be caused by a lack of

interest, but it is important not to portray it as the opposite of interest or other positive emotions. In an attempt to clarify the relationship between boredom and interest, Daschmann et al. (2014) claim that

> *... boredom constitutes more than the absence of interest. Lack of interest is affectively neural and does not cause emotional pain, whereas boredom is emotionally distressing. Due to different affective loads, lack of interest and boredom, also has different motivational consequences (p.23).*

This also tells us something about the fact that boredom is not the same as being apathetic either, even though it may seem that they have many similarities. In boredom, there is a desire to actually be interested, but there may be external or internal reasons why boredom takes over, and makes it difficult to get out of the situation despite the desire for change.

The research shows various factors that can contribute to boredom in the school situation, such as monotonous and repetitive activities as Hill and Perkins (1985) say "... boredom occurs when stimuli are constructed as subjectively monotonous" (p. 237). In their research they identified monotonous teaching as one of the main reasons for the occurrence of boredom. Occurrence of boredom may also be related to the students' feeling of subject matter as meaningless or the feeling that the activity is worthless. This means that if students experience a given school assignment as relevant to their needs, it becomes more meaningful or valuable to them and therefore less likely that the activity will provoke academic boredom (Daschmann et al., 2011). It seems that there is a growing agreement in this approach to boredom in school. Other studies investigated whether a lack of sense of meaning and value in working with school subject matter, could lead to boredom in the school situation. The results also indicate that the experience of the teaching material as worthless or meaningless can lead to academic boredom. Even though approaches to explain what causes boredom vary considerably, it is quite obvious that several aspects of classroom teaching can evoke academic boredom in school (Robinson, 1975; Daschmann et al., 2011). This necessitates a closer look at boredom in the light of Pekrun's (2006) 'control-value theory'.

Academic boredom as a goal achievement emotion
In control-value theory, goal achievement emotions are defined as emotions directly related to mastering activities or achieving results. Most emotions that are related to students' learning and mastery of subject matter at school are considered as goal achievement emotions since they are related to behavior and outcome. In previous research, goal achievement emotions were particularly linked to performance outcomes (Weiner, 1985; Pekrun et al., 2007).

Control-value theory implies that goal achievement emotions also can be linked to the experience of an activity. Emotions related to the activity itself have traditionally been overlooked in research on ´coping emotions´. Feeling of joy and pride in reaching the goals you have set, and frustration and shame when the effort fails, are examples. It can also be that one feels anger at assignment requirements, or that one is bored in class. In other words, boredom is one of the activity-related emotions. When students assess the value of the activity as negative, and the control too low, researchers claim that boredom has occurred. They explain it as follows:

> *... if demands are too low, as in monotonous routine activities, there may be insufficient challenge and a lack of intrinsic value, thus producing boredom. Conversely, if demands exceed capabilities and cannot be met, it may also be difficult to detect meaning in the activity, thus reducing its value. Furthermore, subjectively devaluing material that is too difficult may serve to cope with the threat implied by high demands (Pekrun et al. 2007, p.21).*

It is also emphasized in the control-value theory that goal achievement emotions affect students' cognitive resources, motivation to learn, and the use of different learning strategies (Pekrun et al., 2007; 2014). At the same time, we are talking about some of the consequences of boredom. It should not be possible to talk about academic boredom without its consequences. However, the consequences are often underestimated.

Consequences of Academic Boredom

Boredom is a common complaint in school-based learning situations, but the serious consequences it can have for students' performance and health are often undercommunicated (Gerritsen et al., 2013). Research show that there is a negative correlation between boredom on the one hand and motivation, the use of in-depth strategies, self-regulation and consequently achievements on the other. Furthermore, there seems to be a positive relationship between boredom on the one hand and irrelevant thoughts and being easily controlled by the environment on the other (Pekrun et al. 2002; Acee et al., 2010; Pekrun et al., 2014).

It is quite widespread in our daily life to hear statements signalizing that boredom is considered rather a trivial and temporary discomfort that can disappear with a simple change in circumstances. However studies reveal that it is important to regard academic boredom as a factor that is associated with very serious challenges and negative consequences. It is precisely because boredom has a painful side. There is a positive correlation between boredom on one hand and depression and anxiety on the other hand. Academic boredom also has a negative correlation

with the feeling of having a meaningful life (Eastwood et al., 2012). This means that the more a student gets bored, the less meaningful life she/he feels she/he has, and the greater the chance of developing depression. In addition boredom can be a trigger for skipping school, dropping out and at last but not least reduced goal achievement.

Due to these consequences, we should be careful to say that it is trivial, because it is clear that boredom can develop into a bigger problem in students. With this in mind, there is serious work that should be done when it comes to mapping the phenomenon based on an operationalizable definition.

Wanted: A Comprehensive and Operationalizable Definition

According to Vodanovich (2003) the lack of a unanimous agreement on the definition of boredom has limited the measurements of the phenomenon. Currently it may seem that boredom is usually defined somewhat imprecisely in terms of how it feels to be bored, which indicates that the main focus is directed to define boredom by putting the main emphasis on the experiential components of boredom. While some researchers on the other hand, try to provide a definition of boredom by placing the main emphasis on the underlying mental proceses that occur when boredom arise. Eastwood et al. (2012) make an important point when they argue that

> *... by definition, the bored person wishes to, but is unable to, become engrossed in satisfying activity. Boredom is the experience of being disengaged and stuck in an endless dissatisfying present (p.484).*

Furthermore, they distinguish between mental processes and experiential components, and highlight the relationship between them. In a more detailed form they suggest the following perception of the phenomenon. Boredom is defined as an...

> *... aversive state that occurs when we (a) are not able to successfully engage attention with internal (e.g., thoughts or feelings) or external (e.g., environmental stimuli) information required for participating in satisfying activity; (b) are aware of the fact that we are not able to engage attention and participate in satisfying activity, which can take the form of either awareness of high degree of mental effort expended in an attempt to engage with the task at hand or awareness of engagement with task- unrelated concerns (e.g., mind wandering); and (c) attribute the cause of our aversive state to the environment (e.g., 'the task is boring', 'there is nothing to do') (p. 484).*

Thus, boredom, to a great extend is defined as a reluctant state. In a school context, academic boredom will be a reluctant condition one experiences in class or while working independently with school work. It can occur when the students are unable to mobilize their attention using internal information such as thoughts and feelings, or using external information such as environmental stimuli in the classroom. Academic boredom can also occur when one is aware of the fact that one is unable to attract attention and participate in a given activity. This can take the form of either an awareness that a high degree of effort will be needed, or that one is more concerned with something else that is not related to the task. This reluctant condition occurs when students attribute the cause of the condition to the environment, such as the teacher's teaching or the academic content. Furthermore, it appears that boredom is a result of different combinations of the following three elements (Eastwood et al. 2012):

a) mental processes

b) experiential components and / or

c) psychological causes.

The mental processes consist of: 1) inadequate orientation of the attention, 2) attribution of lack of attention to the environment, 3) failure in executive control processes and 4) unsuccessful attempts to attract attention through regulation of the warning system.

Furthermore, the experiential components consist of: 1) awareness of difficulties with concentration (for example: mental exertion and / or thought migration), 2) non-optimal stimulation, 3) negative emotions, 4) limitations and chaotic state, 5) subjective slow perception of time.

And when it comes to psychological causes, it is important to take into account 1) chronic weaknesses of the attentional system (eg: ADHD, diffuse acquired brain damage, etc.), 2) chronic inability to articulate a satisfactory goal of engagement and 3) chronic over-sensitivity or hypersensitivity to stimuli.

The interaction between these three groups of antedecedents can cause negative experiences and trigger development of boredom in the classroom that hinders students' school-based learning. From educational and psychological perspective, it is reasonable to ask for intervension for boredom where the main aim is to prevent academic boredom in classrooms. We also have to admit that it is impossible to totally eliminate boredom our lives, neither in the classrooms. Therefor it is an important task for school professionals to help students to develop capasities and the nessesary strategies to cope with boredom as conscious individuals.

Based on the perspectives of Pekrun et al. (2007; 2014), Daschmann et al. (2011), Eastwood et al. (2012), and Tze (2016) discussed above, we can say that creation of teaching-learning settings that prevent and help students to handle boredom necessitates following qualities:

- Variety and excitement in the class that ensure involvement
- Experiencing the content, material and learning activities as meaningfull
- Reasonable amount of stimulation and challenges
- Feeling of being in the class is better than being outside
- Good teacher-student relationship
- Interlinking learning material and practice/ daily life.
- Enthusiasm
- Student-adaptive teaching / Scaffolding in the class
- Grantig more autonomy to the students
- Positive reinforcement
- Supporting students even after failure

Conclusion

Academic boredom is a very rich concept and at the same time a widespread phenomenon. It does not have a clear and consise definitions yet. However there is a broad agreement among the researchers that academic boredom is one of many school-related emotions, and is described as a negative deactivating goal achievement emotion. Based on the current research in the field, it is clear that academic boredom can have serious negative consequences for students' school-based learning. In the long run academic boredom can also be a precursor to other deeper psychopathological conditions such as depression and anxiety. Existing research literature focuses mostly on academic boredom among undergraduate and graduate students. The restricted number of studies addressing academic boredom among elementary and secondary school students, show that there are identifyable factors in teaching-learning settings. Identifying the antecedents and presecutors can give us opertunities to develop satisfying teaching-learing enviroments that possibly can reduce academic boredom and its rise. At the same time it is utmost important to equip the young students to cope with boredom when they encounter it, and develop a form of academic stamina. The aim in this attempt is to highlight what one as a student can accoplish by not surrendering to the boredom. This can take time, but it is nevertheless in line with the origin of the German word for boredom ¨Langeweile¨: ¨long time¨.

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The Development of a Reflective Teaching Model for Reading Comprehension in English Language Teaching

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Abstract

The main objective of the paper is to develop a Reflective Teaching Model for Reading Comprehension (RTMRC) in English Language Teaching (ELT). In recent decades, the concept of 'reflection' has become widely used in relation to an effective teaching process in various contexts, such as reflective teaching, reflective practices, reflective inquiry, self-observation, self-evaluation, and peer review. Although it is widely accepted in terms of use, the notion of 'reflection' is still broad and confusing, since it has different meanings and is used diversely in various areas of education. Thus, the first part provides an overview of the numerous perspectives in different research fields on the concept of reflective teaching in ELT reading comprehension, which contribute to the analysis, synthesis, and summary of RTMRC. In the second part, an evaluation of researchers' perspectives in teaching methodology and English language teaching is provided. We have concluded that our summary model based on the literature review is suitable as an instructional framework for ELT practitioners during the teaching process. Moreover, our review indicates that the stages of RTMRC that have been identified are appropriate for use in teaching and learning reading comprehension.

Keywords:
Reflective Teaching, Reading Comprehension, English as a Foreign Language.

Introduction

The concept of 'reflection' has a decades-long history of use. Almost a century ago, John Dewey (1933) had already applied the concept of 'reflection', 'reflective thought', and 'reflective thinking'. Dewey (1933) emphasized the relationship between learning and reflection and indicated that learners should reflect upon their professional actions and their consequences (Pacheco, 2005; Richardson, 1990). Richards (1990, p. 1, cited in Edwards, 2017) stated that reflection or critical reflection involves an activity "in which an experience is recalled, considered, and evaluated." Reflection is an important learning component for both

learners and teachers (Habók & Magyar, 2018a, 2018b, 2019). Pacheco (2005) also indicated that reflection and reflective learning have more positive effects on learning that underline the importance of developing and using reflective practices.

However, many teachers have misconceptions about reflection, for example, that 'reflection' means 'just thinking' and 'simple thinking' about the teaching and learning process. Paterson and Chapman (2013) prepared a precise description of the reflective practice to interpret reflective teaching and learning practices more clearly. They established that reflection not only includes a simple overview and description of a learner's activity, but rather requires cognitive and metacognitive activities in which the learner recognizes what has been learned, mobilizes his/her prior knowledge, and connects new information to existing information. It also comprises affective and metacognitive activities, which help the learner to evaluate his/her emotions and enthusiasm. This interpretation also requires a conscious teaching activity from teachers.

This study is intended to examine various studies of reflective teaching and to compare them as well as to discover possible distinctions. By considering gaps and distinctions in various studies, a summary of a new Reflective Teaching Model for Reading Comprehension (RTMRC) will be created to provide instruction in reading comprehension in English Language Teaching (ELT).

Review of Related Literature

Criteria for the Development of the Teaching Model

A model is a design of practical procedures that can be used in teaching school children to achieve their desired goals (Akyol, Çakıroğlu, & Kuruyer, 2014; Ghilay & Ghilay, 2015; Habók 2012). Richey and Seels (1994, cited in Joyce, Weil, & Calhoun, 2015) stated that the term 'model of teaching' means preparing a plan that can form the basis for the teaching design and developing teaching materials in the classroom environment or other settings. Borich (2014) also highlighted that an educational model can include instructional specifications combined with instructional theory and learning practice, thereby ensuring the quality of education. In this process, the focus is on an analysis of learning goals and needs, and the goal is to monitor the teaching and learning process and to meet emerging needs. To elaborate on an instructional design like this, Gustafson and Branch (2002) summarized a variety of traditional instructional design models. The models they described stress such components as analysis, design, development, implementation, and evaluation.

However, Reiser and Dempsey (2012) underlined some criteria that should be involved in all instructional design models. They pointed out that instructional design should fulfil the following criteria: it has to (1) be student-centered; (2) be goal-oriented; and (3) be focused on meaningful performance; as well as (4) be ensure the assessment of the validity and reliability of outcomes; (5) be empirically measurable and make self-correction possible; and (6) allow for a team effort. Based on these criteria, the authors attempted to develop an RTMRC for the instruction of reading comprehension in ELT.

Components of Reflective Teaching

As previously noted, reflection and reflective teaching are interpreted in a broad sense. A study by Ashwin, Boud, and Coate, et al. (2015, 266) described reflective teaching using Dewey's ideas, according to which "reflection is the active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion which it tends". They also pointed out the key component of reflective teaching, namely, systematic re-evaluation of the teaching experience when necessary to change teaching practices. Spalding and Wilson (2002) defined reflective teaching as "an activity or process in which an experience is recalled, considered, and evaluated, usually about a broader purpose" (Spalding & Wilson 2002, 1394).

Implementing reflective practices is based on both present and past teaching activities. To underline this fact, Donald Schön's study (1983) indicated two kinds of reflective practices, reflection-on-action, and reflection-in-action. Reflection-on-action means carefully re-thinking previous teaching and learning activity. The emphasis is on evaluating one's own strengths and weaknesses to develop more effective approaches in a situation. Reflection-in-action involves monitoring and assessing one's own and others' behavior in teaching and learning events (cited in Edwards, 2017).

