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Editorial

Dear IEEJE Readers,

While humanity is slowly leaving behind a long and tiring pandemic process, we are trying to get back to normal together. But in the process, we realize that we have new 'normals' left to us from the pandemic process. Masks, social distancing, different modes of communication, new regulations in schools and classrooms, transformations in distance education, etc. All these new 'normals' that have just entered our lives also directly affect scientific research processes.

We are happy to be with you in our new volume and issue with nine articles prepared by invaluable researchers in these difficult conditions. We hope you will find at least one of the papers relevant for your interest and/or field of research.

I would like to thank our Editor-in-Chief, Dr. Kâmil Özerk, for giving me opportunity to introduce this issue. I would like to express my thanks to Dr. Hayriye Gül Kuruyer, Dr. Turan Temur and Dr. Murat Şahin Doğan for their editorial management and coordination of review process. I also would like to thank to Dr. Abdullah Kaldırım, IEJEE's technical staff and all the peer-reviewers. And last, but not least, I want to express my deep gratitude for the researchers that preferred IEJEE for their research publications.

Sincerely,

Dr. Gökhan Özsoy

Acting Editor-In-Chief, IEJEE

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Effects of a Greek Traditional Dance Programme on Sensorimotor Synchronization and Auditory Reaction Time of Young Children

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Abstract

The purpose of this study was to evaluate the effects of a Greek traditional dance programme on sensorimotor synchronization (SMS) and reaction time on primary school children (6.41 ± .41 yr.). We randomly assigned 61 children to either the dance group (31 children, 15 boys, 16 girls, 6.42 ± .40 yr.), who took part in a dance programme of 12 lessons (3 times/week), or the control group (30 children, 16 boys, 14 girls, 6.40 ± .42 yr.). Before and after the intervention, we assessed both groups for SMS (walking in synchrony to 80 and 120 beats/min) and reaction time. Two-way ANOVA repeated measures show that the dance group performed significantly better on SMS compared to the control group at 80 beats/min (BPM), but not at 120 BPM. We discuss the results in relation to spontaneous motor tempo and the information-processing theory. In relation to reaction time, no significant difference was observed between the two groups at the end of the intervention. However, the dance group showed a significant improvement between pre- and post-tests. It may be concluded that a dance programme of 12 lessons constitutes an effective and enjoyable activity for the improvement of young children's sensorimotor synchronization at 80 BPM and perhaps reaction time.

Keywords:

Dance, Sensorimotor Synchronization, Reaction Time, Primary School

Introduction

The word 'rhythm' originally derives from the Greek word 'rhythmos', which refers to any regular recurring motion. Natural rhythms, such as the rising of the sun or the changing of the seasons affect everything we do, our very existence. For example, circadian rhythms create a regular sleep and eating pattern, which is associated with external environmental and social factors, even in the absence of daily environmental signals (Roenneberg & Merrow, 2016). Moving on time to a rhythm, usually to music, is an integral part of the human experience and is observed in a wide range of cultures. Although there are many features that

distinguish dance traditions, rhythm is at the centre of almost all of them (Bose et al., 2019).

Sensorimotor synchronization (SMS) refers to the ability to synchronising movements with rhythmic stimuli (Repp & Su, 2013). Specialists from the field of dance education might be more familiar with the term rhythmic ability (Chatzopoulos et al., 2019). Previous research has documented the importance of SMS for sports performance (MacPherson et al., 2009) and children's language and literacy development (Thomson & Goswami, 2008). Moreover, poor SMS performance is associated with speech- and writing-related developmental disorders (Ladányi et al., 2020). Slater et al. (2013) reported that SMS is related to reading ability not only in populations with reading difficulties but in typically-developing children as well. However, despite the importance of SMS for children's motor and literacy development, there is limited research examining the improvement of SMS in school settings.

One of the main skill components of dance is moving in synchrony to the beat of the music. Therefore, dance lessons can be an instrument to improve rhythm. However, there has been limited empirical research on dance programmes integrated into school curricula and their effects on children's SMS improvement (Chatzihidiroglou et al., 2018). Theoretically, dance may play a role in developing children's rhythm, particularly since several studies have reported that professional adult dancers show better synchronization to the beat compared to non-dancers (Jin et al., 2019; Karpati et al., 2016). However, these studies provide a correlational link between dance level and rhythm performance rather than a cause-and-effect link (Chatzopoulos, 2019). Better rhythm performance of the dancers might be attributed to their better sense of rhythm or might be a result of the selection process by experienced dance teachers. Most of the studies examining the effects of dance on children's development have concentrated on dependent variables that are not directly related to dance. For example, previous studies have claimed that dancing may improve children's health-related quality of life (Theocharidou et al., 2018), cardiovascular fitness (Burkhardt & Brennan, 2012), or contribute to healthy weight maintenance (Staiano et al., 2017). While these variables are desirable educational benefits, they might be achieved through other aerobic activities. Moreover, they do not provide information on whether children's SMS is improved through dance, or how many dance lessons are required for the improvement of SMS.

Previous studies originating from the music education domain have reported positive results of music training on SMS (Repp & Su, 2013). For example, Zachopoulou et al. (2003) reported that a music and movement programme, based on Orff's approach, improved rhythmic synchronization in preschool children. While music education uses both (a) body movement in synchronization with music and (b) practising musical instruments to improve rhythmic synchronization, dance education involves only body movement in synchrony with rhythmic stimuli. Moreover, music training generally focuses on producing sound using specific hand and finger movements while dance training focuses on following sound using whole-body movements. So far, it has not been fully understood whether dance training affects children's SMS (Jin et al., 2019).

Traditional dance is considered a form of cultural expression that combines physical activity, social interaction, personal and emotional expression. All these elements comprise a holistic experience, which provides pleasure to participants and increases their motivation for participation. This type of dance is relied on structured movement patterns performed in time to rhythmic stimuli and provides opportunities for self-expression. Especially in Greece, folk dances are an integral part of the society and are performed at every important moment of life (e.g., weddings and birthdays). Several studies have reported the psychosocial benefits of traditional Greek dance (Lykesas et al., 2017). However, there is a research gap regarding the effect of traditional dance on young children's SMS.

Reaction time is defined as the time between stimulus onset and the completion of a movement (e.g., pressing of a target button). Performing dance movements often requires fast movement responses to sounds (i.e., well-developed reaction-time ability).Usually, dancers must quickly change their movement or direction in accordance with certain accents in music. An accent is the stress or special emphasis placed on a particular note. An example of an accent would be a louder beat in a song. Accents are important for the beginning of the counting in a dance movement sequence, and the regular accentuation of metrically organised music facilitates the execution of the movements. In dance lessons, teachers often use numbers to count the sequence of dance movements, and the children perform the movements in time with the counting. Young children may become more aware of accents with dance games, such as when dancing around the room and changing direction or movement on accented beats. Kattenstroth et al. (2013) reported that elderly people (mean age of 68.60 ± 1.45 yr.) engaged in dancing showed enhanced reaction time compared to non-dancers. Although reaction time is an important component of the dance performance, the research in this field is limited.

Movement synchronization to rhythmic stimuli and reaction time are crucial factors in dance

performance and daily/ sports activities (Mann et al., 2007). Traditional dancing requires both SMS and reaction time. Therefore, this study aimed to investigate whether 12 dance lessons would be sufficient to elicit significant improvements in SMS and reaction time of young children.

Method

Participants

The study sample consisted of 61 children who attended an primary school centre (31 boys and 30 girls, age 6.41 ± .41 yr.). The dance group consisted of 31 children (15 boys and 16 girls, age 6.42 ± .40 yr.) and the control group consisted of 30 children (16 boys and 14 girls, age 6.40 ± .42 yr.). The sample size was determined using G*Power (version 3.1.7, F. Faul, University Kiel, Germany) with a medium effect size at f = 0.25, an alpha of 0.05, and a power of 0.80. Thus, the required sample size was set to 34 (Faul et al., 2007).

We conducted the study in accordance with the ethical guidelines of the local university, and all procedures followed the latest version of the Declaration of Helsinki. Informed consent was obtained from the guardians of the subjects, and the latter could withdraw from the study at any time without any negative consequences. The subjects were free of acute musculoskeletal injuries, did not receive any previous dance or sports training and had no diagnosed learning disabilities.

Procedures

A physical education (PE) teacher who was also a certified traditional dance instructor taught the dance group. The dance group followed a 4-week dance programme, which took place three times a week (total 12 sessions, 45 min/session).

The dance programme consisted of the following three traditional dances: 'sousta Kritis', 'ta koukia' ('beans'), and 'choros sta tria'. The dances were chosen according to the following criteria: (a) they consist of basic locomotor movements that can be performed by the children and (b) they are highly repetitive (Little & Hall, 2017).

The focus of each lesson was one or two of the following dances:

- Sousta. 'Crete Sousta': Men and women perform this dance in pairs. It is a kind of opposite-pair dance. The couples sometimes approach each other, move away from each other, and sometimes hold hands, making turns (https://www.youtube.com/watch?v=5z0zlETVoT8).
- Ta koukia ('the broad beans'): This is a mimetic dance and it is usually performed on Halloween and at weddings. The dance consists of two parts. In the first, we have a dance with three steps;in the second, we have mimetic movements that represent the planting, carving, picking, and loading of beans (https://www.youtube.com/watch?v=ZMLbHzavDaA).
- Choros sta tria ('three-step dance'). Choros sta tria is the first dance that a dancer learns from childhood. The dance got its name from the three main progressive steps performed by dancers (https://www.youtube.com/watch?v=eRAExkVM_FA).

To promote children's self-expression and improvisation, the dance steps and positions were combined with the Laban movement concepts: body awareness, spatial awareness, effort, and relationships (Gilbert, 2015). To foster freedom of choice and increase motivation, the children were explored their own ways of expressing the dance themes, and instructions were provided through analogies (Chatzopoulos et al., 2020; McCutchen, 2006). The structure of the lessons included:

- Warm-up with dynamic stretching exercises and music (Chatzopoulos et al., 2015; Lykesas et al., 2020).
- Introduction of the dance theme and the dance steps.
- Practising the dance steps.
- Dance improvisation; searching for personal expression.

Cooling down with motion and relaxation rhythmic games. Participants in the control group attended their regular PE lessons during the 4-week intervention period and were taught basic movement skills. The control group was taught by their regular PE teacher.

Measurements

Before and after the intervention, we applied the following tests to measure SMS and Auditory reaction time of children.

Sensorimotor Synchronization

We assessed SMS by using the K-Rhythm-test, which consists of a software programme and two force plates (KINVENT, www.k-invent.com). The participants were asked to walk in place in synchrony with the beat of the metronome at 80 and 120 beats/minute (BPM) (Karpati et al., 2016). The system captured (a) the time of the beat and (b) the participants' corresponding foot contact (sampling frequency 100 Hz). The sensorimotor asynchrony (rhythmic ability) is defined as the temporal absolute difference between the beat and the corresponding foot contact (Karpati et al., 2016). Thus, lower absolute asynchrony scores indicate better performance (i.e., greater synchrony).

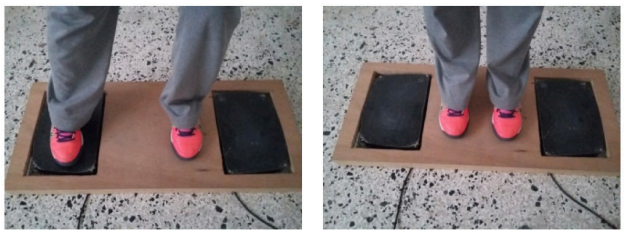
Before the measurement, the participants were acquainted with the apparatus and thereafter performed 24 steps in synchrony with the beat of the metronome. The first eight steps of the 24 served as an adaptation period. The mean of the absolute differences from the rest of the 16 steps was used for statistical analysis. The reliability was reported in Chatzopoulos (2019).

Auditory Reaction Time

The reaction time measurement entailed movement of the dominant foot in response to an auditory stimulus. The participant stands at attention and, upon hearing a sound from the computer (after a fore period of 2–3 sec randomised across trials), performs a fast side-step of the dominant foot to the corresponding force plate (20-cm distance, Fig. 1). The reaction time is defined as the time between the onset of the stimulus and the participant's foot contact on the force plate. Participants completed one practice attempt and three trials with 30-second rest periods. We then used the best of the three attempts for statistical analysis. The reliability of the test was reported in Chatzihidiroglou et al. (2018).

Figure 1

Reaction-Time Measurement



Note. The person in the figure is a model who did not participate in the study.

Statistical Analyses

We analysed the data using a two-way ANOVA repeated measures design with the between-subject factor group (dance group vs. control group), and the within-subject factor time (pre vs. post). In the case of significant interaction, we applied a post hoc analysis with Bonferroni correction to determine significant differences.

Furthermore, effect sizes of ANOVA are presented as partial eta-squared values and for t-tests as Cohen's d values. All statistical analyses were performed through SPSS. The statistical significance level was set at $p \leq .05$.

Results

The descriptive statistics of the dependent variables are presented in Table 1.

Synchronization at 80 beats

The repeated measures ANOVA indicate a significant interaction effect between group and time of measurement ($F_{1,59}$ = 4.38, p = .04, η_p^2 = .06). At the beginning, no significant differences were observed between the two groups (t = 1.1, p = .54, d = .28). At the end, the dance group performed significantly better than the control group (t = 2.92, p = .04, d = .75).
Synchronization at 120 beats

No significant interaction effect was observed between group and time of measurement ($F_{1,59}$ = .76, p = .38, η_p^2 = .01). Moreover, there was no significant difference between the two groups at the beginning (t = .94, p = .45, d = .24) and at the end of the intervention (t = 1.84, p = .10, d = .47).

Auditory reaction time

No significant interaction effect was observed between group and time of measurement ($F_{1,59}$ = 1.46, p = .23, η_p^2 = .02). There was no significant difference between the two groups at the beginning (t = .01, p = .25, d = .30) and at the end of the intervention (t = .19, p = .84). However, the dance group showed significant improvement between pre and post measurement (t = 2.93, p = .006, d = .62) whereas the control group showed no significant difference between pre and post measurement (t = 1.03, p = .30, d = .25).

Discussion

SMS and reaction time are crucial factors for the successful execution of daily and sports activities (MacPherson et al., 2009). The purpose of this study was to investigate the effects of a Greek traditional dance programme on SMS and reaction time of primary

Table 1

Sensorimotor Synchronization (SMS) (msec) and Auditory Reaction Time (msec) of the Dance Group and the Control Group in Pre- and Post-Tests.

	Dance group		Control group	
	Pre	Post	Pre	Post
SMS 80 BPM	182.8 ± 48.59	145.4 ± 48.46*	176.0 ± 39.59	171.4 ± 48.78
SMS 120 BPM	147.2 ± 40.92	129.0 ± 36.46	155.4 ± 43.96	147.0 ± 48.22
Reaction time	808.1 ± 295.80	644.1 ± 227.04	718.4 ± 306.24	654.5 ± 187.78

**Significant difference between the two groups ($p < .05$).*

school children. The study results show that a dance programme of 12 lessons may enhance children's rhythmic synchronization at 80 BPM but not at 120 BPM. Moreover, regarding reaction time, no significant differences was observed between the dance group and control group at the end of the intervention.

The ability of movement synchronization with music is an important aspect of dance performance. In dance lessons, movement synchronization refers to either the synchronization of one's movements with the beat of music or with those of another dance partner. The results of this study show that a Greek traditional dance programme enhanced the children's SMS at 80 beats/min. This finding is in agreement with those originating from the field of music/movement education (Zachopoulou et al., 2003). However, while music/movement education focuses on producing sounds with hand and finger rhythmic movements, dance training focuses on aesthetic whole-body movements in synchrony with the beat of the music. Therefore, a comparison of the results of studies in music education and those of the present study should be made with caution. Besides, the absence of other studies necessitates further investigation regarding the effects of dance on rhythmic synchronization.

Previous studies have shown that professional dancers demonstrate better synchronization performance than non-dancers (Jin et al., 2019; Karpati et al., 2016). However, these studies do not provide a causal link between the dancers' level and rhythmic synchronization. Therefore, it is unclear whether the dancers' superior performance is the result of extensive dance training or the result of the selection process by experienced dance teachers. The participants of this study were young children without any previous music or dance experience. Therefore, the improvement of SMS could be an indication that it may be trained in young children.

According to Drewing et al. (2006), rhythmic synchronization substantially improves during childhood until about the late teens, and thereafter remains at least relatively stable until old age. According to the current study, a dance programme enhanced the SMS of young children. Therefore, future studies could examine whether dancing increases the rate and the magnitude of the developmental trend of children's SMS.

An important issue of this study is the absence of significant difference between the dance group and the control group at 120 BPM. The non-significant finding might be attributed to children's Spontaneous Motor Tempo (SMT), which refers to the rate at which children choose to tap in the absence of external rhythmic stimuli. Studies of beat synchronization in children reported that approximately 120 BPM is the preferred spontaneous tempo of children (McAuley et al., 2006). Additionally, it has been shown that movement synchronization is most accurate when the tempo of the rhythmic stimulus is around the SMT (Styns et al., 2007); thus, any further improvement may be difficult to achieve. Moreover, the period of 12 dance lessons may not be sufficient to improve synchronization at 120 BPM. The limited number of studies in this area necessitates further research.

SMS is an essential component of the perception and performance of dance movements and daily/ sports activities. Yet, the underlying mechanisms are still not entirely understood. Two main theoretical approaches to SMS can be distinguished: information-processing theory and dynamic systems theory. Information-processing theory usually deals with discrete movements (i.e., those preceded and followed by a period without motion) whereas dynamic theory deals primarily with continuous movement. The basic mechanisms of SMS are studied with the finger-tapping paradigm. As finger-tapping on a surface generates discrete events, most researchers using the finger-tapping paradigm have adopted information-processing perspective whereas dynamic systems theorists generally preferred continuous movement tasks (Repp & Su, 2013).

According to the information-processing theory, rhythmic synchronization of discrete movements is thought to involve a clock-like mechanism that incorporates an explicit representation of the time interval defined by each discrete movement.

It is assumed that synchronization with an external rhythm is achieved using a central timekeeper through three distinct processes: (a) an internal clock that captures temporal information and acts as a pacemaker, (b) relational memory systems that estimate duration and create a memory trace of the time interval, and (c) decision processes to enable motor preparation and trigger action initiation (Rose et al., 2021). Within the theoretical framework of the information-processing approach, a stable SMS is maintained through the processes of phase and period correction. Without such correction, error variance due to internal timekeeper variability would accumulate and lead to asynchrony (Repp & Su, 2013). In the phase-correction process, information about the asynchrony (time difference) between the finger-tap and the click of the metronome is used to adjust the start point of the next timekeeper interval. It is assumed that this is an automatic process (i.e., it occurs without participants' awareness). The period correction adjusts the internal representation of the temporal interval when mismatch is detected between an inter-tap (period between two finger-

taps) and metronome intervals (period between two clicks of the metronome). The period-correction process is assumed to be more under cognitive control. Phase correction is believed to be sufficient for maintaining synchronization with an isochronous stimulus sequence (such as that produced by a metronome) whereas period correction appears to come into play only when the period of the stimulus sequence is changed in a systematic way (e.g., tempo changes) (Repp & Su, 2013).

In dance lessons, participants often must quickly change their movements in time with certain music accents. Therefore, it was expected that a dance programme would improve their auditory reaction time. According to the study, there was no significant difference between the dance group and the control group at the end of the intervention. Also, the dance group performed significantly better at the end of the intervention compared to pre-test data. This could indicate that dance activities may have a positive effect on the development of reaction time. The findings of this study are aligned with those of a previous study involving preschool children and that reported no significant difference between the dance group and the control group at the end of a dance programme (Chatzihidiroglou et al., 2018). On the contrary, Kattenstroth et al. (2013) reported that the reaction time of elderly participants significantly improved after a dance programme. The different findings could be attributed to the different ages of the participants of the samples. The sample of Kattenstroth et al. (2013) consisted of elderly people, ours of young children, and it is well established that the reaction time performance decreases and becomes more variable with age (Dykiert et al., 2012). Furthermore, physical activity of older participants also affects the reaction-time performance (Spirduso, 1980). Therefore, the comparison of the results of studies with samples of participants of different ages should be made cautiously. Nonetheless, there is definitely a need for further research on the effects of dance on children's reaction time.

Limitation

The study has some limitations. The limitation of this study is that the study participants consisted of young children (6–7 years old). SMS and auditory reaction time measurements require concentration that young children probably did not have at the time of measurement.

Conclusion

SMS and auditory reaction time are important factors for the successful execution of daily and sports activities. In the present study, the importance of dancing for the development of SMS in young children has been stressed. Considering the importance of SMS for children's motor and cognitive development, we suggest that dance should be a basic component of the curriculum in primary school education.

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References

Bose, A., Byrne, Á., & Rinzel, J. (2019). A neuromechanistic model for rhythmic beat generation. *PLoS Computational Biology, 15*(5), e1006450.

Burkhardt, J., & Brennan, C. (2012). The effects of recreational dance interventions on the health and well-being of children and young people: A systematic review. *Arts & Health, 4*(2), 148–161.

Chatzihidiroglou, P., Chatzopoulos, D., Lykesas, G., & Doganis, G. (2018). Dancing effects on preschoolers' sensorimotor synchronization, balance, and movement reaction time. *Perceptual and Motor Skills, 125*(3), 463–477.

Chatzopoulos, D. (2019). Effects of ballet training on proprioception, balance, and rhythmic synchronization of young children. *Journal of Exercise Physiologyonline, 22*(2), 26–37.

Chatzopoulos, D., Yiannakos, A., Kotzamanidou, M., & Bassa, E. (2015). Warm-up protocols for high school students. *Perceptual and Motor Skills, 121*(1), 1–13.

Chatzopoulos, D., Doganis, G., & Kollias, I. (2019). Effects of creative dance on proprioception, rhythm and balance of preschool children. *Early Child Development and Care, 189*(12), 1943–1953.

Chatzopoulos, D., Foka, E., Doganis, G., Lykesas, G., & Nikodelis, T. (2020). Effects of analogy learning on locomotor skills and balance of preschool children. *Early Child Development and Care*, 1–9.

Drewing, K., Aschersleben, G., & Li, S.-C. (2006). Sensorimotor synchronization across the life span. *International Journal of Behavioral Development, 30*(3), 280–287.

Dykiert, D., Der, G., Starr, J. M., & Deary, I. J. (2012). Sex differences in reaction time mean and intraindividual variability across the life span. *Developmental Psychology, 48*(5), 1262–1276.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175–191.

Gilbert, A. G. (2015). *Creative dance for all ages: A conceptual approach (Second edition)*. Human Kinetics.

Jin, X., Wang, B., Lv, Y., Lu, Y., Chen, J., & Zhou, C. (2019). Does dance training influence beat sensorimotor synchronization? Differences in finger-tapping sensorimotor synchronization between competitive ballroom dancers and nondancers. *Experimental Brain Research, 237*(3), 743–753.

Karpati, F. J., Giacosa, C., Foster, N. E. V., Penhune, V. B., & Hyde, K. L. (2016). Sensorimotor integration is enhanced in dancers and musicians. *Experimental Brain Research, 234*(3), 893–903.

Kattenstroth, J.-C., Kalisch, T., Holt, S., Tegenthoff, M., & Dinse, H. R. (2013). Six months of dance intervention enhances postural, sensorimotor, and cognitive performance in elderly without affecting cardio-respiratory functions. *Frontiers in Aging Neuroscience, 5*, 5.

Ladányi, E., Persici, V., Fiveash, A., Tillmann, B., & Gordon, R. L. (2020). Is atypical rhythm a risk factor for developmental speech and language disorders? Wiley Interdisciplinary Reviews. *Cognitive Science, 11*(5), e1528.

Little, S., & Hall, T. (2017). Selecting, Teaching and Assessing Physical Education Dance Experiences. *Journal of Physical Education, Recreation & Dance, 88*(3), 36–42.

Lykesas, G., Giosos, I., Theocharidou, O., Chatzopoulos, D., & Koutsouba, M. (2017). The effect of a traditional dance program on health-related quality of life as perceived by primary school students. *Journal of Education and Training Studies, 6*(1), 96.

Lykesas, G., Giossos, I., Chatzopoulos, D., Koutsouba, M., Douka, S., & Nikolaki, E. (2020). Effects of Several Warm-Up Protocols (Static, Dynamic, No Stretching, Greek Traditional Dance) on Motor Skill Performance in Primary School Students. *International Electronic Journal of Elementary Education, 12(*5), 481–487.

MacPherson, A. C., Collins, D., & Obhi, S. S. (2009). The Importance of Temporal Structure and Rhythm for the Optimum Performance of Motor Skills: A New Focus for Practitioners of Sport Psychology. *Journal of Applied Sport Psychology, 21*(sup1), S48-S61.

Mann, D. T. Y., Williams, A. M., Ward, P., & Janelle, C. M. (2007). Perceptual-cognitive expertise in sport: A meta-analysis. *Journal of Sport & Exercise Psychology, 29*(4), 457–478.

McAuley, J. D., Jones, M. R., Holub, S., Johnston, H. M., & Miller, N. S. (2006). The time of our lives: Life span development of timing and event tracking. Journal of Experimental Psychology. *General, 135*(3), 348–367.

McCutchen, B. P. (2006). *Teaching dance as art in education.* Human Kinetics.

Repp, B. H., & Su, Y.-H. (2013). Sensorimotor synchronization: A review of recent research (2006-2012). *Psychonomic Bulletin & Review, 20*(3), 403–452.

Roenneberg, T., & Merrow, M. (2016). The Circadian Clock and Human Health. *Current Biology : CB, 26*(10), R432-43.

Rose, D., Ott, L., Guérin, S. M. R., Annett, L. E., Lovatt, P., & Delevoye-Turrell, Y. N. (2021). A general procedure to measure the pacing of body movements timed to music and metronome in younger and older adults. *Scientific Reports, 11*(1), 3264.

Slater, J., Tierney, A., & Kraus, N. (2013). At-risk elementary school children with one year of classroom music instruction are better at keeping a beat. *PloS One, 8*(10), e77250.

Spirduso, W. W. (1980). Physical fitness, aging, and psychomotor speed: A review. *Journal of Gerontology, 35*(6), 850–865.

Staiano, A. E., Marker, A. M., Beyl, R. A., Hsia, D. S., Katzmarzyk, P. T., & Newton, R. L. (2017). A randomized controlled trial of dance exergaming for exercise training in overweight and obese adolescent girls. *Pediatric Obesity, 12*(2), 120–128.

Styns, F., van Noorden, L., Moelants, D., & Leman, M. (2007). Walking on music. *Human Movement Science, 26*(5), 769–785.

Theocharidou, O., Lykesas, G., Giossos, I., Chatzopoulos, D., & Koutsouba, M. (2018). The positive effects of a combined program of creative dance and BrainDance on health-related quality of life as perceived by primary school students. *Physical Culture and Sport. Studies and Research, 79*(1), 42–52.

Thomson, J. M., & Goswami, U. (2008). Rhythmic processing in children with developmental dyslexia: Auditory and motor rhythms link to reading and spelling. *Journal of Physiology, Paris, 102*(1-3), 120–129.

Zachopoulou, E., Derri, V., Chatzopoulos, D., & Ellinoudis, T. (2003). Application of Orff and Dalcroze activities in preschool children: Do they affect the level of rhythmic ability? *Physical Educator, 60*(2), 50–66.

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Narrative to Investigate Language Skills of Preschool Children*

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Abstract

This study aimed to evaluate the language skills of preschool children through narrative. The Turkish Test of Early Language Development (TEDIL) was used to evaluate the receptive and expressive verbal language skills of the children, and language samples were collected using the Edmonton Narrative Norms Instrument (ENNI). The Mean Length of Utterance (MLU), Number of Different Words (NDW), and Total Number of Words (TNW) were examined in the language samples taken from the narrative analysis. A total of 100 children, 50 in the age group of 48-60 months and 50 in the age group of 61-72 months, were evaluated. According to the results obtained from the evaluation of the language skills of the children between the ages of 48 and 60 and 61 and 72 months, it was found that, children between the ages of 61-72 months were more likely to tell longer stories than the children of 48-60 months. It was seen that there were developmental differences in NDW and TNW in the stories of children between these two age groups. It has been revealed that the ENNI can be used as a language tool to assess the language skills in preschool children.

Keywords:

Preschool, Narrative, Language, Development

Introduction

Children's language development improves in the first five years of life, starting from their first word until they form meaningful speech. Children often use narrative during the process of speaking to share their ideas and their experiences. Children's stories are important for determining language skills (Boudreau, 2008). Soares et al.(2010) reported that early storytelling in children develops with social and family interaction and early language acquisition in school, as well as during mother-child interaction.

Narrative skills show that a child can talk about his/her life beyond the use of grammar. Early narrative skills in children require a high level of language and cognitive skills. Stories are far more than the flow of unrelated words and sentences. Storytelling requires the use of complex and consistent linguistic structures. In order to create a coherent

linguistic structure, expressions that link the characters and events must be used in the narration (Paul & Smith, 1993; Shiel et al., 2012; Uchikoshi et al., 2005). Complex syntactic structures and stories that elicit longer expressions are associated with comprehension skills, writing skills, and verbal language development. This provides a link between language and cognitive development. When cognitive development is considered to be the most basic tool for understanding the world, it is emphasized that acquiring narrative skills is not only a game for children, but also a means of expressing meanings that are inherent in life (O'Neill et al., 2004; Stadler et al., 2005; Wagner et al., 2000).

Early narrative skills, including increased vocabulary, are associated with literacy skills such as using knowledge and clues, understanding the subject, morphological and syntactic skills, and various writing skills. Children's narrative skills advance them towards the process of oral literacy and prepare them for learning the written language, which is necessary for academic success. That is, stories support early literacy by creating a bridge between oral and written language (Çakıroğlu, 2019; Dickinson & Smith, 1994; Hayward et al., 2009; Griffin et al., 2004; Westby et al., 1989).

In an examination of related literature, Stadler and Ward (2005) emphasized the importance of early storytelling by stating that stories require more complex language than daily language. Using appropriate words, pronouns, and conjunctions in the story increases the level of pre-reading language usage and facilitates the transition from spoken language to written language. Dickinson and Tabors (2002) also suggested that preschool story skills positively affect reading comprehension and receptive language in later periods. Another study by O'Neill et al. (2004) emphasized that the ability to produce stories in the early period can support mathematical skills.

Creating stories requires a high level of language use and cognitive skills. One should be able to plan what one has to say, sort thoughts, organize them in a meaningful way, and design the story with creative elements (Hegsted, 2013). Stories are one of the best ways to observe and evaluate children's pragmatic skills (appropriate language use in the context of verbal and non-verbal language) (Cummings, 2015). In addition to cognitive skills, storytelling at an early age is also related to socio-emotional development, including social cognitive skills such as bonding, emotional recognition, perspective, and awareness of the human mind and behavior (Schick & Melzi, 2010). It was emphasized that early storytelling skills supported children's recall and planning skills in the future (Jack et al., 2009). Narrative skills not only enable children to convey the social messages of real and fictional events to others, but also enable them to form an oral meaning from their experiences. The language development of a small child includes the ability to narrate verbally. Lever and Senechal (2011) emphasized that it is important for children to learn the language as a whole in order to develop the ability to express abstract thoughts in their stories. The narrative is also an important result of early learning and positively affects the areas of social, emotional, and cognitive development (Shiel et al., 2012).

In studies on the development of storytelling, Soares et al. (2010) stated that two-year-old children were unable to use narration and only used time expressions in their vocabulary. At the age of three to four years, children used story patterns such as 'once upon a time" and "they lived happily ever after." Slobin (2004) found that although three-year-old children were able to form sentences, they were not successful in forming a story. Four-year-old children were able to narrate on the subject in accordance with given instructions, with storytelling forming a developmental transition for children between three and five years old. Munoz et al. (2003) reported that three and four-year-old children combined two or three events and had fewer stories compared to five-year-old children. Four-year-old children were able to tell meaningful stories but they could not form compatible sentences to form a full story. Five-year-old children were able to produce stories composed of interrelated sentences reflecting a consistent structure. Özcan (2005) emphasized that children between three and four years of age cannot produce stories; they use content outside of the plot that does not belong to the story. A consistent story is not observed until the age of five. Boudreau (2001) also suggested that five-year-old children could not produce regular stories following stage order. Similarly, Shapiro, and Hudson (1991) emphasized that the narrative skills of preschool children were weaker than those of primary school children. They stated that children under the age of six seem to have acquired the knowledge and skills necessary for story production, but cannot link events and characters without support. Once children are six years old, they can comprehend the sectional structures for story development and can make a consistent narrative. When the children reach the age of five to six, the problem of the subject and the solutions related to the subject show gradual development while forming the story, and children are able to tell more detailed stories (Kemper et al., 1995).