Cirocki and Farrelly (2016), in turn, also established the nature of reflective teaching and distinguished between three types of reflection such as content reflection (what), process reflection (how), and premise reflection (why). Furthermore, Senge (1990, cited in Taggart & Wilson, 2005) identified three types of reflection; (1) technical reflection, (2) practical reflection, and (3) critical reflection. Technical reflection in education includes a reflection on teaching strategies, techniques, and skills. This type is related to Schön's reflection-on-action types and focuses on the questions the teacher asks: What did I implement? How can I teach more effectively? Practical reflection

highlights concentration on professional practice, what it means, and why it is important. Critical reflection unites the previous two levels of reflection. In addition, it contains a reflection on the teaching context in the broadest sense, including political, financial, and ethical factors.

In some studies (Graves, 2002; Fatemipour, 2013), reflection is a significant tool for teachers. It helps to explore, understand, and reconsider their teaching practice. Reflection means not only seeing and recognizing, but also understanding teaching and learning processes. Brookfield (2017) indicated in his study that the meaning of reflective teaching combines a wide range of practices, such as teaching inventories, observation checklists, self-evaluation scales, and students' evaluation tools. From the perspective of the reflective teaching process, he pointed out four sources that can be used by teachers for an effective reflective teaching process. The teachers can decide if they will use one or more of the sources. These are students' views, teacher colleagues' perceptions, personal experiences, and/or theoretical research.

Richards and Lockhart (2005, 4) noted that reflective teaching denotes a process which generally describes how the teacher teaches in the classroom and what kinds of methods they apply; they viewed as "the ongoing process and a routine part of teaching, it enables teachers to feel more confident in trying different options and assessing their effects on teaching". They also indicated that it is a cyclical process in which the teacher moves from one teaching stage to the next to fully grasp how they matter in the classroom situation. Additionally, they introduced reflective teaching as an action plan which comprises the following components: planning, action, observation, and reflection. Richards and Lockhart (2005) clearly stated that "their book does not set out to tell teachers what effective teaching is, but rather tries to develop a critically reflective approach to teaching, which can be used with any teaching method or approach" (Richards and Lockhart 2005, 3). According to them, therefore, reflective teaching can be applied together with several teaching methods and strategies to support students' learning.

Hulsman, Harmsen, and Fabriek (2009) also regarded reflective teaching as the cyclical process of acting, observing, analyzing, presenting and feedback. In their research on medical students, they used this cyclical structure with the observational approach. Babaei and Abednia (2016) examined the connection between reflective teaching and English language teachers' self-efficacy beliefs. In their reflective teaching process, they agreed with Calderhead (1989, 43) that "reflective teaching involves critical inquiry, analysis, and self-directed evaluation".

Other researchers, such as Dewey (1933) and Schön (1983), also explored a cyclical structure of reflective thinking. In their conception, the first stage is to identify a problem. The next stage is to go back to the root of the problem and examine it from the perspective of a third person. Based on this step, we decide if the problem needs to be changed. In this stage, the following activities are required: observation, reflection, data collection, and consideration of moral principles. The next stage is evaluation, which refers to a review of the implementation of the process, its consequences, and outputs. The next stage in the cyclical structure can be acceptance or rejection of the final solution (Taggart & Wilson, 2005).

Quite a few years ago, Kolb (1984, cited in Dennison, 2009) also carried out an experiment in teaching with his model of reflective teaching and confirmed the cyclical structure of learning and teaching. He identified four main parts of the reflective teaching process: (1) experience that we gained in the past or the present; (2) observation, which records what happened during the teaching event; (3) reflection, which involves defining, analysing, and concluding; and (4) planning, which makes it possible to make plans for further action.

In one distinct study (Pollard, Black-Hawkins, & Hodges, et al., 2014), it was mentioned that reflective teaching is a cyclical process where teachers monitor, evaluate, and revise their teaching practice continuously. In line with this view, reflective teaching can also be defined as "A systematic self-evaluation cycle conducted by teachers toward their teaching through an open discussion with colleagues or written analysis. Since it is a cyclical process, the teachers should monitor, reflect, evaluate and revise their practice constantly to meet the high standard of teaching" (Ratminingsih, Artini, & Padmadewi, 2018, 170).

Reflective teaching is defined by Farrell (2007) and Garzon (2018, 75) as "the process of teachers' consciously subjecting their beliefs about teaching and learning to critical analysis, assuming their responsibility in the classroom, and engaging in a process of improving teaching practices". Kennedy-Clark, Eddles-Hirsch, and Francis, et al. (2018) also emphasized the role of observation, engagement, and beliefs. According to their theory, "reflective practice is a process of learning that occurs through observation and engaging in discussion of practice so that questions about tacit beliefs and pedagogical

practices could be examined" (Kennedy-Clark et al, 2018, 43). Apart from those researchers, Clarke (2008) based on earlier studies also conducted observational research in mathematics in the southern United States. In his conception of the reflective teaching process in the field of mathematical problem solving, he used three phases, understanding, planning, and looking back, which refer to a circular process.

Distinctions from the Above Studies of the Components of Reflective Teaching

Thus, based on the above studies, two main points can be highlighted: the nature of reflective teaching and the reflective teaching process. In the nature of reflective teaching, several key components can be identified:

- Reflective teaching is taking a conscious look at actions with emotions and enthusiasm to achieve higher-level understanding. For this definition of reflective teaching, these authors (Ashwin, et al., 2015; Edwards, 2017; Fatemipour, 2013; Graves, 2002; Spalding & Wilson, 2002) applied the word, "reflection' in different ways; a conscious look, persistent and careful consideration, systematic re-evaluation, recalled and considered, rethinking, monitoring, and reconsider.

- Reflective teaching is based on both present and past events for effective learning. These studies (Edwards, 2017; Taggart & Wilson, 2005) used this nature of 'reflection on present and past events' in different ways; reflection-on-action and reflection-in-action, and identify a problem and go back to the root.

- Reflective teaching is a cyclical process. These researchers (Clarke, 2008; Dennison, 2009; Dewey, 1933; Hulsman et al., 2009; Kolb, 1984; Pollard, et al., 2014; Ratminingsih, Artini, & Padmadewi, 2018; Richards & Lockhart, 2005; Schön, 1983; Taggart, & Wilson, 2005) applied the term, 'cyclical process' in different ways; ongoing process and routine work, cyclical structure, systematic self-evaluation cycle, and circular process.

- In reflective teaching, various teaching methods and strategies can be applied and examined to help students learn more effectively (Kennedy-Clark, et al., 2018; Richards & Lockhart, 2005).

In the case of reflective teaching process, various researchers have put forward different approaches to the reflective teaching process. However, these approaches have common objectives in that they are designed to re-evaluate teaching experiences systematically to change teaching practices. It is also clear that these researchers had different approaches to their different fields. Among their approaches, there are four common components: planning (consideration and thinking), acting (experience, practices, response, involvement in a scenario, and learning), reflecting (observation, review, recollection, documenting what happened, and recording the scenario), and evaluating (determination, interpretation, and assessment). These four components are more common than other stages of the reflective teaching process. These factors are presented in Table 1 in a comparison of the different researchers' reflective teaching stages.

Conceptual Components to the Reading Comprehension Process

We now highlight certain research to present the theoretical background to the conceptual alternatives to the reading comprehension process. Various authors have pointed out that reading comprehension is a complex process during which readers use a number of mental processes, such as reading words, creating meanings, organizing the text, and applying strategies (Habók & Magyar, 2018; Käsper, Uibu, & Mikk, 2018; Rastegar, Kermani, & Khabir, 2017). Kusumawati

Table 1. *Comparison of various authors' reflective teaching stages in the reflective teaching process*

Authors	Reflective teaching process					
	Planning	Acting	Reflection	Analysis	Evaluation	Feedback
Taggart & Wilson (2005)	✓		✓		✓	
Richards & Lockhart (2005)	✓	✓	✓		✓	
Clarke (2008)	✓		✓			✓
Dennison (2009)	✓	✓	✓			
Hulsman, et al. (2009)			✓	✓		✓
Pollard, et al. (2014)	✓	✓	✓	✓	✓	
Babaei & Abednia (2016)			✓	✓	✓	
Garzon (2018)	✓	✓	✓	✓	✓	✓
Kennedy-Clark, et al. (2018)		✓	✓	✓	✓	
Ratminingsih et al. (2018)	✓	✓	✓		✓	✓

and Widiati (2017, 175) noted that "comprehension is a bridge between the known and the unknown". They also emphasized that comprehension is something that humans do from the early years. In an effort to comprehend information, they stated that the reader must relate his/her new information to his/her prior knowledge. Connors-Tadros (2014, 2) pointed out that "reading is an active and complex process that involves: (a) understanding written text, (b) developing and interpreting meaning, and (c) using meaning as appropriate to the type of text, purpose, and situation". Additionally, Gilbert (2017, 181) claimed that "reading in both first and second language context includes the reader, the text, and the interaction between the reader and the text". Reading comprehension is also defined by Lim, Eng, and Mohamed, et al. (2018, 146) as "a cognitive process that takes place when an individual interacts with the text".

According to Nordin, Rashid, and Zubir, et al. (2013, 469) "comprehending a text is an interactive process between the readers' background knowledge and the text itself". They divided this process into two parts: (1) the bottom-up approach to reading and (2) the top-down approach to reading. Baker and Boonkit (2004) observed that reading is also a process of bottom-up, top-down, and interactive approaches. To understand these three processes, Khaki (2014, 187) also identified three approaches to teaching these processes in the interaction approach; according to him, the students choose, based on the situation, which process (bottom-up or top-down) is more appropriate for them. For example, if the reader has background knowledge of the text, the top-down approach is more appropriate; however, if he/she does not have sufficient background knowledge, the bottom-up approach is more beneficial; the interaction approach is the most common in the language teaching classes if there are both types of readers (who have sufficient background knowledge, and who do not have such kind of knowledge) in the class.

Heilman, Blair, and Rupley (1986, cited in Suwanto, 2014) identified three levels of reading comprehension for English language teachers providing instruction on reading comprehension; (1) literal, (2) interpretative, and (3) critical comprehension. Literal comprehension highlights that a reader explicitly understands the key information in the text. Interpretative comprehension means that the reader can analyse and evaluate the text, and can personally react to ideas in the text. Critical comprehension requires that the reader can react critically to text information and form his/her own opinion of it. These three levels are of great importance for students' reading comprehension and the evaluation of students' achievement.

Apart from these definitions of and approaches to reading comprehension, reading events can also be considered. Widdowson (2015) described which factors affecting a reading event can influence reading comprehension. These include the reader's background and prior knowledge, quality of reading materials, and type of teacher and text instructions. According to Yang (2016), the factors which affect strategies for developing reading comprehension can be divided into two dimensions: situational and individual. The situational dimension includes classroom settings, teaching methods, and reading texts. The individual dimension can be influenced by readers' age, motivation, learning strategies and style, personal circumstances, and certain other latent factors.

Fitrisial, Tan, and Yusuf (2015, 17) also listed the individual, task, and strategy as factors that influence reading events. They noted that 'person' means the reader whose general knowledge, age, aptitude, and learning strategies and styles are included in the learning process. 'Task' indicates all kinds of activities in which the reader must engage during the teaching session. Finally, 'strategy' involves an awareness of strategy use to interpret the text, e.g. how to select key information and main ideas, and how to predict the message of the text.

In his study, Staden (2010) also pointed out that there are only three main events affecting students' reading comprehension process. (1) Learner factors involve learner motivation, needs, opinions, values, relationships to peers, etc. (2) Home factors refer to parents' education, social relations, socio-economic status, etc. (3) School factors indicate teachers' characteristics, the structure of the education system, school facilities, etc.

Huang (2013, 151) identified certain factors that motivate students' reading as follows: cultural values, instructional methods, and structures in the school environment. Snow (2003) also characterized reading comprehension as an interactive process of deducing and constructing meaning from the text. This process involves three components: first, the reader who is reading and is involved in the comprehension process; second, the text that had to be processed and comprehended; and, third, the activity in which the reader is engaged during the comprehension process. These three significant components of reading comprehension proceed within a social context.

Zhang (2016, 132) also identified three variables, which influence reading and reading success. These are (1) text characteristics; (2) reader/viewer characteristics; and (3) social context. Another study (Walker, 2008)

also indicated that there are five factors of the reading event, which must be taken into consideration during teaching. These are text, reader, task, teaching technique, and teaching context. These factors do not act separately but affect one another in teaching and learning. Walker (2008) also emphasized the notion of the 'context' in which environment the teaching has been implemented. Its role cannot be analyzed separately, since it is closely related to other factors, such as text, reader, task, teaching techniques, and context. Then, Suwanto (2014) also stated that a reader's understanding of the text depends on his/her prior knowledge, skills, thinking ability, strategies, observations, the readiness of facilities, and the text objective. In addition, Suwanto (2014) stressed that understanding only depends on readers' socio-cultural background.

Zhang and Zhang (2013, 37) indicated that "reading is a constructive process in which the text, the reader, and the context interact". In this process of interaction, the reader can reconstruct the information in the text based on his/her ability to decode and working memory based on his/her schemata. Thus, both the reader and the text can be considered as the main parts of the teaching-learning context.

Distinction from the Above Studies of Reading Comprehension Process

To conclude these research findings on the reading comprehension process, some concepts can be highlighted in two main categories: reading comprehension and factors affecting reading events. On the whole, two important perspectives on reading comprehension can be identified as follows.

- Reading comprehension is an interactive process between the reader and the text. These studies (Gilbert, 2017; Lim, et al., 2018; Nordin et al, 2013) described this interactive process in different ways; interaction between the reader and the text, individuals interact with the text, and interactive process between the reader's background knowledge and text itself.

- Reading comprehension is the relationship between known and unknown information. These studies (Khaki, 2014; Kusumawati & Widiati, 2017; Snow, 2003; Suwanto, 2014) showed this type of relation into different ways; interactive process of deducing and constructing meaning from the text, interaction approach between top-down and bottom-up, and understanding only depends on readers' socio-cultural background.

Some common key components emerge from among the factors affecting the reading event described by various researchers. Although it is difficult to count all the factors affecting students' reading comprehension, the most common factors that can be reflected by teachers during instruction are strategy, text, task, reader, and context. In the case of context, some authors, such as Snow (2003), Staden (2010), Suwanto (2014), Yang (2016), and Zhang (2016), describe 'context' as a kind of readers' socio-cultural context. However, other authors, such as Walker (2008) and Zhang and Zhang (2013), found that the context indicates the instructional context. The most common issues of these two kinds of contexts show that the reader, text, strategies, and task are involved in the cases of these two kinds of contexts. These factors are also summarized in Table 2 in a comparison of the different authors' views. These factors in reading comprehension are also to be considered as the main factors that can be reflected during the instruction process for reading comprehension.