In another study conducted by Işıtan, and Turan (2014) showing that storytelling is gradual like language development, five basic periods are emphasized in the development of storytelling of preschool children. The children of three to four years of age were in the labeling period, and their stories had verbal labeling and included inconsistent repeating sentences; four year old children were in the period of the listing

and they could list the status of the characters in the story and their stories were subject-centered; five year old children are in the period of connection, the connection can be seen between the sentences related to the subject center; The period between five to six was the ranking period and the children produced stories in a logical, hierarchical order and accordance with cause-effect relationship; It is stated that the six year period was narrative period and that the stories told by children include all the characteristics of the previous ages (Işıtan & Turan, 2014).

Several studies showed that demographic features related to child and family affect the language development of the child (Gagne & Crago, 2010; Lee, 2013; Reese & Read, 2000; Saranlı et al., 2017; Schneider et al., 2006; Topbaş et al., 2004; Yıldız et al., 2009). In the studies conducted, it has been stated that being more open to stimuli after the age of two, when the language skills of children increase with their ages, and that the perception and attention are more intensely affected by language development (Reese & Read, 2000; Topbaş et al., 2004). It has been also emphasized that as children grow up and environmental stimuli increase, language awareness, the number of words used, and language skills increase. Besides, it was stated that while children complete their language development stages with age, they learn to build meaningful sentences and understand the language they use. Thanks to the stimuli from the environment, they can establish logical relationships and make sense of the language they have started to speak (Şen et al., 2010). A study conducted by Saranlı et al. (2017) found that recipient language scores increase by age; recipient language scores of the 73 to 77-month-old children are significantly higher than scores of 48 to 60-month-old-children, and scores of 61 to 72-month-old children are higher than the scores of 48 to 60-month-old children. In a study of Korean children, it was shown that children's ability to produce stories is an age-related developmental process (Lee, 2013). In addition, Işıtan and Turan (2014) emphasized that the age and gender-related differences in the storytelling skills of children with normal development can be seen in details

In studies that examined the relationship between gender and language development, Karmiloff and Karmiloff-Smith (2002) reported that cognitive development that was effective in language acquisition of girls occurred between 14 and 20 months, while this same change started in boys between the age of 20 and 24 months. They emphasized that the reason girls speak earlier than boys is that they have a wider vocabulary and speak more. In addition, it was stated that in the process of acquiring the mother tongue, girls performed at a higher level than boys in terms of speaking fluently, correctly in accordance with grammar rules, and with proper pronunciation. In another study, it was stated that girls who watch and imitate their mothers are able to speak better than boys in terms of the amount of speech, vocabulary, and proper formation of sentences (Tulu, 2009). Although some recent studies have concluded that there is no significant difference between girls and boys (Çiyiltepe, 2006; Erdoğan et al., 2005), others found that the language skills of gifted boys are better than those of girls (Saranlı et al., 2017).

Mother-child interaction and the quality of interaction in language development in the early childhood period contribute to language development in the following years. Longitudinal studies have proven that the sensitivity of mothers to interaction with the child's communication attempts has positive effects on language proficiency in the following years. The language used by the mother, the frequency of speaking with the child, and answering or asking questions is extremely important in language development. Some studies emphasized that mothers with low education and socioeconomic level use simpler language structures while talking with their children and do not use positive and supportive verbal communication (Baykan et al., 1995; Berkman, 1990). Schneider et al. (2006) also found that demographic characteristics such as the education level of the family affect language development. Furthermore, having an appropriate environment where children can learn and use language is closely related to language development. Erdoğan et al. (2005) claimed that the level of a mother's education does not affect the language development of five to six-year-old children who attend kindergarten, while the duration of attendance at nursery class or kindergarten is effective on the language development of children. In summary, the presence of a rich, stimulating environment in which a child experiences the language offered and there is a good model for using the language positively, supports the verbal communication of children.

Language Evaluation and Narrative

In recent years, storytelling has become a common feature of clinical evaluation and intervention. Storytelling analysis provides valuable insight into how children bring information together about language areas. Botting (2002) stated that the use of narration in language evaluation has three theoretical reasons: creating normative data, the relationship between narration and literacy, and dividing communication difficulties into different subgroups.

There are many language tests that evaluate words and sentences alone in the literature and clinical practices. Through storytelling, the child evaluates all aspects of receptive and expressive language. When

creating stories that require high-level language use, children should use words and sentences in accordance with their purpose. It was emphasized that being a good narrator is an important skill in the life of young children. The stories that we learn about verbal language skills also facilitate the transition to reading and writing. Thus, it is emphasized that storytelling supports the academic achievement of school-age children (Schneider et al., 2006). The study of McCabe (1994) on the importance of storytelling development in the preschool period, suggested that creating a coherent story in terms of meaning positively affected the adaptation period to school and literacy skills. He also emphasized the importance of evaluating the narrative skills of preschool children in identifying children at risk for learning and literacy difficulties.

Storytelling skills are very important in preschool education, being widely applied in daily activities of the early age period. In this period, the storytelling is peculiar to the child and the fictional feature of the stories can also be observed. Such imaginary stories reflect the creativity of the child (Pistav Akmese, 2015). At the same time, as the stories have the developmental characteristics of the children, the levels of development can be compared thanks to the normative information. Thanks to the determination of the story development of the children with normal development, language problems in children can be identified and corrected in this early period. In addition, as the ability to tell stories predicts literacy skills, intervention programs for early storytelling skills positively affect advanced academic skills. Therefore, it is important to evaluate native language-specific storytelling skills in children with normal development. The aim of this study is to evaluate the language skills of children with normal hearing whose mother tongue is Turkish in the preschool period (48-60 months and 61-72 months) through narration. Within this context, the research questions of the study are as follows:

1. Do the results of preschool children's receptive language, expressive language, verbal language scores, and MLU, NDW, and TNW differ according to the age groups of the children?
2. Do the results of preschool children's receptive language, expressive language, verbal language scores, and MLU, NDW, and TNW differ by gender?
3. Do the results of preschool children's receptive language, expressive language, verbal language scores, and MLU, NDW, and TNW differ according to the level of maternal education?
4. Is there a relationship among preschool children's age, education of the mother, receptive language, expressive language, verbal language scores, and MLU, NDW, and TNW results?

Method

This study, which deals with the language development of preschool children, is a descriptive survey. MLU, NDW, and TNW, the three developmental features for language development, and the receptive language, expressive language, and verbal language scores of preschool children between 48 and 60 months of age and 61 and 72 months were studied.

The study consists of 100 children with normal hearing in the preschool period. Demographic information about the parents of the children included in the study is given in Table 1.

When the distribution of children in the study group by age is examined, the average age of 50 children between 48 and 60 months is 4.11 ±.19, the average age of the mothers is 35.9 ± 4.60, and the average age of the fathers is 38.6 ± 4.99. The average age of 50 children between 61 and 72 months is 5.14 ± 0.25, the average age of mothers is 35 ± 4.59, and the average age of fathers is 38.4 ± 5.32. Six (12%) of the mothers of 48 to 60-month-old children who participated in the study had primary education, 18 (36%) had high school education, and 26 (52%) had university education.

Table 1

Demographic Information of the Child and His Family (N:100)

Variable		48-60 month		61-72 month	
		Mean ±*sd*		Mean ±*sd*	
Child age average		4.11 ± .19		5.14 ±.25	
Mother age average		35.90±4.60		35.00±4.59	
Father age average		38.60±4.99		38.40±5.32	
Mother's educational status		N	%	N	%
	Primary education	6	12	9	18
	High school	18	36	19	38
	University	26	52	22	44
Gender	Females	25	50	25	50
	Males	25	50	25	50

Nine (18%) of the mothers of the children between 61 and 72 months are primary school graduates, 19 (38%) are high school graduates, and 22 (44%) are university graduates. One hundred children were included in the study: 25 boys and 25 girls in the 48 to 60-month age group, 25 boys and 25 girls in the 61 to 72-month group.

Data Collection Tools

The demographic information form containing information about the characteristics of children and their families, the Turkish Test of Early Language Development (TEDIL) to evaluate the receptive language, expressive language, and verbal language scores of children with normal hearing in the preschool period, and the Edmonton Narrative Norms Instrument (ENNI) storytelling tool to identify MLU, NDW, and TNW among language skills were used in the study.

Demographic form

The demographic information form is a form containing demographic information about the children in the study group and their families, such as children's age, gender, and mothers' educational level.

Turkish Test of Early Language Development (TEDIL)

Turkish Test of Early Language Development is applied to children aged 2;0 and 7;11. It is used to evaluate the receptive and expressive language of children whose mother tongue is Turkish. When the test is applied, the child's appropriate response to the items is marked as one point, and when it is not appropriate it is marked as zero points. The raw score is obtained with the total score that occurs. The raw score is then converted into standard language scores. The compound score obtained provides information about the child's general verbal language (Topbaş & Güven, 2013).

The Edmonton Narrative Norms Instrument (ENNI)

The narrative skills assessment test ENNI is a tool that evaluates the language skills of four to nine-year-old children through narration. A training story consists of two sets of co-stories, A and B story sets. In this study, the A story set was used. The story shown to the children moves from simple pictures with two animal characters to a complex story with four characters. It was developed by Schneider et al. (2005) and it is a norm-based test. The stories used start with an educational story that prepares children to narrate. This story, which consists of five pictures, two characters, and an event, is applied to the child together with the researcher. Then, in order to motivate the child, we say "Now I'm turning this story to you and I can't see, can you tell me what's going on there? I am listening to you carefully." We pass to the A1, A2, and A3 stories, respectively. In order to indicate that the researcher is listening carefully, the researcher says "uh-huh", "continue", and "very well" between the pages to guide the child without affecting the story. Stories are recorded with a voice recorder. The records obtained are analyzed using the language sample program.

Data Collection

After the parental consent form was signed by the parents of the children participating in the study, the demographic information form containing general information about the children participating in the study and their families was filled out. Later, in order to evaluate the children's receptive language and Expressive Language Scores skills, the TEDIL and ENNI were applied in two sessions of 15-20 minutes as an individual interview with the child.

Data Analysis

Sound recordings obtained from TEDIL and ENNI were analyzed with the Systematic Analysis of Language Transcripts (SALT) language sample analysis program. The quantitative data obtained were analyzed using the SPSS 25.0 program. After the data were found to be normally distributed, general information was given using descriptive statistics. The t-test was used to detect the differences between MLU, NDW, TNW, and TEDIL tests obtained from ENNI by age and gender. The difference between TEDIL and ENNI, MLU, NDW, and TNW was analyzed by one-way analysis of variance (ANOVA). Pearson correlation analysis was performed for the relationship between the age of the child, TEDIL scores and the MLU, NDW, and TNW scores obtained from ENNI, and the level of maternal education.

Results

In the findings of the study, in which the study aimed to evaluate the language skills of preschool children through narration, the age and gender of children, the relationship between the variables of receptive language, expressive language, verbal language scores, and story development according to the level of maternal education were discussed. In the following section, the findings of the research are given according to the research questions.

1- Do the results of preschool children's receptive language, expressive language, verbal language scores, and MLU, NDW, and TNW differ according to the age groups of the children?

Information on the comparison of TEDIL scores by the age of the research group is given in Table 2.

In Table 2, when the TEDIL scores of children are compared, the mean of 61 to 72- month-old children is

higher in all three subtests compared to the average of 48 to 60- month-old children, but the difference causes a statistically significant difference between receptive language scores (p <.05) and verbal language scores (p < .05).

Information regarding the comparison of the age group and the storytelling scores are given in Table 3.

In Table 3, when the MLU, NDW, and TNW scores of A1, A2, and A3 stories included in the A story set are examined according to the age groups of the children, the mean scores of A1 NDW and TNW, A2 NDW and TNW, and A3 NDW and TNW of children aged 61 to 72 months are found to be higher than 48 to 60-month-old children. When the two age groups were compared, there was a significant difference between NDW and TNW obtained from the stories of A1, A2, and A3 of 48 to 60 and 61 to 72-month-old children (p <.05).

2- Do preschool children's receptive language, expressive language, verbal language scores, and MLU, NDW, and TNW results differ by gender?

Information on the comparison of TEDIL scores by age groups and genders of the research group is given in Table 4.

In Table 4, when the TEDIL scores of the children were compared, the average of the girls was higher than that of the boys, but the difference between the scores of receptive language, expressive language, and verbal language scores was not statistically significant.

Information regarding the comparison of the storytelling scores of the children in the study group by age groups and genders is given in Table 5 and Table 6.

Table 2

The T-test Results of TEDIL Scores According to the Age of the Children in the Research Group

TEDIL	Age	*N*	Mean	*sd*	*p*
Receptive language scores	48-60 m	50	98.82	9.08	.009*
	61-72 m	50	103.46	8.24	
Expressive language scores	48-60 m	50	97.02	6.63	.124
	61-72 m	50	99.34	8.24	
Verbal language scores	48-60 m	50	97.56	7.76	.013*
	61-72 m	50	101.64	8.34	

*p<.05

Table 3

The T-test Results of the Ages of the Children in the Research Group and the A History Set MLU, NDW, and TNW Scores

ENNI	Age	*N*	Mean	*sd*	*p*
A1 MLU	48-60 m	50	5.77	2.05	.187
	61-72 m	50	6.26	1.59	
A1 NDW	48-60 m	50	28.14	10.60	.003*
	61-72 m	50	33.70	7.30	
A1 TNW	48-60 m	50	53.52	22.34	.004*
	61-72 m	50	66.84	22.20	
A2 MLU	48-60 m	50	6.31	2.20	.157
	61-72 m	50	6.86	1.67	
A2 NDW	48-60 m	50	43.28	14.26	.000*
	61-72 m	50	52.18	9.83	
A2 TNW	48-60 m	50	79.58	36.14	.002*
	61-72 m	50	101.50	31.82	
A3 MLU	48-60 m	50	6.33	2.19	.141
	61-72 m	50	6.90	1.59	
A3 NDW	48-60 m	50	55.64	18.12	.047*
	61-72 m	50	62.18	14.04	
A3 TNW	48-60 m	50	127.28	49.91	.002*
	61-72 m	50	161.86	58.17	

*p < .05

In Table 5, when the MLU, NDW, and TNW scores of A1 and A2 stories in the A group set of 48 to 60-month-old children were examined according to age, it was observed that the mean scores of A1 MLU, A2 MLU, and A3 NDW of 48 to 60-month-old girls was higher than that of boys and the difference was statistically significant in favor of girls (p <.05).

When A1, A2, and A3 MLU, NDW, and TNW scores in the A history set of 61 to 72-month-old children in the study group were examined according to gender in Table 6, it was found that the mean of A1 NDW, A2 NDW, A3 MLU, and A3 NDW girls were higher than boys, and the difference was statistically significant in favor of girls (p <.05).

3- Do the results of preschool children's receptive language, expressive language, verbal language scores, and MLU, NDW, and TNW differ according to the educational level of the mother?

Information on comparison of receptive language, expressive language, and verbal language scores according to the educational level of the mother of the children in the study group is given in Table 7.

When Table 7 is examined, no statistically significant difference was found between the mothers' educational level (primary, high school, university) and TEDIL receptive language, expressive language, and verbal language scores (p > .05).

Table 4

The T-test Results of TEDIL Scores According to the Gender of the Children in the Study Group

Age		TEDIL	*N*	Mean	*sd*	*p*
48-60 m	Receptive language scores	Females	25	105.36	8.23	.104
		Males	25	101.56	7.97	
	Expressive language scores	Females	25	100.40	9.24	.369
		Males	25	98.28	7.20	
	Verbal language scores	Females	25	103.36	9.16	.147
		Males	25	99.92	7.22	
61-72 m	Receptive language scores	Females	25	100.96	9.32	.096
		Males	25	96.68	8.49	
	Expressive language scores	Females	25	97.84	6.64	.388
		Males	25	96.20	6.67	
	Verbal language scores	Females	25	99.32	7.59	.109
		Males	25	95.80	7.68	

**p<.05*

Table 5

The T-test Results of MLU, NDW, and TNW Scores According to the Gender of 48 to 60-Month-Old Children in the Study Group

ENNI		*N*	Mean	*sd*	*p*
A1 MLU	Females	25	6.39	2.08	.032*
	Males	25	5.15	1.86	
A1 NDW	Females	25	30.84	9.68	.071
	Males	25	25.44	10.98	
A1 TNW	Females	25	57.76	19.80	.182
	Males	25	49.28	24.28	
A2 MLU	Females	25	6.92	2.35	.049*
	Males	25	5.69	1.91	
A2 NDW	Females	25	45.88	12.51	.201
	Males	25	40.68	15.64	
A2 TNW	Females	25	85.04	31.56	.290
	Males	25	74.12	40.10	
A3 MLU	Females	25	6.90	2.18	.066
	Males	25	5.76	2.08	
A3 NDW	Females	25	60.68	17.34	.048*
	Males	25	50.60	17.81	
A3 TNW	Females	25	140.84	43.12	.054
	Males	25	113.72	53.33	

**p<.05*

The information regarding the comparison of the storytelling scores of the children in the research group according to the educational level of the mother is given in Table 8.

When Table 8 is examined, the difference between the mothers' educational status (primary, high school, and university) and MLU, TNW, and TNW scores of A1, A2, and A3 stories was not statistically significant (p > .05).

Correlation values of the children's age, educational level of the mothers, receptive language, expressive language, verbal language scores, correlation MLU, NDW, and TNW scores for A1, A2, and A3 stories are given in Table 9.

In Table 9, the relationship between age, mothers' educational level of the children in the research group, TEDIL, and the MLU, NDW, and TNW scores of the ENNI story set were examined.

A positive correlation was found between the educational status of the mother and receptive language scores (r = .209, p < .005), A2 MLU (r = .198, p < .005), and A3 NDW (r = .198, p < .005). A positive correlation was found with expressive language scores (r = .443, p < .005) and verbal language scores (r = .871, p < .005). Expressive language scores were positively correlated with verbal language scores (r = .824, p < .005), and negative correlations with A1 NDW (r = -.210, p < .005).

Table 6

The T-test Results of MLU, NDW, and TNW Scores According to the Gender of 61 to 72-Month-Old Children in the Study Group

ENNI		*N*	Mean	*sd*	*p*
A1 MLU	Females	25	6.39	1.59	.548
	Males	25	6.12	1.61	
A1 NDW	Females	25	35.88	8.73	.033*
	Males	25	31.52	4.76	
A1 TNW	Females	25	70.28	22.55	.278
	Males	25	63.40	21.75	
A2 MLU	Females	25	7.05	1.40	.431
	Males	25	6.68	1.92	
A2 NDW	Females	25	55.04	9.87	.038*
	Males	25	49.32	9.10	
A2 TNW	Females	25	104.88	29.37	.458
	Males	25	98.12	34.36	
A3 MLU	Females	25	7.35	1.68	.043*
	Males	25	6.45	1.38	
A3 NDW	Females	25	67.04	13.99	.013*
	Males	25	57.32	12.56	
A3 TNW	Females	25	174.44	52.87	.128
	Males	25	149.28	61.51	

*p<.05

Table 7

The One-Way Analysis of Variance (ANOVA) Results of the Children in the Research Group in Relation to the TEDIL Scores According to the Educational Level of the Mother

TEDIL		Sum of squares	*df*	Mean square	*F*	*p*
Receptive language scores	Between groups	438.25	2	219.12	2.845	.063
	In-group	7471.78	97	77.02		
	Total	7910.04	99			
Expressive language scores	Between groups	45.73	2	22.86	.398	.673
	In-group	5577.02	97	57.49		
	Total	5622.76	99			
Verbal language scores	Between groups	262.47	2	131.23	1.954	.147
	In-group	6515.52	97	67.17		
	Total	6778.00	99			

*p<.05

Table 8

One-Way Analysis of Variance (ANOVA) Results of the Children in the Research Group in Relation to MLU, NDW, and TNW Scores According to the Educational Level of the Mother

		Sum of squares	*df*	Mean square	*F*	*p*
A1 MLU	Between groups	8.06	2	4.03	1.189	.309
	In-group	328.91	97	3.39		
	Total	336.98	99			
A1 NDW	Between groups	221.32	2	110.66	1.237	.295
	In-group	8678.03	97	89.46		
	Total	8899.36	99			
A1 TNW	Between groups	91.48	2	45.74	.084	.920
	In-group	52963.27	97	546.01		
	Total	53054.76	99			
A2 MLU	Between groups	17.03	2	8.51	2.248	.111
	In-group	367.39	97	3.78		
	Total	384.42	99			
A2 NDW	Between groups	326.38	2	163.19	.968	.384
	In-group	16359.32	97	168.65		
	Total	16685.71	99			
A2 TNW	Between groups	526.25	2	263.12	.204	.816
	In-group	125124.58	97	1289.94		
	Total	125650.84	99			
A3 MLU	Between groups	.79	2	.39	.105	.900
	In-group	367.13	97	3.78		
	Total	367.93	99			
A3 NDW	Between groups	1089.26	2	544.63	2.051	.134
	In-group	25754.92	97	265.51		
	Total	26844.19	99			
A3 TNW	Between groups	2825.08	2	1412.54	.435	.649
	In-group	314979.42	97	3247.21		
	Total	317804.51	99			

**p<.05*

Table 9

Correlation Values of the Children's Age, Educational Level of the Mothers, Receptive Language, Expressive Language, Verbal Language Scores, Correlation MLU, NDW and TNW Scores for A1, A2, and A3 Stories

Child's Age	1												
Mother education	.008	1											
Receptive language scores	.293*	.209*	1										
Expressive language scores	-.141	.085	.443*	1									
Verbal language scores	.260*	.179	.871*	.824*	1								
A1 MLU	.223*	.138	.031	-.032	-.009	1							
A1 TNW	.385*	.157	-.060	-.210*	-.161	.592*	1						
A1 NDW	.372*	.041	-.073	-.052	-.082	.578*	.767*	1					
A2 MLU	.269*	.198*	-.048	.011	-.032	.724*	.542*	.522*	1				
A2 TNW	.416*	.119	-.091	-.066	-.097	.582*	.676*	.629*	.631*	1			
A2 NDW	.351*	.023	-.099	-.068	-.104	.539*	.587*	.743*	.602*	.845*	1		
A3 MLU	.256*	.044	-.115	-.119	-.144	.666*	.584*	.528*	.755*	.572*	.559*	1	
A3 TNW	.315*	.198*	-.015	-.041	-.038	.563*	.741*	.625*	.560*	.808*	.649*	.610*	1
A3 NDW	.378*	.026	-.129	-.041	-.108	.465*	.644*	.807*	.501*	.725*	.824*	.583*	.773*

**p<.05*

Discussion

The aim of this study was to evaluate the language skills of preschool children between the ages of 48 to 60 and 61 to 72 months through narration. In this study, preschool children's receptive language, expressive language, verbal language scores, and language skills through narration and the developmental criteria MLU, NDW, and TNW were evaluated. The relationship between receptive language, expressive language, verbal language scores, MLU, NDW, and TNW in these age periods and demographic characteristics such as children's age, gender, and educational status of the children were examined.

The study found that 61 to 72-month-old and 48 to 60-month-old children had significant differences between receptive language and verbal language scores and between NDW and TNW scores obtained from A1, A2, and A3 stories. According to gender, the difference between the averages of A1 MLU, A2 MLU, and A3 NDW in children between 48 and 60 months and A1 NDW, A2 NDW, A3 MLU, and A3 NDW in children between 61 and 72 months of age were statistically significant in favor of girls. The difference between the educational level of the mother (primary school, high school, and university) and the mean scores of receptive language, expressive language, verbal language, and MLU, TNW, and TNW for A1, A2, and A3 stories was not statistically significant. In addition, a positive correlation was found between the age of the child and receptive language scores, verbal language scores, the MLU, NDW, and TNW scores obtained from the A1, A2, and A3 stories. A positive correlation was also found between the educational status of the mother and receptive language scores, A2 MLU, and A3 NDW. There was a positive relationship between receptive language scores, expressive language scores, and verbal language scores. At the same time, there was a positive relationship between expressive language scores and verbal language scores, and a negative relationship with A1 NDW.

The relationship between age, educational level of the mother, receptive language, expressive language, verbal language scores, and MLU, NDW, and TNW will be discussed in accordance with the literature.

Differences between language skills according to children's ages

This study found that 61 to 72-month-old children had higher receptive language scores and verbal language scores than those of 48 to 60-month-old children, and the difference was significant concerning receptive language scores and verbal language scores. When we take into account the storytelling skills, the MLU, NDW, and TNWs obtained from ENNI of 61 to 72-month-old children are higher than those of 48 to 60-month-old children. Although the MLU difference in the groups is not statistically significant, the difference between NDW and TNW is statistically significant. In our study, it was observed that TNW increased with age and 61 to 72-month-old children had more vocabulary than those 48 to 60 months old. When we compared the NDW in children between 48 and 60 months and those between 61 and 72 months, it was found that children between 61 and 72 months of age have different words than children between 48 and 60 months. This study concluded that the NDW showed a developmental characteristic with age. Similar to this study's results, developmental traces that differ by age have also been reported in narrative studies with different cultures (Gagne & Crago, 2010; Schneider et al., 2006). Munoz et al., (2003) stated that complex syntactic structures of children in the four and five-year age group indicate developmental change. Although the five-year olds' MLU is longer than that of the four-year olds, their stories are similar in length and their narratives do not differ. Shapiro and Hudson (1991) stated that preschool children have good story-making abilities, but they are inadequate in the use of high-level structures.

Gender-Based Differences in the Language Skills of the Children

The findings of the study revealed that girls between the ages of 48-60 and 61-72 months had higher receptive language scores and verbal language scores than boys, but the difference was not statistically significant. When we take the storytelling skills into account according to gender, the children between the ages of 61 and 72 months have higher MLU, NDW, and TNW than those aged 48-60 months. In other words, narration increases with age. The difference between the A1, A2 MLU, and A3 NDW averages of 48 to 60-month-old girls and A1, A2, A3, NDW, and A3 MLU of 61 to 72-month-old girls was found to be statistically significant. In this study, while there was no difference in the recipient and expressive language in age groups, it was concluded that the girls in both age groups received higher scores in their stories in terms of vocabulary. When the literature is analyzed, different study results regarding language skills by gender draw attention. The results generally state that girls' language development is more advanced than that of boys (Karacan, 2000; Karmiloff & Karmiloff-Smith, 2002; Tulu, 2009; Yıldız Bıçakçı & Aral, 2009) or that there is no significant difference between the genders (Çiyiltepe, 2006; Erdoğan et al., 2005).

Pistav Akmese et al. (2019) suggested that in the typical age group of 61 -72 months, there was no significant relationship between genders with a test of early literacy subtests (receptive vocabulary knowledge, phonological awareness, the knowledge of alphabet, and listening comprehension).

Differences Between Language Skills of Children According to the Level of Mother Education

In this study, the effect of mothers´ educational levels on children's language skills was examined in both preschool groups between the ages of 48-60 and 61-72 months. According to the mother's educational level, it was found that there was no significant difference between the receptive and expressive and mean word length of the children, and the number of different and total words. Similar to this study, Erdogan et al. (2005) asserted that the scores they received from children's language tests did not differ according to the level of the mothers' education. Contrary to the results of the study conducted by Erdogan et al. (2005), studies have shown that demographic features affect language development of the child. One of these studies, conducted by Schneider et al. (2006), emphasized that demographic features such as the educational level of the family affect language development. Pistav Akmese et al. (2019) stated that there is a statistically significant relationship between hearing loss with early literacy subtests (receptive vocabulary knowledge and listening comprehension) and maternal education (p <.05). It is thought that the difference between the studies in the literature and our study is due to the fact that a large majority of the mothers of the children in our sample group had high school or university education.

Relationship Between Children's Age, Maternal Educational Level, Receptive Language, Expressive Language, Verbal Language Scores, and MLU, NDW, and TNW

In this study, a positive relationship was found between age and receptive language scores and verbal language scores of children between 48-60 and 61-72 months. When the relationship of the storytelling scores with age was examined, it was seen that there was a positive relationship between MLU, NDW, and TNW of preschool children in this study. It has been concluded that MLU, which we consider as the ratio of morphemes to expressions, increased with age in preschool period. Similar to the results of the study, O'Neill et al. (2004) emphasized that MLU positively correlates with the age of the child. In another study, it was emphasized that clinical applications related to MLU may also be important in evaluating high-level structural skills and MLU language skills by emulation (Munoz et al., 2003). NDW, which evaluates the variety of word levels, and TNW, which reveals the child's ability to produce words, also increase with age. Similar to this study, a study with Korean children emphasized that the ability of children to produce stories is an age-related developmental process (Lee, 2013). A positive correlation was found between mothers' educational level and TEDIL acceptor standard score, A2 MLU, and A3 NDW. In this study, there was no difference between the educational level of the mother and language skills, but receptive language scores, A2 MLU, and A3 NDW scores increased in these sections as the mothers' educational level increased. Different results can be obtained in studies that will be conducted with a larger sample in this regard.

As a result, it was observed that MLU, NDW, and TNW results in this study were more sensitive than word syntax analysis. In their study, Paul and Smith (1993) emphasized that the developmental differences of children's stories in this period generally reflect changes in the length of use of the language.

Conclusions

This study examined the language skills, receptive and expressive and verbal language scores, MLU, NDW, and TNW of children between 48-60 months and 61-72 months of age. In the results of this study, differences in the receptive and expressive language scores of the children in the preschool period and NDW and TNW scores in their narration were presented. There was no significant difference in MLU scores. It was found that 61 to 72-month-old children use different word roots and their vocabulary is better than 48 to 60-month-old children. MLU, NDW, and TNW scores showed some statistical differences which are not clinically significant in 48 to 60 and 61 to 72-month-old girls who participated in the study, where receptive and expressive language scores and MLU, NDW, and TNW scores were higher than those of boys, but the difference between receptive and expressive language scores was not significant. It was concluded that there were statistical differences in some areas but they did not provide a clinical significance In this study, it was found that family's education level did not make any difference in receptive and expressive language scores, MLU, NDW, and TNW language criteria. Furthermore, when its relationship was examined, it did not have sufficient effect on language scores. In this study group, a positive correlation was found between the age of the children and the language of receptive and expressive language, and MLU, NDW, and TNW. It was revealed that MLU, NDW, and TNW increased with age, and that the ability of storytelling in children in the preschool period has a developmental characteristic and can be used as a clinical tool by reflecting age characteristics.

Suggestions

- Narrative can be used as a clinical tool in the risk and disability groups for the evaluation of language skills in preschool children.

- It is emphasized in the literature that early language skills predict the success of the school period (Stadler & Ward, 2005). They can also be used in school-age children to evaluate narrative language skills.

- In this study, the stories of preschool children were examined at the word level. In this period, a wide range of research can be conducted by examining children's stories in terms of story grammar theory.

- Preschool plays an important role in the language development of children. Supporting storytelling and storytelling skills of children in preschool education will support their language development positively.

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References

Baykan, S., Temel, F.Z., Ömeroğlu, E., Bulduk, S., Ersoy, Ö. Avcı., N., & Turla, A. (1995). *Ankara'da farklı sosyoekonomik düzeydeki 0-6 yaş çocuklarının gelişim durumlarının incelenmesi üzerine bir araştırma.* Milli Eğitim Bakanlığı Okul Öncesi Eğitimi Genel Müdürlüğü ve Gazi Üniversitesi Mesleki Eğitim Fakültesi.

Berkman, S. (1990). *Erken çocuk eğitiminde farklı modeller seminer bildirileri.* UNICEF.

Botting, N. (2002). Narrative as a tool for the assessment of linguistic and pragmatic impairments. *Child Language Teaching and Therapy, 18*(1), 1-21. https//doi.org/10.1191/0265659002ct224oa

Boudreau, D. (2001). The development of narrative abilities in children. *Language Learning Language Learning and Education, 8*(2), 2-7. https://doi.org/10.1044/lle8.2.2

Boudreau, D. (2008). Narrative abilities: Advances in research and implications for clinical practice. *Topics in Language Disorders, 28*(2), 99-114. https://doi.org/10.1097/01.TLD.0000318932.08807.da

Cummings, L. (2015). Pragmatic disorders. *Pragmatics and Society, 6*(2), 1-17. https://doi.org/10.1075/ps.6.2.09pet

Çakıroğlu, A. (2019). The language acquisition approaches and the development of literacy skills in children. *International Electronic Journal of Elementary Education, 11*(2), 201-206. https://doi.org/10.26822/iejee.2019248600

Çiyiltepe, M. (2006). Dil ve konuşma gelişiminde sorunlara yol açan nedenler. In S. Topbaş (Ed.), *Dil ve Kavram Gelişimi* (pp.158- 189). Kök Yayıncılık.

Dickinson, D. K. & Smith, M. W. (1994). Long-term effects of preschool teachers' book readings on low-income children's vocabulary and story comprehension. *International Reading Association, 29*(2), 104–122. https://doi.org/10.2307/747807

Dickinson, D. K., & Tabors, P. O. (2002). Fostering language and literacy in classrooms and homes. *YC Young Children, 57*(2), 10-18.

Erdoğan, S., Bekir H. B., & Aras Erdoğan, S. (2005). Alt sosyoekonomik bölgelerde ana sınıfına devam eden 5-6 yaş grubundaki çocukların dil gelişim düzeylerine bazı faktörlerin etkisinin incelenmesi. *Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi,14*(1), 231-246.

Gagne, A., & Crago, M. (2010). The use of the ENNI to assess story grammar competency of school-aged French speaking children with and without specific language impairment. *Canadian Journal of Speech-Language Pathology and Audiology, 34*(4), 231–245.

Griffin, T.M., Hemphill, L., Camp, L., & Wolf D. P. (2004). Oral discourse in the preschool years and later literacy skills. *First Language, 24*(2), 123-147. https://doi.org/10.1177/0142723704042369

Hayward, D. V., Schneider, P., & Gillam, R. B. (2009). Age and task-related effects on young children's understanding of a complex picture story. *Alberta Journal of Educational Research 55*(1), 54-72.

Hegsted, S. (2013). *Narrative development in preschool and school-age children.* Utah State University Undergraduate Honors Capstone Projects. https://digitalcommons.usu.edu/honors/140.

Işıtan, S., & Turan, F. (2014). Çocuklarda dil gelişiminin değerlendirilmesinde bir anlatı analizi yaklaşımı olarak öykü anlatımı. *Eğitim Bilimleri ve Uygulama, 13*(25), 105-124.

Jack, F., Macdonald, S., Reese, E., & Hayne, H. (2009). Maternal reminiscing style during early childhood predicts the age of adolescents' earliest memories. *Child Development, 80*(2), 496-505. https://doi.org/10.1111/j.1467-8624.2009.01274.x.

Karacan, E. (2000). Çocuklarda dil gelişimini etkileyen faktörler. *Sürekli Tıp Eğitim Dergisi, 7,* 254-258.

Karmiloff, K., & Karmiloff Smith, A. (2002). *Pathway to language.* Harvard University Press.

Kemper, S., Vandepute, D., Rice, K., Cheung, H., & Gubarchuk, J. (1995). Speech adjustments to aging during a referential communication task. *Journal of Language and Social Psychology, 14*, 40-59. https://doi.org/10.1177/0261927X95141003

Lee, J. Y. (2013). *The use of the ENNI to assess narrative abilities of young Korean children* (Unpublished master thesis) University of Alberta.

Lever, R., & Sénéchal, M. (2011). Discussing stories: On how a dialogic reading intervention improves kindergartners' oral narrative construction. *Journal of Experimental Child Psychology, 108*(1), 1–24. 10.1016/j.jecp.2010.07.002

McCabe, A., & Rollins, P. R.(1994). Assessment of preschool narrative skills. *American Journal of Speech Language Pathology, 3*, 45-56. https://doi.org/10.1044/1058-0360.0301.45

Munoz, M. L., Gillam, R. B., Pena, E. D., & Gulley-Faehnle, A. (2003). Measures of language development in fictional narratives of Latino children. *Language, Speech, and Hearing Services in Schools, 34*(4), 332-342. https://doi.org/10.1044/0161-1461(2003/027)

O'Neill, D. K., Pearce, M. J., & Pick, J. L. (2004). Preschool children's narratives and performance on the peabody individualized achievement test revised: Evidence of a relation between early narrative and later mathematical ability. *First Language, 24,* 149-183. https://doi.org/10.1177/0142723704043529

Özcan, M. (2005). *The emergence of temporal elements in narrative units produced by children from 3 to 9 plus 13* (Unpublished doctoral dissertation). Middle East Technical University.

Paul, R. & Smith, R. L. (1993). Narrative skills in 4-year-olds with normal, impaired, and late- developing language. *Journal of Speech & Hearing Research, 36*(3), 592–598. https://doi.org/10.1044/jshr.3603.592

Pistav Akmese, P. (2015). Çocuklarda öykülemenin gelişimi ve dilin değerlendirilmesinde kullanımı. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi, 3*(16), 293–305. https://doi.org/10.1501/Ozlegt_0000000233

Pistav Akmese, P., Sezgin, D., & Öğüt, F. (2019). Investigation of early literacy skills in preschool children with deaf and hard of hearing. *International Electronic Journal of Elementary Education, 12*(2), 137-143. https://doi.org/10.26822/iejee.2019257659

Reese, E., & Read, S. (2000). Predictive validity of the New Zealand MacArthur communicative development inventory: Words and sentences. *Journal of Child Language, 27*(2), 255–66. https://doi.org/10.1017/s0305000900004098.

Saranlı, A. G., Er, S., & Deniz, K. Z. (2017). Okul öncesi dönemdeki üstü yetenekli çocukların dil gelişimlerinin analizi, *Yaşadıkça Eğitim, 31*(1), 1-20.

Shapiro, L. R. & Hudson, J. A. (1991). Tell me a make-believe story: Coherence and cohesion in young children's picture-elicited narratives. *Developmental Psychology, 27*(6), 960-974. https://doi.org/10.1037/0012-1649.27.6.960

Schick, A. & Melzi, G. (2010). The Development of children's oral narratives across contexts. *Early Education and Development, 21*(3), 293-317. https://doi.org/10.1080/10409281003680578

Schneider, P., Dubé, R.V., & Hayward, D. (2005). *In The Edmonton Narrative Norms Instrument.* http://www.rehabresearch.ualberta.ca/enni/.

Schneider, P., Hayward, D., & Dube, R. V. (2006). Storytelling from pictures using the Edmonton Narrative Norms Instrument. *Journal of Speech Pathology and Audiology, 30*(4), 224-238.

Shiel, G., Cregan, Á., McGough, A., & Archer, P. (2012). Oral language in early childhood and primary education (3-8 years). *National Council for Curriculum and Assessment.* http://www.erc.ie/documents/oral_language_in_early_childhood_and_primary_education_3-8_years_.pdf

Slobin, D. I. (2004). The many ways to search for a frog: Linguistic typology and the expression of motion events. In S. Strömqvist & L. Verhoeven (Eds.), *Relating Events in Narrative* (pp. 219–257). Psychology Press.

Soares, A. D., Goulart, B. N. G., & Chiari, B. M. (2010). Narrative competence among hearing-impaired and normal-hearing children: analytical cross-sectional study. *Sao Paulo Medical Journal, 128*(5), 284-288. https://doi.org/10.1111/1460-6984.12427

Stadler, M. A. & Ward, G. C. (2005). Supporting the narrative development of young children. *Early Childhood Education Journal, 33*(2),73–80. https://doi.org/10.1007/s10643-005-0024-4

Şen, S. Yıldız Çiçekler, C., & Yılmaz, R. (2010). Okul öncesi eğitim kurumlarına devam eden ve etmeyen 5-6 yaş çocukların üstdil becerilerinin incelenmesi. *Ondokuz Mayıs Üniversitesi Eğitim Fakültesi Dergisi, 29*(2), 37-54.

Topbaş, S., Bestoy, U., Demirpehlivan, B., Sezer, E., Kılıç, M. A., & Deniz, M. (2004). *Gaziantep ilinde yaşayan 5:0-8:0 yaş çocuklarının dil gelişimlerinde sesbilgisel işlemlerin incelenmesi.* 2. Ulusal Dil ve Konuşma Bozuklukları Kongresi Bildiri Kitabı. Kök Yayıncılık.

Topbaş, S., & Güven, S., (2013). *TEDIL-Türkçe Erken Dil Gelişim Testi (TELD-3: Test of Early Language Development-Third Edition: Turkish).* Detay Yayıncılık.

Tulu, Y. (2009). *Ana dili Türkçe olan ve ana dili Türkçe olmayan (iki dilli) 4–7 yaş çocukların dil düzeylerine etki eden faktörlerin incelenmesi* (Yayınlanmamış yüksek lisans tezi). Selçuk Üniversitesi.

Uchikoshi, Y., Santos, C., Gomez, F., Keith, K., & Jazo, E. (2005). Narrative development in bilingual kindergarteners: can Arthur help? *Development Psychology, 41*(3), 464–478. https://doi.org/10.1037/0012-1649.41.3.464.

Wagner, C. R., Nettelbladt, U., Sahlen, B., & Nilholm, C. (2000). Conversation versus narration in pre-school children with language impairment. *International Journal of Language and Communication Disorders, 35*(1), 83-93. https://doi.org/10.1080/136828200247269.

Westby, C., Richard, V. D., & Maggart, Z. (1989). Assessing narrative competence. *Seminars in Speech and Language, 10*(1), 63-76. https://doi.org/10.1055/s-0028-1082490

Yıldız Bıçakçı, M., & Aral, N. (2009). Dil gelişimi. In N. Aral & T Duman(Eds.), *Eğitim Psikolojisi* (pp.115-130). Kriter Kitabevi.

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It's Hard, but I Can Do It: How an Independent Engineering Fair Project Can Affect Student Perceptions Of Science

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Abstract

Incorporating authentic engineering practices into educative experiences in elementary school has the potential to positively impact student consideration of STEM careers and increase student self-efficacy in later engineering study. Additionally, as students move from primary to secondary grades, their interest in STEM topics tends to decline. To that end, teachers and researchers at Chaparral Elementary facilitated an independent engineering fair project to engage students in authentic practices of engineering to solve a self-identified problem with a designed or improved solution. We investigated how students' perceptions of science and engineering were affected by their engagement in the practices of engineering through a two-week long independent engineering fair project. Data sources for the study include student surveys, researcher qualitative memos, informal student interviews, and student presentations. Our findings indicate that as students engaged with their independent engineering projects, their understanding of science as a tool for explaining the natural world improved and their perceptions of science and engineering and themselves as scientists and engineers was positively impacted.

Keywords:

Elementary Science, Elementary Engineering, Engineering Fair, Student Perceptions

Introduction

The introduction of engineering practices in elementary school has the potential to positively impact student consideration of careers across science, technology, engineering, and mathematics (STEM) fields (National Academy of Engineering and National Research Council, 2009; Ritz & Fan, 2015). Engineering design is an iterative process that introduces students to the notion that there are likely multiple solutions to a problem through a context requiring relevant content knowledge across STEM domains (National Research Council, 2009). In addition to supporting 21st century skills such as problem solving through a reflective, collaborative process using higher-order thinking

(Fan & Yu, 2017; Marulcu & Barnett, 2015; Wendell et al., 2017), engineering processes have been shown to support student content understandings in science (Atman et al., 2007; Capobianco et al., 2015; English & King, 2015; Guzey et al., 2017; Marulcu & Barnett, 2015; Wendell & Rogers, 2013).

As students move from elementary school to secondary school, their interest in science tends to decline (Christidou, 2011; Kang & Keinonen, 2018; Potvin & Hasni, 2014b). However, introducing engineering practices to students in the early grades has been shown to increase their self-efficacy in engineering in the college years (Fantz et al., 2011). To this end, additional research is needed to understand in what ways engineering can be implemented into elementary school curriculum and how it impacts students' perceptions of STEM practices and career fields (McCormick & Hammer, 2016; McFadden & Roehrig, 2019).

Background

Traditionally, elementary teachers have attempted to engage students in authentic science through the inclusion of science fair projects. Some argue that science fairs serve as a source of anxiety for teachers, parents, and students (Carrier, 2006) and that the common step-by-step formulaic processes do not connect students to authentic science (Magee & Flessner, 2012). However, science-fair projects that promote student-guided inquiry have the potential to increase student self-efficacy in science (Dionne et al., 2012) and increase student attitudes towards and understanding of inquiry (Schmidt, 2014). Additionally, engaging in student-centered inquiry experiences in science can aid students as they approach more complex scientific concepts (Bellipanni & Lilly, 1999).

Combining an approach towards elementary science education that values the inclusion of engineering processes and student-centered, autonomous, inquiry experiences we worked with three fifth-grade teachers at a local elementary school to design and implement an independent engineering fair. We used the engineering fair experience to investigate how students approach the process of engineering design and how completing an individual project impacted their perceptions of science.

Science Project Fairs

Science fairs have traditionally been used to engage students in authentic science and researchers have concluded that engaging students earlier with hands-on experiences in science eases the transition to complex scientific concepts (Bellipanni & Lilly, 1999) Dionne and colleagues studied students' motivational factors for participating in science fairs and the influence on their interest in STEM careers. Factors included an interest in science, self-efficacy, assurance of achievement, social aspect, and working on strategies to gain scientific knowledge. The authors stated, "for teachers who strive to make science more appealing to a larger audience of students, science fairs are considered to be promising pedagogical activities because they promote inquiry-based learning" (Dionne et al., 2012, p. 672). Schmidt (2014) confirmed participation in science fairs increased students' attitudes and understanding of inquiry. The study revealed students who have more autonomy over their projects gained the most positive attitudes towards science (Schmidt, 2014).

Engineering as a Tool to Learn Science

The Nebraska Project was a collaboration of the College of Engineering and Technology and the College of Education and Human Sciences at the University of Nebraska-Lincoln and designed for middle and high school math and science teachers. The program focused on increasing teacher awareness of engineering and increasing their self-efficacy in teaching engineering. Teachers participating in the programs reported an increase student interest in math, science, and engineering. In the second year of the program, researchers specifically asked students if their interests towards STEM were increased. Eighty-six percent of the students said they "strongly agreed" or "agreed" they learned something from their lessons and 75% stated the lessons increased their interest in STEM. The concluding impact on students also showed increased awareness and interest in engineering (Nugent et al., 2010). These findings suggest a positive influence on students' attitudes and interest in STEM.

Engineering poses real-world solutions to problems and students are given the autonomy to solve them (Cunningham & Lachapelle, 2014). It is not surprising that studies show an increase in students' interest in STEM careers when engineering design is incorporated in curriculum (Benenson, 2001; Cunningham & Lachapelle, 2014; Fortus et al., 2004; Silk et al., 2009). Engineering challenges situated in the real world are often attractive to and motivating for students, particularly those who are otherwise underserved or underrepresented in the discipline (Cunningham & Lachapelle, 2014). Fortus and colleagues (2004) supported using design-based science (DBS) to increase student knowledge and interest in science. Current curriculum, they argued, is not based in real-world problems where students struggle through decisions that are not easy to make (Fortus et al., 2004). In addition to solving real-world problems of relevance to students, including engineering design in the classroom allows students

to question their data when it is contrary to what they believe to be right (Benenson, 2001) and students can represent their ideas with concrete artifacts (Fortus et al., 2004).

Silk, Schunn, and Cary (2009) conducted a study of the pre-post gains of scientific reasoning of eighth-grade students located in a high-needs urban setting. The methods of instruction consisted of an emphasis on DBS, inquiry, and textbook curriculum supporting science methods used in the DBS project. Results concluded significant gains in science reasoning using all three methods of teaching, with DBS curriculum showing the most gains. The study concluded "student's knowledge of science reasoning improves if it is taught explicitly in a rich context" (Silk et al., 2009, p. 219).

Ganesh and Fulton (2011) also supported using engineering-design projects to increase students' knowledge in science and technology when they are involved in the learning process. Using engineering design over a two-year period, the authors wanted to determine the characteristics of a successful learning experience for middle school students. Characteristics included: hands-on experiences using engineering design, using the instructional sequence of the 5E's (engage, explore, explain, elaborate, and evaluate), access to technology and tools, and an apprenticeship with university students and engineers. Students became empowered and gained knowledge in technology (Ganesh & Fulton, 2011).

Engineering and Student Self-Efficacy, Interest, and Attitude Towards STEM

A study of college students determined those who were exposed to engineering practices at a younger age tended to be more interested and have higher self-efficacy in engineering (Fantz et al., 2011). Inspired by this research, Zhou and colleagues (2017) studied the influence of engineering at the middle-school level. Their study investigated how toy-design activities increased students' self-efficacy in and knowledge of engineering design. Students with limited experience in engineering design may have lower self-efficacy and thus not enroll in engineering programs later in their schooling career. Fostering self-efficacy as early as elementary could help increase interest in engineering. The study included 24 middle school students between the ages of 13-14 who were engaged in building relatable objects they could play with, such as a Marshmallow Challenge and Nerf Blaster Dissection, capitalizing on relevance and students' prior knowledge and skills. The results of the study showed an increase in self-efficacy in engineering as well as increased knowledge of engineering design (Zhou et al., 2017).

Engineering in Elementary

While there is little present research investigating how exposure to the processes of engineering design affects elementary students, researchers have suggested exposure to science and engineering as early as elementary school may have a positive effect on students' self-efficacy, attitude, and interest in science (Cunningham & Lachapelle, 2014; Samuels & Seymour, 2015; Zhou et al., 2017). The current literature is centered on middle and high school students, suggesting more research is needed at the elementary levels (Cunningham & Lachapelle, 2014; Dionne et al., 2012; Hirsch et al., 2007; McFadden & Roehrig, 2019; Nadelson et al., 2015).

Student Perceptions of Science and their Possible Selves

Student perceptions of their possible future selves are influenced by their current identity and experiences and represent specific, personalized conceptions of who one could become in a given social context (Markus & Nurius, 1986). For students to imagine their future possible selves engaging in science coursework or careers, they need to feel as though there is a place for them in science and that they possess the competencies required. Engaging students in authentic, relevant, problem-driven science experiences has the potential to positively affect student perceptions of and motivation for science learning (Hellgren & Lindberg, 2017; Kang & Keinonen, 2018; Potvin & Hasni, 2014a).

Context

This study was conducted at Chaparral Elementary (a pseudonym). Chaparral Elementary includes grades pre-k through fifth and is in a suburban setting in the central United States. Upon enrollment, a majority (55.8%) of the 513 students were identified as Caucasian, 12.7% Hispanic, 7% Black, 5.1% Native American, 1.4% Asian, and 18.1% two or more races. Over half of the students (56.3%) are eligible for Free/ Reduced Lunch. On state readiness testing, 47% of all fifth-grade students scored proficient and above (Office of Educational Quality & Accountability, 2017). Fifth-grade classes at Chaparral Elementary are 1:1, meaning for each student in the class there is a laptop computer available for use. In addition, at the time of the study the district utilized Google Classroom for student-teacher communication and assignments that require the use of technology.

The independent engineering fair took place over a two-week period near the end of the academic year, after state testing (see Feille et al., 2021a). Students were asked to identify a real-world problem they were interested in, research possible solutions, use research

findings and content knowledge to design or improve a solution, communicate their proposed solution through the use of drawn prototypes, and present their process at the close of the fair. The design portion of the project focused students on an iterative process using drawn sketches for generation and communication of student ideas, an important step prior to constructing physical prototypes (McFadden & Roehrig, 2019).

This qualitative, single case study investigates the effect of individual engineering fair projects as authentic science teaching and learning experiences. Participants in the larger study include fifth grade students across three classes and their classroom teachers. This manuscript includes only student-focused data and investigates the question, how does participation in an individual engineering fair project affect student perceptions of science?

Participants

The participants in this study include 29 of 90 fifth grade students in three classes. Although all 90 fifth grade students completed the engineering fair projects, the students included in the study provided both parent permission and student assent to contribute data to the study. All identifying information was immediately removed from student data and each assenting student was assigned a unique numerical identifier and later a pseudonym. To avoid the identification of any participants, only the student's gender and assigned class remain as an identifying feature in the reporting of data (see Table 1).

Table 1
Consenting student participants

Class	Male	Female
Ms. Powers*	5	5
Ms. Myer*	5	7
Ms. Ferguson*	2	5

Note: Teacher names are pseudonyms

Data

The data sources used in this study include a student survey (Elementary Student Perceptions of Science Instrument [ESPOSi]), researchers' observations and field notes collected throughout student work and presentation of individual engineering fair projects, as well as recorded and transcribed informal interviews conducted at student presentations.

The ESPOSi student survey seeks to provide a baseline of student understandings of science as an explanation of the natural world, view and value of science, and view and value of formal science learning (Nettles et al., 2018). The survey utilizes multiple modes of questioning including single-choice and multiple-choice as well as open-response questions. Student responses are then coded as Low-Mid-High for each question utilizing a rubric (see Appendix). Finally, students are described as Low-Mid-High for each of the three focus areas (science as an explanation of the natural world, view and value of science, and view and value of formal science learning).

The research team moved among classes while students worked on their individual engineering fair projects and for student final presentations of their projects acting as participant observers. During this time, the research team interacted with students inviting them to describe their ideas and thoughts about the process. Detailed field notes and post-experience reflections were recorded to describe observations of student work, student-teacher/student-student interactions, and any notable questions or descriptions.

Finally, consenting student presentations were audio recorded and prototype drawings and diagrams were photographed. At the close of their presentation, each student was asked if their ideas about science and engineering had changed throughout the project as well as how they now thought of themselves as scientists and engineers. Responses were audio recorded and hand transcribed.

Method

Prior to beginning their individual engineering fair projects, each student completed the ESPOSi online using Qualtrics (Qualtrics, 2018) and their assigned laptop computer. For nine school days, the students spent approximately one hour each day on their engineering fair projects. Table 2 outlines the timeline of the study.

Table 2
Study outline

Study Day	Event	Data Collected
Prior to project	Obtain parent permission ESPOSi	ESPOSi Survey Data
Day 1	Topic Brainstorm	Observational Memos
Day 2	Purpose	Observational Memos
Day 3	Background Research	Observational Memos
Days 4 - 6	Prototype Plan	Observational Memos
Days 7 - 8	Improve Prototype Design	Observational Memos
Day 9	Present project and final prototype design.	Audio recorded Student Presentations & Informal Interviews

ESPOSi results were analyzed according to the survey rubric (See Appendix). Field notes and informal student interviews were transcribed and coded using MAXQDA 2018 (VERBI Software, 2017) for data analysis. Using constant comparative analysis (Glaser, 1965), data segments were coded primarily with themes

taken from the ESPOSi student survey (science as explanation of natural world, view and value of science, and view and value of formal science learning) and secondarily with themes that emerged throughout data collection and analysis (Stake, 2010). Regular research team meetings were used to identify researcher agreement and discuss instances of conflicting coding to come to consensus.

Student silhouettes were then constructed using individual ESPOSi results paired with coded data segments from research memos and presentation transcriptions. Silhouettes of the participants lack the detail of portraiture (Lawrence-Lightfoot & Hoffmann-Davis, 1997) but can provide an "outline or shadow" of the individual participant and their perceptions of science throughout the independent engineering fair project (Feille et al., 2018, p. 33).

Findings

Researcher memos and field notes were used to investigate student perceptions of science throughout their experience participating in an independent engineering fair. Informal student interviews and student presentation data provide a source of triangulation in conjunction with ESPOSi pre-experience survey results.

ESPOSi

Fifth grade students at Chaparral Elementary generally demonstrated Mid-level perceptions of formal science learning (*N* = 25). This indicates that students generally associate science learning with passive learning practices related to specific content; and when learning is active students refer to general descriptions of practice such as "experiments" or "hands-on." Only three students demonstrated a Low perception of formal science learning while zero demonstrated a High perception of formal science learning. Students can be described as demonstrating Mid (*N* = 11) to High (*N* = 14) perceptions of science indicating that students see science as a meaningful enterprise, applicable to career choice, and necessary at the basic level of knowledge for society. In addition, students may initially turn to scientific practices as methods for problem solving. Very few students (*N* = 3) demonstrated a Low perception of science. Most student participants indicated Low (*N* = 20) to Mid (*N* = 8) conceptions of science as a way of knowing and understanding the natural world. This reveals that although they are aware of science as a field of study, the application of scientific practices and knowledge may be limited to an academic or content-specific setting. Table 3 describes the ESPOSi rubric coding by question.

Field Observations

Throughout student work on their independent engineering fair projects, researcher field memos revealed that although students frequently struggled with the autonomy of the project (Brophy et al., 2008), they appreciated attending to a topic they had interest in (Brown, 2017; Cunningham & Lachapelle, 2014). Early in the project, a lack of knowing the nature of engineering practices resulted in student frustrations for a few students who shared an intense focus on finding the "right answer" (Memo_Day2). Due to the novelty of the engineering practices, many students also struggled to understand their role related to their self-identified problem (Memo_Day3). The novelty of the process and the lack of a "right" answer required scaffolding and prompting for some students more than others (Lou, 2015; McFadden & Roehrig, 2019). Some of students' struggles seemed to relate to individual teacher's teaching engineering self-efficacy (see Feille et al., 2021b). As the teachers' confidence in facilitating the engineering fair project gained, so did students' comfort. Through teacher scaffolding and reassurance, students eventually came to understand that their purpose was to create or improve upon a solution to their identified problem and that failure along the way was all a part of the process (Memo_Day4).

Over the course of the project, students generally moved away from a more simplistic view of science as a way of knowing where they talked primarily of science topics from the context of an academic setting towards a broadened view of science and engineering in real-world contexts (English & King, 2015). Because the project focused students' attention on identifying a problem and designing their self-conceived solution, students were free to capitalize on their own creativity rather than work within prescribed situations and scenarios (Memo_Day4). By the end of their experience, many students reflected upon the broader application of scientific and engineering practices for problem solving and understanding phenomena of the natural world (Fortus et al., 2004).

Table 3

ESPOSi Results by question

	Perceptions of Formal Science Learning				Perceptions of Science			Science as a way of knowing		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q1	Q2	Q3
Low	12	11	4	5	8	3	1	18	20	20
Mid	15	16	13	4	8	20	3	10	8	5
High	1	1	11	19	12	5	24	0	0	3

Additionally, several students were forced to recognize how their current scientific understandings could limit their proposed solutions but used the project to support scientific research and investigation on their own (Ganesh & Fulton, 2011). Rather than seeing limited content knowledge as a dead end, students instead identified who might be important design partners or resources as their proposed prototype moved forward (Memo_Day5).

Student Presentations

"I thought like, science, and (pause) technology and stuff like that. I always thought it was circuitries, and circuit boards, and wires, and speakers and batteries. and all that stuff. But really it's like everything. Science is everything" (Lena_presentation). During student presentations, students continued to reflect upon how they think about science differently after the project, "I think science can be a lot more fun than I first thought about it" (Jeremy_presentation). Students talked about science as broader than how they originally conceptualized the subject, more than "just chemicals". "Science is pretty much anything that is man-made and like a helpful, like piece of material that helps us in the world" (Marc_presentation). They continued to describe science as difficult or hard, but their perceived self-efficacy was improved with several students indicating "science is hard, but I can do it" (Memo_presentations).

Embracing the value of failure was something several students mentioned in their presentations celebrating that repeated failure usually ends in success, "You might fail 1,000 times. As long as you make it once, it doesn't matter" (Eddie_presentation). The persistence they experienced contributed to their understanding of engineering, "Well, it doesn't always work the first time. You have to go through it multiple times. You have to brainstorm, one idea, your first idea isn't going to work. That's for sure. You have to keep it and add on to it" (Hannah_presentation). Problems in design frustrated some students and had them grappling with how much support or feedback they really wanted, "(I felt) frozen, like I wasn't really sure what to do...and sometimes getting too much help is baddish, then you also want to ask for help when you need it the most" (Elijah_presentation).

Students also described science and engineering as progress, tools to make the world a better place (Lena_presentation). They recognized that their creativity played a role in using the tools and practices of science and engineering to improve their world, "I learned that really science could be anything. Like whether it's a rock or it's a new computer. And that really that, like, if you are creative, you can make an entirely new line of technology" (Jasmine_presentation). For some, being able to showcase their creativity contributed significantly to their enjoyment of the project, "I had a lot of fun doing this project...(be)cause I saw a lot of creativity in it. And I love doing creative things" (Ella_presentation).

A very small number of consenting students ended up without completed projects. It is possible that a fear of failure contributed to student apathy (Memo_presentations). One student admitted he usually quits on projects like this, but he committed to finishing this project and wished he had done more.

I know I could have had a better problem and a better answer just because I wanted to rush through it. I feel kind of happy about it because I actually did something...Usually I don't get finished with problems and work like this. I wish I could have done a better job (Roman_presentation, Memo_presentations).

The limitations of time and the constraints of the formal classroom environment hindered some students. "To do one project takes a long time" (Justin_presentation) and some struggled with the structure of the slideshow, so many students were not at the point they hoped to be by the time of the presentations.

Silhouettes

When considering science as an explanation of the natural world, students generally described science as broader than they originally thought. Science became for them a tool to understand more about their world through the independent engineering fair project. Students' views and values of science were impacted as they began to consider themselves as ones capable of doing science and engineering. They appreciated the creative aspect associated with solving authentic and relevant problems (Brown, 2017; Cunningham & Lachapelle, 2014; Nugent et al., 2010). For several of the students, the experience shifted their views towards formal science learning as they began to see learning in the science classroom as something they could enjoy and desire to work hard for. A selection of student silhouettes is shared in Table 4.

Concluding Statements

Students entered the engineering design process with an emerging understanding of science as a tool to explain the natural world and did not consider the practices of science and engineering when approaching problems. Students may not have seen themselves as scientists or engineers prior to engaging in the independent engineering fair project and instead considered science primarily in the context of schoolwork rather than a personal endeavor. However, working through their self-identified problem to conceptualize a new or improved

Table 4

Selected Participant Silhouettes

Pseudonym	ESPOSi	Silhouette
Elijah	Low Perceptions of Formal Science Learning Low Perceptions of Science Low Conceptions of Science as a way of knowing	Entering the project with overall low perceptions of science, Elijah struggled with the patience to commit to solving his problem. He encountered several problems with his design that had him feeling "frozen" and unsure with how much help to ask for. Despite persisting through the project, he admitted he doesn't see himself as an engineer because he doesn't have the "patience for things."
Sadie	Low Perceptions of Formal Science Learning Mid Perceptions of Science Low Conceptions of Science as a way of knowing	Sadie entered the project with a low perception of formal science and science as a way of knowing. She acknowledged that the project helped her learn a lot about how things work and thanks to the project she kind of "got into (science) now". The project helped her value the processes of science and engineering, admitting that she can't just "do something random" and expect it to work out.
Jasmine	Mid Perceptions of Formal Science Learning Mid Perceptions of Science Low Conceptions of Science as a way of knowing	Jasmine began the engineering fair project with mid-level views of science and a low conception of science as a way of knowing. But through the project learned that science is broader than her previous conceptions. Coming to understand the role of creativity helped her to engage with the project acknowledging that her desire to be creative could contribute to her future as an engineer.
Roman	Mid Perceptions of Formal Science Learning High Perceptions of Science Low Conceptions of Science as a way of knowing	Roman started the project with a varied perception of science. While he valued science and tolerated the formal classroom, he had low conceptions of science as a way of knowing. He described himself as a student who usually rushes through work. Completing the project gave him a sense of pride, despite admitting he knew he could have done better.
Addie	High Perceptions of Formal Science Learning High Perceptions of Science Mid Conceptions of Science as a way of knowing	Addie began her project with high perceptions of science. She already understood the incredible reach of science knowing that "we could do things that seem completely impossible – but it happens and it is possible." Engineering was new to Addie and understanding that it is more than "just building" but "constantly improving upon other things" allowed her to see herself as an engineer.

solution allowed many of them to see the practices of engineering as tools to use for problem solving and the scientific content related to their problem as a means to better understand and explain the world around them. Additionally, engaging in the project helped them understand the nature of engineering and the iterative process of prototype design and improvement resulting in a persistence through and appreciation for the process of failure.

This has significant implications to the field of science education and the endeavor to encourage students from all cultural backgrounds and genders to enter STEM fields, therefore addressing the issues of diversity within STEM careers (National Science Board, 2020). Students must first identify as one capable of doing science or engineering before considering a STEM career (Capobianco et al., 2015). Through the independent engineering fair project, each student worked as an engineer and scientific researcher as they sought to design or improve a solution to their identified problem allowing them to identify as capable of engaging in the practices of science and engineering.

The timing of authentic engagement with the practices of engineering during the fifth-grade year may address the decline in interest in STEM students experience as they move from elementary to secondary grades (National Academy of Engineering and National Research Council, 2009). If a task such as the independent engineering fair can address students' perceptions of science and formal science learning, it is possible that value of and commitment to STEM course work and endeavors can be positively impacted (Fantz et al., 2011).