Development of the Reflective Teaching Model for Reading Comprehension

To conclude the conceptual alternatives of reflective teaching described above, first, the most distinct factor described by almost all the researchers in reflective

Table 2. *Comparison of various researchers' views on the factors affecting the reading event*

Authors	Reflective teaching process					
	Teacher	Strategy	Reader	Task	Text	Context
Snow (2003)			✓	✓	✓	✓
Walker (2008)		✓	✓	✓	✓	✓
Staden (2010)	✓	✓	✓	✓	✓	✓
Zhang & Zhang (2013)			✓		✓	✓
Suwanto (2014)		✓	✓	✓	✓	✓
Fitrisial, Tan, and Yusuf (2015)	✓	✓	✓		✓	
Widdowson (2015)		✓	✓		✓	
Yang (2016)	✓	✓	✓	✓	✓	✓
Zhang (2016)			✓		✓	✓
Gilbert (2017)			✓		✓	

teaching (Ashwin, et al., 2015; Cirocki & Farrelly, 2016; Fatemipour, 2013; Garzon, 2018; Hulsman, Harmsen, & Fabriek, 2009; Pollard, et al., 2014; Ratminingsih, Artini, & Padmadewi, 2018; Richards & Lockhart, 2005; Spalding & Wilson, 2002; Taggart, & Wilson, 2005) is that reflective teaching is a cyclical and conscious process. Therefore, a teacher who uses reflection should know the main concepts of this process. Second, considering what distinct stages from Table 1are to be included in this process, various researchers have consistently described four main stages in this process: planning, acting, reflecting, and evaluating (see Fig. 1).

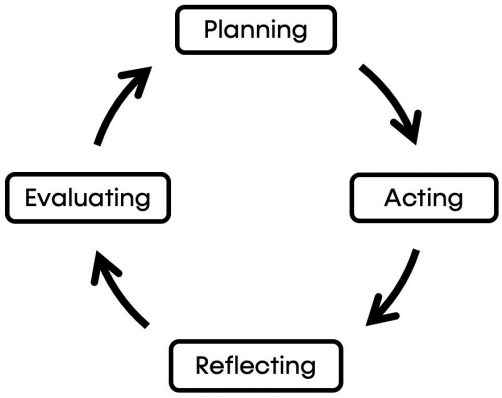

Figure 1. The reflective teaching process

In the conclusion of the reading comprehension process, according to these researchers, the first main idea is that reading comprehension is a process in which the reader interacts with the text. Actually, in the reflective teaching process related to students' reading comprehension, merely reflecting on the reader and text is not sufficient. Therefore, the second main idea is that five distinct main factors affect students' reading comprehension process, according to the researchers. These are listed in Table 2. These are context, strategy, reader, task, and text. The third main idea is that the notion of 'context', where instruction occurs as a kind of instructional context, is interconnected with other factors, such as task, reader, text, and strategy. To reconfirm the role of this third concept, Walker (2008, 28–31) also stated that context, which proceeds during the teaching event, plays a key role in influencing learning. She highlighted some important factors to be considered during the teaching context. These are the teaching strategy (teacher's methodology), organization work while completing the reading task (group work, pair work, individual work, and scheduling), text (source of information), and reader's characteristics (prior knowledge and previous experiences in learning situations). Therefore, the structure of these three components is visualized in Fig. 2.

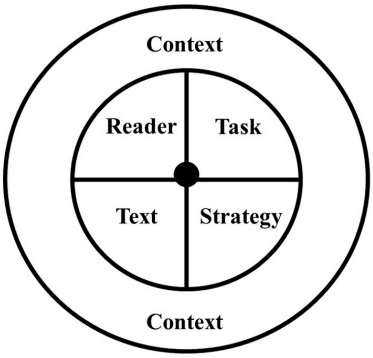

Figure 2. Factors in the reading event

Based on a number of studies (Ashwin, et al., 2015; Cirocki & Farrelly, 2016; Fatemipour, 2013; Garzon, 2018; Hulsman, Harmsen, & Fabriek, 2009; Richards & Lockhart, 2005; Spalding & Wilson, 2002; Taggart, & Wilson, 2005), reflective teaching is used in different fields such as mathematics, English language teaching, dance education, and the sciences. Therefore, to apply the reflective teaching process in teaching reading comprehension, the teacher can construct a new RTMRC and conduct experimental research to test it. Richy and Seels (cited in Joyce, Weil, & Calhoun, 2015) stated that the model of teaching consists of planning and designing teaching materials and implementing teaching in the classroom environment or in other settings. Therefore, to be able to construct a reflective teaching model, the previously mentioned two summaries (reflective teaching process and factors in the reading event) can be integrated into the teaching design of the reflective teaching in the reading comprehension process. On the whole, a tentative Reflective Teaching Model for Reading Comprehension (RTMRC) can be created as shown in Fig. 3.

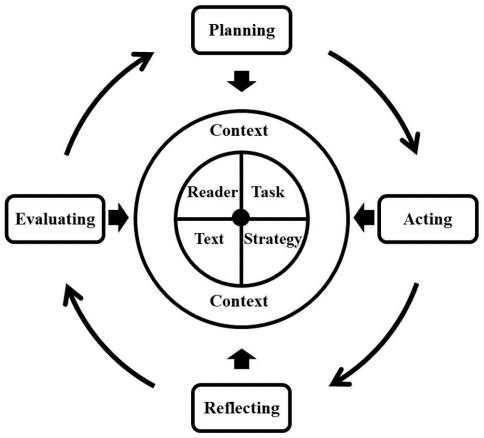

Figure 3. Reflective Teaching Model for Reading Comprehension

Four main components are involved in this reflective teaching model: planning, acting, reflecting, and evaluating. According to Richards and Lockhart (2005,

28), in the planning stage, the teacher can plan the factors before the teaching session. For example, who is going to do what activities (reader and task)? How does the teacher intend to implement his/her revised teaching strategies (strategy)? What are the changes to the curriculum (text)? To monitor these components, the teacher can develop questionnaires or apply other methods, e.g. prepare a self-evaluation questionnaire to monitor his/her own reflection on the teaching process.

In the acting stage, the teacher can execute the previous planning parts. In the reflecting stage, Richards and Lockhart (2005) also highlighted those teaching events will rarely go precisely as expected in implementing the plan. The most important factor in this stage is to make certain to record any deviations from the plan and the reason why they have occurred. The teacher can use a structured students' questionnaire as one of the reflecting pools to reflect on what has happened during the teaching-learning process (Brookfield, 2017; Habók & Magyar, 2018a; Habók & Magyar, 2018b).

In the evaluating step, the last point of the cycle, Richards and Lockhart (2005) also suggested that the teacher can evaluate two factors: the teaching and learning process and students' achievement. To evaluate the teaching and learning process, the teacher can review the questionnaires that are applied in the reflecting stage. After evaluating the questionnaire, the teacher can think about what actions (strategy/task/reader/text) are to be changed for the next lesson. As regards evaluation, the teacher can assess students' achievement at the end of the learning session or unit.

Researchers' Perceptions of the Reflective Teaching Model for Reading Comprehension (RTMRC)

We applied two levels to develop Reflective Teaching Model for Reading Comprehension (RTMRC). In the first level, various authors' conceptual alternatives of reflective teaching and reading comprehension were reviewed, analyzed, synthesized, and summarized to develop a new tentative RTMRC design for ELT. In the second level, the evaluation form of this tentative RTMRC design and its related reviewed descriptions were sent to experts in teaching methodology and English language teaching for evaluation. Criteria developed by Reiser and Dempsey (2012) were used to evaluate the effectiveness of the RTMRC.

In this stage of evaluation, an evaluation form which was adapted from Nguyen and Suppasetseree (2016) was developed by the researchers. This evaluation form is also based on the instructional design criteria of Reiser and Dempsey (2012) mentioned above. There are two main parts in this form. In the first part, a four-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree) was used. In the second part, a list of open-ended questions was attached to monitor participants' thoughts and opinions on the developed model, after which the RTMRC was reconstructed on their recommendations similar to the research of Nguyen and Suppasetseree (2016). The results were grouped into three main levels to evaluate the efficacy of the RTMRC on reading comprehension.

We examined means and standard deviations using descriptive statistics. In case where the mean of the evaluation list ranges from 1.00 to 2.00, it indicates that the RTMRC is less appropriate, according to the experts' opinion. If the mean is between 2.01 and 3.01, it also reveals that the RTMRC is appropriate. According to our interpretation, if the mean falls between 3.02 and 4.00, it indicates that the RTMRC is the most appropriate. Table 3 presents the results of experts' opinion.

Based on these findings, items 1, 3, 4, 5, 8, and 10 have slightly lower means, and items 2, 6, 7, and 9 have the highest mean scores. However, this is not a great problem, as all mean scores for these items

Table 3. *The Results of Experts' Evaluation on the Development of RTMRC*

No	Item	Mean	SD
1	Step 1, Planning is appropriate.	3.50	.58
2	Step 2, Acting is appropriate.	4.00	.00
3	Step 3, Reflecting is appropriate.	3.00	.00
4	Step 4, Evaluating is appropriate.	3.00	.00
5	The steps in the RTMRC are clear and easy to implement.	3.75	.50
6	The outcomes can be measured in a valid and reliable way.	4.00	.00
7	The RTMRC is empirical, iterative, and self-correcting.	4.00	.00
8	Each element of the RTMRC is linked to another element.	3.75	.50
9	The RTMRC can facilitate student-student interaction.	4.00	.00
10	The RTMRC has sufficient capacity to be able to teach students' reading comprehension.	3.25	.50
	Total	3.60	.50

are above 3.02 (based on the above criteria for the effectiveness of the RTMRC from Table 3). Thus, it can be interpreted that all the steps in the RTMRC design are highly appropriate for providing instruction in reading comprehension in ELT, according to the experts. In addition, all the experts agree that: (1) the steps in the RTMRC are clear and easy to implement in a classroom environment; (2) the outcomes can be measured in a valid and reliable way; (3) the RTMRC makes self-correction possible; (4) each element of the RTMRC is linked to another element;(5) the RTMRC can facilitate student–student interaction; and (6) the RTMRC has sufficient capacity to be able to teach students' reading comprehension.

Discussion

This study aimed to develop an RTMRC for ELT. We, therefore, reviewed various studies on reflective teaching and reading comprehension. These theoretical approaches were analysed, synthesized, and interpreted. After that, we elicited the opinion of four experts for a model. As the results showed, all the components may be involved in the teaching model. The literature review and experts' responses confirmed that the RTMRC was appropriately designed based on the criteria for instructional design developed by Reiser and Dempsey (2012).

In the RTMRC, the theory of constructivism is involved in focusing on students' understanding, processing, and evaluating of the reading text. The RTMRC is student-centered, teamwork-oriented, and easy to implement in teaching students' reading comprehension skills.

We concluded that the four main stages can be identified. In stage 1, planning, the teachers need to plan and consider who, what, and how to teach, as well as why. This stage can be applied by preparing the lesson plan to teach reading comprehension. In this stage, the teacher can plan to use the different kinds of teaching strategies for reading comprehension and student-centered learning. In stage 2 (acting), the teacher can teach based on his/her planning. In stage 3 (reflecting), for the reflection on the text (a text which has been taught), the teacher can ask the students some reflective questions after teaching with one strategy. The teacher can also reflect on his/her teaching based on strategy, reader, task, and text. In this kind of reflection, the teacher can reflect on the reader, task, and strategy using a students' preference questionnaire. This type of questionnaire can be distributed to the students after using one strategy type in the class. Therefore, stage 3 is also appropriate for teachers. In stage 4 (evaluating), the teacher must evaluate the reflected data from the students' preference questionnaire and the reflective questions after instruction. Therefore, it can be interpreted that this RTMRC has sufficient capacity to form the basis for teaching students reading comprehension.

It should be pointed out that this is a pre-assessment of the appropriateness of the RTMRC for teaching reading comprehension. We are aware of the low sample number, but seeing experts' opinions was important at this stage. All the experts confirmed that the RTMRC is logical and appropriate for teaching ELT reading comprehension. Therefore, later, the researchers can do experimental research on the effect of the RTMRC design on students' achievement in this area.

Pedagogical Implications

First, in the stage of planning, the teacher must plan the lessons based on text, strategy, reader, and task. However, he/she should especially consider which reading strategy is the most appropriate for his/her students or class, how to analyze students' needs, how to reflect on his/her actions in the class, and how to evaluate the reflected data for his/her progress. Only when teachers can plan successfully, the further stages of the RTMRC will be easier for them. Second, the RTMRC is highly transparent and supportive not only for teachers but also for their students in reading comprehension. As this RTMRC seems to be one of the most basic and systematic instructional designs, it may be beneficial for the education system and its participants.

Conclusion

This paper has developed the RTMRC by reviewing different researchers' perspectives on the concept of reflective teaching in ELT reading comprehension. To conclude this paper, two main parts can be found: What are the different authors' conceptual alternatives in reflective teaching in ELT reading comprehension? What are the results of four experts' evaluations on the RTMRC design? For the different researchers' concepts on the RTMRC, we pointed out different research perspectives to compare the similarities and differences among them.

Reviewing the different researcher's perspectives on the reflective teaching process, we found that there were different conceptual, theoretical, and practical factors. Then we deduced a summarized conceptual reflective teaching process which involves four main components: planning, acting, reflecting, and evaluating. These factors are only for the reflective teaching process. Therefore, we looked for perspectives on how to use this reflective teaching process in the area of students' reading comprehension in ELT.

We identified certain factors on students' reading comprehension process and then sought to determine the factors that affect the teaching of this process to students. As a result, we reviewed different studies and drew comparisons of what similar factors may influence this process among students. Thus, we found four main factors: the readers themselves, the teacher's strategy, text, and the students' task during the instruction process. Many studies showed that reflective teaching can be used in different fields; language teaching, music, mathematics, etc. Therefore, we concluded that reflective teaching process can be used in teaching reading comprehension process. And after studying reading comprehension process thoroughly, we noticed that if these four factors of reading events (reader, strategy, text, and task) can be reflected during teacher's reflective teaching process (planning, acting, reflecting, and evaluating), it would be more beneficial for students' reading comprehension process. That is how we arrived at the RTMRC design presented here.

In terms of evaluation, four experts in the field all agreed that this instructional design was highly appropriate for the teaching and learning process. Based on the findings, it can be concluded that this RTMRC is beneficial for the English language teaching and learning process.

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Me While I am Learning Mathematics: Reflections to Elementary School Students' Drawings

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Abstract

Each child will not become senior mathematicians in the future but all children have the right to get learning opportunities which he/she can develop his/her mathematical understanding at school. The success of children in mathematics is closely related to how they are taught mathematics. At this point, the role of teaching mathematics stands out in elementary school since they first encounter mathematics as a subject. Elementary school is the place where students first experience success or failure in mathematics. Therefore, the fundamentals of students' tendencies towards mathematics which will set and affect their future learning life are also laid here. The present study aims to examine the perceptions of elementary school students towards learning mathematics by means of their drawings. Drawings are tools for children to express themselves; they provide information about students' drawings on their classes and their understanding of teaching. In this context, based on the experiences of elementary school students, the phenomenon of learning mathematics was aimed to be defined from their perspective. This research employed phenomenology as a qualitative research design. The study group of the research consisted of 326 elementary school students. The data were collected through the drawings of students on the subject of "me while I am learning mathematics". Content analysis was used in the analysis of the data. According to the research results, it is seen that the math learning environment is usually classroom; people in the learning environment are usually teacher and student(s); materials in the learning environment are general items in the classroom environment; symbols in the learning environment are usually numeral-number-four operation symbols; learning mathematics is usually happy-enjoyable-fun and the process of learning mathematics is usually to do arithmetic.