This study is limited by scale, with a participant population including only one third of fifth grade students in a single school. Additionally, our participants were not hindered by traditional constraints related to district and state-mandated testing due to the timing of the project. This leaves room for future studies to consider the ways that this process might be integrated throughout the school year and warrants investigation into how the implications may change with a more inclusive, intentional, school-year long focus.

References

Atman, C. J., Adams, R. S., Cardella, M. E., Turns, J., Mosborg, S., & Saleem, J. (2007). Engineering Design Processes: A Comparison of Students and Expert Practitioners. *Journal of Engineering Education, 96*(4), 359–379. https://doi.org/10.1002/j.2168-9830.2007.tb00945.x

Bellipanni, L. J., & Lilly, J. E. (1999). What Have Researchers Been Saying About Science Fairs? *Science and Children, 36*, 46–50.

Benenson, G. (2001). The unrealized potential of everyday technology as a context for learning. Journal of Research in Science Teaching: The Official *Journal of the National Association for Research in Science Teaching, 38*(7), 730–745. https://onlinelibrary.wiley.com/doi/pdf/10.1002/tea.1029

Brophy, S., Klein, S., Portsmore, M., & Rogers, C. (2008). Advancing engineering education in P-12 classrooms. *Journal of Engineering Education, 97*(3), 369–387. https://doi.org/10.1002/j.2168-9830.2008.tb00985.x

Brown, J. C. (2017). A metasynthesis of the complementarity of culturally responsive and inquiry-based science education in K-12 settings: Implications for advancing equitable science teaching and learning. *Journal of Research in Science Teaching, 54*(9), 1143–1173. https://doi.org/10.1002/tea.21401

Capobianco, B. M., Yu, J. H., & French, B. F. (2015). Effects of Engineering Design-Based Science on Elementary School Science Students' Engineering Identity Development across Gender and Grade. *Research in Science Education, 45*(2), 275–292. https://doi.org/10.1007/s11165-014-9422-1

Carrier, S. J. (2006). The road to stress-free science fairs. *Science and Children, 44*(1), 36–39.

Christidou, V. (2011). Interest, attitudes and images related to science: Combining students' voices with the voices of school Science, teachers, and popular science. *International Journal of Environmental & Science Education, 6*(22), 141–159. https://files.eric.ed.gov/fulltext/EJ944846.pdf

Cunningham, C. M., & Lachapelle, C. P. (2014). Designing engineering experiences to engage all students. *Engineering in Pre-College Settings: Synthesizing Research, Policy, and Practices*, 117–140. https://doi.org/10.2307/j.ctt6wq7bh.10

Dionne, L., Reis, G., Trudel, L., Guillet, G., Kleine, L., & Hancianu, C. (2012). Students' sources of motivation for participating in science fairs: An exploratory study within the Canada-wide science fair 2008. *International Journal of Science and Mathematics Education, 10*(3), 669–693. https://doi.org/10.1007/s10763-011-9318-8

English, L. D., & King, D. T. (2015). STEM learning through engineering design: fourth-grade students' investigations in aerospace. *International Journal of STEM Education, 2*(1), 14. https://doi.org/10.1186/s40594-015-0027-7

Fan, S.-C., & Yu, K.-C. (2017). How an integrative STEM curriculum can benefit students in engineering design practices. *International Journal of Technology and Design Education, 27*(1), 107–129. https://doi.org/10.1007/s10798-015-9328-x

Fantz, T. D., Siller, T. J., & Demiranda, M. A. (2011). Pre-collegiate factors influencing the self-efficacy of engineering students. *Journal of Engineering Education, 100*(3), 604–623. https://doi.org/10.1002/j.2168-9830.2011.tb00028.x

Feille, K., Nettles, J. R., & Weinburgh, M. H. (2018). Silhouettes of Development: A Tool for Understanding the Needs and Growth of Science Teachers. *Journal of Science Teacher Education, 29,* 1–16. https://doi.org/10.1080/1046560x.2017.1422644

Feille, K., Pyle, J., Marshall, J., Wildes, A. (2021b) It's not a perfect thing: Facilitating an independent engineering fair with fifth grade students. *Annual conference of the American Educational Research Association.*

Feille, K., Wildes, A., Pyle, J., & Marshall, J. (2021a). Inspiring young minds with an elementary engineering fair. *Science and Children*.

Fortus, D., Dershimer, R. C., Krajcik, J., Marx, R. W., & Mamlok-Naaman, R. (2004). Design-based science and student learning. *Journal of Research in Science Teaching, 41*(10), 1081–1110. https://doi.org/10.1002/tea.20040

Ganesh, T. G., & Fulton, I. A. (2011). *Design-based research: A framework for designing novel teaching and learning experiences in middle school engineering education.* ASEE/IEEE Frontiers in Education Conference.

Glaser, B. G. (1965). The Constant Comparative Method of Qualitative Analysis. *Social Problems, 12*(4), 436–445. https://doi.org/10.2307/798843

Guzey, S. S., Harwell, M., Moreno, M., Peralta, Y., & Moore, T. J. (2017). The Impact of Design-Based STEM Integration Curricula on Student Achievement in Engineering, Science, and Mathematics. *Journal of Science Education and Technology, 26*(2), 207–222. https://doi.org/10.1007/s10956-016-9673-x

Hellgren, J. M., & Lindberg, S. (2017). Motivating students with authentic science experiences: changes in motivation for school science. *Research in Science & Technological Education, 35*(4), 1–18. https://doi.org/10.1080/02635143.2017.1322572

Hirsch, L. S., Carpinelli, J. D., Kimmel, H., Rockland, R., & Bloom, J. (2007). The Differential Effects of Pre-engineering Curricula on Middle School Students' Attitudes to and Knowledge of Engineering Careers. *2007 37th Annual Frontiers In Education Conference - Global Engineering: Knowledge Without Borders, Opportunities Without Passports,* S2B-17-S2B-21. https://doi.org/10.1109/fie.2007.4417918

Kang, J., & Keinonen, T. (2018). The Effect of Student-Centered Approaches on Students' Interest and Achievement in Science: Relevant Topic-Based, Open and Guided Inquiry-Based, and Discussion-Based Approaches. *Research in Science Education, 48*(4), 865–885. https://doi.org/10.1007/s11165-016-9590-2

Lawrence-Lightfoot, S., & Hoffmann-Davis, U. J. (1997). *The art and science of portraiture.* Jossey-Bass. le.

Lou, Y. (2015). Design Fixation and Cooperative Learning in Elementary Engineering Design Project: A Case Study. *International Electronic Journal of Elementary Education, 8*(1), 133–146.

Magee, P. A., & Flessner, R. (2012). Collaborating to improve inquiry-based teaching in elementary science and mathematics methods courses. *Science Education International, 23*(4), 353–365. http://eric.ed.gov/?id=EJ1001629

Markus, H., & Nurius, P. (1986). *Possible Selves. American Psychologist, 41*(9), 954–969. https://doi.org/10.1037/0003-066x.41.9.954

Marulcu, I., & Barnett, M. (2015). Impact of an engineering design-based curriculum compared to an inquiry-based curriculum on fifth graders' content learning of simple machines. *Research in Science & Technological Education, 34*(1), 85–104. https://doi.org/10.1080/02635143.2015.1077327

McCormick, M. E., & Hammer, D. (2016). Stable Beginnings in Engineering Design. *Journal of Pre-College Engineering Education Research (J-PEER), 6*(1). https://doi.org/10.7771/2157-9288.1123

McFadden, J., & Roehrig, G. (2019). Engineering design in the elementary science classroom: supporting student discourse during an engineering design challenge. *International Journal of Technology and Design Education, 29*. https://doi.org/10.1007/s10798-018-9444-5

Nadelson, L. S., Pfiester, J., Callahan, J., & Pyke, P. (2015). Who is doing the engineering, the student or the teacher? The development and use of a rubric to categorize level of design for the elementary classroom. *Journal of Technology Education*. https://doi.org/10.21061/jte.v26i2.a.2

National Academy of Engineering and National Research Council. (2009). *Engineering in K-12 Education.* National Academies Press. https://doi.org/10.17226/12635

National Research Council. (2009). *Engineering in K–12 education: Understanding the status and improving the prospects.* National Academies Press.

National Science Board. (2020). *The State of U.S. Science & Engineering.* https://ncses.nsf.gov/indicators/

Nettles, J., Feille, K., & Stewart, M. (2018). Informal summer science workshops and student perceptions of science. *Presented at the Meeting of School Science & Mathematics.*

Nugent, G., Kunz, G., Rilett, L., & Jones, E. (2010). Extending engineering education to K-12. *Technology and Engineering Teacher, 69*(7), 14–14.

Office of Educational Quality & Accountability. (2017). *Oklahoma School Profiles.* http://oeqa.ok.gov/

Potvin, P., & Hasni, A. (2014a). Analysis of the Decline in Interest Towards School Science and Technology from Grades 5 Through 11. *Journal of Science Education and Technology, 23*(6), 784–802. https://doi.org/10.1007/s10956-014-9512-x

Potvin, P., & Hasni, A. (2014b). Interest, motivation and attitude towards science and technology at K-12 levels: a systematic review of 12 years of educational research. *Studies in Science Education, 50*, 85–129. https://doi.org/10.1080/03057267.2014.881626

Qualtrics. (2018). *Qualtrics*. http://www.qualtrics.com

Ritz, J. M., & Fan, S.-C. (2015). STEM and technology education: international state-of-the-art. *International Journal of Technology and Design Education, 25*(4), 429–451. https://doi.org/10.1007/s10798-014-9290-z

Samuels, K., & Seymour, R. (2015). The middle school curriculum: Engineering anyone? *Technology and Engineering Teacher, 74*(6), 8–8.

Schmidt, K. M. (2014). *Science fairs and science olympiad: Influence on student science inquiry learning and attitudes toward stem careers and coursework.*

Silk, E. M., Schunn, C. D., & Cary, M. S. (2009). The Impact of an Engineering Design Curriculum on Science Reasoning in an Urban Setting. *Journal of Science Education and Technology, 18*(3), 209–223. https://doi.org/10.1007/s10956-009-9144-8

Stake, R. E. (2010). *Qualitative research: Studying how things work*. Guilford Press.

VERBI Software. (2017). *MAXQDA 2018 [computer software]*. VERBI Software. https://www.maxqda.com

Wendell, K. B., & Rogers, C. (2013). Engineering Design-Based Science, Science Content Performance, and Science Attitudes in Elementary School. *Journal of Engineering Education, 102*(4), 513–540. https://doi.org/10.1002/jee.20026

Wendell, K. B., Wright, C. G., & Paugh, P. (2017). Reflective Decision-Making in Elementary Students' Engineering Design. *Journal of Engineering Education, 106*(3), 356–397. https://doi.org/10.1002/jee.20173

Zhou, N., Pereira, N. L., George, T. T., Alperovich, J., Booth, J., Chandrasegaran, S., Tew, J. D., Kulkarni, D. M., & Ramani, K. (2017). The Influence of Toy Design Activities on Middle School Students' Understanding of the Engineering Design Processes. *Journal of Science Education and Technology, 26*(5), 481–493. https://doi.org/10.1007/s10956-017-9693-1

Appendix

		Secondary Code		
Primary Code	Relevant ESPOSi Questions	Low	Medium	High
Science as a way of knowing Science is both a body of knowledge and the processes and practices used to add to that body of knowledge. Science knowledge is cumulative and many people, from many generations and nations, have contributed to science knowledge. Science is a way of knowing used by many people, not just scientists. (Appendix H NGSS)	What are some things that you know, if you are really good, or an expert at science?	LOW: One-word response that is simplistic or general in nature	MID: Provides simplistic evidence of understanding of the practices of science but is limited to a single facet of science as an explanation of the natural world	HIGH: Detailed response that demonstrates an explicit understanding of science as a process to explain the natural world
	If someone told you they were "doing science", what would you think they were doing?	LOW: General response that is not specific to scientific explanation of the natural world	MID: General response that is related to a scientific process providing explanation of the natural world	HIGH: Detailed response is related to a scientific process providing explanation of the natural world
	Click on each picture that you think of as Science.	0-3	4-6	7+
Perceptions of Science. What are students' understandings and perceptions of and appreciation for science (as a tool, as a way of knowing, and as a potential career)?	If science was not a required subject to study (meaning people did not have to take science classes), how would it impact you? Your friends? Your city? Your country?	LOW: Response that indicates a positive impact	MID: General response that shows limited value of science	HIGH: Specific response that details impact and personal and/or broader value of science
	Click in the box next to each career (job) that you think needs science	0-4	5-8	9+
	You notice that your birdfeeder in your back yard is running out of birdseed faster than usual. What would you do to find out why?	Take down the birdfeeder	Ask an adult who might know OR Look it up on the internet	Collect data and observations and investigate
	Click next to all of the things you expect to do in your next science class at school.	0-3	4-7	8-11
	Which picture best shows what you think of when you think of science at school?	Notes from textbook or website	Teacher demonstration	Formal lab science OR Learning about schoolyard habitat OR Lab with safety equipment
Perceptions of formal science learning What are students' understandings and perceptions of and appreciation for classroom-based science learning?	What do you hope your science class next year will be like? What do you hope will happen in science class?	LOW: Vague response without reference to science processes or content	MID: Passive recipient of scientific knowledge or active participant without specific reference to scientific process or content	HIGH: Active participant in specific scientific processes or content
	Imagine you are at school and your next class is science. What will you be doing?	LOW: Vague response without reference to science processes or content	MID: Passive recipient of scientific knowledge or active participant without specific reference to scientific process or content	HIGH: Active participant in specific scientific processes or content

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Teachers' Experiences on Instructional Design Based Professional Development: A Narrative Inquiry

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Abstract

Empowering teachers as instructional designers strengthen the link between theory and good practice. The purpose of the research is to explore two teachers' experiences about a professional development (PD) program. The PD includes a one academic year program with the aim of developing teachers' instructional design knowledge and skills using Understanding by Design model as reference. Teachers' instructional designs improved in terms of UbD design principles, and they reported change in their attitudes and teaching practices after the fourth cycle. Continuous discipline-specific feedback and trust bond based on prolonged communication underlined as major elements of PD that facilitated teacher change.

Keywords:

Professional Development, Curriculum, Narrative Analysis

Introduction

Considering the role of education in providing students with complex and high-level skills so that they can achieve self-realization and contribute to society, it is critical to use scientific knowledge for production, doing research by using gained information in their professional and daily life, problem solving and decision-making skills (Trilling & Fadel, 2009). This brings the necessity of teaching-learning activities that are compatible with the current curriculum but can go beyond the attainments foreseen in the programs in terms of skills, reaching the student with authentic methods and putting student participation and performance to the forefront. Participation is especially important in terms of transformative competencies that empower students to shape the future (OECD, 2019). As 21st skills became essential, more and more countries across the world give effort to adjust their educational systems to equip children and young people with the skills that go beyond 3Rs (Global Partnership for Education, 2020). School curricula were recommended to allow non-linear learning paths, be more flexible and relevant to unique characteristics and talents of students (OECD, 2019). Designing flexible learning environments that allow all students to experience 21st century skills and fulfill their potentials, the participation

of teachers in the instructional design process is very critical. The importance of teachers' involvement in the instructional design process along with their widely accepted implementations is also emphasized in literature (Kelly, 1999; Penuel & Gallagher, 2009; Pinto, 2005). Similarly, in Turkish context more research studies have been carried out to empower teachers as designers (Hacıömeroğlu, 2018; Ozgen, 2019; Yurtseven & Altun, 2019). The fact that teachers create their instructional design leads them to embrace this instructional design and to implement it more effectively (Ben-Chaim et al., 1994, Fullan & Hargreaves, 1992, Voogt et al.,2016). Empowering teachers as instructional designers also strengthens the link between plan and implementation, thus ensuring that high-level skills are delivered to students efficiently.

Teachers as Instructional Designers

Although teachers' professional development (PD) as instructional designers are widely accepted in the relevant literature, how teachers will achieve this development still stands out as an open subject for research. At this point, directing teachers too little or too much during the design process can cause negativity during the design process (Pinto, 2005). Teachers were recommended to work with experts to adopt the aims and methods of instructional design and to be involved in an informed design process (Nieveen&Van der Hoeven, 2011). Providing support by teacher educators in a PD activity is useful in terms of both the creation of the design and the learning processes of teachers (Clarke & Hollingsworth, 2002; Garet et al., 2001; Putnam & Borko, 2000). At this point, widely accepted effective practices about PD studies should also be considered. For example, Darling-Hammond (2012) mentioned five important elements of effective PD as sustainable, content-based, embedded in professional learning communities, and original environments that include teaching, assessment, monitoring and reflection.

Understanding by Design

Along with the importance of empowering teachers as instructional designers in the context of professional development studies, the instructional design model to be used in these studies also become prominent. In this context, it becomes important to adopt an instructional design model that is compatible with the general objectives of education, which is holistic, includes all stages of the teaching-learning process and supports the teacher in terms of the activities to be carried out throughout the process.

Understanding by design (UbD) model, which emphasizes the designer role of the teacher among contemporary teaching design models and focuses on student learning, has been a model frequently preferred by teachers and school administrators. UbD is a design model that focuses on students' understanding and accepts learning as a process of discovery. In this process, while teachers act as mentors and facilitators, they create their designs with the philosophy of "backwards design", while students also try to achieve permanent understandings by exploring, questioning, and applying information to new areas (Yurtseven & Altun, 2019). The most distinctive aspect of UbD is the backwards design approach. Backward design suggests firstly determining learning outcomes and assessment evidence, and then planning teaching-learning activities to gain these outcomes and evidence (Biggs & Tang, 2011; & Wiggins & McTighe, 2005). Planning the learning process in line with the expected outcomes of students at the end of the process gives opportunity to focus on learning rather than teaching. In an instructional design that focuses on learning, content knowledge, teaching methods and materials used are in the second place in line with learning outcomes. In this way, UbD has three stages: (1) identifying desired results, (2) determining assessment evidence, and (3) planning learning experiences and instruction (Wiggins & McTighe, 2005). The second distinctive aspect of UbD is that it focuses on student understanding. It suggests that understanding associates with making inferences and transferring the knowledge into new situations. It divides understanding into six facets as explanation, interpretation, application, perspective, empathy, and self-knowledge (McTighe & Wiggins, 2012; Wiggins & McTighe, 2005).

The reason why UbD is chosen for this study can be expressed with is teacher empowering aspect, focusing on student learning, and development of 21st century skills. From this point of view, the aim of the study is to examine teachers' UbD learning experiences within the PD program. We focused on the research question: What are the experiences of teachers throughout the PD program in terms of their improvement in instructional design knowledge and skills? To frame teachers' narratives, we had below sub-questions:

- How did the teachers' knowledge of UbD design principles develop?
- How did the teachers' skills to prepare UbD plans develop?
- What are the experiences of the teachers about the class implementations of their instructional designs?
- How do teachers evaluate their changes in the PD process?
- Which goal do teachers set for themselves regarding their PD in the future?

Method

We used the narrative study design, one of the qualitative research designs. Qualitative research includes studies aimed at understanding the experiences of individuals and determining what meanings individuals attribute to these experiences. In the narrative studies, the experiences of individuals related to their real-life situations are tried to be presented within the framework of their own stories. Individuals tell their experiences in a narrative way, with a beginning, middle, and end (Merriam & Tisdell, 2016). Narrative studies aim to make inferences about how individuals understand situations, others and themselves (Polkinghorne, 2007). The difference of narrative studies from other qualitative research designs is that it helps others or individuals to organize their own actions, experiences and events in a meaningful way and relates the consequences of actions and events over time. Within the scope of narrative studies, some or all of the lives of individuals can be included, as well as shorter and focused studies (Chase, 2011).

Narrative studies should have dimensions of situation, continuity, and interaction. Accordingly, narrative studies are individual interactions that take place depending on a situation, focusing on the past, present, and future (continuity) (Connelly & Clandinin, 1990). From this point of view, the study focused on the changes in knowledge, skills, and attitudes of the two teachers about the UbD process, their past and current PD participation; and their expectations for the future were identified. Similarly, the researchers made suggestions for the PD process based on the past and present experiences of the participants. Detailed information about the participants and the PD process was included to form the context of the teacher's narratives. The interaction with the participant teachers continued at all stages of the PD process and during the interviews.

To describe the narratives of the teachers' experiences these steps are followed:

- Before the PD process, teachers were interviewed. Their expectations from the process were asked,
- PD trainings were provided to teachers based on the UbD model for developing instructional design,
- Teachers prepared their first UbD designs,
- Teachers were given feedback about their designs in the interim meetings, and finalized the design by making the necessary revisions,
- Teachers prepared their second, third and fourth instructional designs respectively,
- Teachers implemented the instructional designs in the classroom,
- Interim meetings were held with teachers to hear their opinions about the process.

Participants

The participant teachers are one Turkish Language and one Science teacher working in a private school in Istanbul at the secondary school level. To present the narratives of teachers' learning experience we selected two teachers from two different disciplines and are willing to explain their learning process in more detail. The participant teachers were both task oriented, they were motivated to pursue the professional development program. Turkish language teacher had intrinsic motivation to learn instructional design, however, the science teacher is more extrinsically motivated to complete the tasks within the professional development program. They were both in management positions for their departments. In this sense, their thoughts about the professional development program could reflect the overall views of the other teachers in their departments. This selection of participants allowed us to compare two different stories of teachers.

Turkish Language Teacher: She graduated from Turkish Language Teaching Undergraduate Program. After graduation, she worked as a Turkish Language teacher for four years at a public school, and later as a Turkish Language teacher at private schools. She has been working at her current school for ten years. For the last three years, she has been working as the secondary school vice principal as well as head of the Turkish Language department. She completed her 24th year in the profession. She adopts student-centered teaching as a learning approach. She is a teacher open to innovations but accepts such innovations if the innovations will make a difference in the teaching environment. She prefers to work in cooperation with her colleagues as a professional principle.

Science Teacher: She graduated from Science Teaching Undergraduate Program. After graduation, she worked as a science teacher in a public school for twenty years, and after retiring from there, she worked as a science teacher in private schools. She has been working for eight years at his current school. For the last two years, she has been the head of the science department. She completed her 30th year in the profession. She adopts child-centered teaching as her learning approach. She contributes to the innovations suggested by the school. She believes that she will be successful in PD training if she is given the right consultancy.

Professional Development Process

This study was carried out throughout 2018-2019 academic year. The content and process of PD

experience is arranged around two major domains: Initial UbD Training and UbD teaching practices. Initial UbD training included a three-day seminar and workshop series with the aim of increasing teachers' knowledge about UbD. UbD teaching practices domain covered teachers' activities and researchers' feedback and observations. There were four mechanisms to support UbD teaching practices: (1) Creating instructional designs, (2) researchers' feedback, (3) class implementations and observations, (4) interactive meetings. Four cycles of teaching practices took place throughout the PD process.

Before starting the PD, a meeting was held with the school principal and two participant teachers as the heads of science and Turkish language department. In this meeting, researchers and teachers discussed about professional experiences of the teachers, their previous UbD PD experiences, and their expectations from the new UbD PD. In the new PD process, the teachers specifically underlined that practicality, teamwork, guidance, supervision, and feedback elements should be incorporated in the PD process. The school management and the teachers also suggested to include weekly interactive meetings to receive specific feedback and guidance.

First Cycle: Initial UbD Training took place within the summer seminar program of the teachers. Besides seminars and workshops, teachers developed their first UbD instructional design. Researchers gave feedback and teachers revised their designs. Teachers mostly encountered difficulties about specifying the big idea, formulating understanding expressions, asking essential questions, planning student-centered implementations, supporting individual differences, and organizing process-oriented assessment tools. Researchers gave their feedback specific to those issues. After the revisions, teachers implemented their first instructional design in their classes.

After the class implementations, first interactive meeting took place. Teachers raised time management, classroom management, student motivation and permanent learning issues about their class implementations. For the initial classroom implementations, teachers reported not being comfortable in the classroom as they used to be. In this interactive meeting, additionally, researchers provided activity samples about participatory learning methods to be included in UbD designs Also, reading materials about formative assessment tools were assigned.

Second Cycle: Teachers developed their second instructional design. Researchers observed a positive development especially in the use of UbD components in the designs. Teachers used the participatory methods in their designs, but they were weak in creating differentiated learning activities. Teachers revised their second designs in line with the researchers' feedback and implemented them in their classes. In the second interactive meeting, teachers discussed about their class implementations. Teachers presented student products, photos, and videos from the implementations. Particularly, students' interest and motivation encouraged teachers more. Teachers reported being more comfortable and flexible than the first class implementation. Researchers, additionally, showed examples of differentiated learning activities. Teachers ask their questions and were assigned with further reading materials.

Third Cycle: Teachers developed their third instructional design. In the third design, it was observed that the teachers became more competent in creating UbD designs. Researchers' feedback in this process consisted of integrating formative assessment tools and technology in their designs. Teachers revised their third designs in line with the researchers' feedback and implemented them in their classes. In the third interactive meeting, teachers discussed their class implementations. They showed the student products, photos, and videos. In this process, teachers mostly started a self-evaluation process. It has been observed that they are willing to express their own development, strengths, and weaknesses.

Fourth Cycle: Teachers individually developed their fourth designs. The researchers reviewed the designs and provided feedback. The designs of teachers were very competent in terms of UbD components. The fourth designs were implemented in the lessons and this time the researchers observed class implementations. Researchers shared their notes from the observations with the teachers.

At the end of the fourth cycle, individual interviews were conducted with the teachers regarding the whole PD process.

Data Collection

The main data source of narrative study is the texts consisted of the stories of the participants (Merriam & Tisdell, 2016). Hence, the texts related to interviews in which the participants describe their experiences of instructional design from the beginning to the end of the process constitute the primary data source of the study. Data collected through the interviews were supported by classroom observations and document review techniques.

Interview

Semi-structured, face-to-face interviews were held with the teachers to encourage them reflect about the professional learning process from the beginning

until the end. Two researchers conducted the interview together. The interview protocol included the following questions:

- How would you describe the instructional design learning and development process you have experienced since the beginning of the school year?
- What were your views and experiences about UbD instructional design before starting the education process?
- How would you evaluate the UbD instructional design training held within the scope of PD? What do you think of its effectiveness?
- How would you describe your experience when you implemented your instructional designs in the classroom? What did you feel, what were your students' reactions?
- What would you suggest to teachers who will be trained about instructional design?

The interviews lasted 60 minutes with the Turkish Language teacher and 45 minutes with the science teacher. The interviews were audio-recorded, and field notes were taken by one of researchers.

Classroom Observations

Researchers observed the class implementation of the final (fourth) designs developed by each teacher. During the observations, the main issues were on to what extent teachers were able to implement the activities in their designs, how they included UbD principles, the communication atmosphere they created in the classroom, time, and classroom management, and to what extent they motivated students to understand. The researchers acted as non-participant observers in the classroom and took notes regarding their observations.

Document Review

Researchers examined four UbD designs developed by each teacher. The designs were scored according to the UbD elements: identifying expected outcomes, the appropriateness of the big idea, essential questions, knowledge, skill, understanding and transfer expressions and the consistency between these elements. To examine assessment evidence, the emphasis was on the relationship between summative and formative assessment tools with expected outcomes and learning activities. In planning learning activities, WHERETO principles were examined.

Data Analysis

To analyze data from interviews content analysis was used. The audio recordings were converted to text, meaningful units that would be the basis for coding in the text were determined and coded. Both researchers read the text many times and reviewed their coding. The researchers once went through the codes together, the agreed codes were accepted directly, and the incompatible codes were discussed and agreed. In the next step, the related codes were brought together, and the themes were determined. Codes and themes were presented in before and after professional development process so that they complement overall narrative of the teachers.

The designs developed by the teachers were put to document analysis. The rubric related to the UbD design principles was used for document review.

The data obtained from the notes taken during the classroom observations were analyzed with the descriptive analysis method.

Validity and Reliability

In qualitative approaches, credibility and consistency for internal validity, transferability and confirmability for external validity should be met (Lincoln & Guba, 1985). Firstly, a prolonged interaction with the participants was provided in the context of PD that continues throughout one academic year. Data obtained through different tools were subjected to prolonged analyzes repeatedly. Researchers had the opportunity to compare, review and confirm the data they obtained from different tools through multiple data collection methods, including interviews, classroom observations, document reviews, and observation notes. All data obtained from the study were analyzed separately by two researchers. Shared forms of which consistency was tested, were sent to two methodologists for expert opinion. The data obtained from the research were explained by giving direct quotations. In addition, the context and process of the research were shared in detail. To ensure the consistency of the research, the whole process, the methods used, and the decisions taken were recorded. In line with the research questions, data collection tools were prepared and reported by considering the UbD instructional design. Each step of the research was carried out by seeing the big picture from beginning to end. Findings were compared with original data. The codes and themes obtained from the data analysis and detailed findings were shared with the participants for member checking procedures. Participants confirmed the results found by the researchers within the scope of data analysis and findings.

In qualitative research, researchers are also expected to express their view of the subject and what they expect from the research. The study was conducted by three researchers. The first researcher has been working as a lecturer in the education faculty of a state university and received a PhD degree in Curriculum and Instruction. The second researcher took part in the study received a PhD degree in Curriculum

and Instruction and has been working as a lecturer at a research center of a private university. The third researcher is a associate professor in a private university who is also a PhD student in Curriculum and Instruction. All three researchers have taken part in many national and international projects and studies as experts in teacher education, educational programs, and instructional design. First researcher is editor of three books, and second researcher contributed to wo books on UbD. Within the scope of the current research, the first two researchers took the role of planning, implementation, observation, development, and feedback of PD. Three researchers took equal part in the reporting of the research.

Results

The results of the study were presented chronologically as before, during and after the PD process in accordance with the nature of narrative research. The answers to the research questions were discussed under these three headings.

Before Professional Development Process

In interviews, teachers were asked to express their UbD knowledge and previous learning experiences before the PD process. Participating teachers attended a PD for UbD-based instructional design one year ago in the same school, but they stated that the training was not generally efficient for them and created a negative attitude at some points. With this previous training, teachers acknowledged the concept of UbD in instructional design. While the Turkish Language teacher associated the UbD design process with previous knowledge in the form of designing the lessons in the introduction, development, and conclusion stages at this point, the science teacher did not associate the UbD design process with any of the processes she previously knew.

When the teachers were asked about this previous learning experience, it was understood from their expressions that they had a strong negative attitude, such as, "It was horrible", "I hated it". Teachers who define their pre-learning experiences with these expressions mostly attributed their negative attitudes to the roles of instructor-teacher and the lack of communication with the instructor: "First, we were passive listeners. We were in a passive position, not in an active position." and "there was no sincerity, we had trouble getting feedback".

In short, teachers' expressions about their pre-educational experiences indicated that they started PD process with a strong negative attitude and limited UbD knowledge.

Professional Development Process

Teachers talked about the initial UbD training through a more positive perspective, despite the negative thoughts they brought to the educational environment. They associated these positive perspectives with the trainer characteristics and the training processes handled. By the words, "You were very sincere, we were 4-5 groups in the activity, you saw everyone in the group-play, I was amazed how it happened. Now we see it too." and "the competence of the incoming instructors is important to our attitude" they defined instructors' characteristics as sincere and competent. The topics they highlighted the most in the training processes were active participation and feedback regarding the process. The Turkish Language teacher gave an example by this expression; "We were very active in the education process, we constantly produced something, we received very effective feedback, it was very good that we were guided to do it (the plans) in a correct way."

Instructional design development, weekly interactive meetings and observation of classroom implementations took place at the second stage of the PD process. For this stage, the teachers again emphasized the importance of feedback. The teachers gave detailed views on feedback and drew attention to the constructiveness of the process and its being related to the teacher's field: "Your criticisms are constructive with proper language. Therefore, I read it again and evaluated it. This is how we can get criticism better. Trust is won this way." and "seeing examples, good and bad, is an opportunity for improvement. It was good to get feedback on our field. It doesn't feel good when I don't see depth in my field.". The teachers stated that they started to notice the lack of knowledge in the previous training during the interactive meetings. During the class implementation, they spent effort, although they had difficulty at the beginning.

For the research question "How do the teachers' skills to prepare instructional design based on UbD develop?", four instructional designs developed by each teacher were examined with the rubric including design standards, and the total scores were obtained by scoring over 3 for each criterion.

Results related to the evaluation are shown in Table 1.

Table 1 shows each teacher made a noticeable improvement in designing unit plans in accordance with design standards. The design skill of each teacher showed a certain improvement. The improvements were reflected in the total score and grand total scores of the teachers in each design. However, it was seen that the increase in the design scores of the Turkish teacher was higher than the design skill of the science teacher.