Keywords:
Drawing, Elementary Students, Learning Math

Introduction

Today's children are growing up in a kind of world where mathematics is effective in all areas of life. The basics of the rapidly developing technology depend on mathematical knowledge. Many education and career opportunities require mathematical expertise. Individuals

need mathematical calculations and analysis for their daily work in the natural flow of life (Haylock & Thangata, 2007; Kilpatrick, Swafford, & Findell, 2001). Therefore, it can be stated that every individual should have basic mathematical skills.

Mathematics is a creative discipline and part of modern life. It equips children with powerful tools that include skills such as logical reasoning, abstract thinking and problem solving to comprehend and change the world (Department for Education and Employment [DfEE], 1999). It gives children the responsibilities necessary not only for their future positions, but also for being active citizens (Goulding, 1997). It can be expressed that the goals of mathematics teaching are in general an individual to be able to cope with the mathematical demands of daily life, gain the basic numerical knowledge and skills that he or she will need, and develop types of mathematical thinking skills that will develop his or her intellectual capacity (Haylock & Thangata, 2007).

Theorical Framework

Individuals begin learning mathematics before they reach elementary school. Starting from infancy, they encounter some situations related to numbers at any age and develop some mathematical skills (Kilpatrick et al., 2001). However, these skills are limited. Children need to understand mathematics so that they can enjoy learning it (Haylock, 2010). They are willing to do and understand it when they first encounter mathematics (Kilpatrick et al., 2001). Therefore, they need to build mathematics by means of reasoning, problem solving, discovery, discussion and practical experiences (Haylock, 2010). Otherwise, mathematics will refer to some procedures learned to achieve specific goals, which causes them to move away from mathematics over time. Because of the reasons previously stated, children who learn mathematics as procedures cannot employ and apply it except in situations similar to those taught (Davis, Goulding, & Suggate, 2017).

Not all children will become senior mathematicians in the future. Some of them will use it more as part of their job in the future, while others will use it at a basic level to continue their daily life. However, every child has the right to receive learning opportunities which provide them with developing their mathematical conception according to their individual potential at school (Edwards, 2007). All children should be provided with opportunities and be supported so that they can understand and learn mathematics (National Council of Teachers of Mathematics [NCTM], 2000). It can be said that their success in mathematics is closely related to how they are taught mathematics. In this context, the role of teaching mathematics appears in the elementary school, where they first encounter mathematics as a subject. Elementary school is the place where they first experience success or failure in mathematics. Consequently, the fundamentals of students' tendencies towards mathematics are laid in elementary education. The effects of teachers on students' mathematics achievement are higher in elementary school than in later years (Hill et al., 2008). Elementary school teachers introduce students to mathematical language, symbolism, and ways of thinking. This introduction includes teaching the basic skills that students will need in their future education years (Cowan, 2006; Lerman, 1998). Elementary school teachers should use interesting, motivating and encouraging mathematical tasks and activities in the classroom so that the situation above can happen effectively (Cowan, 2006). Moreover, enabling learning process to interact with the real world by moving out of the classroom provides students with the opportunity to realize the applicability of mathematics in different environments and concrete experiences. Thus, students can regard mathematics as enjoyable and useful through mathematical experiences in elementary school, and they can develop positive attitudes by valuing mathematics. In addition, elementary school teachers need to create learning environments that support student participation in the mathematics teaching process (National Research Council [NRC], 2000). It can be stated that learning environments where students can express their own ideas and discuss their ideas with each other and their teachers provide students with opportunities to develop strong mathematical ideas, deep insights, discoveries, and new knowledge. Such learning environments serve to develop mathematical motivation and increase self-confidence of students.

Many children experience negative emotions such as anxiety, tension or discomfort when faced with mathematics (Carey et al., 2019). After compulsory education, many students think of making use of mathematics to an extent while not encountering mathematics (Borthwick, 2011). This situation can negatively affect the education and entire life of children (Duncan et al., 2007). Therefore, it will be effective in resolving the problem to determine the perceptions of students about teaching mathematics during elementary school and to consider them while making decisions about teaching. Determining the perceptions of children about the problem in resolving these problems related to teaching process will be beneficial to address them.

Students' drawings about their classrooms provide rich data on their perceptions about teaching (Weber & Mitchell, 1999). Drawings are a tool for children to express themselves. By means of drawings, they can reflect their inner world, express their feelings, and give

clues about personality traits. They can transfer their perceptions about the world and their relationships with people, objects, and places that they consider important. Drawings are unique individual expressions that can represent many different aspects of children (Anning & Ring, 2004; Malchiodi, 1998). They can also express situations that they cannot express orally or in writing with their drawings. Moreover, the drawings encourage children to participate actively in research, as they are creative and fun. Unlike interviews that require children to respond more quickly, drawings give children time to think about what they want to animate in their drawings (Punch, 2002).

The Present Study

In the literature, there are studies examining by means of drawings secondary school students' perceptions of mathematician (Hatısaru & Çetinkaya, 2012; Picker & Berry, 2000; Toluk Uçar, Pişkin, Akkaş, & Taşçı, 2010), mathematics (Yavuz Mumcu, 2020), and mathematics teacher (Gökçek & Güneş, 2011); high school students' perceptions of mathematician (Aguilar, Rosas, Zavaleta, & Romo-Vázquez, 2016; Grevholm, 2010); elementary school students' perceptions of mathematician (Rock & Shaw, 2000) and mathematics lesson (Borthwick, 2011) and the way prospective teachers' were taught and the way they want to teach mathematics in the future (Lee & Zeppelin, 2014). These studies which generally examine the perception of mathematician, employed middle school students in their sample. The present study aims to examine the perceptions of elementary school students towards learning mathematics by means of their drawings. In this context, based on the experiences of elementary school students, the phenomenon of "learning mathematics" is intended to define from their perspective. It is thought that defining how "learning mathematics" is perceived by elementary school students as a result of common experiences will provide valuable tips for mathematics teachers and especially elementary school teachers.

Method

Research Design

Phenomenological approach was employed in this study. In phenomenology, the essence, meaning or structure of these experiences are intended to be understood by focusing on the subjective experiences of individuals related to a case (Creswell, 2007; Merriam & Grenier, 2019; Patton, 2015). For this purpose, it is attempted to define how the phenomenon is perceived from participants' perspective, by collecting data from individuals who experience the researched case. This process focuses on the common points in the experiences of individuals (Creswell, 2007). Based on this, the phenomenon of "learning mathematics" was investigated by means of the drawings of elementary school students. It may be desirable to examine children's drawings from a phenomenological perspective since it gives us the opportunity to view the drawings from various perspectives. However, attributing a meaning to only the drawings can cause misinterpretations. It is appropriate to evaluate various factors that affect how, what, and why children draw together (Malchiodi, 1998). For this purpose, it was considered to conduct interviews with children about their drawings. However, no interview was conducted due to the reasons such as some of the children at the elementary school level not wanting to talk, as suggested by their teachers, and that they could not express what they wanted to say, and because of the high number of participants. Instead, the students were asked to explain their drawings in a few sentences.

Study Group

Convenience sampling method was employed in order to determine the study group of the research. In this method, it is considered that the access to the participants is easy, that the participants are suitable for research and available for participation in the study (Neuman, 2014). In this context, the study group of the research consists of 326 elementary school students who continue their education in Bartın Province in the second semester of the 2018-2019 academic year. Among of the study group, 25 students (13 girls, 12 boys) were in 1st grade, 109 students (52 girls, 57 boys) were in 2nd grade, 86 students (36 girls, 50 boys) were in 3rd grade, and 106 students (55 girls, 51 boys) were in 4th grade.

Data Collection Process

There are various data formats collected in a phenomenological research (Creswell, 2016). In this study, the data were collected with the students' drawings and written explanations expressing these drawings. For this purpose, firstly, schools planned to collect data were visited. School administrators and elementary school teachers were informed about the research. Secondly, the elementary school teachers, whose the classroom was suitable for the research, were asked to read the instruction written by the researcher and distribute the papers prepared for drawing in the classrooms they teach in the visual arts class. It can be stated that they can make more detailed explanations if needed. The instructions are as follow: I would like you to make a drawing on "Me while I am learning mathematics". Your drawing should reflect how you think about learning mathematics. For this purpose, think about what your drawing will contain for a few minutes before you

start drawing. When someone looks at your drawing, he or she should be able to see how you perceive learning mathematics. I will give you a piece of paper to draw. You can make your drawing on the paper bordered by a frame. Explain your drawing with a few sentences on the lines placed under the frame. While drawing, you can use a coloured pencil if you want. Please do not look at each other's drawings while you are drawing, just draw your own thought. In this way, the application process was carried out in six different classes, in ten different elementary schools at different times and in accordance with the curriculum.

Data Analysis

In the design of phenomenology, the researcher interprets the meanings of common experiences based on the data obtained, reduces the information obtained in the research to important expressions or quotations and combines them into categories and analyses the data (Creswell, 2007). Based on this, content analysis was employed in data analysis. Content analysis involves coding, categorizing, linking categories, and making theoretical conclusions (Cohen, Manion, & Morrison, 2018) and it is a useful method of analysing perceptions (Julien, 2008). In the analysis of the data, each grade level was analysed separately. In the analysis process, in order to interpret the drawings correctly, explanations about the drawings and drawings of the students were evaluated together. Each drawing was examined several times by two researchers, and in each examination, descriptions related to the drawings were read and similar drawings were grouped under the same category. Sub-categories related to the categories that produced as a result of grouping were formed and repetition frequencies (f) and percentages (%) of these sub-categories were calculated. In order to support the categories with the drawings, the drawings that are considered to represent the relevant category best were determined. In order to provide coding reliability, Consensus / (Consensus + Disagreement) x 100 (Miles & Huberman, 1994) formula was used. Accordingly, if the calculated value is 70% and above, the codings are accepted to be reliable. The value calculated in this study was found to be 86% and was considered reliable for the study.

Results

The results were presented under the categories of "mathematics learning environment, people in mathematics learning environment, tools in mathematics learning environment, mathematical symbols in learning environment, expressions reflecting emotions while learning mathematics, and action in mathematics learning process" that were determined as a result of content analysis. Each grade level was examined separately according to the mentioned categories, and the results were presented with tables and drawings.

The findings according to the mathematics learning environment in the drawings of elementary school students were presented in Table 1.

When Table 1 is examined, it can be seen that the category of mathematics learning environment based on students' drawings consists of seven sub-categories: Classroom, study room, schoolyard, nature, park, market and undefined. Accordingly, it is seen that the mathematics learning environment is the most perceived as class at all grade levels. In some class levels, learning environment was stated as schoolyard,

Table 1. *Mathematics Learning Environments in Students' Drawings*

Category	Sub-categories	Grade level	*f*	%	Category	Sub-categories	Grade level	*f*	%
Mathematics learning environment	Classroom	1st grade	8	32	Mathematics learning environment	Classroom	1st grade	-	-
		2nd grade	71	65.13			2nd grade	-	-
		3rd grade	63	73.25			3rd grade	-	-
		4th grade	69	65.09			4th grade	1	0.94
	Study room	1st grade	-	-		Market	1st grade	-	
		2nd grade	4	3.66			2nd grade	1	0.91
		3rd grade	-	-			3rd grade	-	-
		4th grade	3	2.83			4th grade	-	-
	Schoolyard	1st grade	2	8		Undefined	1st grade	15	60
		2nd grade	6	5.50			2nd grade	23	21.10
		3rd grade	-	-			3rd grade	23	26.74
		4th grade	-	-			4th grade	29	27.35
	Nature	1st grade	-	-					
		2nd grade	4	3.66					
		3rd grade	-	-					
		4th grade	4	3.77					

Figure 1. Sample Drawings Related to the Category of Mathematics Learning Environment

nature, and study room, while park and market are the least expressed environments. In addition, no information about the learning environment was included in the drawings or expressions of the students in each grade level. Examples of drawings of elementary school students related to the category of mathematics learning environment were presented in Figure 1.

Figure 1 shows some examples of students' drawings related to sub-categories of mathematics learning environment. While the students were explaining their drawings, there are mostly such expressions as "the classroom came to my mind", "this is my classroom", "I drew a mathematics lesson in the classroom", "we are solving the mathematical problem in the classroom", "our teacher is teaching the math in the classroom", "I drew my teacher to teach the mathematics in the classroom". In addition, there are a few expressions such as "I am studying mathematics in my room", "mathematics in the schoolyard", "I am discovering mathematics in nature", "I am playing games in the park with the square", "I spend money in the market and I am calculating".

The results of the people in the mathematics learning environment in the drawings of elementary school students were presented in Table 2.

When Table 2 is examined, the category of people in the mathematics learning environment based on the drawings of the students consists of seven

Table 2. *People in Mathematics Learning Environment in Students' Drawing*

Category	Sub-categories	Grade level	*f*	%	Category	Sub-categories	Grade level	*f*	%
People in mathematics learning environment	Only oneself	1st grade	11	44	People in mathematics learning environment	Mother and child	1st grade	-	-
		2nd grade	21	19.26			2nd grade	1	0.91
		3rd grade	21	24..41			3rd grade	-	-
		4th grade	43	40.56			4th grade	-	-
	Only teacher	1st grade	-	-		Angle man	1st grade	-	-
		2nd grade	8	7.33			2nd grade	-	-
		3rd grade	2	2.32			3rd grade	-	-
		4th grade	4	3.77			4th grade	2	1.88
	Students	1st grade	9	36		No one	1st grade	4	16
		2nd grade	24	22.01			2nd grade	17	15.59
		3rd grade	7	8.13			3rd grade	20	23.25
		4th grade	12	11.32			4th grade	21	19.81
	Teacher and student(s)	1st grade	1	4					
		2nd grade	38	41.86					
		3rd grade	36	41.86					
		4th grade	24	22.64					

Figure 2. Sample Drawings Related to the People in Mathematics Learning Environment

sub-categories: only oneself, only teacher, students, teacher and student(s), mother and child, angle man and no one. According to this, despite the differences in terms of grade levels, it is seen that people in the mathematics learning environment are generally perceived as teacher and student(s), only oneself, students and only teachers. People in the learning environment were expressed as mother and child at one grade level and "angle man" at one grade level. Besides, people in the learning environment were not expressed in the drawings or expressions of the students in each grade level. Sample drawings of elementary school students related to the category of people in the mathematics learning environment were presented in Figure 2.

In Figure 2, sample drawings of students related to the subcategories in the category of people in mathematics learning environment were presented. While the students were explaining their drawings, they mostly included statements such as "the teacher is teaching us mathematics", "the teacher is waiting, the children are thinking about the answer", "the teacher is waiting, we are writing the questions on the board", "the teacher called me to the board", "we are applauding our friend who solved the question correctly". In addition to this, there are a few expressions such as "I am doing mathematics homework alone at home", "a mother is teaching mathematics to her child", "the man is showing angles".

Table 3 shows the results related to tools in mathematics learning environment in students' drawing.