Table 1.
Evaluation Results of the UbD Instructional Design

	Science				Turkish Language			
Unit plan;	I.	II.	III.	IV.	I.	II.	III.	IV.
Stage 1: Expected Outcomes								
1.Describes ideas that are worth understanding/researching, transferable and essential.	1	1	2	2	1	2	2	3
2. Defines understanding objectives as generalizations in full sentences: Students will understand.....	1	1	2	2	1	2	3	3
3. Indicates long-term transfer objectives that are desired and require real success.	1	2	2	3	1	2	3	3
4.It includes several essential questions that are open-ended, stimulating and focusing on thinking.	1	2	3	3	2	2	3	3
5. Define the standards, tasks and program objectives required for all stages.	1	2	2	3	1	2	3	3
6. Define the necessary knowledge and skills to reach understanding and fulfill the general objectives.	1	2	2	2	2	2	3	3
7. All the elements listed above are in harmony with each other.	1	1	2	2	2	2	3	3
Stage 1 Total Points	7	11	15	17	10	14	20	21
Stage 2: Assessment Evidence								
8. Defines valid assessment evidence that will lead to all the expected outcomes.	1	1	2	2	1	2	2	3
9. Includes authentic performance tasks based on one or more indicators of understanding.	-	1	2	3	2	2	3	3
10. It provides enough opportunities for students to succeed.	1	1	2	2	1	1	2	2
11. It includes assessment criteria to ensure that each task is compatible with the desired results and provides appropriate feedback on performances.	1	2	2	2	1	2	2	2
Stage 2 Total Points	3	5	8	9	5	7	9	10
Stage 3: Planning learning experiences								
12. It includes learning activities and instruction to help learners to:								
a. Obtain targeted knowledge and skills,	1	1	2	2	1	1	2	3
b. Make sense of big ideas,	1	1	2	3	1	2	2	3
c. Transfer what they have learned to new learning environments.	1	2	2	3	1	2	3	3
13. Uses WHERETO principles effectively to make the unit attractive to all students.	1	1	2	2	1	2	3	3
14. All stages of the design are in harmony with each other.	1	1	2	2	1	2	2	3
Stage 3 Total Points	5	6	10	12	5	9	12	15

** 1: low, 2: medium, 3: high*

When the science teacher's UbD designs were examined, it was found that there was a significant improvement especially in the big idea, essential question, meaning and transfer expressions. In the first design, superficial expressions were preferred at the level of knowledge, but in the final design, the transfer between deep knowledge and real life was expressed more clearly. However, it was seen that the desired level was still not accomplished in the comprehension statements. In Table 2, this development was shown with first and fourth design examples.

Another striking issue in the initial design, science teacher did not include the performance task supporting the summative assessment, she only used the tools to test students' knowledge. On the other hand, in the fourth design, the performance task was clearly expressed, and in the formative assessment, teacher included tools for the evaluation of the learning process as well as the assessment of the knowledge attainments. Table 3 shows the improvement on first and fourth designs in terms of UbD's assessment and evaluation component.

The most significant improvement in designs was seen in the preference of methods that can hook the learners in the process. Although, the teacher did not include the activities that support individual differences in the first design, it was included in the

Table 2.
Improvement on Expected Outcomes

Big Idea	First design	It is emphasized that weight is a force.
	Fourth design	Electrical energy turns into light, heat and motion energy.
Essential question	First design	Under what force does an apple standing on a tree fall down from the tree?
	Fourth design	How is electrical energy transformed into other types of energy?
Understanding	First design	Student learns to use dynamometer.
	Fourth design	Student understands that there are electric charges.
Transfer	First design	Student understands that the force of gravity affecting the mass is weight.
	Fourth design	Student takes the necessary precautions for the safety of life and property by considering the implementations of grounding in daily life and technology and emphasizes its importance when necessary.

Table 3.
Improvement on Assessment and Evaluation

Summative Assessment Performance Task	First design	-
	Fourth design	Open ended exam Performance task
Formative Assessment	First design	Graphic drawing Diagnostic branching tree
	Fourth design	Question answer Self-assessment Experiment sheets

Table 4.
Improvement on Learning Experiences

Hooking students	First design	Experiment
	Fourth design	Group work Experiment Discussion
Tailoring learning by different needs	First design	-
	Fourth design	In the performance task, students will be able to differentiate their products according to their interests and learning styles.

Table 5.
Improvement on Desired Results

Big Idea	First design	The story, which is a literary genre, is divided into genres according to the author's approach and point of view; a story can be reproduced according to the author's different points of view.
	Fourth design	Poetry allows us to express our feelings and thoughts using few words.
Essential question	First design	What are the characteristics that allow us to classify stories as event stories or situation stories?
	Fourth design	What causes us to like some poems more and be influenced more by these poems?
Understanding	First design	Student understands the characteristics that distinguish between situation and event stories.
	Fourth design	Student understands that the subject and main emotion of the poem are effective in determining the genre of the poem.
Transfer	First design	Student gains reading pleasure and habit.
	Fourth design	Student realizes that the emotion that dominates the poem determines the genre.

performance task of the fourth design. Table 4 shows the improvement on first and fourth designs.

When the Turkish Language teacher's UbD designs were examined, significant improvement was observed, especially in the big idea, essential questions, understanding and transfer expressions. In the final design, it was observed that the expressions of big ideas, essential questions, understanding, and transfer were clearer and encourage higher-level thinking. UbD components were also in harmony with each other. The first and fourth design examples of this development were shown in Table 5.

Another noteworthy element in designs was that evaluation tools developed in favor of the fourth design in both quantitative and qualitative terms. The Turkish Language teacher included a result-oriented performance task in the initial design and final design. However, whereas tools examining students' knowledge attainment were preferred in the first design, in the latest design, tools evaluating learning processes were included in addition to knowledge acquisitions. It was seen that formative assessment also included self-assessment tools. The first and fourth design examples of this development were shown in Table 6.

The most distinctive development in designs was that the methods that can hook the learners in the process were included more in the latest design. At the same time, implementations that allow individual differences were used more in many stages of the design. In the first design, the teacher included only the reading circle activity as a participatory method, whereas in the final design, discussion, group work and cooperative learning methods were used to support various skills of students. While the only activity that took individual differences of the students into consideration was the reading circle in the first design, activities addressing individual differences were incorporated both int the learning process and in the performance task. The first and fourth design examples of this development were shown in Table 7.

Researchers observed the class implementation of both teachers' final designs. Teachers used the following expressions regarding classroom observations while implementing a part of their lesson designs:

Table 6.
Improvement on Assessment and Evaluation

Summative Assessment Performance Task	First design	Exit cards Performance task
	Fourth design	Structured grid Attainment test Cooperative learning worksheet Google form Performance task
Formative Assessment	First design	Open ended questions Teacher observation
	Fourth design	Open ended questions Peer-assessment Teacher observation Self-assessment

Table 7.
Improvement on Learning Experiences

Hooking students	First design	Reading circle
	Fourth design	Discussion Group work Cooperative learning
Tailoring learning by different needs	First design	Students will be supported by taking different roles in the reading circle.
	Fourth design	Students will take roles according to their individual differences in the cooperative learning process. Those who choose to speak at the discussion event will be given the opportunity. In the performance task, students will determine the poet and poetry according to their interests, and they will both tell the poet and show poetry performance according to their abilities.

> *"I was excited. Nobody has been in my class for a long time. I was excited but I said stop to myself because everything was already planned. The plan reduced my excitement. When I did what I had to do, everything went well. "- Turkish Language Teacher*

> *"If we hadn't received feedback, we wouldn't have done the lesson observation process so comfortably." - Science Teacher*

The teachers drew attention to the fact that they planned their UbD designs in detail and this helped them with the implementation. They also appreciated the feedback and guidance they received.

Researcher's observation notes, focused on student learning, the effectiveness of the use of participatory methods and the appropriate use of essential questions in both teachers' lessons. At this point, the researcher's observation notes and the document review results on teachers' instructional designs are compatible with each other.

After Professional Development Process

When teachers evaluated their knowledge and attitudes as a result of the PD process, they described one of the basic points they learned during the experience of instructional design process based on UbD as effective planning knowledge:

> *"It makes the teacher's job easier. The preparation process is difficult, but it gets easier afterwards, your job is easier, you are comfortable. The units I process with UbD became more permanent. I did not believe this in the past, now I do."*

They stated that they can evaluate the unit holistically regarding this planning competence, they are more effective in classroom and time management, and they can ensure permanent learning by activating students. When the teachers said that they focused on student participation, they expressed their opinion by; *"The children are bored with everything we do which do not make children active. It offers the teacher an opportunity to keep the student active in the classroom. More permanent than our lecturing"* and *"It makes me plan individualized plans. I could do it with one activity for the whole class, but I couldn't reach all of them. It is perfect for the new generation. We have to change because they have changed.".* Teachers' views on classroom and time management are as, *"Planning is very important and it provides classroom control when you have your way planned."* and *"I thought units would take longer time before, it takes even shorter now. It is time saving which is a huge advantage".*

It is noteworthy that the teacher's designing their lessons effectively is described as a facilitating and relaxing process. The Turkish Language teacher expressed this situation by, *"It is something that relieves the teacher conscientiously. It also relaxes me when I look at it as a manager. Management systems also relax."*

When teachers were asked what new goals they have for their PD after the process, they stated that they wanted to improve themselves in increasing student motivation in the first place. *"More learning techniques to increase motivation in the classroom. This group of students is everywhere, and the most important thing is to provide motivation for them", "To increase the motivation to learn. It proceeds very well after the students have studied and produced by themselves. We were wondering if they were learning in chaos. They learn from each other. » and "When I'm in class, the classroom should be well behaved, I was a little strict, it is the only way that they can pay attention. If they deal with something else, they can't listen to me. But now it's different. A year and a half ago, speaking was a chaos for me. If we change, they will change."* statements show that teachers focus on classroom dynamics and the student's desire to learn.

The teachers also stated that they want to focus on differentiation to make UbD plans more effective.

Discussion

In this study, the PD process of one Turkish language and one science teacher were examined. Teachers worked on the UbD instructional design in the PD process. Teachers' experiences throughout the learning cycles of the PD were reported in terms of before, during, and after PD phases.

Both teachers stated that they had no knowledge of UbD when they first received UbD training and that UbD has very different elements compared to previous designs. Teachers had little prior experience in terms of lesson planning. Throughout their prior UbD training experience, the main difficulty was the general attitude of the instructor. The instructor behaved very cold towards them, was closed to communication, presented the subject by simply explaining it straight away, and teachers were passive. For this reason, the teachers emphasized that they did not enjoy the first UbD training process at all, were not willing to understand, and had a negative attitude towards the subject. Later in the process, especially the Turkish Language teacher was not involved in this design process, and only the science teacher developed the lesson design. However, because the instructor's feedback was limited to good, medium, and wrong expressions for the whole design, the science teacher

stated that she did not have any information about where she did it wrong or right. She expressed that her motivation for making the next design was low and she was confused about what to do. The Science teacher stated that she developed three designs because the school administration asked her to do, but she did not have enough knowledge and skills to create UbD designs. The negative attitude towards PD experiences can be attributed to the attitude differences between those who decide to change (management) and practitioners (teachers) in the literature (Maskit, 2011) and the management's view about teachers (Desforges, 1995; Fullan, 2007). Also, components of the given training can also be examined in relation to the design (Garet et al., 2001; Newmann et al., 2000) and the instructor's approach (Harris et al., 2014). Studies related to the effect of the instructor's approach on PD have shown that the role adopted by the instructor and the support systems impact has an impact on the effectiveness of PD (Blank & de las Alas, 2009; Cavanaugh, 2013; Guskey & Yoon, 2009; Zaslow et al., 2010).

In the context of this study, when the school administration informed the teachers that they would receive training for the second time from another instructor on UbD, the teachers requested a meeting from the instructors who would provide UbD training. Also, they stated that they would express their requests from the instructors about this process in order to prevent the negativity in the previous UbD training experience. A meeting was held where teachers, school administrator and instructors came together. In this process, the teachers stated that they wanted a sincere educational environment because they felt more comfortable in a friendly environment and could easily ask the questions they had in their minds. Many studies have discussed the effects of teachers' emotions on PD (Avalos, 2011; Golombek & Doran, 2014). Studies have shown that the interaction between emotions and cognitive processes plays a role in the teachers' professional identity formation (Bullough, 2009; Dang, 2013; Starkey et.al., 2009). In addition, they wanted workshops besides the seminars, which allow them to develop UbD designs. In addition, the teachers insisted on receiving feedback about their work with detailed explanations, and suggestions should be given for the proper stages of the design, the stages they did wrong and the corrections of their mistakes. In addition to the requests, teachers also negotiated about holding weekly interactive meetings to discuss about the designs and class implementations. Researchers organized the PD process considering the requests of the teachers and the school management. After the initial UbD training, teachers revealed that they enjoyed the process and felt safe. The instructors' being friendly, sincere towards them and being competent in the activities they told and practiced has a great effect on the formation of the learning atmosphere. Teachers were encouraged to participate and to ask questions. In this way, they developed their UbD knowledge more accurately. The effects of mutual interaction on learning because of the creation of a positive learning environment in the PD process have been discussed in the context of socio-cultural learning theory (Mahn & John-Steiner, 2002; Vygotsky, 1994). Socio-cultural theory draws attention to the need for teachers' cognition, emotion, and action domains to be handled together in the professional learning process (Golombek & Doran, 2014). In particular, a new action plan for the needs of teachers was determined and implemented at each interactive meeting.

Both the science teacher and the Turkish Language teacher pointed out that they found a similarity between the UbD design process with learning a new language and that it was a difficult process as well. UbD has many different elements compared to other design models. Teachers' previous design experiences include a planning process of at most two hours, while the UbD design process includes 12-20 class hours. Due to this unfamiliarity, teachers associated UbD learning with a foreign language learning. In particular, the teachers stated that they had difficulties in formulating big ideas, determining performance tasks, and planning the process according to students' differences. Those processes do not mostly take place in traditional planning. Therefore, it is a natural result that teachers have difficulties because they do not have experiences. Teachers were content about detailed and constructive feedback about their designs, sample designs and activities relevant to their field, and therefore, they made rapid progress in their knowledge and skills in the design process. These views of teachers are consistent with studies that focus on shaping PD according to the needs of teachers and establishing a solid support system and continuous feedback (Aelterman et al., 2013; Darling-Hammond et al., 2017). According to teachers, the trust bond formed over time between the instructors and themselves had a very important place for the development of teachers' UbD designing skills. Teachers appreciated that instructors continuous support, and their competence in design and their guidance on the subject without offending the teachers may have caused them to establish trust. These components are thought to cause teachers to develop a positive attitude towards PD and are also related to the effectiveness of PD (Torff & Sessions, 2008).

Both teachers stated that they were in a hurry to complete the design at first class implementations, therefore they did not focus much on the effect it creates on the students. However, later, they realized that they developed their knowledge and skills in the design process; they learned from the experiences

of each other at the interactive meetings; and that they showed positive change and development in the classroom implementations with the suggestions of the instructors. Teachers stated that as the process moved on, the focus in the classroom was the students' learning. Even they changed the activities that students did not enjoy, they kept getting feedback from students, and they encouraged students to work on more original and creative tasks, both in the learning process and performance tasks. Since teachers felt incompetent about UbD in the first designs, they were weak in reaching the students in the classroom environment or in motivating the students. However, over time, as they became competent in the design process and understanding the basics of UbD, namely the importance of understanding by the student, may have led to the development of communication and interaction with students in the classroom. The teachers stated that the positive development they observed in their students created a motivating force for them to do the next design better. As teachers saw the positive effect of using different materials in the classroom environment, using methods that make the student active, receiving feedback from them, giving opportunities to develop products; they gave more space to that type of activities and games, and supported students' individual differences. This was the most important breaking point of teachers in the UbD design process. The positive reflection of the training they received in the classroom environment by the students created an important source of motivation for teachers to give importance to the PD and to learn more about UbD designs. In the relevant studies, the positive reflection of the subjects and methods addressed in the PD process on the classroom environment has been considered as one of the most important factors in teachers' change (Armor & Yelling, 2007; Garet et al., 2001; Guskey, 2002, Wayne et al., 2008).

Researchers observed improvement in the final designs compared to the initial UbD designs of both teachers, with the guidance and feedback they received. Particularly, teachers were eager to develop designs in the desired quality as they saw the suggestions that they received from the instructors had impact on students' learning in the classroom, motivation, and products. When the designs of science and Turkish Language teachers were examined separately, it was observed that the designs of the Turkish Language teacher showed more improvement than science teacher's design. The Turkish Language teacher has a personality supporting her to ask detailed questions. In the interactive meetings, she asked more questions to the instructors to understand the subject. In addition, when she thought that the designs were not of the desired quality, she requested additional time to complete the design. In addition, Turkish teacher had more private school experience and spent more time in various PD activities. All these reasons may have enabled the Turkish Language teacher to create UbD designs providing reach learning opportunities for students.

Teachers' opinions about the PD after the process revealed remarkable findings. Both teachers stated at the beginning of the UbD training, they believed UbD designs would cause difficulties in organizing the curriculum, but the UbD designs saved time. The teachers emphasized that determining the big idea while planning the UbD design process provides an important concept in determining the outline of the subject, a main framework in teaching principles, and enables to eliminate unnecessary details in the unit. At this point, it is thought that the structure of the UbD focused on essential questions designed around big ideas helps teachers. In this way, students can reach more meaningful meta learning outcomes (Tomlinson & McTighe, 2006; Wiggins & McTighe, 1998). Big ideas and essential questions force teachers to prioritize the gains that students want to see in their lessons (Erickson, 1998).

As another finding, the teachers stated that the UbD design process requires effort and embracing a holistic approach by designing was not easy. Teachers pointed out that many factors affecting teaching were handled separately in the previous design process, so while having an analytical thinking structure before, it is very important to have a holistic thinking process when creating UbD designs. They also expressed that it was not easy to get used to this way of thinking and it was necessary to have time. A planning process based on UbD encourages teachers to think more holistically by focusing on basic concepts and to build relationship between outcomes through big ideas (Wiggins & McTighe, 2011; Seeger et al., 2018; Virgin, 2014). Teachers emphasized that planning was very important in the teaching process, a good planning facilitated the class implementation process, increases interaction, and contributes to meaningful learning. In many studies, it was concluded that a good lesson plan is effective in asking quality questions, increasing classroom interaction and realization of conceptual learning (Ding & Carlson, 2013; Drost & Levine, 2015; Li et al., 2009).

The plans for their future PD activities were centered around students' needs and motivation. Teachers still felt incompetent in differentiating activities according to students' needs. They wanted to participate at PD on differentiated instruction methods, techniques, and assessment. In addition, teachers stated that the factor that determines the desired quality of activity in classroom practices was student motivation. They emphasized that the different interests and needs of the students also differentiated the factors that motivate them; so that they should refresh their

knowledge about providing student motivation. In this process, it emerges as a very important finding in that the needs of students are the main determinant in planning the PD of teachers (Aelterman et al., 2013; Avalos, 2011; Desimone, 2009; Garet et.al, 2001; Guskey, 2002).

Conclusions

Based on the narratives of the teachers, we can conclude the major effective elements of future PD as following:

Before starting the PD process, it is necessary to have interviews with teachers about their expectations in terms of content and methodology. In this meeting, all the stakeholders, i.e., instructors, school administrators, head of the departments and teachers, should be present. The questions such as "what are the teachers' PD needs?" "How the training will be held?" "How the process will be planned?" "What are the expectations from teachers?" must be addressed.

In the second stage, activities should be carried out to establish a bond of trust between teachers and instructors. The main subject of the present study was UbD. UbD training was given to teachers for three days before starting the design process. In this process, it was revealed that the competence of the instructors, their communication with teachers, and their attitude to answer the questions of teachers are very important for teachers. Before proceeding to the main design activities, ice breaker games can be carried out to make all the stakeholders ready for the learning process. A two-way communication between teachers and instructors also facilitates professional learning process.

The tasks expected from teachers should be clearly announced. Information and reminders about the task deadlines will help teachers remain on task.

Detailed feedback should be given to the designs of the teachers. It is also effective, when, the strengths and weakness of the designs are explained in detail and examples specific to the disciplines are provided. To enable documentation, the communication about initial, revised, and final designs should be kept in written format.

Organizing interactive meetings to encourage teachers share and discuss about their work and class implementations. Giving feedback and guidance specific to raised issues in these meetings will contribute to the PD outcomes of teachers.

In later designs, with the consent of the teacher, the instructors can observe the class implementations. After the observation, teachers and the instructors should discuss and make new decisions about their designs.

In long-term studies involving the PD of teachers; when feedback is given to teachers' work, classroom observations and meetings, the instructors should adopt a sincere, communicative, competent, and non-judgmental attitude.

References

Aelterman, N., Vansteenkiste, M., Van Keer, H., De Meyer, J., Van den Berghe, L., & Haerens, L. (2013). Development and evaluation of a training on need-supportive teaching in physical education: Qualitative and quantitative findings. *Teaching and Teacher Education, 29*, 64-75.

Altun, S., & Yurtseven, N. (2019). Tasarımcı öğretmen: UbD el kitabı. Asos Yayıncılık.

Armour, K. M., & Yelling, M. (2007). Effective professional development for physical education teachers: The role of informal, collaborative learning. *Journal of teaching in physical education, 26*(2), 177-200.

Avalos, B. (2011). Teacher professional development in teaching and teacher education over ten years. *Teaching and teacher education, 27*(1), 10-20.

Ben-Chaim, D., Joffe, N., & Zoller, U. (1994). Empowerment of elementary school teachers to implement science curriculum reforms. *School Science and Mathematics, 94*(7), 356-366.

Biggs, J., & Tang, C. (2011). Train-the-trainers: Implementing outcomes-based teaching and learning in Malaysian higher education. *Malaysian Journal of Learning and Instruction, 8*, 1-19.

Blank, R. K., & De Las Alas, N. (2009). *The Effects of Teacher Professional Development on Gains in Student Achievement: How Meta Analysis Provides Scientific Evidence Useful to Education Leaders.* Washington, DC: Council of Chief State School Officers. Retrieved from https://files.eric.ed.gov/fulltext/ED544700.pdf.

Branch, R. M. (2009). *Instructional design: The ADDIE approach* (Vol. 722). Springer.

Bullough, R. V. (2009). Seeking eudaimonia: The emotions in learning to teach and to mentor. In Schutz P., Zembylas M. (eds), *Advances in teacher emotion research* (pp. 33-53). Springer.

Cavanaugh, B. (2013). Performance feedback and teachers' use of praise and opportunities to respond: A review of the literature. *Education and Treatment of Children, 36*(1), 111-136.

Chase, S. (2011). Narrative Inquiry: Still a Field in the Making, In N.K. Denzin & Y.S.Lincoln (Eds.), *The SAGE Handbook of Qualitative Research* (4th ed.),pp.421–434. Sage

Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and teacher education, 18*(8), 947-967.

Connelly, F. M., & Clandinin, D. J. (1990). Stories of experience and narrative inquiry. *Educational researcher, 19*(5), 2-14.

Crawford, C. (2004). Non-linear instructional design model: eternal, synergistic design and development. *British Journal of Educational Technology, 35*(4), 413-420.

Dang, T. K. A. (2013). Identity in activity: Examining teacher professional identity formation in the paired-placement of student teachers. *Teaching and teacher education, 30*, 47-59.

Darling-Hammond, L. (2012). *Powerful teacher education: Lessons from exemplary programs.* Josey-Bass.

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). Effective teacher professional development. *Learning Policy Institute. Retrieved from* https://files.eric.ed.gov/fulltext/ED606743.pdf.

Desforges, C. (1995). How does experience affect theoretical knowledge for teaching?. *Learning and Instruction, 5*(4), 385-400.

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher, 38,* 181-200.

Ding, M., & Carlson, M. A. (2013). Elementary teachers' learning to construct high-quality mathematics lesson plans: A use of the IES recommendations. *The Elementary School Journal, 113*(3), 359-385.

Drost, B. R., & Levine, A. C. (2015). An analysis of strategies for teaching standards-based lesson plan alignment to preservice teachers. *Journal of Education, 195*(2), 37-47.

Edmonds, G. S., Branch, R. C., & Mukherjee, P. (1994). A conceptual framework for comparing instructional design models. *Educational technology research and development, 42*(4), 55-72.

Fullan, M. (2007). The new meaning of educational change (4th ed.). Teachers College Press.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38,* 915–945.

Golombek, P., & Doran, M. (2014). Unifying cognition, emotion, and activity in language teacher professional development. *Teaching and Teacher Education, 39,* 102-111.

Guskey, T. R. (2002). Professional development and teacher change. *Teachers and teaching, 8*(3), 381-391.

Guskey, T. R., & Yoon, K. S. (2009). What works in professional development?. *Phi delta kappan, 90*(7), 495-500.

Gustafson, K. L., & Branch, R. M. (2002). What is instructional design. *Trends and issues in instructional design and technology,* 16-25.

Global Partnership for Education. (2020). 21st Century Skills: What potential role for the Global Partnership for Education?-A landscape review. https://www.globalpartnership.org/content/21st-century-skills-what-potential-role-global-partnership-education

Haciomeroglu, G. (2018). Emoji nesline öğretmek: öğretmen adaylarının bir matematik etkinliği geliştirmesine yönelik yansıtıcı görüşlerinin incelenmesi [Teaching the Emoji Generations: Examining the Role of Reflections on the Student Teachers' Development of a Mathematical Activity]. *International Journal of Educational Studies in Mathematics, 5*(1), 11-22.

Hargreaves, A., & Fullan, M. G. (1992). Understanding teacher development. Teachers College Press.

Harris, T. B., Chung, W., Hutchins, H. M., & Chiaburu, D. S. (2014). Do trainer style and learner orientation predict training outcomes?. *Journal of workplace learning, 26* (5), 331-344.

Kelly, A.V. (1999). *The curriculum: Theory and practice* (4th ed).Sage.

Li, Y., Chen, X., & Kulm, G. (2009). Mathematics teachers' practices and thinking in lesson plan development: a case of teaching fraction division. *ZDM, 41*(6), 717-731.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry.* Sage

Mahn, H., & John-Steiner, V. (2002). The gift of confidence: A Vygotskian view of emotions. In G.Wells & G.Claxton (Eds.), *Learning for life in the 21st century* (pp.46-58). Blackwell Publishing.

Maskit, D. (2011). Teachers' attitudes toward pedagogical changes during various stages of professional development. *Teaching and teacher education, 27*(5), 851-860.

McTighe, J., & Wiggins, G. (2012). *Understanding by design framework*. Association for Supervision and Curriculum Development.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.

Newmann, F. M., King, M. B., & Youngs, P. (2000). Professional development that addresses school capacity: Lessons from urban elementary schools. *American journal of education, 108*(4), 259-299.

Nievenn, N. & van der Hoeven, M. (2011). Building the curricular capacity of teachers: insights from the Netherlands, In P.Patrick & L.Ria (Eds.), *Beginning teachers: a challenge for educational systems-CIDREE Yearbook 2011* (pp.49-64). ENS de Lyon, Institut français de l'éducation.

OECD. (2019). OECD Future of Education and Skills 2030 OECD Learning Compass 2030 A Series Of Concept Notes. https://www.oecd.org/education/2030-project/teaching-and-learning/learning/learning-compass-2030/

Ozgen, K. (2017). Öğretmen adaylarının matematiği farklı disiplinler ile ilişkilendirme etkinlikleri tasarlama becerileri [The Skills of Prospective Teachers to Design Activities that Connect Mathematics to Different Disciplines]. *İnonu University Journal of the Faculty of Education, 20*(1), 101-118.

Penuel, W. R., & Gallagher, L. P. (2009). Preparing teachers to design instruction for deep understanding in middle school earth science. *The Journal of the Learning Sciences, 18*(4), 461-508.

Pinto, R. (2005). Introducing curriculum innovations in science: Identifying teachers' transformations and the design of related teacher education. *Science education, 89*(1), 1-12.

Polkinghorne, D. E. (2007). Validity issues in narrative research. *Qualitative inquiry, 13*(4), 471-486.

Putnam, R. T., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational researcher, 29*(1), 4-15.

Reiser, R.A., Dempsey, J.V. (2007). *Trends and Issues in Instructional Design* (2nd ed.). Pearson Education, Inc.

Seeger, V., Wood, S., & Romans, D. (2018). Questioning for Meaning: Enhancing Questioning Strategies of Teacher Candidates through the Understanding by Design Approach. *College Quarterly, 21*(3).

Starkey, L., Yates, A., Meyer, L. H., Hall, C., Taylor, M., Stevens, S., & Toia, R. (2009). Professional development design: Embedding educational reform in New Zealand. *Teaching and teacher education, 25*(1), 181-189.

Torff, B., & Sessions, D. (2008). Factors associated with teachers' attitudes about professional development. *Teacher Education Quarterly, 35*(2), 123-133.

Trilling, B., & Fadel, C. (2009). *21st Century Skills, Enhanced Edition: Learning for Life in Our Times*. Jossey-Bass.

Virgin, R. (2014). Connecting learning: How revisiting big idea questions can help in history classrooms. *The Social Studies, 105*(4), 1-212.

Voogt, J. M., Pieters, J. M., & Handelzalts, A. (2016). Teacher collaboration in curriculum design teams: Effects, mechanisms, and conditions. *Educational Research and Evaluation, 22*(3-4), 121-140.

Vygotsky, L. S. (1994). Extracts from thought and language and mind in society. *Language, literacy and learning in educational practice. Clevedon: Multilingual Matters,* 45-58.

Yurtseven, N., & Altun, S., (2018). The Role of Self-Reflection and Peer Review in Curriculum-focused Professional Development for Teachers. *Hacettepe University Journal of Education, 33* (1), 207-228.

Wayne, A. J., Yoon, K. S., Zhu, P., Cronen, S., & Garet, M. S. (2008). Experimenting with teacher professional development: Motives and methods. *Educational researcher, 37*(8), 469-479.

Wiggins, G. P. & McTighe, J. (2005). *Understanding by design* (Expanded 2nd ed.). Association for Supervision and Curriculum Development.

Wiggins, G. P., & McTighe, J. (2011). *The understanding by design guide to creating high-quality units.* Association for Supervision and Curriculum Development.

Zaslow, M., Tout, K., Halle, T., Whittaker, J. V., & Lavelle, B. (2010). Toward the Identification of Features of Effective Professional Development for Early Childhood Educators. Literature Review. *Office of Planning, Evaluation and Policy Development, US Department of Education.* Retrieved from https://files.eric.ed.gov/fulltext/ED527140.pdf

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Some Predictors of Perceived Support and Proximity in Students during COVID-19 Distance Learning

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Abstract

Due to the COVID-19 pandemic, distance learning and social isolation have dramatically changed the social and learning experiences of adolescents. Given that social isolation can adversely affect students' psychosocial well-being, our study examined the extent to which ICT competences, resilience, and individual types of contact with teachers and classmates contribute to the psychosocial well-being of lower secondary school students (N = 1,813) over an extended period of distance learning. The questionnaires were conducted in groups via videoconferences using the 1ka application. The structural model showed that perceived proximity and support from teachers and classmates as indicators of psychosocial well-being were most strongly predicted by student resilience, teacher organization of group work, student contact with class teachers outside of regular school hours, and contact with classmates through online social networks. These findings have practical applications for teacher education and implementation in teacher practice.

Keywords:

COVID-19, Distance Learning, Students, Psychosocial Well-Being, Support, Proximity

Introduction

The COVID-19 pandemic has drastically changed the lives of children and adolescents around the world. Much of life has come to a standstill, including the closing of educational institutions, the transition to distance learning, and the requirement to reduce interpersonal contact (i.e., maintain social distance). Slovenian students, similar to students in many other countries, had to engage in distance learning for a long period of time. For students, school is not only a place of academic learning, but also a place of socialization, connection with peers, friends, and adults, and a place where they receive both learning and emotional support from peers and teachers. Developing and maintaining students' social relationships with others therefore requires physical proximity between them - on the way to school, hanging out together in the schoolyard or during recess and in the classroom (van den Berg, 2015). All of these relationships are important for students' greater psychosocial well-being and adjustment (Allen et al., 2018;

Law et al., 2013). The present study examined the effects of social isolation and a drastic reduction in direct interactions (mostly limited to individuals within the immediate family) on adolescents' psychosocial well-being.