When Table 3 is examined, the category of tools in mathematics learning environment based on students' drawings consists of eight sub-categories: General

Table 3. *Tools in Mathematics Learning Environment in Students' Drawings*

Category	Sub-categories	Grade level	*f*	%	Category	Sub-categories	Grade level	*f*	%
Tools in mathematics learning environment	General items in classroom environment	1st grade	8	32	Tools in mathematics learning environment	Clock	1st grade	1	4
		2nd grade	82	75.22			2nd grade	3	2.75
		3rd grade	71	82.55			3rd grade	-	-
		4th grade	70	66.03			4th grade	-	-
	Swing	1st grade	-	-		Measurement and drawing materials	1st grade	-	-
		2nd grade	-	-			2nd grade	-	-
		3rd grade	-	-			3rd grade	-	-
		4th grade	1	0.94			4th grade	3	2.83
	Machine-robot	1st grade	-	-		Grocery cart	1st grade	-	-
		2nd grade	1	0.91			2nd grade	1	0.91
		3rd grade	1	1.16			3rd grade	-	-
		4th grade	1	0.94			4th grade	-	-
	Smart board	1st grade	-	-		No tools	1st grade	16	64
		2nd grade	1	0.91			2nd grade	21	19.26
		3rd grade	-	-			3rd grade	14	16.27
		4th grade	1	0.94			4th grade	30	28.30

Figure 3. Sample Drawings Related to the Tools in Mathematics Learning Environment

items in the classroom environment (books, notebooks, pens, paper, table, desk, chair, board, bookcase), swing, machine-robot, smart board, clock, measurement and drawing materials (miter, protractor, ruler), grocery cart. Accordingly, it is seen that tools in mathematics learning environment are perceived as general items in the classroom environment at all grade levels. Additionally, different grade levels, a small number of tools such as swing, machine-robot, smart board, clock, measurement and drawing materials, grocery cart were also expressed. In addition, no information about the tools in mathematics learning environment was included in the drawings or expressions of the students at each grade level. Sample drawings of elementary school students related to the category of tools in mathematics learning environment were presented in Figure 3.

In Figure 3, sample drawings related to the sub-categories of tools in mathematics learning environment were presented. It is seen that most of the drawings include general items in the classroom environment (books, notebooks, pens, paper, tables, desks, chairs, wood, bookshelves). While students explain their drawings, they mostly wrote sentences such as "I am writing the result of the operation in my notebook", "I am drawing the shape of my notebook", "I am doing an operation on the board", "I went to the board and did all the operations", "we are writing the things on the board in our notebook", "we are sitting quietly in our desks, listening to our teacher", and I took out my Maths coursebook and notebook ", "I am using coloured pencil to draw the shapes". In addition to this, there are a few different expressions such as "I made operation on the smart board", "I made a robot with

Table 4. *Mathematical Symbols in Mathematics Learning Environment in Students' Drawing*

Category	Sub-categories	Grade level	*f*	%	Category	Sub-categories	Grade level	*f*	%
Mathematical symbols in learning environment	Numeral-number-four operation symbols	1st grade	13	52	People in mathematics learning environment	Geometric figure -object	1st grade	-	-
		2nd grade	93	85.32			2nd grade	-	-
		3rd grade	52	60.46			3rd grade	8	9.30
		4th grade	50	47.16			4th grade	4	3.77
	Number-count	1st grade	-	-		Letters- four operation symbol	1st grade	-	-
		2nd grade	-	-			2nd grade	-	-
		3rd grade	-	-			3rd grade	-	-
		4th grade	9	8.49			4th grade	2	1.88
	Angel	1st grade	-	-		Measure of length	1st grade	-	-
		2nd grade	-	-			2nd grade	-	-
		3rd grade	-	-			3rd grade	-	-
		4th grade	15	14.15			4th grade	3	2.83
	Fraction	1st grade	-	-		No symbols	1st grade	12	48
		2nd grade	-	-			2nd grade	16	14.67
		3rd grade	1	1.16			3rd grade	25	29.06
		4th grade	6	5.66			4th grade	17	16.03

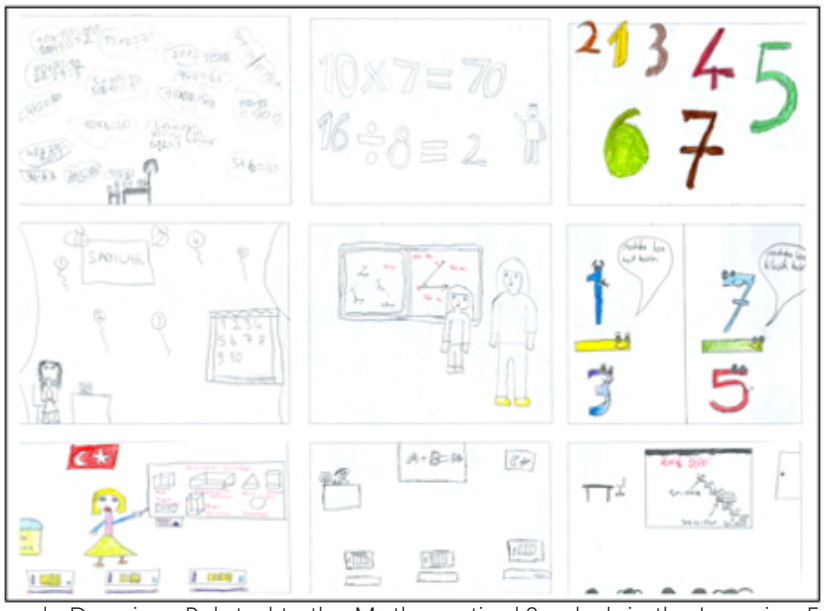

Figure 4. Sample Drawings Related to the Mathematical Symbols in the Learning Environment

geometric objects", "I am riding on the swing while doing an operation", "wow, huge protractor", "I draw a clock", "I am putting my purchases in the shopping cart".

The results related to the mathematical symbols in mathematics learning environment in the drawings of elementary school students were presented in Table 4.

When Table 4 is examined, the category of mathematical symbols in the learning environment based on students' drawings consists of eight sub-categories: numeral-number-four operation symbols, number-count, angle, fraction, geometric figure-object, letters-four operation symbol, measure of length and no symbols. Accordingly, the numeral-number-four operation symbols were most included in the drawings at all grade levels. In addition, numbers-count, angles, fractions, geometric figures-objects, letters-four operation symbols and measure of length were included in the drawings of different grade levels. In addition, no mathematical symbols and no statements explaining the drawings were expressed in the learning environment in each grade level. Sample drawings of elementary school students related the mathematical symbols in the learning environment were presented in Figure 4.

Figure 4 shows sample drawings related to the sub-categories of mathematical symbols in the learning environment. While students were explaining their drawings, they mostly included expressions such as "I am playing with numbers", "numbers and signs are coming to my mind", "I am creating numbers from counts", "I am in the world of numbers", "I drew multiplication and division signs", "I made a huge plus sign". In addition to this, there are different expressions such as "there are angles in mathematics", "I drew simple and compound fractions", "I drew geometric objects on the board", "A + B = 54", "I wrote measurements of length".

The findings related to the expressions reflecting emotions while learning mathematics in the drawings of elementary school students are presented in Table 5.

Table 5. *Expressions Reflecting Emotions While Learning Mathematics in Students' Drawings*

Category	Sub-categories	Grade level	*f*	%
Expressions reflecting emotions while learning mathematics	Happy-enjoyable-fun	1st grade	8	32
		2nd grade	82	75.22
		3rd grade	71	82.55
		4th grade	70	66.03
	Bored- anxious	1st grade	-	-
		2nd grade	-	-
		3rd grade	-	-
		4th grade	1	0.94
	Undefined	1st grade	-	-
		2nd grade	1	0.91
		3rd grade	1	1.16
		4th grade	1	0.94

Figure 5. Sample Drawings Related to the Expressions Reflecting Emotions While Learning Mathematics

When Table 5 is examined, the expressions reflecting emotions while learning mathematics based on students' drawings consist of three sub-categories: happy-enjoyable-fun, bored-anxious and no symbols. Accordingly, learning mathematics at all grade levels is generally perceived as happy-enjoyable-fun. However, emotions while learning mathematics were less expressed as bored-anxious in different grade levels. In addition, no expressions reflecting emotions while learning mathematics were included in the drawings in each grade level. Sample drawings of elementary school students related to the expressions reflecting emotions while learning mathematics were presented in Figure 5.

In Figure 5, sample drawings related to subcategories of expressions reflecting emotions while learning mathematics were presented. While students explained their drawings, they mostly included expressions such as "learning mathematics is good", "mathematics means having fun", "I am happy while learning mathematics", "I love mathematics", "long live mathematics". In addition, there are different expressions such as "I cannot say anything in case the teacher gets angry", "I think the answer to the question is correct", "There are difficult questions", "I am very tired in the mathematics lesson", "It is difficult for those who cannot do it, it is easy for those who can do it".

The results related to the action in the mathematics learning process in the drawings of elementary school students were presented in Table 6.

When Table 6 is examined, the category of action in the mathematics learning process based on the

Table 6. *Action in Mathematics Learning Process in Students' Drawings*

Category	Sub-categories	Grade level	f	%	Category	Sub-categories	Grade level	f	%
Mathematical symbols in learning environment	Doing-learning addition	1st grade	7	28	People in mathematics learning environment	Solving problems	1st grade	7	28
		2nd grade	10	9.17			2nd grade	10	9.17
		3rd grade	8	9.30			3rd grade	8	9.30
		4th grade	2	1.83			4th grade	2	1.83
	Doing-learning subtraction	1st grade	-	-		Listening to the lesson Taught by the teacher	1st grade	-	-
		2nd grade	2	1.83			2nd grade	2	1.83
		3rd grade	1	1.16			3rd grade	1	1.16
		4th grade	1	0.91			4th grade	1	0.91
	Doing-learning multiplication	1st grade	-	-		Learning the subject of symmetry	1st grade	-	-
		2nd grade	25	22.93			2nd grade	25	22.93
		3rd grade	21	24.41			3rd grade	21	24.41
		4th grade	23	21.10			4th grade	23	21.10
	Doing-learning division	1st grade	-	-		Doing addition-subtraction from mind	1st grade	-	-
		2nd grade	6	5.50			2nd grade	6	5.50
		3rd grade	5	5.81			3rd grade	5	5.81
		4th grade	9	8.25			4th grade	9	8.25

Table 6 (Cont.). *Action in Mathematics Learning Process in Students' Drawings*

Category	Sub-categories	Grade level	*f*	%	Category	Sub-categories	Grade level	*f*	%
Action in mathematics learning process	Learning fractions	1st grade	-	-	Action in mathematics learning process	Learning hours	1st grade	1	4
		2nd grade	-	-			2nd grade	7	6.42
		3rd grade	-	-			3rd grade	-	-
		4th grade	5	4.58			4th grade	-	-
	Learning angles	1st grade	-	-		Spending money and calculating	1st grade	-	-
		2nd grade	-	-			2nd grade	1	0.91
		3rd grade	-	-			3rd grade	-	-
		4th grade	12	11			4th grade	-	-
	Learning geometric figures and objects	1st grade	-	-		Round up to decimal	1st grade	-	-
		2nd grade	-	-			2nd grade	-	-
		3rd grade	5	5.81			3rd grade	1	1.16
		4th grade	1	0.91			4th grade	-	-
	Learning measurement of length and girth	1st grade	-	-		Undefined	1st grade	15	60
		2nd grade	-	-			2nd grade	28	25.68
		3rd grade	-	-			3rd grade	22	25.58
		4th grade	1	0.91			4th grade	43	39.44
	Doing mathematics homework	1st grade	-	-					
		2nd grade	4	3.66					
		3rd grade	-	-					
		4th grade	1	0.91					

drawings of the students consists of seventeen sub-categories: doing-learning addition, doing-learning subtraction, doing-learning multiplication, doing-learning division, learning fractions, learning angles, learning geometric figures and objects, learning measure of length and girth, doing math homework, solving problems, listening to the class taught by the teacher, learning the subject of symmetry, adding and subtracting from the mind, learning hours, spending money-calculating, rolling to decimal and undefined. Accordingly, despite some differences in terms of grade levels, it is seen that the actions of doing-learning multiplication, doing-learning addition, and listening to the lesson taught by the teacher stand out in the mathematics learning process. In addition, no actions related to the mathematics learning process were expressed in the drawings at each grade level. Sample drawings of elementary school students related to the action in the mathematics learning process were presented in Figure 6.

Figure 6. Sample Drawings Related to the Action in the Mathematics Learning Process

In Figure 6, sample drawings related to sub-categories of action category in mathematics learning process were presented. When students explained their drawings, the most expressed statements are "mathematics means multiplication", "I draw myself while doing multiplication", "I am doing multiplication on the board", "our teacher is teaching us multiplication", "we are learning addition operation", "the subject is addition operation", "mathematics is addition", "our teacher is teaching the subject", "our teacher is doing an operation on the board", "our teacher is asking questions". In addition, a small number of statements were expressed: "I am solving the problem on the board", "I am measuring the angle", "I am drawing the axis of symmetry", "our teacher is teaching fractions", "I am spending money and calculating in the market", "I am learning geometric objects", "I am doing addition and subtraction from the mind". There are different expressions such as "I do the process", "our teacher is teaching us measurements of length".

Discussion and Conclusion

In this research, which aims to examine the perceptions of elementary school students towards learning mathematics by means of their drawings, students' drawings were described in six subcategories: "mathematics learning environment, people in mathematics learning environment, tools in mathematics learning environment, mathematical symbols in learning environment, expressions reflecting emotions while learning mathematics, and action in mathematics learning process".

According to the research results, it is seen that the mathematics learning environment is mostly perceived as labeled under the subcategory "classroom" at all grade levels. Similarly, in Picker and Berry's (2000) research which examined the mathematic perceptions of secondary school students, the drawings included a schoolteacher and classroom descriptions. Classroom is an environment where elementary school students spend most of their time during education and accordingly, their perceptions about education are shaped during this period. In a properly structured classroom learning environment, students begin to regard mathematics as logical, valuable, and useful over time. When this positive trend towards mathematics is combined with students' individual efforts and own efficacy, a classroom can be the third teacher (Kilpatrick et al., 2001). However, mathematics teaching should be carried out not only in the classroom but also in non-classroom settings. For example, as a result of this research, a small number of schoolyard (8 students), nature (8 students), park (1 student) and market (1 student) were expressed as mathematics learning environment. Non-classroom environments can develop a positive attitude towards mathematics and more motivation in students, by allowing them to realize the applicability of mathematics (Barbosa & Vale, 2016). Students have the opportunity to use and apply the mathematics they learned in the classroom in real life. In this way, they realize the value of mathematics as daily life skills with real experiences. They can create a solid foundation for knowledge and understanding of the world around them in mathematics (Kennard, 2007). Education by means of activities in the natural environment makes the subject fields interesting and easier to understand (Bunting, 2006). Such activities facilitate the creation of an informal meeting space that encourages problem solving, connecting, promoting communication, and the application of other mathematical skills in a meaningful context (Richardson, 2004). Learning mathematics through open-air experiences such as museum visits which includes mathematical exhibitions and a series of outdoor games where players need to perform certain tasks using mathematics offers different alternatives to teachers and students (Ho, 2008). Masingila, Davidenko and Wisniowska (1996), Fägerstam and Blom (2013) stated that there is a potential positive relationship between non-classroom activities and their mathematics skills and competences. Therefore, it can be stated that it is necessary to ensure that students encounter non-classroom mathematical activities in elementary school, and that teachers are provided with the necessary opportunities in schools; and perhaps, teachers should be trained on this subject.