Components of Psychosocial Well-Being

Psychosocial well-being is a superordinate construct that encompasses emotional or psychological well-being as well as social and collective well-being (Larson, 1996; Martikainen, 2002). It is synonymous with 'quality of life' as a whole, as it includes emotional, social and physical components. In the past, the concept was mainly used in clinical practice. For example, Engels' (1997) biopsychosocial model explains illness as the result of an interaction between mechanisms at the biological, psychological and social levels. In this context, psychological and social well-being play a protective role in the dynamic balance between health and illness (Fava & Sonino, 2018). With Positive Psychology, well-being became the subject of intensive psychological research in the 1990s. Keyes (2007) identifies three components of psychological well-being: emotional or subjective well-being, psychological well-being, and social well-being. Well-being encompasses different areas in an individual's life. Davis (2019) writes about five domains, which we illustrate with the example of distance learning during the COVID-19 pandemic: (i) Emotional well-being is the ability to cope with stress while regulating negative emotions. For example, the student does not panic and remains calm when unable to connect with the teacher via videoconferencing, calls the teacher and informs them about the connection problem. (ii) Physical well-being is the ability to maintain physical condition through healthy lifestyle and good exercise habits. For example, after sitting at the computer, the student does some exercises to strengthen their spine, and in the afternoon exercises. (iii) Social well-being is the ability to communicate with others, develop meaningful relationships, and maintain a support network that helps an individual to overcome loneliness. For example, the student is in daily contact with their friends through social media and occasionally calls classmates. (iv) Workplace well-being is the ability to pursue one's interests and learning goals, leading to further education. The student completes learning tasks in the e-classroom (e.g., Moodle environment, Microsoft Teams) as assigned by the teacher. (v) Social well-being is the ability to actively participate in the community or environment in which the individual lives. For example, in situations where multiple people are present, the student behaves responsibly and adheres to safety measures that prevent the spread of the coronavirus. Davis (2019) emphasizes that ensuring that an individual achieves all of these types of well-being to some degree is necessary for overall well-being.

Psychosocial well-being in students during the first wave of the COVID-19 pandemic

There was little study of psychosocial well-being in students during the first wave of the COVID-19 pandemic in the spring of 2020. Studies focused primarily on academic issues, such as those related to learning processes (student motivation, opportunities to make connections or test knowledge at a distance, etc.) (e.g. König et al., 2020; Niemi & Kousa, 2020). From a psychosocial perspective, studies on the perception of a pandemic as a stressful situation and on students' and teachers' reactions or adaptation to it predominated (Ellis et al., 2020; Ristić Dedić, 2020; Rupnik Vec et al., 2020). The results of the rare studies on the psychosocial aspects of distance education in the first wave of the epidemic showed the negative consequences of such education on various aspects of psychological well-being and mental health among primary, secondary school and university students. In a sample of Italian adolescents aged 13 to 20, Buzzi et al. (2020) found that adolescents' levels of general anxiety increased, with girls and younger adolescents being more anxious than others. Adolescents were anxious about the impact of distance learning on their learning, as well as changes in their social relationships, particularly relationships with friends. Just over a fifth reported less communication and meetings with friends, and at the same time an increase in communication with friends via online social networks, with girls significantly more likely to communicate with friends in this way. At the same time, adolescents reported that in addition to conversations with family members, conversations with peers and friends were most important in meeting their emotional and social needs. Ellis et al. (2020) reached a similar conclusion among Canadian adolescents with an average age of 17. They reported major concerns about distance learning, both in terms of its impact on learning performance and in terms of deterioration of relationships with peers and friends (41% had very strong concerns of this kind). At the same time, the study found that the reduction in the amount of time spent with friends was an important predictor of their feelings of loneliness. Ristić Dedič (2020) found that the biggest stressor for Croatian high school students was not being able to meet with friends in person. A survey of Slovenian high school students (Rupnik Vec et al., 2020) also showed that the biggest problem with distance learning was that they longed to see their classmates (77% of students aged 9-12, 65% of students aged 12-15, and 54% of students aged 15-18). In general, girls experienced such feelings more than boys. Significant deterioration in psychosocial well-being was also found in studies of university students, who reported increased stress, anxiety, feelings of loneliness, and depression as a result of reduced social networks, lack of interactions, and less emotional support from peers and friends (Elmer et al., 2020; Eving et al., 2021).

In summary, the results of studies from the first wave of school closures primarily show reductions in social, emotional, and occupational well-being. In our study, we focused mainly on the aspect of students' social and emotional well-being.

Indicators and Correlates of Psychosocial Well-Being

In school, students are involved in two important social systems - relationships with teachers and with classmates/peers. Perceived closeness and support from students and teachers, as well as feelings of loneliness or missing teachers and peers, can be considered indicators of students' social and emotional well-being. Perceived support and closeness is established through the student's social ties to other individuals, groups, and a larger community, such as the classroom (Cooke et al., 1988). Studies show a positive relationship between teacher support and learning skills (Patrick et al., 2007), intrinsic motivation (Ryan et al., 1994), and, by encouraging student involvement, student achievement (Klem & Connell, 2004). Some studies highlight significantly greater teacher support for girls (Reddy et al., 2003), while other studies report equal teacher support for boys and girls (DeWit et al., 2010).

During COVID-19 distance learning, such support became even more important. Teachers needed to ensure that students remained engaged in learning despite their physical absence (following the teacher's explanations in the videoconference, finding an assignment in the e-classroom, completing it, and sending it to the teacher for review). In distance education, students are required to regulate their own learning and maintain motivation to achieve learning objectives, which they are often unable to do (Fryer & Bovee, 2016). Therefore, in order to achieve the learning objectives, the teacher's support is needed more than in regular classes in school. In addition, emotional support is also important when students face various problems (e.g. boredom, frustration) during distance learning.

The period of distance learning combined with social isolation due to the containment of the spread of the virus also changed the social lives of children and young people dramatically. Overnight, their previous social networks, in which they had been involved in school and outside, dissolved. They maintained them, at least in part, through online social networks, satisfying their need to socialize in this way. Perceived peer support has been shown in previous research to be an important factor in maintaining adolescent mental health, and was particularly important during distance learning (Chaturvedi et al., 2021; Ye et al., 2020). In contrast, missing classmates and teachers is a feeling associated with loneliness, defined as a perceived discrepancy between actual and desired social relationships (Peplau & Perlman, 1982). Loneliness may be due to the perceived or objective social isolation of students. It represents a negative aspect of students' psychosocial well-being. Most studies from the first wave of the pandemic reported that the respondents experienced feelings of missing someone (Ellis et al., 2020; Eving et al., 2021; Ristić Dedić, 2020). Such feelings have an important evolutionary function, signalling disruption to individuals and motivating them to restore relationships (Cacioppo et al., 2015). At the same time, these feelings can also lead to side effects, such as a decrease in trust in others, leading to defiant behaviour and even greater social isolation (Cacioppo et al., 2009), or a deterioration in mental health, including internalizing disorders (Ye et al., 2021). A friendly peer network and good family relationships are particularly important in preventing these feelings.

In addition to contact with others who provide social and emotional support, students' ability to cope with stressful situations, and thus their well-being, is highly dependent on their resilience (Scales et al., 2016). This refers to the individual's ability to respond positively and adapt successfully to novel or extraordinary, persistently difficult, or significant changes in circumstances (Masten et al., 2004). Resilience in children and adolescents has been found to be influenced by both their personality traits (internal sources of strength, such as high intellectual ability, self-esteem, and strong social skills) and protective factors in the environment as external sources of strength, such as a positive connection with at least one competent adult (a family member or teacher) or peer/friend whom the children or adolescents can trust while receiving their confidence, help, support, and structure (Grothberg Henderson, 2005; Luthar et al., 2000; Masten & Obradović, 2006). Research shows that about one third of children are able to overcome problems that threaten their development at some point, but two thirds of them can be classified as a vulnerable group that needs concrete support from the environment (Garmezy & Tellegen, 1984; Grothberg, 1995; Ye et al., 2021).

The Aim of The Study

During the COVID-19 pandemic, schools in Slovenia were closed twice for all primary and lower and upper secondary students – in the first wave of the pandemic from mid-March to June 2020, and in the second wave from mid-October to the end of January 2020. In the first wave, the initial focus was on developing the ICT competences of students and teachers to connect and implement the learning process in the first place, and on finding electronic ways to test knowledge. In the second wave, students' (and teachers') basic ICT competences were already

quite well developed, allowing them to focus more on learning (and teaching) itself. However, in the second wave students were exposed to prolonged social isolation for the second time, lasting for three months. This prolonged absence of students from school likely had an impact on their psychosocial well-being.

This study examined the extent to which ICT competences, resilience, and individual types of contact with teachers and classmates contribute to reducing lower secondary students' psychosocial well-being. We focused on indicators of students' emotional and social well-being, specifically the degree of perceived proximity and support and feelings of missing teachers and classmates. We examined the frequency of teachers' contact with students in the context of lessons when pursuing primarily learning goals (contact via e-classes, e-mail, and videoconferencing), as well as additional teacher contact with students about student problems related to both school and social isolation. We also investigated the relationship between student well-being and the frequency of group work in class (which facilitates the achievement of both learning and social integration goals) and the frequency of contact with classmates via online networks (where students meet their needs for belonging, acceptance, etc. in their free time).

Because perceived proximity and support or missing classmates or teachers are outcomes of students' interactions with classmates and teachers, we examined whether these constructs could be predicted by students' resilience, ICT competences and contact with teachers and classmates. We hypothesized a model in which ICT competence was assumed to have a positive association with psychosocial well-being by enabling students to use ICT communication tools effectively and to interact with teachers and classmates during class and with classmates in their free time during the second COVID-19 lockdown. We assumed positive associations between the extent of students' contact with teachers and peers/classmates and their psychosocial well-being, as social support is key to overcoming various difficulties and adapting positively to stressful situations (Borja et al., 2009; Helgeson & Lopez, 2010; Sood et al., 2020). We also hypothesized that there is a positive relationship between resilience and students' psychosocial well-being, which is supported by numerous studies (Polizzi et al., 2020; Srivastava, 2011; Ye et al., 2020).

Method

Participants

Sample of the study included 1,813 students from 21 lower secondary schools from all statistical regions in Slovenia. There were 669 seventh graders (36.9%), 526 eighth graders (29.0%), and 618 ninth graders (34.1%) in the sample. Of these, 868 were boys (47.9%) and 945 were girls (52.1%). There were no significant differences in gender structure between grades, $\chi^2(2) = 1.21$, $p = 0.55$. The mean age of the students was 13.76 years (*sd* = 0.82).

Instruments

Data were collected through an online survey.

Four items asked students about their ICT competences, i.e., how well they could browse the Internet and use e-classrooms, e-mail, and videoconferencing. Students responded on a 5-point scale (1 - very poor, 5 - excellent). The Cronbach's α-coefficient of internal consistency was 0.85.

Students' resilience was measured using the Slovenian adaptation of the Connor-Davidson Resilience Scale (CD-RISC-10) (Kavčič et al., 2021). Participants rated on a 5-point scale (1 - not at all, 5 - almost always) how they cope with stressful situations, obstacles, and changes (e.g., *I can deal with whatever comes*). The extracted factor explained 73.8% of the item variance and showed high reliability ($\alpha = 0.96$).

The extent of student contact was determined by the frequency of contact with teachers during lessons, additional contact with class teachers, and contact with classmates via online networks. Students rated on a 4-point scale (1 - (almost) never, 2 - once a week, 3 - several times a week, 4 - every day) how often, on average, they were in contact with teachers via e-classrooms, e-mail, and videoconferencing during the three-month distance learning period. Next, students rated on a 5-point scale (1 - once a month, 2 - every 14 days, 3 - once a week, 4 - 2 to 4 times a week, 5 - every day) how often they had contact with their classroom teacher in addition to the instructional time provided in the high school curriculum and mandatory home instructional time. These meetings typically involve discussion of problems related to learning and relationships with classmates, teachers, and others.

Finally, on a 6-point scale, students rated the average daily time spent in contact with classmates through electronic channels such as social media (FB, Instagram, Snapchat), text messages, phone calls, and video calls (1 - I had no contact, 2 - up to half an hour, 3 - half an hour to an hour, 4 – 1 to 2 hours, 5 – 2 to 4 hours, 6 - more than 4 hours). Additionally, on a 5-point scale, students compared the frequency of group work during distance learning to that in school (1 - significantly less than in the classroom or not at all, 3 - same as in the classroom, 5 - significantly more than in the classroom).

Students' psychosocial well-being was measured as perceived closeness and support to classmates and teachers and feelings of missing them. We developed

a 17-item questionnaire in which students compared on a 5-point scale how much they experienced different feelings during distance learning than they did at school (1 - much less than before, 3 - same as before, 5 - much more than before). Four items related to perceived closeness (two related to perceived closeness to classmates, e.g. *I feel that I am close to my classmates,* and two related to perceived closeness to teachers, e.g. I feel that I can turn to teachers when I need something. Nine items related to perceived support – three related to perceived support from classmates (e.g. *I feel I can talk to my classmates about my feelings*) and six related to perceived average support from the teacher and perceived support from the class teacher (e.g. *I feel the teacher/class teacher cares about me*). Four items measured how much there was a feeling of missing others, with two items related to missing classmates (e.g., *I miss hanging out with classmates*) and two related to missing teachers (e.g., *I miss direct contact with teachers*).

Data Collection and Statistical Procedures

The study was approved by the Ethics Commission of the Faculty of Arts, University of Ljubljana (application number 211-2020). Prior to data collection, informed consent was obtained from parents for their children's participation in the study. Data were collected via the 1KA web application (1ka, 2021) in the first half of January 2021. Students responded to the online questionnaire during group videoconferences with the assistance of school counsellors. Parental consent was obtained prior to collecting data from students.
Structural equation modelling using the R lavaan package (Rosseel, 2012) was conducted to describe the relationships among the variables under study. The WLSMV estimator was used due to the discrete and largely nonnormally distributed manifest variables (see Table 1) and multivariate nonnormality (Mardia's bp1 estimate of multivariate skewness = 86.37, $p < .001$; Mardia's bp1 estimate of multivariate kurtosis = 1789.41, $p < .001$) was used.

Scale scores were calculated as the mean or median of responses on all scale items.

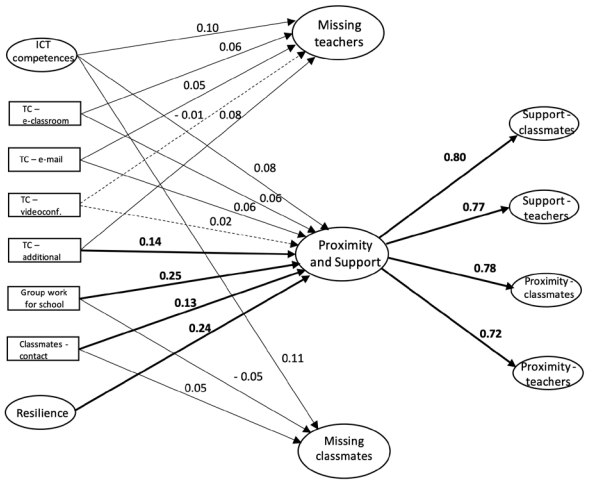
Results

The hypothesized model (Figure 1) showed a marginal fit to the data, $\chi^2(594) = 1588.12$, $p < .001$, CFI = .90, RMSEA = .030, 95% CI for RMSEA = .029–.032, SRMR = .043. This fit was achieved after the inclusion of two pairs of correlated uniqueness (of two items within the Teachers' Support and two items within the Resilience scale) suggested by the modification indices. The results for the measurement part of the model in relation to the latent variables studied are presented in Table 1.

Descriptive statistics for the scale scores are presented in the upper part of Table 2. The students in our sample were moderately resilient and felt very competent in using ICT. During the second wave of the COVID-19 pandemic they felt as supported and close to their classmates and teachers as they did before distance learning started (2.94), but they reported missing their classmates (3.94) and teachers more (3.33).
The lower part of Table 2 presents descriptive statistics for single indicator items related to different types of contact students had with their classmates and teachers. On average, students spent 2.57 hours a day in contact with classmates they met not only during mandatory e-learning, but also through online social networks, texting, phone calls, and video calls, but there was considerable variability in the data for this variable. Students also reported that their teachers were less likely to give them instructions for group work than they were in the pre-distance learning classrooms.

Students reported that their contact with teachers during distance learning was most often via videoconferencing and e-classrooms (Mdn was several times a week), but students were less likely to be contacted by their teachers via e-mail (Mdn was once a week). 41.8% of students reported having additional contact with their class teachers - half of them reported having meetings with teachers once every two weeks or once a month, and the other half had more regular additional contact.

Figure 1
The Resulting Structural Model of the Relationships Among ICT Competences, Resilience, Contact and Psychosocial Well-being



Note. ⟶ $p < .001$; ⟶ $p < .05$; ⇢ non-significant ($p > .05$)
TC - teacher contact; additional - teacher contact with students outside regular school hours

Figure 1 shows the relationships among the studied variables. According to the obtained path coefficients, student resilience, group work for school, contact with classmates, and additional contact with teachers contributed the most to students' perceived proximity and support from teachers and classmates (standardized path loadings were .24, .25, .13, and .14,

Table 1

Descriptive Statistics for Items Included in the Model

Item	*M*	*sd*	γ_1	γ_2	λ
Resilience					
Item 1	3.63	0.98	−0.46	−0.04	0.628
Item 2	3.56	0.93	−0.26	−0.24	0.745
Item 3	3.31	1.09	−0.23	−0.53	0.527
Item 4	2.94	1.15	−0.04	−0.66	0.622
Item 5	3.64	1.04	−0.45	−0.29	0.564
Item 6	3.86	0.99	−0.58	−0.17	0.679
Item 7	3.08	1.14	−0.09	−0.69	0.665
Item 8	3.52	1.01	−0.35	−0.24	0.716
Item 9	3.37	1.06	−0.27	−0.40	0.756
Item 10	3.38	1.14	−0.36	−0.55	0.617
ICT competences					
Browsing the Internet	4.35	0.83	−1.42	2.33	0.737
Use of e-classrooms	4.43	0.79	−1.55	2.86	0.798
Use of videoconferencing	4.58	0.72	−2.03	4.98	0.765
Use of e-mail	4.44	0.85	−1.69	2.88	0.717
Missing classmates					
I miss hanging out with classmates.	4.04	1.07	−1.07	0.57	0.889
I miss being able to talk to classmates.	3.83	1.04	−0.74	0.13	0.860
Missing teachers					
I miss the live contact with the teachers.	3.41	1.04	−0.38	−0.10	0.910
I miss being able to talk to teachers about something.	3.25	0.95	−0.12	0.24	0.809
Classmate support					
I have a feeling my classmates care about me.	2.78	0.80	−0.33	1.12	0.583
I have a feeling that one of my classmates can help me with schoolwork (show me how to do something, or give me advice).	3.09	0.93	−0.13	0.22	0.632
I have a feeling that I can talk to one of my classmates about my emotions, feelings.	2.82	0.96	−0.10	0.33	0.632
Teacher support					
I have a feeling that teachers care about me.	3.03	0.78	−0.22	1.34	0.554
I have a feeling that one of the teachers can help me with schoolwork (show me how to do something, or give me advice).	3.03	0.85	−0.10	0.56	0.612
I have a feeling that I can talk to one of my teachers about my emotions, feelings.	2.58	0.87	−0.47	0.05	0.591
I have a feeling that my class teacher cares about me.	3.05	0.70	−0.32	2.66	0.569
I have a feeling that my class teacher can help me with schoolwork (show me how to do something, or give me advice).	3.05	0.77	−0.06	1.11	0.687
I have a feeling that I can talk to my teacher about my emotions, feelings.	2.72	0.79	−0.58	1.02	0.631
Classmate proximity					
I have a feeling I can turn to classmates if I need anything.	3.19	0.90	0.06	0.34	0.804
I have a feeling that I am close with my classmates.	2.88	0.95	0.18	0.24	0.732
Teacher proximity					
I have a feeling I can turn to my teachers if I need anything.	3.13	0.82	0.05	0.91	0.704
I have a feeling that I am close with my teachers.	2.82	0.78	−0.25	1.44	0.796

Note. γ_1 *– skewness,* γ_2 *– excess kurtosis.*

Table 2

Descriptive statistics for the constructs and single items included in the model

	N	*M/Mdn*[b]	*sd/MAD*[c]	γ_1	γ_2	α
Resilience	1813	3.43	0.73	–0.09	0.21	0.88
ICT competences	1813	4.44	0.66	–1.99	5.80	0.85
Missing classmates	1813	3.94	0.99	–0.92	0.47	0.87
Missing teachers	1813	3.33	0.92	–0.30	0.28	0.85
Proximity and support	1813	2.94	0.50	–0.30	1.78	0.85
Classmates contact[b]	1813	1.50	1.50	/	/	/
Group work for school	1813	2.19	1.01	0.78	0.14	/
TC[a] – videoconferencing[b]	1813	3	1	/	/	/
TC – e-mail[b]	1813	2	1	/	/	/
TC – e-classroom[b]	1813	3	1	/	/	/
TC – additional[d] contact[b]	757	3	1	/	/	/

Note. [a]*TC – teacher contact;* [b]*Median was calculated;* [c]*MAD – median absolute deviation from the Median;* [d]*Number of students who reported contact with class teachers (in addition to the lessons and compulsory home class periods);* γ_1 *– skewness,* γ_2 *– excess kurtosis.*

respectively). Slightly less influential, but still significant with regard to students' sense of proximity and support, were contact with teachers via e-classrooms and e-mail and their ICT competences. However, videoconferencing with teachers during COVID-19 distance learning did not contribute significantly to students' sense of proximity and support. We also found that students' ICT competences, their contact with teachers via e-mail and e-classrooms, and additional time they spent with their class teachers were significantly related to feelings of missing teachers. Similarly, ICT competences and contact with classmates via online social networks, phone or video calls were significantly related to feelings of missing classmates. However, group work for school negatively predicted feelings of missing classmates, and the effect was small but significant.

Discussion

This study examined the extent to which students' ICT competences, resilience, and various distance contact with teachers and classmates contributed to students' psychosocial well-being during distance learning in the second wave of the COVID-19 pandemic (late October 2020 to early February 2021). The construct of well-being was described using the latent variables of perceived proximity and support (which include perceived support and proximity from classmates and teachers), missing teachers, and missing classmates. The results provide support for our theoretical model.

Small but statistically significant positive path coefficients (ranging from .08 to .11) were found for the relationships between students' ICT competence and perceived support and proximity, and feelings of missing classmates and teachers. ICT competence was an important tool for students to maintain contact with classmates (especially during their free time) and teachers during the pandemic. Students rated their ICT competences very high, with an average score of 4.44 on a 5-point scale. Research shows that ICT competence reduced stress in adolescents even before the pandemic by enabling them to spend their free time online, where they gained a sense of greater social support (Manago et al., 2012; Nabi et al., 2013). However, in a time of social isolation during the pandemic, this competence was also important for maintaining students' psychosocial well-being by supporting communication with others. For healthy, functional development, adolescents need the contact with peers and adults that enables them to meet their needs for competence, autonomy, and connectedness (Ryan & Deci, 2000) and that motivates them to learn.

In the model, the three indicators of students' psychosocial well-being were also predicted with different types of contact with classmates and teachers. During distance learning, this contact was limited and mostly restricted to electronic communication. Direct contact with classmates was limited to learning situations when teachers organized work in groups and to free time contact when they socialized through online social networks. Students reported that there was less group work during distance learning than at school. At the same time, the results showed that teachers' organization of work in groups was important for feelings of support and proximity with classmates (.25). In a situation of complete social isolation, work in groups was practically the only contact in the school context in which students could satisfy the need for social contact with peers and the need for acceptance by classmates, in addition to achieving learning goals. However, social acceptance by peers/classmates is particularly important in early adolescence (Wigfield et al., 2006). Our findings support the notion that the introduction of computer-based collaborative learning in distance education can promote better learning outcomes and motivate students to learn and interact (Chen et al., 2018). In studies that examined a

traditional learning environment prior to the pandemic (e.g., Kyndt et al., 2013; Roseth et al., 2008), group work was found to be effective, especially when organized as collaborative learning. During the pandemic, group work enabled students to talk with their peers about the various hardships and stresses of the pandemic, share effective coping strategies, and support each other (Sood et al., 2020). In our study, higher perceived frequency of group work was also negatively related to feelings of missing classmates (–.05).

To a lesser but important extent, perceived feelings of support or proximity were related to students' contact with classmates via social networks (.13). A lower correlation was expected here because an individual's social network includes classmates as well as others who might provide support to the individual. Research with adults and university students has shown that individuals often seek social support in social networks when faced with various stressful experiences, and that lower levels of support received in these networks are also associated with poorer behavioural outcomes, such as post-traumatic stress disorder (Brewin et al., 2000; Ozer et. al., 2003).

Teachers' contact with students was generally tied to the implementation of the learning process to achieve academic goals. Teachers communicated with students indirectly (via e-classrooms and e-mail) or directly (via videoconferencing). It was surprising to see that both forms of indirect communication contributed more to students' perceived support and proximity (.06) than direct communication via videoconferencing (.02), since one would expect that direct, "live" communication between teachers and students through videoconferencing, which allows for verbal and nonverbal communication, would provide teachers with more opportunities to support students and would be perceived by students as providing better support. One possible explanation for these findings is that contact via e-mail may be more personal and show teachers' special concern for a particular student, whereas during videoconferencing teachers are likely to focus primarily on instruction (explaining and reviewing learning material). Effective two-way communication during videoconferencing may have been hindered by additional factors, e.g., some students were unable to connect to the videoconference, some lost their Internet connection during class, etc. In general, research on the use of videoconferencing during the pandemic has shown that such instruction is less personalized (Eving et al., 2021) and that students have negative attitudes toward using Zoom as a videoconferencing system for distance learning. They emphasize the negative impact of such instruction on their learning experience and motivation to learn, especially when it lasts for a long period of time (Serhan, 2020). It seems that the same was the case with the students in our sample.

Some class teachers had additional contact outside their home class periods, as reported by 770 of the student respondents (42%). In these meetings, class teachers talked to students about the current situation regarding the pandemic, the difficulties they faced, and coping strategies. Although these meetings took place infrequently – on average once a month to once every two weeks – the results show that they contributed notably to students' perception of support and proximity (.14) and feelings of missing teachers (.08). According to the students, these meetings provided considerable relief, in the sense that they then recognized that their classmates were struggling with the same or similar difficulties, and that the teacher encouraged and reassured them, giving them hope that they would soon return to school. Perceived support can act as an incentive in digital learning situations (Fryer & Bovee, 2016), which was important during the COVID-19 pandemic, especially given the decline in student motivation.

Our data also showed a positive association between resilience and students' psychosocial well-being (.24), which is consistent with findings from the first wave of the spring 2020 COVID-19 epidemic showing that university students' psychosocial well-being also depends on individual resilience (Polizzi et al., 2020; Srivastava, 2011; Ye et al., 2020). More resilient individuals find it easier to tolerate stressful situations, such as the COVID-19 pandemic, and to cope with persistent stressors. More resilient students perceive less distress and more support than less resilient students (Sood & Sharma, 2020), and resilience, along with social support, has been shown to mediate between the stressful COVID-19 situation and acute stress problems (Ye et al., 2021).

Conclusions

In summary, the study shows that students' resilience, teachers' organization of group work, students' contact with class teachers outside regular school hours, and contact with classmates through online social networks contributed most to adolescents' psychosocial well-being during distance learning. According to Kiswardy (2013), the resilience of adolescents in distance learning could be enhanced by providing a safe and accepting learning and social environment, building a sense of belonging, enabling supportive peer relationships, creating opportunities for participation in class and other school activities, and providing learning opportunities for all students, especially those who need additional support and special forms of encouragement. While attending to the social integration processes among students (building belonging and supportive peer relationships) is primarily the responsibility of the class teacher under normal school conditions, it seems that all teachers should consciously attend to them during distance learning, along with school counsellors. The

findings of this study suggest that it would be useful for teachers to organize student work in groups more frequently during distance learning, taking advantage of the already demonstrated positive effects of collaborative learning on both students' academic and social integration outcomes (Roseth et al., 2008). In addition, providing equal opportunities for all students and establishing clear rules for videoconferencing (e.g., that all students should be connected to a videoconference with a video feed) would likely be beneficial in facilitating students' two-way communication with teachers and classmates.

Our study has several limitations. First, the results reflect only the students' perspectives. It would be useful to contrast them with teachers' views in further research. Second, due to the constraints of the lockdown situation, our sample included only students whose parents provided online consent for their children to take part in our study, and thus it is very likely that we did not receive consent from some less ICT literate parents for their children to participate. In further research, it would be useful to obtain additional information about the content of contact (with both classmates and teachers) that affect feelings of perceived proximity and support, and to investigate why videoconferencing did not contribute to greater perceived support and proximity.

We can nevertheless conclude that the results of our study provide initial insight into the factors that contribute to the lower secondary students' perceived proximity and support, which is an important aspect of students' psychosocial well-being during distance learning. These findings may be a starting point for planning pre-service and in-service teacher education that would enable teachers to provide social support to their students and thus enhance their well-being.

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References

1KA (Version 21.02.16) [software]. (2021). Ljubljana: Faculty of Social Sciences. https://www.1ka.si.

Allen, K., Kern, M. L., Vella-Brodrick, D., Hattie, J., & Waters, L. (2018). What schools need to know about fostering school belonging: A meta-analysis. *Educational Psychology Review, 30*(1), 1–34. https://doi.org/10.1007/s10648-016-9389-8.

Borja, S. E., Callahan, J. L., & Rambo, P. L. (2009). Understanding negative outcomes following traumatic exposure: The roles of neuroticism and social support. *Psychological Trauma-Theory Research Practice and Policy, 1*(2), 118–129. https://doi.org/10.1037/a0016011.

Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology, 68*(5), 748–766. https://doi.org/10.1037/0022-006X.68.5.748

Buzzi, C., Tucci, M., Ciprandi R., Brambilla, I., Caimmi, S., Ciprandi, G., & Marseglia, G. L. (2020). The psycho-social effects of COVID-19 on Italian adolescents' attitudes and behaviors. *Italian Journal of Pediatrics,* 46–69. https://doi.org/10.1186/s13052-020-00833-4.

Cacioppo, J. T., Fowler, J. H., & Christakis, N. A. (2009). Alone in the crowd: The structure and spread of loneliness in a large social network. *Journal of Personality and Social Psychology, 97*(6), 977–991. http://dx.doi.org/10.1037/.

Cacioppo, J. T., Cacioppo, S., Cole, S. W., Capitanio, J. P., Goossens, L., & Boomsma, D. I. (2015). Loneliness across phylogeny and a call for comparative studies and animal models. *Perspectives on Psychological Science, 10*(2), 202–212. http://dx.doi.org/10.1177/1745691614564876.

Chaturvedi, K., Vishwakarma, D. K., & Singh, N. (2021). COVID-19 and its impact on education, social life and mental health of students: A survey. *Children and youth services review, 121,* 105866. https://doi.org/10.1016/j.childyouth.2020.105866.

Chen, J., Wang, M., Kirschner, P. A., & Tsai, C. C. (2018). The role of collaboration, computer use, learning environments, and supporting strategies in CSCL: A meta-analysis. *Review of Educational Research, 88*(96), 799–843. https://doi.org/10.3102/0034654318791584.

Cooke, B.D., Rossmann, M.M., McCubbin, H.I., & Patterson, J.M. (1988). Examining the definition and assessment of social support: A resource for individuals and families. *Family Relations, 37*(2), 211–216. https://doi.org/10.2307/584322

Davis, T. (2019, January 2). What Is Well-Being? Definition, Types, and Well-Being Skills. *Psychology Today.* https://www.psychologytoday.com/us/blog/click-here-happiness/201901/what-is-well-being-definition-types-and-well-being-skills

De Wit, D., Karioja, K., and Rye, B. (2010). Student perceptions of diminished teacher and classmate support following the transition to high school: are they related to declining attendance? *School Effectiveness and School Improvement, 21*(4), 451–472. https://doi.org/10.1080/09243453.2010.532010.

Ellis, W. E., Dumas, T. M., & Forbes, L. M. (2020). Physically Isolated but Socially Connected: Psychological Adjustment and Stress Among Adolescents During the Initial COVID-19 Crisis. *Canadian Journal of Behavioural Science, 52*(3), 177–187. http://dx.doi.org/10.1037/cbs0000215.

Elmer T., Mepham, K., & Stadtfeld, C. (2020). Students under lockdown: Comparisons of students' social networks and mental health before and during the COVID-19 crisis in Switzerland. *PLoS ONE 15*(7): e0236337. https://doi.org/10.1371/journal.pone.0236337.

Engel, G. L. (1997). From biomedical to biopsychosocial. *Psychotherapy and Psychosomatics, 66*(2), 57–62. https://doi.org/10.1159/000289109.

Ewing, L. A., & Cooper, H. B. (2021): Technology-enabled remote learning during COVID-19: perspectives of Australian teachers, students and parents, *Technology, Pedagogy and Education, 30*(1), 41–57. https://doi.org/10.1080/1475939X.2020.1868562.

Fava, G. A., & Sonino N. (2008). The Biopsychosocial Model Thirty Years Later. *Psychotherapy and Psychosomatics, 77*(1), 1–2. https://doi.org/10.1159/000110052.

Fryer, L. K., & Bovee, H. N. (2016). Supporting students' motivation for e-learning: Teachers matter on and offline. *The Internet and Higher Education, 30,* 21–29. https://doi.org/10.1016/j.iheduc.2016.03.003.

Garmezy, N., & Tellegen, A. (1984). Studies of stress-resistant children: Methods, variables, and preliminary findings. *Advances in applied developmental psychology, 1*, 231–287.

Grothberg, E. (1995). *A Guide to Promoting Resilience in Children: Strengthening the Human Spirit.* http://resilnet.uiuc.edu/library/grotb95b.html.

Grothberg Henderson, E. (2005). *Resilience for Tomorrow.* Iguazu: International Council of Psychologists Convention.

Helgeson, V.S., & Lopez, L. (2010). Social support and growth following adversity. In W.R. John, J.Z. Alex, & J.S. Hall (Eds.), *Handbook of Adult Resilience* (pp. 309–330). The Guilford Press.

Kavčič, T., Avsec, A., & Kocjan, G. Z. (2021). Psychological functioning of Slovene adults during the COVID-19 pandemic: does resilience matter?. *Psychiatric Quarterly, 92*(1), 207–216.

Keyes, C. L. M. (2007). The Mental Health Continuum: From Languishing to Flourishing in Life. *Journal of Health and Social Behavior, 43*(2), 207–222. https://doi.org/10.2307/3090197.

Kiswardy, V. (2013). Analiza koncepta rezilientnosti v kontekstu vzgoje in izobraževanja. *Andragoška spoznanja, 19*(3), 46–64.

Klem, A. M., & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of school health, 74*(7), 262–273.

König, J., Jäger-Biela, D. J., & Glutsch, N. (2020). Adapting to online teaching during COVID-19 school closure: teacher education and teacher competence effects among early career teachers in Germany. *European Journal of Teacher Education, 43*(4), 608–622. https://doi.org/10.1080/02619768.2020.1809650

Kyndt, E., Raes, E., Lismont, B., Timmers, T., & Cascallar, E. (2013). A meta-analysis of the effects of face-to-face cooperative learning. Do recent studies falsify or verify earlier findings? *Educational Research Review, 10,* 133–149. http://dx.doi.org/10.1016/j.edurev.2013.02.002.

Larson, J.S. (1996). The World Health Organization's definition of health: Social versus spiritual health. *Social Indicator Research, 38*(2), 181–192. https://doi.org/10.1007/BF00300458

Law, P. C., Cuskelly, M., & Carroll, A. (2013). Young people's perceptions of family, peer, and school connectedness and their impact on adjustment. *Journal of Psychologists and Counsellors in Schools, 23*(1), 115–140. https://doi.org/10.1017/jgc.2012.19.

Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child development, 71*(3), 543–562.

Manago, A. M., Taylor, T., & Greenfield, P. M. (2012). Me and my 400 friends: The anatomy of college students' Facebook networks, their communication patterns, and well-being. *Developmental psychology, 48*(2), 369. https://doi.org/10.1037/a0026338.

Martikainen, P. (2002). Psychosocial determinants of health in social epidemiology. *International Journal of Epidemiology, 31*(6), 1091–1093. https://doi.org/10.1093/ije/31.6.1091

Masten, A. S., & Obradović, J. (2006). Competence and resilience in development. *Annals of the New York Academy of Sciences, 1094*(1), 13–27. https://doi.org/10.1196/annals.1376.003.

Nabi, R. L., Prestin, A., & So, J. (2013). Facebook friends with (health) benefits? Exploring social network site use and perceptions of social support, stress, and well-being. *Cyberpychology, 16*(10), 721–727. https://doi.org/10.1089/cyber.2012.0521.

Niemi, H. M., & Kousa, P. (2020). A case study of students' and teachers' perceptions in a Finnish high school during the COVID pandemic. *International journal of technology in education and science, 4*(4), 352–369. https://doi.org/10.46328/ijtes.v4i4.167

Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2003). Predictors of post-traumatic stress disorder and symptoms in adults: a meta-analysis. *Psychological bulletin, 129*(1), 52 – 73. https://doi.org/10.1037/0033-2909.129.1.52.

Patrick, H., Ryan, A. M., & Kaplan, A. (2007). Early adolescents' perceptions of the classroom social environment, motivational beliefs, and engagement. *Journal of educational psychology, 99*(1), 83–98. https://doi.org/10.1037/0022-0663.99.1.83.

Peplau, L. A., & Perlman, D. (Eds.). (1982). *Loneliness: A sourcebook of current theory, research, and therapy.* Wiley.

Polizzi, C., Lynn, S. J., & Perry, A. (2020). Stress and coping in the time of covid-19: pathways to resilience and recovery. *Clinical Neuropsychiatry, 17*(2), 59–62.

Reddy, R., Rhodes, J. E., & Mulhall, P. (2003). The influence of teacher support on student adjustment in the middle school years: a latent growth curve study. *Develpomental Psychopathology, 15*(1), 119–138. https://doi.org/10.1017/S0954579403000075.

Ristić Dedić, Z. (2020). *Pilot istraživanje učeničkih potreba i suočavanja s izazovima online nastave u ožujku 2020.* godine (Preliminarno izvješće) – Serija IDIZ-ovi vidici 003. Institut za društvena istraživanja u Zagrebu.

Roseth, C. J., Johnson, D. W., & Johnson, R. T. (2008). Promoting early adolescents' achievement and peer relationships: The effects of cooperative, competitive, and individualistic goal structures. *Psychological Bulletin, 13*(2), 233–246. https://doi.org/10.1037/0033-2909.134.2.223.

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software, 48*(2), 1–36. https://www.jstatsoft.org/v48/i02/.

Rupnik Vec, T., Preskar, S., Slivar, B., Zupanc Grom, R., Deutsch, T., Ivanuš Grmek, M., Mithans, M., Kregar, S., Holcar Brunauer, A., Preskar, S., Bevc, V., Logaj, V., & Musek Lešnik, K. (2020). *Analiza izobraževanja na daljavo v času epidemije Covid-19 v Sloveniji [Analysis of distance education during the Covid-19 epidemic in Slovenia].* Partial report, July 2020. Zavod RS za šolstvo.

Ryan, R. M., & Deci, E. L. (2000). Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68.

Scales, P. C., Benson, P. L., Oesterle, S., Hill, K. G., Hawkins, J. D., & Pashak, T. J. (2016). The dimensions of successful young adult development: A conceptual and measurement framework. *Applied Developmental Science, 20*(3), 150–174. https://doi.org/10. 1080/10888691.2015.1082429.

Serhan, D. (2020). Transitioning from face-to-face to remote learning: Students' attitudes and perceptions of using Zoom during COVID-19 pandemic. *International Journal of Technology in Education and Science (IJTES), 4*(4), 335–342.

Sood, S. & Sharma, A. (2020). Resilience and Psychological Well-Being of Higher Education

Students During COVID-19: The Mediating Role of Perceived Distress. *Journal of Health Management, 22*(4), 606–617. https://doi.org/10.1177/0972063420983111.

Srivastava, K. (2011). Positive mental health and its relationship with resilience. *Industrial Psychiatry Journal, 20*(2), 75–76. https://doi.org/10.4103/0972-6748.102469.

Tiego, J., Testa, R., Bellgrove, M. A., Pantelis, C., & Whittle, S. (2018). A hierarchical model of inhibitory control. *Frontiers in psychology, 9*, 1339. https://doi.org/10.3389/fpsyg.2018.01339.

Van den Berg, Y. H. M. (2015). *Peers in proximity. New perspectives on interpersonal processes in the classroom* (Doctoral dissertation, [Sl: sn]).

Wigfield, A., Byrnes, J. P., & Eccles, J. S. (2006). Development during earlyand middle adolescence. In P. A. Alexander & P. H. Winne (Eds.), *Handbook of educational psychology* (pp. 87–105). Mahwah, NJ: Erlbaum.

Ye, Z., Yang, X., Zeng, C., & Li, X. (2020). Resilience, Social Support, and Coping as Mediators between COVID-19-related Stressful Experiences and Acute Stress Disorder among College Students in China. *Applied Psychology: Health and Well-being, 12*(4), 1074–1094. https://doi.org/10.1111/aphw.12211.

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Analysis of Writings of Fourth-Grade Turkish-Speaking Students with Low Vision in Terms of Legibility and Spelling Errors

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Abstract

The purpose of this descriptive study is to analyze the writings of fourth-grade Turkish-speaking students with low vision in terms of legibility and spelling errors. The study is a general survey design and used the criterion sampling method. The study group consisted of 32 students with low vision. A Multidimensional Legibility Scale was used to evaluate students' writing legibility. The researcher developed a Spelling Error Evaluation Form to determine the spelling errors. The Mann-Whitney U test and a descriptive analysis were performed to analyze the study data. The findings of the study reveal that fourth-grade students' writings with low vision were generally not legible or were legible at a moderate level. In terms of spelling errors, it was observed that fourth-grade students with low vision made the most errors in letters, words, and spelling. Typing the letter smaller/larger than the relevant range was the most frequent, and suffix (*-ki*) was the least misspelled. It was observed that fourth-grade students' legibility and spelling error scores with low vision did not differ according to the variables of gender, school type, and braille. Also, a significant and negative correlation between spelling errors and legibility scores was found. The findings are discussed within the framework of the relevant literature and presented some suggestions for future measures and research.

Keywords:

Students with Low Vision, Legibility, Spelling Error, Visual Impairment, Special Education

Introduction

Visual impairment is considered an umbrella term that includes people with low vision and those visually impaired (blind) (Kreuzer, 2007). This concept is incorporated in the last version of the International Classification of Diseases (ICD-11) under visual impairment. It is classified as follows: mild visual impairment, moderate visual impairment, severe visual impairment, and total visual impairment (blindness) (World Health Organization [WHO], 2020). The concept of low vision is also considered a general category within visual impairment. Visual impairment is common in society and there are approximately 285 million people

visually impaired worldwide, most of whom are low vision (WHO, 2012).

In Turkey, students with low vision receive education either in inclusive environments where they attend with peers with normal vision or at schools for the visually impaired, which have been opened for visually impaired students (Yilmaz, 2020). Therefore, the aims and achievements that students will gain are the same. As the scope of the research is the writing skills, when the curriculum applied to the students is examined (Ministry of National Education [MONE], 2019), we encounter different writing acquisitions. For example, the students are expected to acquire skills such as writing letters and numbers especially in the first four years of the program. Using capital letters and punctuation marks in appropriate places, leaving appropriate spaces, writing numbers, question marks, and suffix abbreviation correctly are among the skills they are supposed to learn. However, the study findings reveal that the students encounter several skills-related problems with writing.

Low vision is a visual impairment that limits the independent display of actions or tasks associated with seeing in daily life (Verezen, 2009). In educational terms, it is defined as the ability of an individual to read printed materials written in large or standard font size with the help of magnifying glasses (Safak, 2009). In this respect, many students diagnosed with low vision encounter various problems in their daily lives and academic environments. For example, they may have difficulties reading, writing, orientation, and mobility, or performing tasks related to the use of vision, such as shopping and technology (Macnaughton et al., 2019). Students with low vision have difficulty in basic academic skills such as writing skills. Students with low vision have two literacy tool options: printed (standard) materials and braille (Holbrook, 2009). In other words, students with low vision can sometimes use braille and sometimes large font materials based on their vision and individual needs (Yalcin, 2020).

Markowitz (2006) claimed that handwriting might be challenging for students with low vision. McCall (1999) stated that students with low vision may have massive, irregular, and inconsistent letter structures and have difficulty leaving equal space between words and writing in a straight line and especially when the teacher shows the shapes of the letters. It reveals the problems experienced by students with low vision in writing. A study by Harris-Brown et al. (2015) also showed that the font size of students with low vision varies. They cannot write straight, and there are irregularities between letters and words and spaces. Harley et al. (1997) explained that students with low vision make different spelling errors. Examples of such mistakes are unequal letter spacing, combined spelling of words, difficulty in line straightness, inconsistency in letters, differences in size and slope in letters, omitting words, not non-compliance with to margins.

Some situations that students with low vision have may negatively affect their writing. In other words, there may be many reasons why students with low vision have difficulty in proper and good handwriting, and these may result from several factors. For example, motor skills (fine motor), visual factors (visual field), and mechanical (kinaesthetic knowledge) difficulties (Arter et al., 1996; Kaiser et al., 2009; McCall, 1999) are some of these factors. Due to these situations, students with low vision may show inadequacy in writing skills, which is considered an academic skill (Aki et al., 2008). Successful writing depends on students' writing speed and legibility (Atasavun Uysal & Duger, 2012). Studies highlighted that students with low vision spend more time writing and have lower average scores than their peers with normal vision (Aki et al., 2008). In a study by Atasavun Uysal and Duger (2012), no significant difference in the legibility scores of students with low vision after literacy education was observed. According to Graham et al. (1998), when students focus on fast writing, they can ignore the importance and legibility of an essay. Harris-Brown et al. (2015) reported that the handwriting legibility of students with low vision does not differ from their peers with normal vision. In contrast, Atasavun Uysal & Aki (2012) found that the legibility of students' writing with low vision and students with normal vision differed significantly. They also reported a significant relationship between legibility and visual-motor coordination. However, the research literature has limited studies investigating the writing skills of students with low vision, especially when they read and write in Turkish. These studies examined the relationship between kinesthetic sensory and writing performance (Aki et al., 2008) and writing skills and visual-motor control (Atasavun Uysal & Aki, 2012), the suitability of the literacy tool (Tiryaki, 2012), the effect of literacy education on font type and font size (Atasavun Uysal & Duger, 2012), the impact of writing preparation material (Kirac, 2003), teaching legible handwriting (Safak, 2011), handwriting kinematics, and factors affecting the pencil holding position (Guven, 2020) and written expression skills (Aslan, 2020; Aslan & Cakmak, 2020). However, in terms of legbility and spelling errors, no studies have addressed the students' writings with low vision. Students with low vision may encounter certain problems in their writing skills. In this context, we should determine the situations of students with low vision regarding their writing skills.

The purpose of the study

This study aimed to fill the gap in the literature, based on the lack of research, and analyze the students' writings with low vision from legibility and spelling errors. The study provides examples for teachers working with students with low vision in a topic where

the writings of students with low vision are locally and universally integrated. Considering studies on students' legibility and spelling errors with low vision are limited, the results of the study would provide useful information to educators (special education teachers) and families. Moreover, analyzing spelling errors will provide a rich source of information in shedding light on specific difficulties students encounter in writing process (Protopapas et al., 2013). This study aims to analyze the writings of fourth-grade Turkish-speaking students with low vision in terms of legibility and spelling errors. Hence, the research aims to seek answers to the following research questions:

1. What is the legibility for the texts of fourth-grade students with low vision?

    1.1. Do the legibility scores of fourth-grade students with low vision differ by *gender*, *school type*, and *braille*?

2. What are the spelling errors made by fourth-grade students with low vision?

    2.1 Do the spelling errors of fourth-grade students with low vision differ by *gender*, *school type*, and *braille*?

3. Is there a relationship between legibility scores and spelling error scores of fourth-grade students with low vision?

Method

Research Design

A screening study is a research approach to describe a past or present situation (Karasar, 2000). Screening studies allow the investigation process to be performed without deteriorating natural conditions or making a changing environment. In this study, the researcher used the legibility scale to examine students' writing with low vision and developed an evaluation form to determine spelling errors. In addition, analysis of differences and correlation calculations were performed in terms of the variables of *gender*, *school type*, and *braille* for both conditions.

Study Group

The study group consists of 32 Turkish-speaking students diagnosed with low vision. The students with low vision in the study group were selected from the students in primary schools and inclusive classes for the visually impaired in Ankara, the capital city of Turkey. To determine the participants, the criterion sampling method was used. (Buyukozturk et al., 2011; Patton, 2014; Yildirim & Simsek, 2006). In accordance with this approach the following inclusion criteria were employed: i) Attending the fourth grade, ii) Having a health board report regarding the vision status and not having any additional disabilities (hearing loss, mental disability, etc.), iii) Having functional vision skills at a medium or good level according to Gazi Functional Vision Assessment Tool (Safak et al., 2013) and iv) Using printed (standard) materials according to the Literacy Tool Assessment (Tiryaki, 2012). The demographic characteristics of students with low vision in the study group are given in Table 1.

Table 1

Demographic Characteristics of Study Group

Variables	Categories	*f*	%
Gender	Male	18	56.3
	Female	14	43.7
School Type	Schools for the Visually Impaired	19	59.4
	Inclusive Environments	13	40.6
Braille	Yes	17	53.1
	No	15	46.9
Functional Vision Skills	Medium Level	21	65.6
	Good Level	11	34.4

Data Collection Tools

Multidimensional Legibility Scale and Spelling Error Evaluation Form were used as data collection tools in the study.

The purpose of using The Multidimensional Legibility Scale was to evaluate the legibility of the students' writings. Yildiz & Ates (2007) developed the scale, and Gok & Bas (2020) adapted it to basic vertical writing. The scale consists of the following five sub-dimensions: letter slope, spacing, size, shape, and line straightness. The scale was developed according to the analytical evaluation approach. Accordingly, they each sub-dimension was evaluated to serve triple grading; 3 points: sufficient, 2 points: partially sufficient, and 1 point: not sufficient. In this context, it can obtain a maximum of 15 points and a minimum of 5 points from the full scale. The total points received are also categorized in three ways; 5-8.3 point range: not legible, 8.4-11.7 point range: moderately legible, and 11.8-15 point range: legible. A sample writing of a student with low vision is illustrated in Figure 1.

Spelling Error Evaluation Form was utilized to identify the spelling errors made by the fourth-grade students with low vision. The researcher prepared the form inspiring from several other studies on Turkish-speaking children (e.g., Babayigit, 2019; Erden et al., 2002; Erturk & Kucuktepe, 2019; Sugumlu, 2020; Uludag, 2002; Yildirim, 2018). During the determination of the items to be included in the form, the opinions of the visually impaired education specialist (3), the Turkish education expert (2), and the assessment and evaluation specialist (1) were obtained. They were asked to evaluate the items related to spelling errors as appropriate, be corrected, and not suitable to serve a triple assessment. In line with experts' recommendations, an evaluation form consisting of six sections and 21 items was developed. The form was

also evaluated with the help of two students who were not included in the study group. The form consists of the following sections with 21 items: letter (5), syllable (3), word (3), sentence (3), spelling (4), and punctuation (3). Calculation of spelling errors is evaluated based on the frequency of the errors made by the students. Table 2 shows some spelling errors from the writing of the students with low vision regarding the spelling error evaluation form items.

Data Collection

The data were collected in the 2020-2021 academic year after obtaining the ethical permission process. In addition, as the targeted study group consists of primary school (fourth-grade) students, the students' parents were informed and asked to voluntarily sign the Parent Consent Form for their children to participate in the study.

Figure 1

Sample Writing of a Student with Low Vision

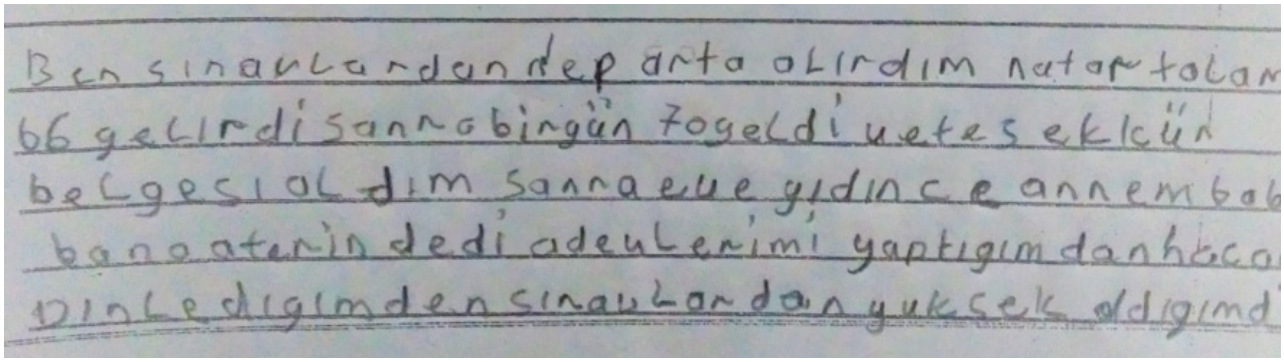


Table 2

Examples of Spelling Errors

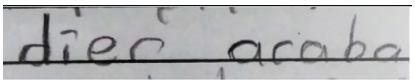
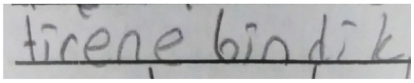
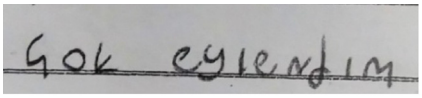
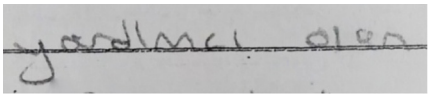
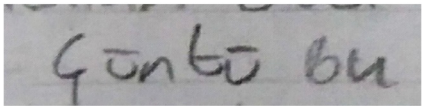
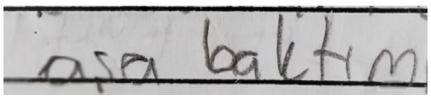
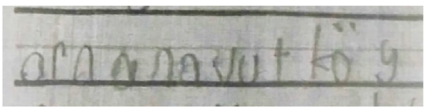
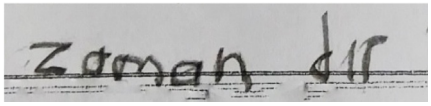
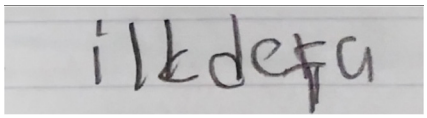
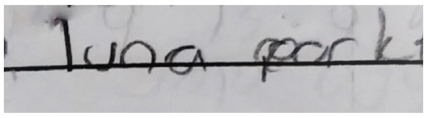
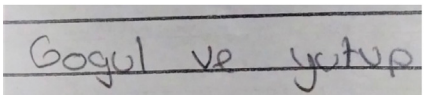
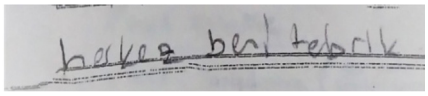
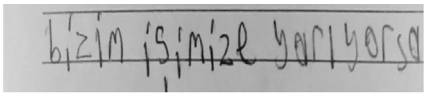
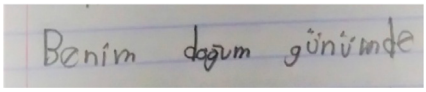
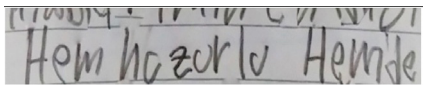
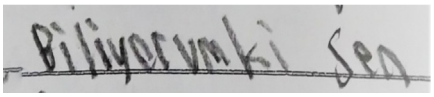
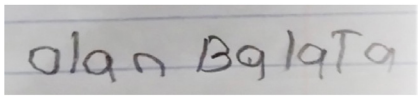
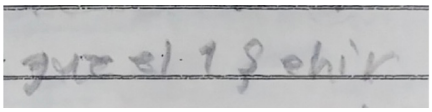
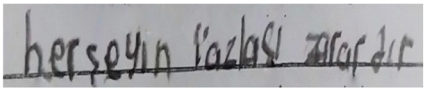
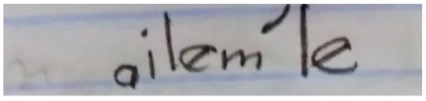
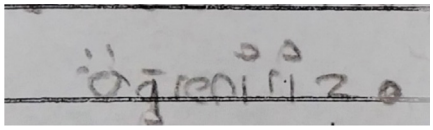
Sections	Items	What Students Wrote
Letter	Skipping Letters	
	Letter Addition	
	Letter Mixing/Changing	
	Writing the Letter Smaller/Bigger than the Relevant Range	
	Not Writing the Letter Properly	
Syllable	Skipping Syllable	
	Syllable Addition	
	Syllable Separation	

Table 2. continue

Examples of Spelling Errors

Sections	Items	What Students Wrote
Word	Combined Spelling of the Word	
	Dividing the Word	
	Misspelling	
Sentence	Leaving the Sentence Incomplete	
	Not Writing the Sentence in a Straight Line	
	Not Leaving Indents at the Beginning of a Sentence (Paragraph)	
Spelling	Misspelling suffix *(-de)*	
	Misspelling suffix *(-ki)*	
	Misspelling Uppercase/Lowercase Letters	
	Misspelling Numbers	
Punctuation	Not Using Punctuation in the Proper Place	
	Wrong Use of Punctuation	
	Not Writing Punctuation Properly	

The researcher personally visited to the schools with students with low vision and collected the data in the Turkish lessons in the students' curriculum. The student's classroom teachers and the researcher were together during the data collection process. Due to the COVID-19 pandemic in Turkey, the researcher paid attention to social distance rules during the explanation process. The classroom teachers also kept a certain distance from the students while distributing and collecting papers. At the begining of the lesson, teachers introduced the researcher to the students. The researcher brified the students about the study and explained the purpose and scope of the study with the information on what to do in this process and emphasized that participation is on a voluntary basis. He then asked students with low vision to do free writing. Graham et al. (2011) believed that allowing students to write in their preferred mode increases the validity of writing assessments. Accordingly, students wrote about the subject they wanted without any subject limitation. For the data collection process, a period of 40 minutes was allocated in the Turkish lesson. However, there was no limitation on time and word and page counts for the students. While the students with low vision used an average of 9.5 minutes to write, they wrote average 43 words during this period. The students' papers were collected by the teachers and delivered to the researcher. Afterward, the researcher ended the data collection process by thanking the students who participated in the study.

Data Analysis

The data analysis procedures of the study were performed using the SPSS 21.0 package program. Descriptive analyses such as frequency (*f*), percentage (%), arithmetic mean ($\bar{X}$), and standard deviation (*sd*) were used in the data analysis. Also, normality analyses were performed. In this context, the researcher analyzed the distribution of normality of the scores obtained from the legibility scale and the spelling error evaluation form from the fourth-grade students with low vision participating in the study. To check the distribution of normality, Kolmogorov-Smirnov and Shapiro-Wilk analyses were conducted, and thus, the Skewness and Kurtosis coefficient values were checked. The findings of the analyses showed that the *p* values were significant ($p < 0.05$), and the Skewness-Kurtosis coefficient values did not range within the desired threshold. The significance of these results indicates that the data do not show normal distribution (Hair et al., 1998). According to the findings, it would be safe to state that the data at hand do not show a normal distribution. Therefore, non-parametric analyses were performed in the survey. The Mann-Whitney *U* test was performed to analyze whether the data obtained from two unrelated samples created a significant difference concerning each other and whether the legibility and spelling error scores of fourth-grade students with low vision differ by *gender*, *type of school,* and *braille*. The correlation between legibility and spelling errors was analyzed using Spearman's rank correlation method.

Inter-Coder Reliability

The inter-coder reliability of the study was performed to determine legibility and spelling errors were calculated through a random sampling method for nine out of 32 students (30%). The coder's and researcher's evaluations for all writings were compared using the formula *"Agreement / [Agreement + Disagreement] X 100"* (House et al., 1981). According to the findings, the inter-coder reliability for legibility was found to be 95.6% and 92.1% for spelling errors.

Results

The findings on the legibility of the writings of fourth-grade students with low vision are shown in Table 3.

Table 3 shows that the writings of four students with low vision are legible. It is noteworthy to mention that these students are girls, participate in inclusive environments, and do not know how to read braille. The essays of 11 students with low vision are legible at a moderate level. Most of these students are boys, attend school for the visually impaired and know how to read braille. The essays of 17 students with low vision are not legible. The papers of more than half of the students with low vision are not legible, and the number of students is close to each other in terms of gender, school type, and braille.

Table 3

Findings Regarding the Legibility Level

Variables	Categories	Not Legible		Moderately Legible		Legible		Total	
		f	%	*f*	%	*f*	%	*f*	%
Gender	Male	10	55.5	8	44.5	-	-	18	56.3
	Female	7	50.0	3	21.5	4	28.5	14	43.7
School Type	Schools for the Visually Impaired	11	57.8	8	42.2	-	-	19	59.4
	Inclusive Environments	6	46.1	3	23.2	4	30.7	13	40.6
Braille	Yes	10	58.8	7	41.2	-	-	17	53.1
	No	7	46.8	4	26.6	4	26.6	15	46.9

The descriptive statistics findings of the scores of the fourth-grade students with low vision from the sub-dimensions and the total of the legibility scale are shown in Table 4.

Table 4
Descriptive Statistics on Scores Obtained from the Legibility Scale

Dimensions	*n*	*Min.*	*Max.*	*M*	*sd*
Slope	32	1.00	3.00	1.81	.78
Spacing	32	1.00	3.00	1.81	.69
Size	32	1.00	3.00	1.87	.55
Shape	32	1.00	2.00	1.68	.47
Line Straightness	32	1.00	2.00	1.37	.49
Total	32	5.00	13.00	8.56	2.43

Table 4 shows that students with low vision exhibited the highest performance in the size dimension (M = 1.87) and the most inadequate performance in the line straightness dimension (M = 1.47). The average score they obtained from the scale was M = 8.56.

The Mann-Whitney U test was performed to determine whether the scores of fourth-grade students with low vision from the sub-dimensions and total of the legibility scale differ by gender. The test results are summarized in Table 5.

Table 5
Mann Whitney U-Test Results of Legibility Scores by Gender

Dimensions	Gender	*N*	Mean Rank	Sum of Rank	*U*	*P*
Slope	Male	18	14.83	267.00	96.00	.222
	Female	14	18.64	261.00		
Spacing	Male	18	15.00	270.00	99.00	.261
	Female	14	18.43	258.00		
Size	Male	18	15.97	287.50	116.50	.658
	Female	14	17.18	240.50		
Shape	Male	18	16.17	291.00	120.00	.777
	Female	14	16.93	237.00		
Line Straightness	Male	18	16.72	301.00	122.00	.856
	Female	14	16.21	227.00		
Total	Male	18	15.25	274.50	103.50	.387
	Female	14	18.11	253.50		

The scores of fourth-grade students with low vision obtained from the sub-dimensions of slope (U = 96.00; p > 0.05), spacing (U = 99.00; p > 0.05), size (U = 116.50; p > 0.05), shape (U = 120.00; p > 0.05), line straightness (U = 122.00; p > 0.05), and total (U = 103.50; p > 0.05) do not make a significant difference by gender. No difference in the scores obtained by the boys and girls from the sub-dimensions and the total of the legibility scale was observed.

The Mann-Whitney U test was performed to determine whether the scores of fourth-grade students with low vision from the sub-dimensions and total of the legibility scale differ by the school type. The test results are shown in Table 6.

As Table 6 shows, the scores of fourth-grade students with low vision obtained from the sub-dimensions of slope (U = 109.00; p > 0.05), spacing (U = 96.50; p > 0.05), shape (U = 106.50; p > 0.05), line straightness (U = 89.50; p > 0.05) and total (U = 85.00; p > 0.05) do not significantly differ by the school type. According the table, only the scores obtained from the size (U = 74.50; p < 0.05) sub-dimension of the legibility scale made a significant difference by the school type. The mean rank in size sub-dimension scores revealed that the average of students with low vision in inclusive environments is higher than that of the students in schools for the visually impaired.

The Mann-Whitney U test was used to see whether the scores of fourth-grade students with low vision from the sub-dimensions and total of the legibility scale differ by braille. The test results are shown in Table 7.

As shown in Table 7, the scores that fourth-grade students with low vision obtained from the sub-dimensions of slope (U = 119.50; p > 0.05), spacing (U = 108.00; p > 0.05), shape (U = 100.50; p > 0.05), line straightness (U = 89.50; p > 0.05), and total (U = 91.00; p > 0.05) do not make a significant difference by the braille. The scores obtained from the size (U = 74.50; p < 0.05) sub-dimension of the legibility scale significantly differed by the braille. The findings of the mean rank in size sub-dimension revealed that the average scores of the students who do not know braille is higher than the students who know braille.