According to the research results, although there are some differences in terms of grade levels, it is seen that people in the mathematics learning environment are generally perceived as teachers and student(s), only oneself, students and only teachers. The statements which the students explained their drawings about the people in the mathematics learning environment shows that the teacher mostly instruct the subject and the students listen, and write the things written on the board in their notebooks. This indicates that the teacher is at the forefront in the learning environment. Students' understanding of mathematics, their ability to use mathematics and their self-confidence are shaped by the instruction at school. Students should learn mathematics by understanding and actively developing new knowledge through experience and prior knowledge (NCTM, 2000). Successful learning takes place in student-centered environment in which the focus is on the knowledge, skills, attitudes and beliefs that students bring to the educational environment; in knowledge-centered focusing on what to teach, what is taught, and doing by understanding, in assessment-centered learning environments focusing on providing opportunities to make students' thinking and learning visible and

in a community-centered learning environment encouraging a culture of questioning, respect and risk-taking (Donovan & Bransford, 2005). For this, teachers need to create learning environments that support student participation (Bransford, Brown, & Cocking, 2000).

According to the research results, it is seen that the tools and materials in the mathematics learning environment at all grade levels are mostly perceived as general items (books, notebooks, pencils, paper, tables, desks, chairs, boards, bookshelves) in the classroom. This result indicates that teaching mathematics is carried out more traditionally. The most important role of teachers in the learning process of students is to determine activities, organize the learning environment and use technology effectively (NCTM, 2000). Technology, visual and physical models, manipulatives, and spending time on visualization enable students to access a wider mathematical experience (Holton et al., 2009). The purpose of using such tools is to demonstrate mathematical ideas and build mathematical understanding (Bahr & de Garcia, 2010). Tools are materials, models, and representations that students use to organize their thoughts and follow these organized steps while solving problems (Ernst & Ryan, 2014). Tools provide students with valuable and interesting experiences in mathematics and offer them the opportunity to embody abstract ideas (Burns & Silbey, 2000). They can encourage students' logical thinking, number and spatial skills, classification, sorting and grouping skills (Freiman, Kadijevich, Kuntz, Pozdnyakov, & Stedøy, 2009). They help students create mathematical concepts and support meaningful learning (Bahr & de Garcia, 2010). Moreover, it was determined that using tools increases the ability to keep knowledge in mind and problem solving (Clements & McMillen, 1996). The use of technological tools can make it fun for students to engage in geometry, pattern, and number-perceiving activities (Holton et al., 2009). Such tools can be said to make it easier for students to learn and understand basic skills. Therefore, it can be said that elementary school teachers should use a variety of tools to help students do mathematics during mathematics teaching.

According to the research results, in terms of mathematical symbols in the learning environment, numeral-number-four operation symbols were included the most in the drawings at all grade levels. Teaching numbers and operations is the core of elementary school mathematics (Thanheiser, Whitacre, & Roy, 2014). Most elementary school mathematics is based on the operations of addition, subtraction, multiplication and division (Freitag, 2014). Numbers form the cornerstone of the entire mathematics curriculum internationally (Reys & Nohda, 1994). The first mathematical reasoning of young children is related to numbers, and most likely their first mathematical representation consists of numbers (Fuson, 1992). NCTM (2000, p.32) emphasizes that all students should learn numbers, ways to represent numbers, relationships between numbers and number systems, the meaning of operations and their relationships with each other, the ability to do operations fluently. The numbers in elementary mathematics program in Turkey and operations are located mainly in the fields of learning (Ministry of National Education [MoNE], 2018). Therefore, according to the results of the research, it is an expected situation to include numerical-count-four operation symbols in the student drawings. However, the learning fields of geometry, measurement and data processing (MoNE, 2018) in the elementary school mathematics program should not be ignored. NCTM (2000) emphasizes that students should understand the patterns, relationships and functions of elementary school students related to different learning fields, that they should be able to represent and analyze mathematical structures using algebraic symbols, they should be able to use models to represent numerical relationships, they should be able to make visualization while solving problems, use spatial reasoning and geometric models, they should be able to apply appropriate techniques, tools, and formulas to determine measurements, they should be able to use and select appropriate statistical methods to analyze data, and that they should be able to develop and evaluate data-based inferences and predictions. Based on this, it can be said that the relevant symbols can be created in the minds of the students by allocating enough time to the learning fields mentioned during the teaching of the elementary school teachers. According to the research findings, it is notable that there are numbers, counts, angles, fractions, geometric figures and objects, letters-four operation symbols and length measurement symbols in the drawings of different grade levels. For example, the inclusion of letters and four operation symbols in the drawings of two fourth grade students indicate the transition to algebraic thought in students.

According to the research findings, learning mathematics at all grade levels is generally perceived as happy-enjoyable-fun. Based on this, it can be stated that students' attitudes towards learning mathematics are positive. The attitude towards mathematics is expressed as "a belief in loving or not loving mathematics, participating in or avoiding mathematics activities, believing that someone is good or bad in mathematics, and that mathematics is useful or useless" (Neale, 1969, p. 632). Positive attitudes can increase students' desire to learn and make use of mathematics (Eshun, 2004). It was stated that students who have a positive attitude towards mathematics are more successful in mathematics (Nicolaidou & Philippou, 2003; Sanchez, Zimmerman,

& Ye, 2004). Moreover, when students first go to school, it is stated that their attitudes towards mathematics are positive, their attitudes become less positive as the grade level gets higher and often become negative in high school (Biatchford, 1996; Nicolaidou & Philippou, 2003). However, students' attitudes towards mathematics affect various variables including factors related to students themselves, factors related to school, teacher and education, and factors related to the home environment and society (Fraser & Kahle, 2007; Mohamed & Waheed, 2011). Therefore, it can be said that elementary school teachers' presenting an effective teaching to their students and creating a positive learning environment will help students develop a positive attitude towards learning mathematics.

According to the research results, despite the differences in terms of grade levels, it is seen that the actions of doing-learning multiplication and addition, and listening to the lesson taught by the teacher stand out in the math learning process. Elementary school mathematics is the beginning of mathematics education and it contains the fundamental principles of mathematical concepts and forms the basis for further learning (Ma, 1999). The basis of elementary school mathematics is arithmetic skills related to addition, subtraction, multiplication and division (Freitag, 2014; NCTM, 2000). Consequently, arithmetic operations are expected to stand out as an action in the mathematics learning process in students' drawings. However, it should be noted that learning actions towards geometry, measurement, and data processing (MoNE, 2018) learning fields in the elementary school mathematics curriculum were not included in the students' drawings. This is due to the reason that as a discipline, math learning fields are interconnected. For example, numbers take place in all fields of mathematics. Patterns are a part of teaching geometry. Reasoning, proving, problem solving, and representation processes are used in all content fields (NCTM, 2000, p. 31). Based on this, it can be stated that the mathematical content and teaching process should be followed in a consistent and balanced manner.

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Primary Teachers' and Students' Images of Teachers and Learning Environments

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Abstract

The aim of the study was to reveal the learning environments created by primary teachers in science classes and their teaching styles and compare them with the learning environments and teaching styles that their students dream of. Qualitative survey research design was used to find an answer to the research problem. In this study, the Draw-A-Science –Teacher-Test Checklist (DASTT-C) was used to collect the data. The DASST-C was developed by Thomas et al. (2001) and a useful tool to show how science teaching environment is and how teacher behaviors in the science teaching environment are. A total of 50 primary teachers and 120 primary school students (third and fourth graders) participated in this study. The DASST-C score sheet was used to analyze the data and the criteria proposed by Şahin-Kalyon (2020) were used to evaluate the learning environment. The findings revealed that the images of the participating teachers about themselves showed that they have almost adopted each teaching style equally. In other words, the teachers have adopted student-centered, teacher-centered, and both teacher and student-centered teaching equally. In the drawings of the participating primary school students, the most frequently depicted image of teacher was the teacher with an explicit teaching style, followed by the exploratory teaching style, and conceptual teaching style. In other words, most of the students depicted a teacher adopting the teacher-centered teaching in their drawings. The analyses revealed that the students of the teachers with the exploratory and conceptual teaching styles largely illustrate teachers in their drawings with the exploratory teaching style. The students of the teachers with the explicit teaching style also largely illustrated teachers in their drawings with the explicit teaching style. The study showed that the teaching style teachers have and the learning environments they adopt are similar to the teacher images students have and the learning environments they portrayed.

Keywords:
Learning Environment, DASST-C, Teaching Style, Science Teaching

Introduction

When it comes to the learning environment, the first thing that comes to mind is a room consisting of desks lined up one after another, a teacher desk in front of these desks, a teacher cabinet, and a blackboard. However, the learning environment corresponds to much more than

this. The learning environment refers to in-school or out-of-school environments and cultures in which students accomplish learning. The elements that make up this culture are students, teachers, and other elements in the learning environment. The learning environment includes student-teacher and student-student interaction and what the teacher does to make the educational environment suitable for the student. While creating the learning environment, in addition to the physical elements of the educational institution (classes, laboratories, etc.), the students' characteristics, the culture to be generated, methods to measure learning, and activities that best support learning are taken into account. Creating a complete learning environment for students as part of a specific course or curriculum is perhaps the most creative part of the teaching profession (Bates, 2015). The teacher should assume important responsibilities while creating the learning environment. Teachers play a critical role in the learning process because they have many responsibilities, such as planning both in-class and out-of-class scientific activities, forming study groups, and helping students acquire the necessary skills (Bakır, 2016). This is rather a complicated cognitive activity, as the teacher needs to combine pieces of information from different areas (content knowledges, teaching strategies, curriculum knowledge...etc.) together to plan and teach a subject (Magnusson et al.,1999).

Today, learning environments are places where students are responsible for their learning, seeking solutions to real-world problems, thus opportunities to explore the natural world are offered. To do so, curricula are renewed to educate individuals with the required qualifications. For this reason, the characteristics and roles that teachers will have also change. Thanks to the renewed curricula, teachers adapt to their new roles, learn how to guide students, and prepare the best learning environment (Yıldız-Duban, 2013).

There are two theories that try to explain how individuals learn. The first is known as the behaviorist theory, which tries to explain learning through observable and measurable behaviors, and the second is the cognitive theory, which tries to explain learning through mental processes. Learning environments can be traditional and constructivist. If you want to be successful in teaching children science, you must use both theories and combine them with the constructivist theory (Abruscato & Derosa, 2010 as cited in Ulu, 2012).

As in every school subject, one of two approaches, traditional or constructivist, is generally preferred in science teaching. In a classroom where the traditional approach is adopted, the teacher only transfers scientific facts to students, as students often passively receive the information. In a class where the constructivist approach is adopted, some students are actively involved in the inquiry, discovery, and learning processes (Del Greco et al., 2018). A teacher allows students to discover scientific facts. He/she is not in the role of an information conveyor; rather, he/she offers guidance.

The constructivist approach is considered one of the most effective ways to learn and teach science (Lay & Khoo, 2013). In this approach, students actively participate in the process, perform activities, and make observations. Then, they learn what the information they have attained means by sharing what they have acquired through activities and observations with their friends. In a nutshell, students internalize scientific facts because they experience science as a process of doing something or looking into something (Lay & Khoo, 2013). Primary teachers know well how to design learning environments and guide students to develop students' understanding of scientific knowledge and method in science classes. To this end, he/she asks some of the following questions: "What shall I do with my students to help them understand this science concept? How should I organize the learning environment? What materials are there to help me? How should I evaluate my students?" Almost Every teacher tries answering such questions, and these questions are there to be answered by teachers who are dedicated to doing the best for their students (Magnusson et al., 1999).

While searching answers for these questions; teachers try different ways to teach students the best. There is no one valid way of teaching. Different teachers may adopt different teaching styles. Therefore, the teaching style a teacher has is thought to be important. The concept of teaching style is very different from the method of instruction used by a teacher. Two teachers can both use same teaching methods, and still differ identifiably from each other (Fischer & Fischer, 1979).

Teaching style is the combination of the type of teaching peculiar to each teacher (Fischer & Fischer, 1979), teaching behaviors consistently demonstrated by teachers in the learning-teaching process (Üredi & Üredi, 2007) and their knowledge of pedagogy, behaviors in the classroom, preferred teaching methods, beliefs and needs (Grasha, 2002).

The teaching styles possessed by teachers determine many elements of the teaching-learning process such as information sharing in the teaching-learning process, preferred teaching methods, materials used and classroom interaction (Maden, 2012). Therefore, teachers' teaching styles gain importance. According to Koshy et al. (2000) consideration of teaching styles is important in mathematics education. The case

is the same for the science course. It would be safe to conclude that what students learn about science and scientists in science classes is affected by the methods, teaching styles their teachers teach about science and scientists (Finson et al. 2006).

The activities performed, teaching styles used and what kind of learning environment is used in science classes, in primary school have an important effect on students who have an idea about what science and the nature of science are. At this level of education, all important skills, such as science process skills and producing arguments are imparted to students. Therefore, studies are needed to examine what a teacher does in the classroom and the classroom environment and what kind of science classes students want to be in and how kind of teacher they want to be with. However the literature revealed that studies examining the learning environment are usually conducted through scales (den Brok et al., 2010; Efe et al., 2007; Welch et al., 2014).

With this study, it was aimed to elicit the teaching style preferred by the teacher, the learning environment he/she creates, the teacher model that the student wants to be, and the learning environment in which the student wants to be present in drawings.

This study, in this context, examined the teachers' and students' images of the science teacher and learning environment. Previous studies revealed that the images of pre-service teachers were generally examined (Acisli, 2017; Akkus, 2013; Alkış-Küçükaydın & Gökbulut, 2020; El-Deghaidy, 2006; Üner & Akkus, 2016; Yılmaz et al., 2007), but studies examining the images of students are limited (Türkmen & Ünver, 2018; Ulu & Ocak, 2018; Yılmaz et al., 2008). In these studies where students' images of teacher in science classes were examined, the analyzes were made by one evaluation tool. In the current study on the other hand, the learning environments and teacher images of science classes drawn by both students and teachers were evaluated multiple evaluation tools by using different criteria and the findings obtained in the current study were discussed in reference to the literature. Therefore, the study is different from similar studies in the literature.

Classes and laboratories where science lessons are conducted are essential areas where ideas are translated into practice and both teachers and students achieve goals in science curricula (Hofstein et al. 1982). Also, this study is considered important because it presents both teachers' and students' images of science teacher and science learning environments comparatively.

Finally; teachers' teaching styles are thought to be a determining factor on the learning environments they create. For this reason, in the current study, it was discussed whether the learning environments that teachers present in their drawings are sufficient for science classes while revealing their styles as well.

Purpose of the Study

The aim of the study was to reveal the learning environments created by primary teachers in science classes and their teaching styles and compare them with the learning environments and teaching styles that their students dream of. To this end, the study has the following research questions:

1. What are the primary teachers' images of their teaching styles in science classes?

2. How are the teachers' images of the learning environment they create in science classes?

3. What is primary school students' image of the primary teacher in science classes?

4. What is primary school students' images of the learning environment in science classes?

5. How do primary school students' images of the primary teachers is related to their teacher's image of her teaching style in science classes?

Method

Research Design

The aim of the study was to reveal the learning environments created by primary teachers in science classes and their teaching styles and compare them with the learning environments and teaching styles that their students dream of. Fink recommends qualitative survey for the discovery of the meanings and experiences individuals attribute to events and situations (Jansen, 2010). Thus, qualitative survey research was used in the current study. Qualitative surveys collect information about the meanings people attribute to their experiences and the way they express themselves and provide data to answer questions such as: "What is X and how different people, communities and cultures think and feel about X and why?" Qualitative survey research does not aim to establish frequencies, or other parameters, but to determine the diversity of some areas of interest within a given population. Qualitative survey is the study of diversity (not distribution) in a population. Therefore, the aim in the current study while giving numbers is to emphasize diversity.

Researchers using qualitative surveys do not aim at representative or generalizable results, nor do they want to provide information about the "typical" or "average" individual. Their purpose for using qualitative questionnaires is to bring depth and individual

meaning to the questions of interest. "Depth and uniqueness" rather than breadth and representation are their points of departure. Qualitative survey research is particularly useful when there are not many people to participate or you do not want many people to participate (Fink, 2003).

Participants

The selection of the participants is of great importance to find relevant answers to the research questions. The participants were expected to participate in the study on a volunteer basis. A purposive sampling method, including the snowball sampling method, was used to select a sample of heterogeneous groups of teachers and students. The participants of the study consist of 50 primary teachers and 120 primary school students. Table 1 depicts the number of students and teachers participating in the research.

Table 1. *Participants*

Participants	Grade		Total
	3	4	
Teachers	27	23	50
Students	58	62	120

In the study, first, data were collected from teachers, then the DASST-C score sheet was used to analyze the data, and teachers with exploratory, conceptual, and explicit teaching styles were determined. These teachers were asked if they could draw pictures to their students. Eleven teachers (5 third grade teachers, 6 fourth grade teachers) had their students draw pictures and delivered them to the researcher. In this way, 120 primary school students were reached.

Data Collection Tool

In this study, the DASTT-C, was used as the data collection tool. This test was expected to determine the participants' image of the science teacher and science teaching. The DASTT-C is a modified version of Draw-A-Scientist-Test Checklist (DASTC) developed by Finson et al., (1995) to determine student images of scientists. The DASTT-C instrument consists of two main episodes. In the first episode, participants are instructed to draw a picture of themselves teaching science, while asked the following two questions about their drawings in the second episode: "What is the teacher doing? and What are the students doing?" In this study, the DASTT-C was prepared separately for the teachers and primary school students. The items in the test prepared for the teachers were translated directly into Turkish. In the test prepared for the students, the item that instructed the participants to drawing was constructed differently. In the original test, the drawing instruction is as follows "Draw your own picture as a science teacher at work." The instruction in the student test used in this study is stated as follows: "If you were a primary school teacher, how would you conduct the science class? Please draw a picture." In the second part, the original statements are used in both tests (What is the teacher doing? and What are the students doing?)

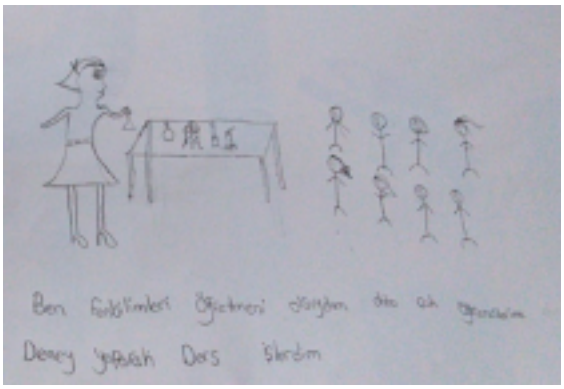
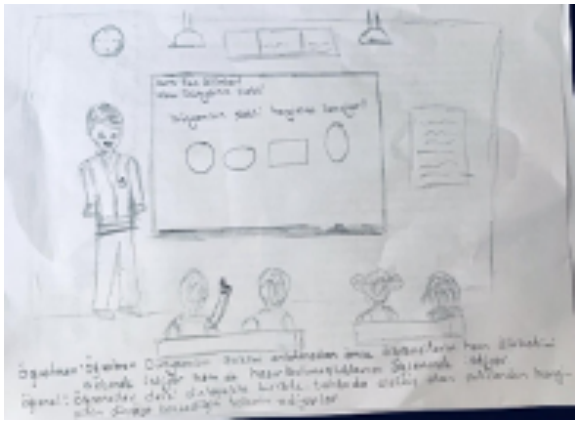
Data Analysis Approach

The data collected in this study were evaluated in two stages. In the first stage, a DASTT-C score sheet was used while in the second stage, the learning environment evaluation criteria of Şahin-Kalyon (2020) were used in the second stage. A DASTT-C score sheet is composed of three sections: teacher, student, and environment. The teacher section is divided into two subsections. The first section focuses on the teacher's activities, such as demonstrating, lecturing, and using visual aids. The second section focuses on the teacher's position (location concerning students and posture). The student section is divided into two subsections. The first section focuses on the students' activity (watching and listening, responding to teacher/text questions), while the second section focuses on students' positions (seated).

The environment section is a single section. This section focuses on the learning environment. Under this section, students' desks, the location of the teacher's desk, and the presence of materials are evaluated.

Scoring of the drawings is based on the absence or presence of the situations specified in the aforementioned sections. In other words, if one of the situations stated in the sections of the DASTT-C score sheet is present in the drawing, then 1 point is assigned, yet if it is absent, then 0 point is assigned. Thus, the lowest score to be taken from the test is 0, while the highest score to be taken is 13. A score between 0 and 4 represents student-centered images; a score between 5 and 9 represents both student and teacher-centered images, and a score between 10 and 13 represents teacher-centered images. These score ranges are categorized under the following three teaching styles: exploratory, conceptual, and explicit.

Exploratory teaching style (0–4): Teacher knows that his/her students are responsible for their learning and believes that students can manage the learning process. The curriculum is open to students' interests. The teacher leads and guides students' activities and inquiries. Alternative assessment methods are used in this teaching style. Conceptual teaching style (5–9): Teacher believes that students need themed and conceptual learning experiences. The teacher establishes connections between concepts and scientific processes. In teacher-centered classes, activities based on manual dexterity, group works, and

	Teacher	Student
Exploratory teaching style		
	T1: The teacher is planting seedlings for children so that they can learn by doing and experiencing. Students are allowed to actively participate by doing group work. Some are bringing seedlings while others are carrying water in buckets. Another group of students is arranging the place where the seedlings will be planted. Then, they will plant flowers and parsley.	T1S1 : The teacher has taught the subject of plants in the science class and then took the children to the garden to reinforce the subject. She introduces daisy, grass, and rose to them in the garden.
Conceptual teaching style		
	T5: In the science class, the teacher teaches how to measure the volume of rigid objects that do not have a specific geometric shape with the experiment method. The students in the back row are next to the teacher, and they learn by surprise.	T5S3: If I were a science teacher, I would do more experiments with my students.
Explicit teaching style		
	T9: Before the teacher explains the shape of our world, he wants to attract students' attention and wants to learn about their readiness. Students listen to the lesson and guess, which of the shapes drawn on the board looks like the world.	T9S1: The teacher lectures on the smartboard so that students can understand better.

T1: Teacher 1, T1S1: Teacher 1, Student 1

Figure 1. Sample Drawings of Teachers and Students

discussions are included. It is tested whether important concepts are understood. Explicit teaching style (10–13): Teacher believes that students lack knowledge and need help with learning. The curriculum is focused on specific outcomes. Lecturing means teaching. The teacher is the source of information and he/she initiates activities. The evaluation is focused on content knowledge. The teacher and student drawings were evaluated considering the abovementioned situations. Figure 1 depicts some samples of how the teacher and student drawings have been evaluated.

While scoring the drawing produced by the teacher coded as T9, the scores from three different sections of the DAST-C score sheet were summed. This teacher received 4 points from the teacher section in the score sheet, 3 points from the student section, and 4 points from the environment section; thus, he/she received a total of 11 points. After the drawings were analyzed using the DASTT-C score sheet, the elements included in the learning environment depicted in the drawings were also evaluated. While evaluating the drawings, the criteria proposed by Şahin Kalyon (2020) were used. These criteria are shown in Figure 2.

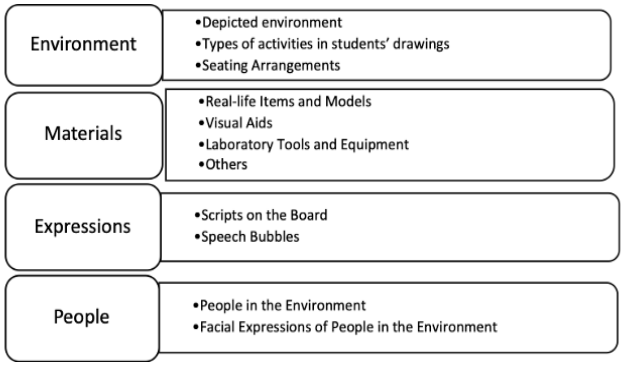


Figure 2. Themes of the Analysis

For inter-coder consistency, 30% of the data were sent to another researcher. In order to calculate the inter-coder consistency, the formula proposed by Miles and Huberman (1994, p. 64) was used. The consistency between the researchers was found to be 81%.

Results

Primary Teachers' Teaching Styles in Science Classes

To determine the teachers' teaching styles, a DASST-C score sheet was used. Through the scoring performed, the teaching styles of the teachers were found and are presented in Table 2.

Table 2. *Teaching Styles of the Teachers*

Teaching style	*n*	%
Exploratory teaching style	18	36
Conceptual teaching style	17	34
Explicit teaching style	15	30

As can be seen in Table 2, the distribution of the participating teachers across the different teaching styles seems to be equal, but the exploratory and conceptual teaching styles seem to be used by a relatively higher number of teachers than the explicit learning style.

When the pictures of teachers who have an exploratory teaching style are examined, it seems that these teachers generally depict students doing activities or experiments in/out of the classroom in their pictures. In the pictures, students are depicted doing experiments or activities individually or as a group. In the pictures, the teachers seem to make students discover the concepts to be instructed.

In the pictures of teachers who have conceptual teaching style, a group of students are doing activities or experiments, while the teacher includes other students in the classroom by asking questions. They also stated that they did the experiment together with the students.

In the pictures of the teachers who have an explicit teaching style, all of the teachers depicted themselves explaining the subject on the board.

Findings related to the teachers' attitudes towards the items in the DASST-C score sheet teacher section are given in Table 3.

Table 3. *Teacher Section of DASTT-C Data for Participants (teachers)*

	Teacher section of DASTT-C	*n*	%
Activity	Demonstrating experiment/activity	20	40
	Lecturing/giving directions (teacher talking)	24	48
	Using visual aids (chalkboard, overhead, and charts)	21	42
Position	Centrally located (head of class)	27	54
	Erect posture (not sitting or bending down)	37	74

Twenty primary teachers (40%) drew themselves, demonstrating experiment/activity and twenty-four primary teachers (48%) drew themselves lecturing and giving directions to the class. Twenty-one teachers (42%) drew themselves using visual aids, twenty-seven teachers (54%) drew themselves standing head of the class or behind the table or in front of the blackboard, and thirty-seven teachers (74%) drew themselves not sitting or bending down.

Table 4. *Student Section of DASTT-C Data for Participants (teachers)*

	Teacher section of DASTT-C	*n*	%
Activity	Watching and listening (or so suggested by teacher behavior)	20	40
	Responding teacher/text questions	21	42
Position	Seated (or suggested by classroom furniture)	25	50

Half of the participating teachers drew students sitting at their desks (50%). In twenty teachers' drawings, students were illustrated watching and listening (40%) while in twenty-one teachers' drawings, students were drawn responding questions, shaking her/his finger or responding test questions (42%).

Table 5. *Environment Section of DASTT-C data for Participants (teachers)*

Teacher section of DASTT-C		*n*	%
Inside	Desks are arranged in rows (more than one row)	30	60
	Teacher desk/table is located at the front of the room	30	60
	Laboratory organization (equipment on teacher desk or table)	27	54
	Symbols of teaching (ABCs, chalkboard, bulletin boards, etc.)	31	62
	Symbols of science knowledge (science equipment, lab instruments, wall charts, etc.)	26	52

In their drawings, the teachers generally used the classroom as the setting. In the pictures drawn by thirty teachers, desks were arranged in rows (60%). In the drawings, the teacher desk was generally drawn in the middle of the classroom (60%). Laboratory organization or equipment on teacher desk was drawn by 54% of the teachers. Symbols of teaching and science knowledge were drawn by 62% and 52% of the teachers, respectively.

The Learning Environment Created by the Primary Teachers in Science Classes

The drawings of the primary teachers were evaluated within the following four themes: environment, materials, expressions, and people. Each theme consisted of some sub-themes.

Environment

As Table 6 illustrates, almost all primary teachers (*n*= 47) drew themselves in a classroom. Some primary teachers (*n*= 22) drew themselves as if they were doing an experiment. In the drawings of the teachers, in general, teachers were depicted conducting experiments while students were depicted making observations. In addition, in some drawings, only a few students were illustrated as doing experiments, while others were watching them. Some primary teachers (*n*= 13) drew themselves as if they had been lecturing and performing an activity (Table 6). Only two of the teachers included observations in their drawings.

Table 6 shows that the majority (*n*= 29) of the primary teachers drew students as sitting in a traditional-seating arrangement. Some teachers drew students in an individual (*n*= 2) classroom-seating arrangement either in a lab or a classroom. Others drew students in U-shaped (*n*= 6) or clusters (*n*= 5) seating arrangements.

Materials

More than half of the participating teachers drew real-life items or models in their drawings. Teachers reflected their use of real-life items in the classes into their drawings (n= 25). Only one teacher drew a world globe and one teacher drew the earth's crust model. More than half of the teachers drew board and books as visual materials. The most frequently depicted item in their drawings is the board (n= 30). Generally, there are some writings related to the subject and content of the class and some questions on the board. Only seven teachers depicted glass materials in their drawings, while two of them drew two laboratory equipment; spirit lamp and trivet.

Expressions

On the boards in the drawings of the teachers, there are generally writings about the subjects taught (e.g., germination of a bean, movements of the world, sense organs, states of matter). There are questions on the board in the drawings of only two teachers, and on none of the boards in the drawings of the teachers, stages of conducting an experiment and materials used in an experiment were written.

People

There are students and teachers illustrated as people in all drawings of the teachers. Teachers and students were illustrated as happy people in almost all the drawings.

Table 6. *Features of the Environment in the Primary Teachers' Drawings*

Environment								
Depicted environment			Types of activities			Seating arrangements		
	n	%		*n*	%		*n*	%
Classroom	47	94	Experiment	22	44	Traditional (pairs)	22	44
			Activity	13	26	Individual	13	26
Laboratory	1	2	Lecture	13	26	U shape	6	12
						Clusters	5	10
Outdoor	2	4	Observation	2	4	No seating arrangement	8	16

Primary School Students' Image of Primary Teacher in Science Classes

A DASST-C score sheet was used to determine the primary school students' image of the teacher. The students' images of teacher are given in Table 7.

Table 7. *Teaching Styles of the Teachers*

Teaching style	*n*	%
Exploratory teaching style	42	35
Conceptual teaching style	29	24
Explicit teaching style	49	41

As Table 7 illustrates, the most frequently depicted image of a teacher in the drawings of the primary school students is the explicit teaching style (41%), followed by exploratory teaching style (35%), and conceptual teaching style (24%).

Findings related to the students' attitudes towards the items in the DASST-C score sheet teacher section are presented in Table 8.

Table 8. *Teacher Section of DASTT-C Data for Participants (students)*

Teacher section of DASTT-C		n	%
Activity	Demonstrating experiment/activity	28	26
	Lecturing/giving directions (teacher talking)	58	55
	Using visual aids (chalkboard, overhead, and charts)	70	66
Position	Centrally located (head of class)	81	74
	Erect posture (not sitting or bending down)	91	86

Twenty-eight primary school students drew the teacher demonstrating experiment (26%), while 54 primary school students drew the teacher lecturing and giving directions to the students (55%). In 70 drawings of the students, the teacher was drawn using visual aids (66%), in 81 of the drawings, the teacher was depicted as standing head of the class or behind the table or in front of the blackboard (74%), and in 91 the drawings, the teacher was depicted as sitting or bending down (86%).

Table 9. *Student Section of DASTT-C Data for Participants (students)*

Student section of DASTT-C		n	%
Activity	Watching and listening (or so suggested by teacher behavior)	65	61
	Responding to teacher/text questions	48	45
Position	Seated (or so suggested by classroom furniture)	63	59

More than half of the students drew students sitting at their desks (61%). In the drawings of 65 students, students were drawn watching and listening (61%), while in 48 of the drawings, they were drawn responding to the questions, or responding test questions (45%).

Table 10. *Environment Section of DASTT-C Data for Participants (students)*

Environment section of DASTT-C		n	%
Inside	Desks are arranged in rows (more than one row)	69	65
	Teacher desk/table is located at the front of the room	62	59
	Laboratory organization (equipment on teacher desk or table)	15	14
	Symbols of teaching (ABCs, chalkboard, bulletin boards, etc.)	72	68
	Symbols of science knowledge (science equipment, lab instruments, wall charts, etc.)	25	24

In general, the participating students drew the classroom as the setting. In the pictures drawn by 69 students, desks were arranged in rows (65%). In the drawings, the teacher desk is generally drawn in the middle of the classroom (59%). Laboratory setting or equipment on teacher desk was drawn by 15 students. Some symbols of teaching and science knowledge were drawn by 68% and 24% of the students, respectively.

The Learning Environment in Science Classes Created by the Primary School Students in Their Drawings

The primary school students' drawings were evaluated within the following four themes: environment, materials, expressions, and people. Each theme consisted of some sub-themes.

Environment

Table 12 depicts that the primary school students drew themselves as teachers in the classroom (*n*= 90). The number of students drawing themselves in a laboratory is relatively small (*n*= 22). The number of students drawing themselves in an out-of-classroom setting is seven, while the number of students designing a special classroom is one. The students generally drew a teacher lecturing in the class (*n*= 56). Though the number of students drawing a teacher conducting an experiment is high, they indicated, as their teachers did, that they conducted the experiment as teachers (*n*= 48). In the drawings, while the teacher is depicted conducting an experiment, students are portrayed passively listening to their teachers. The number of students drawing the teacher that allows students to observe is six, and the number of students drawing the teacher while making students play is four.

Table 11 shows that the majority (*n*= 62) of the primary school students drew students as sitting in a traditional-seating arrangement. Some students drew students in an individual (*n*= 20) classroom-seating arrangement either in a lab or a classroom, while others drew students in U-shaped (*n*= 2), exclusive (*n*= 1), or laboratory (*n*= 8) seating arrangements.

Table 11. *Features of the Environment in the Drawings of the Primary School Students*

Environment								
Depicted environment			Types of activities			Seating arrangements		
	n	%		n	%		n	%
Classroom	90	75	Experiment	48	40	Traditional (pairs)	62	52
			Activity	2	2	Individual	20	17
Laboratory	22	18	Lecture	56	47	U shape	2	2
						Exclusive	1	1
Outdoor	7	6	Observation	6	5	Laboratory arrangement	8	7
Exclusive classroom	1	1	Game	4	3	No seating arrangement	20	17

Table 12. *Primary School Students' Image of the Primary Teacher in Science Classes According to Their Teachers' Learning Styles in Their Drawings*

	Teacher image of students		
Teacher's teaching style	Exploratory teaching style	Conceptual teaching style	Explicit teaching style
Exploratory teaching style (T1, T2, T3, T4*)	19 (48%)	14 (35%)	7 (17%)
Conceptual teaching style (T5, T6, T7, T8)	15 (37%)	13 (33%)	12 (30%)
Explicit teaching style (T9, T10, T11)	8 (20%)	2 (5%)	30 (75%)

**T4: Teacher 4*

Materials

More than half of the participating students drew real-life items or models in their drawings. In the drawings of the students in which they portrayed themselves as teachers, they generally used real-life items (*n*= 28). Only two students drew a world globe, and two students drew the earth's crust.

More than half of the students drew board and books as visual materials. The most frequently drawn material is the board (*n*= 71). This is followed by book (15) and computer (2). Generally, there are some writings about the subject or content of the course and some questions on the board. Forty students depicted glass materials in their drawings, while seven students drew the following laboratory equipment: spirit lamp, trivet, and magnifier.

Expressions

On the boards in the drawings of the students, there are generally writings about the subjects taught, such as germination of a bean, movements of the world, sense organs, states of matter, force, and movements. Unlike their teachers, students in their drawings also wrote the stages and equipment of an experiment.
People

In all the drawings of the students, students and teachers were portrayed as people. In almost all the drawings produced, teachers and students look happy.

Primary School Students' Image of the Primary Teacher According to Their Teachers' Learning Styles in Their Drawings

In this study, it was aimed to elicit both the primary teachers' and their students' images of the science teacher. Table 12 depicts data related to the comparison of the teacher image drawn by the primary school students and the image drawn by their teachers.

The pictures drawn by 40 students of the four teachers with the exploratory teaching style were analyzed. The findings of the analysis revealed that the teacher in the pictures drawn by 19 students was portrayed with the exploratory teaching style, in 14 of the drawings, the teacher has the conceptual teaching style, and in seven of the drawings, the teacher was portrayed with the explicit teaching style.

The pictures drawn by 40 students of the four teachers with the conceptual teaching style were analyzed. The findings of the analysis revealed that the teacher in the pictures drawn by 15 students was portrayed with the exploratory teaching style in 14 of the drawings, the teacher has the conceptual teaching style, and in 10 of the drawings, the teacher was portrayed with the explicit teaching style. The pictures drawn by 40 students of the three teachers with an explicit teaching style were analyzed. The of the analysis revealed that the teacher in the pictures drawn by 30 students has the explicit teaching style, in 2 of the drawings, the teacher was portrayed with the conceptual teaching style, and in 8 of the drawings, the teacher was illustrated with the exploratory teaching style.

Discussion

The purpose of this study was to reveal the learning environments created by primary teachers in science classes and their teaching styles and compare them with the learning environments and teaching styles that their students dream of.

The findings showed that the images of the participating teachers of themselves is almost adopting each teaching style equally. The scores from the DASST-C score sheet allow determining the teaching style of the teacher and making interpretations about whether the teaching conducted in the classroom is teacher-centered or student-centered.
Studies examining pre-service primary teachers or pre-service teachers from different branches revealed that teaching is generally either teacher-centered or both teacher-centered and student-centered (Akkuş, 2013; Alkış-Küçükaydın & Gökbulut, 2020; Elmas et al., 2011; Tatar, 2012). Unlike the findings in previous studies, the findings of this study revealed that the participating teachers equally used student-centered, teacher-centered, and both student and teacher-centered teaching. Some of today's teachers experienced traditional science learning with teacher-centered practices in the past. Therefore, they may still be conducting their lessons with teacher-centered practices. The other part of the teachers experienced science learning with student-centered practices. Based on their experiences, they may include student-centered practices in their own classrooms.

According to teacher interviews, the main goal of labwork was to connect theory to practice, stimulate interest and enjoyment, and practice laboratory skills and techniques (Ottander & Grelsson, 2006). Yet, the pictures drawn by the teachers showed that nearly half of the teachers preferred to do experiment themselves rather than let students do it. Therefore, in more than half of the pictures drawn, students were generally depicted sitting at their desks and listening to their teachers. The teachers generally preferred materials that are easy to find in daily life. The number of teachers drawing laboratory materials in their drawings was very small. This might be due to the lack of a laboratory in their schools. Another reason might be that the experiments conducted in elementary education require simple materials. Although the number of experiments conducted in the drawings of the teachers is high, the depiction of individual students conducting experiments is very limited. The reason why the teachers did the experiments themselves might be due to the shortage of necessary tools and equipment or lack of time. When the relevant literature is reviewed, it is remarkable that teachers do not conduct experiments at different education levels for various reasons. In their study conducted on 120 science and technology teachers, Demir et al. (2011) found that the majority of the teachers think that the main obstacle in front of their use of laboratory and technology is lack of equipment and shortage of class hours. In the existing research, it has been reported that school administrators are not competent enough to solve problems due to their indifferent behaviours in problems related to laboratories or because their fields of expertise are not related to science lessons (Ayvacı & Küçük, 2005; Karakolcu Yazıcı & Özmen, 2015). This seems to be a major obstacle for teachers who want to use laboratories. In the study where the opinions of classroom teachers about laboratory applications were revealed, teachers think that the experiments had little effect on the retention of the learned information (Uluçınar et al. 2008).

The teachers generally depicted the classroom as the setting in their drawings. Only three teachers chose a laboratory or an out-of-classroom setting in their drawings. The reason for not having a laboratory in their drawings might be due to the lack of a laboratory in their schools. It has been revealed that the knowledge and attitudes of classroom teachers towards outside learning environments are low. (Türkmen, 2015). The fact that teachers do not draw outside classroom environments in their pictures may be due to their low level of knowledge and attitude towards the method mentioned.

It is possible to say that out-of-classroom settings are natural laboratories for science classes. Thus, it can be suggested that out-of-classroom settings should be frequently used for science classes (Şahin-Kalyon, 2020). Yet, only two of the teachers participating in this study depicted a lesson delivered in an out-of-classroom setting in their drawings. When the drawings of the teachers depicting an in-class learning setting were examined, it was seen that the students sat in the traditional seating arrangement. Besides, there are some teachers drawing students seating in clusters or U-shaped seating arrangement.

The teachers depicted board/interactive board and book as visual-teaching materials in their drawings. It was determined that the teachers who drew the board in their drawings generally wrote information on the subject they taught on the board. This might indicate that the teachers are actively using the board.

The most frequently depicted teacher image in the drawings of the students participating in this study was the teacher with the explicit teaching style, followed by the teachers with the exploratory teaching style (35%), and the conceptual teaching style (24%). In other words, the teachers mostly depicted the teacher who has adopted the teacher-centered teaching style in their drawings. In their study, Ulu and Ocak (2018) concluded that 29% of the fourth-t

and fifth-grade students have the student-centered science teaching mental model, 59.9% have both the student and teacher-centered science teaching mental model, and 10.7% have the teacher-centered science teaching model.

In their study, Yılmaz et al. (2008) found that 18.2% of the primary school fourth-grade students had the student-centered science teaching mental model, 56.4% have both the student- and teacher-centered science teaching mental model, and 25.4% have the teacher-centered science teaching mental model. The findings of this study are not in exact compliance with the findings of previously conducted studies. Türkmen and Ünver (2018) concluded that 4.5% of the primary school students have the student-centered perspective of science teaching, 36.4% have both the student and teacher-centered perspective of science teaching, and 59.1% have the teacher-centered perspective of science teaching. This finding is similar to the finding of this study. In the drawings of the students, the teacher is mostly teaching the lesson or doing the experiment himself/herself. Therefore, the students were drawn seating at their desks. The participating students generally depicted the classroom as the setting in their drawings. It is seen that the number of students drawing a teacher teaching in a laboratory or an out-of-classroom environment is very small. Şahin-Kalyon (2020) asked students to draw their dream science classes. One of the findings of this study is that 10% of the students indicated that they dreamt of learning in out-of-classroom settings. In this study, however, only 2% of the students indicated in their drawings that they would teach in out-of-classroom settings, if they were teachers. The students generally depicted a teacher lecturing in their drawings. Although the number of students drawing a teacher doing an experiment is high, they also depicted the teacher as doing the experiment himself/herself rather than making students do the experiment. In these drawings, the teacher is depicted as doing the experiment while students are depicted as passive listeners. When the drawings of the students depicting the learning environment in the classroom were examined, it was seen that the students sat in the traditional seating arrangement. Some real-life materials and models are portrayed in some drawings of the primary school students. In their drawings, the students mostly depicted board/interactive board, book, and computer as visual-teaching materials. The students drawing board in their drawings were found to write information about the subject taught on the board. These findings are similar to the findings obtained from the teachers' drawings. This study examined both the primary teachers' and their students' images of the teacher in science classes. The study findings revealed that the students of the teachers with the exploratory teaching style and conceptual teaching style mostly drew a teacher with the exploratory teaching style in their drawings. The students of the teachers with an explicit teaching style were also observed to mostly draw a teacher with an explicit teaching style.

Some of today's teachers experienced traditional science learning with teacher-centered practices in the past. Understanding the nature of science and how science should be taught are related to such learning experiences. Research has shown that past learning experiences and teachers' images and teaching beliefs are related (Tobin et al, 1990; Thomas et al, 2001; Thomas & Pedersen, 2003). The current study also showed that the teaching style teachers have and the learning environments they adopt are similar to the teacher images students have and the learning environments they portrayed. In the study, the students imagined themselves as a teacher, albeit for a short time, and drew an imaginary classroom. Considering the results obtained, it is possible to say that the students' teaching styles and teacher images are affected by their teachers. The current study was conducted on elementary level. Similar studies can be done at different levels of education to look for similarities and differences. If similarities are found, different evidence will be obtained to say that the teaching style of teachers has a relationship with students' teacher images. This evidence can be motivating for teachers to review their teaching styles.

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