Descriptive statistics of the scores obtained by fourth-grade students with low vision from the sections (including the sub-items) and the sum of the Spelling Error Evaluation Form are presented in Table 8.

According to Table 8, fourth-grade students with low vision make the most letter errors (M = 105.93), followed by word (M = 8.78) and spelling errors (M = 7.06), at the section level. The least a made error is at the syllable level (M = 3.81). In the letter level spelling errors, writing the letter bigger/smaller than the relevant range (M = 51.68) has the highest average, and letter addition (M = .75) has the lowest average. The most common error made at the syllable level is a syllable separation (M = 1.68). At the word level, the combined spelling of the word (M = 7.40) was observed as the most common spelling error. At the sentence level, the most common spelling error not writing the sentence in a straight line (M = 4.93), while less common one leaving the sentence incomplete (M = .87). In the spelling errors, misspelling uppercase/lowercase letters (M = 5.84) have the most

Table 6

Mann Whitney U-Test Results of Legibility Scores by School Type

Dimensions	School Type	*N*	Mean Rank	Sum of Rank	*U*	*P*
Slope	Schools for the Visually Impaired	19	15.74	299.00	109.00	.551
	Inclusive Environments	13	17.62	229.00		
Spacing	Schools for the Visually Impaired	19	15.08	286.50	96.50	.256
	Inclusive Environments	13	18.58	241.50		
Size	Schools for the Visually Impaired	19	13.92	264.50	74.50	.021*
	Inclusive Environments	13	20.27	263.50		
Shape	Schools for the Visually Impaired	19	15.61	296.50	106.50	.417
	Inclusive Environments	13	17.81	231.50		
Line Straightness	Schools for the Visually Impaired	19	14.71	279.50	89.50	.120
	Inclusive Environments	13	19.12	248.50		
Total	Schools for the Visually Impaired	19	14.47	275.00	85.00	.135
	Inclusive Environments	13	19.46	253.00		

*p<0.05

Table 7

Mann Whitney U-Test Results of Legibility Scores According to the Braille

Dimensions	Braille	N	Mean Rank	Sum of Rank	*U*	*P*
Slope	Yes	17	16.03	272.50	119.50	.746
	No	15	17.03	255.50		
Spacing	Yes	17	15.35	261.00	108.00	.419
	No	15	17.80	267.00		
Size	Yes	17	13.38	227.50	74.50	.014*
	No	15	20.03	300.50		
Shape	Yes	17	14.91	253.50	100.50	.204
	No	15	18.30	274.50		
Line Straightness	Yes	17	14.26	242.50	89.50	.087
	No	15	19.03	285.50		
Total	Yes	17	14.35	244.00	91.00	.163
	No	15	18.93	284.00		

**p<0.05*

common error. In punctuation errors, the average of not using punctuation marks in the proper place (*M* = 3.93) is higher than other errors. In general, when looking at all spelling errors, the error writing the letter bigger/smaller than the relevant range (*M* = 51.68) has the highest average, and the misspelling suffixes (*-ki*) (*M* = .15) has the lowest average. In addition, the average of the total spelling errors of students with low vision is *M* = 138.06.

The Mann-Whitney *U* test was used to determine whether the scores obtained by fourth-grade students with low vision from the sections and complete in Spelling Error Evaluation Form create a gender difference. The findings of the test are shown in Table 9.

Table 9 shows that spelling errors of the fourth-grade students with low vision in letter ($U = 125.50$; $p > 0.05$), syllable ($U = 103.00$; $p > 0.05$), word ($U = 124.00$; $p > 0.05$), sentence ($U = 120.50$; $p > 0.05$), spelling ($U = 109.50$; $p > 0.05$), punctuation ($U = 82.50$; $p > 0.05$), and total ($U = 126.00$; $p > 0.05$) do not significantly differ by gender.

The Mann-Whitney *U* test was performed to determine whether the scores of fourth-grade students with low vision differ from the sections of the Spelling Error Assessment Form and their total differ by the school type. The results are shown in Table 10.

Table 10 shows that spelling errors of the fourth-grade students with low vision in letter ($U = 119.00$; $p > 0.05$), syllable ($U = 107.50$; $p > 0.05$), word ($U = 119.00$; $p > 0.05$), sentence ($U = 122.00$; $p > 0.05$), spelling ($U = 100.00$; $p > 0.05$), punctuation ($U = 103.50$; $p > 0.05$), and total ($U = 117.00$; $p > 0.05$) do not significantly differ by school type.

To determine whether the scores of fourth-grade students with low vision from the sections and the sum of the Spelling Error Evaluation Form differ by the braille, the Mann-Whitney *U* test performed. The results of the test are presented in Table 11.

Table 11 shows that spelling errors of the fourth-grade students with low vision in letter ($U = 116.00$; $p > 0.05$), syllable ($U = 104.50$; $p > 0.05$), word ($U = 126.00$; $p > 0.05$),

Table 8

Descriptive Statistics on Spelling Errors

Sections	İtems	*n*	Min.	Max.	$\bar{X}$	*sd*
Letter	Skipping Letters	32	0.00	19.00	1.68	3.51
	Letter Addition	32	0.00	9.00	.75	1.70
	Letter Mixing/Changing	32	0.00	23.00	4.65	6.55
	Writing the Letter Smallar/Bigger than the Relevant Range	32	3.00	174.00	51.68	40.18
	Not Writing the Letter Correctly	32	6.00	133.00	47.15	35.10
	Letter Subtotal	32	14.00	286.00	105.93	76.22
Syllable	Skipping Syllable	32	0.00	13.00	1.40	3.54
	Syllable Addition	32	0.00	10.00	.71	1.90
	Syllable Separation	32	0.00	10.00	1.68	2.33
	Syllable Subtotal	32	0.00	30.00	3.81	7.12
Word	Combined Spelling of the Word	32	0.00	69.00	7.40	16.39
	Dividing the Word	32	0.00	4.00	.43	.94
	Misspelling	32	0.00	5.00	.93	1.60
	Word Subtotal	32	0.00	77.00	8.78	18.08
Sentence	Leaving the Sentence Incomplete	32	0.00	6.00	.87	1.38
	Not Writing the Sentence in a Straight Line	32	0.00	18.00	4.93	4.33
	Not Leaving Indents at the Beginning of a Sentence (Paragraph)	32	0.00	5.00	1.21	1.00
	Sentence Subtotal	32	1.00	21.00	7.03	5.42
Spelling	Misspelling suffix (-de)	32	0.00	2.00	.53	.71
	Misspelling suffix (-ki)	32	0.00	1.00	.15	.36
	Misspelling Uppercase/Lowercase Letters	32	0.00	22.00	5.84	5.90
	Misspelling Numbers	32	0.00	6.00	.53	1.31
	Spelling Subtotal	32	0.00	23.00	7.06	6.09
Punctuation	Not Using Punctuation in the Proper Place	32	0.00	18.00	3.93	3.77
	Wrong Use of Punctuation	32	0.00	12.00	.75	2.18
	Not Writing Punctuation Properly	32	0.00	4.00	.75	1.04
	Punctuation Subtotal	32	0.00	18.00	5.43	4.15
Total Spelling Errors		32	16.00	441.00	138.06	104.80

Table 9

Mann Whitney U-Test Results of Spelling Mistakes According to Gender

Sectioons	Gender	*N*	Mean Rank	Sum of Rank	*U*	*P*
Letter	Male	18	16.47	296.50	125.50	.985
	Female	14	16.54	231.50		
Syllable	Male	18	17.78	320.00	103.00	.371
	Female	14	14.86	208.00		
Word	Male	18	16.61	299.00	124.00	.938
	Female	14	16.36	229.00		
Sentence	Male	18	16.19	291.50	120.50	.834
	Female	14	16.89	236.50		
Spelling	Male	18	17.42	313.50	109.50	.529
	Female	14	15.32	214.50		
Punctuation	Male	18	18.92	340.50	82.50	.097
	Female	14	13.39	187.50		
Total	Male	18	16.61	297.00	126.00	.909
	Female	14	16.49	231.00		

sentence (U = 114.50; p > 0.05), spelling (U = 116.50; p > 0.05), punctuation (U = 103.50; p > 0.05), and total (U = 116.00; p > 0.05) show do not significantly differ by braille.

The results of rank correlation coefficient are presented in Table 12. The results of the test show that there is a significant and negative relationship between the spelling error scores of fourth-grade students with low vision and their legibility scores (r = -.431, p < 0.05).

Discussion and Conclusion

This study investigates the writings of fourth-grade students with low vision in terms of legibility and spelling errors. According to study findings, the handwriting of more than half of the students was not legible. Handwritings of the vast majority of the remaining students were moderately legible, and only four students wrote legible writing. According to McCall (1999), there are wide variations in students' writing with low vision. Moreover, while some students

Table 10

Mann Whitney U-Test Results for Spelling Mistakes According to School Type

Sections	School Type	*n*	Mean Rank	Sum of Rank	*U*	*P*
Letter	Schools for the Visually Impaired	19	16.74	318.00	119.00	.863
	Inclusive Environments	13	16.15	210.00		
Syllable	Schools for the Visually Impaired	19	17.34	329.50	107.50	.529
	Inclusive Environments	13	15.27	198.50		
Word	Schools for the Visually Impaired	19	16.74	318.00	119.00	.860
	Inclusive Environments	13	16.15	210.00		
Sentence	Schools for the Visually Impaired	19	16.42	312.00	122.00	.954
	Inclusive Environments	13	16.62	216.00		
Spelling	Schools for the Visually Impaired	19	17.74	337.00	100.00	.365
	Inclusive Environments	13	14.69	191.00		
Punctuation	Schools for the Visually Impaired	19	17.55	333.50	103.50	.440
	Inclusive Environments	13	14.96	194.50		
Total	Schools for the Visually Impaired	19	16.84	320.00	117.00	.803
	Inclusive Environments	13	16.00	208.00		

Table 11

Mann Whitney U-Test Results of Spelling Mistakes According to Braille

Sections	Braille	*N*	Mean Rank	Sum of Rank	*U*	*P*
Letter	Yes	17	17.18	292.00	116.00	.664
	No	15	15.73	236.00		
Syllable	Yes	17	17.85	303.50	104.50	.373
	No	15	14.97	224.50		
Word	Yes	17	16.41	279.00	126.00	.954
	No	15	16.60	249.00		
Sentence	Yes	17	17.26	293.50	114.50	.621
	No	15	15.63	234.50		
Spelling	Yes	17	17.15	291.50	116.50	.677
	No	15	15.77	236.50		
Punctuation	Yes	17	15.09	256.50	103.50	.362
	No	15	18.10	271.50		
Total	Yes	17	17.18	292.00	116.00	.664
	No	15	15.73	236.00		

Table 12

Correlation Results between the Legibility Scores of Low Vision Students and Spelling Mistakes Scores

	1	2
Spelling Mistakes	-	-.431*
Legibility	-.431*	-

**p<0.05*

may write correctly and legibly, others may find it challenging to achieve their legibility and fluency goals. This is in line with the findings revealed by other studies. When the level of legibility was measured in terms of slope, spacing, size, shape, and line straightness dimensions. The findings of other studies examining these dimensions revealed that the font size of writing of students with low vision varies, and they cannot write in a straight line (Harris-Brown et al., 2015). Harley et al. (1997) claimed that students with low vision had difficulty in line straightness, and there were differences in size and slope in the letters they wrote. In this respect, the results of this study are in line with the findings of the provious studies.

As for the curriculum objectives (MONE, 2019), students with low vision are expected to achieve the same gains in writing as their peers with normal vision. However, based on the results of this study conducted with fourth-grade students, it would be safe to say that the legible writing skills that students with low vision are supposed to acquire have not been adequately improved.

Another finding of this study reveals that the common errors made by fourth-grade students with low vision are letter, word, and spelling errors. The students made the fewest errors at the syllable level. However, the most common error was writing the letter smaller/bigger than the relevant size. Other spelling errors encountered were not writing the letter correctly, mixing/changing letters, skipping syllables, the combined spelling of the word, not writing the sentence in a straight line, not leaving indents at the beginning of the sentences, misspelling uppercase/lowercase letters, and not using the punctuation marks in the proper place. Based on these findings, it would be safe to say that fourth-grade students with low vision made various spelling errors. Some previous studies also examined students' spelling errors with low vision. Harris-Brown et al. (2015) found that the font size written by students with low vision varies. They cannot write straight, and there are irregularities between their letters and words and spaces. In another study, Harley et al. (1997) reported that students with low vision made different spelling errors, such as unequal letter spacing, the combination of words, difficulty in line straightness, inconsistent letters, size and slope differences in letters, skipping words, and not adhering to margins. McCall (1999) stated that the writings of students with low vision may be extensive, irregular, and inconsistent in a letter structure. They may have difficulty leaving equal space between words and writing in a straight line, especially when the teacher shows the shapes of the letters. Cakmak et al. (2016) found that students with low vision had difficulty writing the desired words in the notebook and between the lines. Thus one can say that there is a similarity between the results obtained from this and that of the earlier studies. Students with low vision may experience difficulties in writing skills due to conditions such as motor skills, visual factors, and mechanical challenges (Arter et al., 1996; Kaiser et al., 2009; McCall, 1999). Therefore, they may show inadequacy in writing skills, which is an academic skill (Aki et al., 2008). Markowitz (2006) claimed that it may be challenging to use handwriting for students with low vision. Thus, these factors may have influenced students' writing skills with low vision. The performances of students with low vision in spelling mistakes can be associated with the aforementioned factors.

Furthermore, this study shows that fourth-grade students' legibility and spelling error scores with low vision did not significantly differ according to the gender variable. Harris-Brown et al. (2015) examined the legibility of the writing of students with low vision according to gender. Their study revealed no significant difference between the legibility of the essays of male and female students. Their findings are in line with the findings of this study. These findings reveal that the gender variable does not predict students' writing with low vision regarding legibility and spelling errors.

Apart from the gender variable, another variable examined in this study is school type. The results show that legibility and spelling error scores of the fourth-grade students with low vision did not significantly differ by the school type. In the size dimension, the scores of the students exhibit a difference by the school type. This difference was in favor of the students in the inclusive environments. In Turkey, students with low vision receive education either in schools for visually impaired or in inclusive settings. They follow the same program as students with normal vision do. That means MONE has adopted the normalization principle (Cakmak et al., 2017). Therefore, it would be safe to say that there is no difference between the achievements aimed to be acquired by students. This study revealed no significant difference in legibility and spelling error scores students with low vision who attended the school for the visually impaired and the students who receive their education in inclusive environments. Thus, it would be safe to say that the school type variable does not predict students' legibility and spelling errors.

Another issue examined in this study was braille writing. Students with low vision have two literacy tool options: printed (standard) materials and braille (Holbrook, 2009). Depending on their characteristics and needs, students with low vision can use one or both of these options. Although printed materials were taken as a criterion for fourth-grade students with low vision participating in the study, more than half of the participants also knew braille. The legibility (excluding size dimension) and spelling error scores fourth-grade students with low vision did not significantly differ

by the braille. This finding shows that the difference in size dimension difference is in favor of students who did not know braille. In a study by Savaiano & Hebert (2019), no difference between the mechanics of the writing written with paper-pencil and braille was reported. Another study reported that teachers working students with visual impairment differ in their beliefs about using paper-pencil and braille (Hebert & Savaiano, 2020). The findings of this study revealed that knowing or not knowing braille does not affect students with low vision to write legible and accurate handwriting.

Students with low vision made various spelling errors that were in line with the findings of previous studies. It was also was found that students with low vision who read and write in Turkish make different spelling errors, especially at the spelling level. These errors are mainly related to the spelling of suffixes or numbers. Similar findings were observed in studies conducted with students who read and write in Turkish (e.g., Babayigit, 2019; Sugumlu, 2020; Uludag, 2002). Therefore, the language can be considered an important variable. In this respect, it is thought that the findings obtained from the research provide important information from both international and national perspectives. Another result that should be emphasized in the study is that there is a significant and negative relationship between spelling mistakes and legibility scores. The tendency is that as the legibility level of the writings of fourth-grade students with low vision increases, their spelling errors decrease.

This study has expanded our knowledge about the challenges the students with low vision encounter in their school environment, but it has some limitations. The small sample size, lack of knowledge about the teachers' competence, and lack of addressing the SES-related factors are issues that were not addressed. More research is needed to address these issues and the skill-related issues such as dimensions of the students' writing speed, accuracy, and fluency dimensions of the students writing.

References

Aki, E., Atasavun, S., & Kayihan, H. (2008). Relationship between upper extremity kinesthetic sense and writing performance by students with low vision. *Perceptual and Motor Skills, 106*(3), 963-966. https://doi.org/10.2466/pms.106.3.963-966

Arter, C., McCall, S., & Bowyer, T. (1996). Handwriting and children with visual impairments. *British Journal of Special Education, 23*(1), 25-28. https://doi.org/10.1111/j.1467-8578.1996.tb00939.x

Aslan, C. (2020). *Görme engelli, az gören ve gören öğrencilerin yazılı ifade becerilerinin karşılaştırmalı olarak incelenmesi [Comparative analysis of written expression skills of students with visually impaired, students with low vision and sighted students]* [Doctoral dissertation, Gazi University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=aEzj_IdWAsjiSAfK3qwrBmk43QheALo-f8ZnAXVtUzT9HxOIWzXDwpwoBusxW5H5

Aslan, C., & Cakmak, S. (2020). Metin türleri bağlamında az gören, görme engelli ve gören öğrencilerin yazılı ifade becerilerinin incelenmesi [Examining written expression skills of low vision, visually impaired and sighted students in the context of text types]. *Journal of Mother Tongue Education, 8*(3), 868-885. https://doi.org/10.16916/aded.741627

Atasavun Uysal, S., & Aki, E. (2012). Relationship between writing skills and visual motor control in low vision students. *Perceptual and Motor Skills: Perception, 115*(1), 111-119. https://doi.org/10.2466/24.27.25.PMS.115.4.111-119

Atasavun Uysal, S., & Duger, T. (2012). Writing and reading training effects on font type and size preferences by students with low vision. *Perceptual and Motor Skills, 114*(3), 837-846. https://doi.org/10.2466/15.10.11.24.PMS.114.3.837-846

Babayigit, O. (2019). Ortaokul altıncı sınıf öğrencilerinin sözcük düzeyinde yazım yanlışlarının incelenmesi [Examining the sixth grade students' word-level spelling mistakes]. *Journal of Mother Tongue Education, 7*(1), 94-114. https://doi.org/10.16916/aded.466685

Berninger, V. W., Nielson, K. H., Abbott, R. D., Wijsman, E., & Raskind, W. (2008). Gender differences in severity of writing and reading disabilities. *Journal of School Psychology, 46*(2), 151-172. https://doi.org/10.1016/j.jsp.2007.02.007

Buyukozturk, S., Kilic Cakmak, E., Akgun, O. E., Karadeniz, S., & Demirel, F. (2011). *Bilimsel araştırma yöntemleri [Scientific research methods]*. Pegem.

Cakmak, S., Karakoc, T., & Safak, P. (2016). Az gören öğrencilerin görme becerileri ile ilgili farkındalık düzeylerinin belirlenmesi [The determination of the of the awareness levels of low vision students with reference to their visual skills]. *Abant Izzet Baysal University Journal of Education Faculty, 16*(4), 1687-1705. https://dergipark.org.tr/tr/pub/aibuefd/issue/28550/304592

Cakmak, S., Yilmaz, H. C., & Isitan, H. D. (2017). Determining the appropriateness of visual based activities in the primary school books for low vision students. *European Journal of Educational Research, 6*(4), 523-540. https://doi.org/10.12973/eu-jer.6.4.523

Erden, G., Kurdoglu, F., & Uslu, R. (2002). İlköğretim okullarına devam eden Türk çocuklarının sınıf düzeylerine göre okuma hızı ve yazım hataları normlarının geliştirilmesi [Development of grade level norms for reading speed and writing errors of Turkish elementary school children]. *Turkish Journal of Psychiatry, 13*(1), 5-13. http://www.turkpsikiyatri.com/default.aspx?modul=turkceOzet&gFPrkMakale=11

Erturk, E., & Kucuktepe, C. (2019). Üstün zekâlı birinci sınıf öğrencilerinin ilk okuma ve yazma hatalarının incelenmesi [Investigation of first reading and writing failures of gifted first grade students]. *Eskisehir Osmangazi University Journal of Social Sciences, 20*(Special Issue), 393-411. https://doi.org/doi.org/10.17494/ogusbd.548521

Gok, B., & Bas, O. (2020). İlkokul 1. sınıf öğrencilerinin dik temel yazılarının okunaklılığı üzerine bir inceleme [Investigating the legibility of primary school 1st grade students' manuscript writing]. *Journal of Mother Tongue Education, 8*(2), 572-585. https://doi.org/10.16916/aded.696147

Graham, S., Berninger, V., Weintraub, N., & Schafer, W. (1998). Development of handwriting speed and legibility in grades 1-9. *The Journal of Educational Research, 92*(1), 42-52. https://doi.org/10.1080/00220679809597574

Graham, S., Harris, K., & Hebert, M. (2011). *Informing writing: The benefits of formative assessment. A report from carnegie corporation of New York*. Alliance for Excellent Education.

Guven, Z. (2020). *Az gören çocuklarda el yazısı kinematiğine ve kalem tutma pozisyonuna etki eden faktörlerin incelenerek tipik gelişim gösteren yaşıtları ile karşılaştırılması [The examination of factors affecting handwriting kinematics and pen grip position in children with low-vision and comparison of typically developed peers].* [Master's thesis, Hacettepe University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=aEzj_IdWAsjiSAfK3qwrBtZxQZjpNeQ3Kenvlw043pb0moN-dLIFSpQErMgseAd-

Hair, J. F., Anderson, R. L., Tatham, W., & Black, C. (1998). *Multivariate data analysis: With readings.* PrenticeHall.

Harley, R. K., Truan, M. B., & Sandford, L. D. (1997). *Communication skills for visually impaired learners: Braille, print, and listening skills for students who are visually impaired.* Charles C Thomas.

Harris-Brown, T., Richmond, J., Maddalena, S. D., & Jaworski, A. (2015). A comparison of the handwriting abilities of secondary students with visual impairments and those of sighted students. *Journal of Visual Impairment & Blindness, 109*(5), 402-412. https://doi.org/10.1177/0145482X1510900510

Hebert, M., & Savaiano, M. E. (2020). A survey of the writing instructional practices of Nebraska teachers of students with visual impairments. *Exceptionality,* 1-16. https://doi.org/10.1080/09362835.2020.1850450

Holbrook, M. C. (2009). Supporting students' literacy through data-driven decision-making and ongoing assessment of achievement. *Journal of Visual Impairment & Blindness, 103*(3), 133-136. https://doi.org/10.1177/0145482X0910300302

House, A. E., House, B. J., & Campbell, M. B. (1981). Measures of interobserver agreement: Calculation formulas and distribution effects. *Journal of Behavioral Assessment, 3*(1), 37-57. https://link.springer.com/article/10.1007%2FBF01321350

Kaiser, M. L., Albaret, J. M., & Doudin, P. A. (2009). Relationship between visual-motor integration, eye-hand coordination, and quality of handwriting. *Journal of Occupational Therapy, Schools, & Early Intervention, 2*(2), 87-95. https://doi.org/10.1080/19411240903146228

Karasar, N. (2000). *Bilimsel araştırma yöntemi [Scientific research method].* Nobel.

Kirac, G. (2003). *Az gören öğrencilerin yazmaya hazırlık çalışmalarında bireyselleştirilmiş yazmaya hazırlık materyallerinin etkililiği [The effect of preparation materials to personelised writing in preparations studies to writing of the students who see a little].* [Master thesis, Gazi University]. Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Kreuzer, D. T. (2007). *An analysis of writing practices in 4th- and 5th-grade students with visual impairments.* [Doctoral dissertation, University of California Berkeley with San Francisco State University]. California. https://www.proquest.com/docview/304764389?pqorigsite=gscholar&fromopenview=true

Macnaughton, J., Latham, K., & Vianya-Estopa, M. (2019). Rehabilitation needs and activity limitations of adults with a visual impairment entering a low vision rehabilitation service in England. *Ophthalmic and Physiological Optics, 39*(2), 113-126. https://doi.org/10.1111/opo.12606

Markowitz, M. (2006). Occupational therapy interventions in low vision rehabilitation. *Canadian Journal of Ophthalmology, 41*(3), 340-347. https://doi.org/10.1139/I06-020

McCall, S. (1999). Accessing the curriculum. In C. Arter, H. L. Mason, S. McCall, M. McLinden & J. Stone (Eds.), *Children with visual impairment in mainstream settings* (pp. 29-40). David Fulton.

Memis, A. D. (2018). Examination of legibility and writing speeds of primary school students with respect to writing disposition and writing style. *Universal Journal of Educational Research, 6*(5), 1050-1059. https://doi.org/10.13189/ujer.2018.060526

Ministry of National Education [MONE]. (2019). *Turkish lesson curriculum (Primary and secondary school 1st, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th grades).* https://mufredat.meb.gov.tr/Dosyalar/20195716392253-02-T%C3%BCrk%C3%A7e%20%C3%96%C4%9Fretim%20Program%C4%B1%202019.pdf

Patton, M. Q. (2014). *Qualitative research and evaluation methods* (M. Bütün & S. B. Demir, Trans.). Pegem.

Protopapas, A., Fakou, A., Drakopoulou, S., Skaloumbakas, C., & Mouzaki, A. (2013). What do spelling errors tell us? Classification and analysis of errors made by Greek school children with and without dyslexia. *Reading and Writing, 26*(5), 615-646. https://doi.org/10.1007/s11145-012-9378-3

Safak, P. (2009). Görme yetersizliği olan çocukların eğitimi [Education of visually impaired children]. In G. Akcamete (Ed.), *Genel eğitim okullarında özel gereksinimi olan öğrenciler ve özel eğitim [Students with special needs and special education in general education schools]* (pp. 397-440). Kök.

Safak, P. (2011). *Az gören öğrencinin doğrudan öğretim yöntemiyle okunaklı el yazısı yazma öğretimi [Teaching legible handwriting to students with low vision using direct teaching method] [Paper presentation].* 4th International Turkish Education-Teaching Congress, Sakarya, Sakarya University.

Safak, P., Cakmak, S., Kan, A., & Aydin O'Dwyer, P. (2013). *Gazi İşlevsel Görme Değerlendirme Aracı ile az gören öğrencilerin görme becerilerinin değerlendirilmesi [Evaluation of vision skills of students with low vision with the Gazi Functional Vision Assessment Tool].* (TUBITAK Project Number: 111K549).

Savaiano, M. E., & Hebert, M. (2019). A cross-sectional examination of the writing of students with visual impairments. *Journal of Visual Impairment & Blindness, 113*(3), 260-273. https://doi.org/10.1177/0145482X19854921

Sugumlu, U. (2020). Ortaokul öğrencilerinin yazma çalışmalarındaki yazım ve noktalama hatalarının belirlenmesi [Determination of the spelling and punctuation errors in the writing activities of middle-school students]. *Journal of Mother Tongue Education, 8*(2), 528-542. https://doi.org/10.16916/aded.706748

Tiryaki, D. (2012). *Az gören öğrencilerin kullandıkları okuma yazma araçlarının uygunluğunun belirlenmesi [Literacy media continuing assessment students with low vision]. [Master thesis, Gazi University].* Council of Higher Education Thesis Center. https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=vVNzTGHHhjH-u3WMTo xQ-nGo8g78U8IcgrhgsG_lq58QjX94c3FmDrNNythx-gAB

Ulu, H. (2019). İlkokul birinci sınıf öğrencilerinin dik temel yazılarının okunaklılık ve yazım hataları açısından incelenmesi [An analysis of manuscript handwriting of primary school first grade students in terms of readability and writing errors]. *International Journal of Field Education, 5*(2), 195-211. https://doi.org/10.32570/ijofe.626430

Uludag, E. (2002). İlköğretim ikinci kademe öğrencilerinin yazım ve noktalama kurallarını uygulama beceri düzeyleri [Students' skill fullnes in use of syntax and punctation in middle school grades]. *Erzincan University Journal of Education Faculty, 4*(1), 97-114. https://dergipark.org.tr/en/download/article-file/67014

Verezen, C. A. (2009). *Eccentric viewing spectacles including an introduction in low vision rehabilitation.* [Doctoral dissertation, Radboud Universiteit]. Nijmegen. https://repository.ubn.ru.nl/bitstream/handle/2066/74433/74433.pdf

World Health Organization. (2012). *Global data on visual impairments 2010.* https://www.who.int/blindness/GLOBALDATAFINALforweb.pdf?ua=1

World Health Organization. (2020). *ICD-11: International classification of diseases 11th revision. The global standard for diagnostic health information.* https://icd.who.int/browse11/l-m/en#/http%3a%2f%2fid.who.int%2ficd%2fentity%2f1103667651

Yalcin, G. (2020). Görme yetersizliği olan öğrencilere yönelik ortam, materyal ve program/öğretimsel düzenlemeler [Environment, materials and program/instructional arrangements for visually impaired students]. In P. Pistav Akmese & B. Altunay (Eds.), İşitme yetersizliği ve görme yetersizliği olan çocuklar ve eğitimleri *[Hearing and visually impaired children and their education]* (pp. 271-293). Nobel.

Yildirim, A. (2018). İlkokul 1.sınıf öğrencilerinin bitişik eğik el yazısı hataları üzerine nitel bir araştırma [Qualitative research on the mistakes of 1st grade students in primary school about cursive writing]. *Scientific Educational Studies, 2*(1), 71-92. https://dergipark.org.tr/en/pub/ses/issue/37465/387620

Yildirim, A., & Simsek, H. (2006). *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in the social sciences].* Seçkin.

Yildiz, M., & Ates, S. (2007). *İlköğretim 3. sınıf öğrenci yazılarının okunaklılık bakımından incelenmesi [Examination of primary school 3rd grade students' writing in terms of legibility].* [Paper presentation]. I. National Primary Education Congress, Ankara, Hacettepe University.

Yilmaz, H. C. (2020). Görme yetersizliği olan bireyler için eğitim seçenekleri [Education options for visually impaired individuals]. In H. Gurgur & P. Safak (Eds.), *İşitme ve görme yetersizliği [Hearing and vision impairment]* (pp. 185-213). Pegem.

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Adaptation of AIR Self-Determination Scale - Educator Version to Turkish (AIR SDS-TR)*

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Abstract

The purpose of this study is to adapt Adaptation of AIR Self-Determination- Educator Version The confirmatory factor analysis (CFA) of the scale, which was translated into Turkish and studied in terms of language validity, was carried out on 220 (46.8% female, 53.2% male) special education teachers. Teachers answer the items in the scale by thinking about their students. The age range of the participants in the study was between 25 and 59, and the mean age was 36.12 (*sd* ± 7.03). Sixty-four percent of the students reflected by the data in the study were female and thirty-six percent were male. According to the distribution of the disability groups, 24% of the students had autism and 76% had an intellectual disability. After establishing language, the validity and reliability of the scale of analysis was examined. Item-factor structure has been tested for compliance with a model by confirmatory factor analysis (CFA). Based on this, five-factor structure of Adaptation of AIR Self-Determination Scale - Educator Version has been validated. As a result of the analysis for adaptation of Adaptation of AIR Self-Determination Scale - Educator Version to Turkish, it can be said that the scale is a reliable and valid measurement tool. As a result of the measurement model, the t values of the indicators in the measurement model were between 10.02 and 16.36 and R2 values varied between .39 and .78. Cronbach's Alpha (α) internal consistency coefficient of the scale ranged between .86 and .94. The CR values of the sub-dimensions of the scale vary between .86 and .93, and the AVE values between .51 and .70.

Keywords:

Self-Determination; Special Education; Intellectual Disability; Autism

Introduction

In today's world, all people have the right to make decisions about their own lives, which is one of the most natural facts. Undoubtedly, not all people are the same, and just as each person has individual differences, some people also have special needs. Individuals with intellectual disability, who are among groups that have special needs, also have the right to self-determination. Self-determination refers to a person's taking responsibility for their own life (Zhang & Benz, 2006). According to Wehmeyer (1992),

self-determination is the body of attitudes and skills required for an individual to act independently of external influences and interventions and to make choices about their own actions as the primary subject in their own life. To achieve these skills, the individual must (a) act autonomously, (b) regulate their own behaviour, (c) initiate and respond to actions with psychological resilience, and (d) exhibit behaviours in a self-fulfilling manner (Wehmeyer, 1997). Self-determination is a versatile skills that includes positive competencies, such as making choices, decision-making, problem-solving, goal setting, goal achievement, self-observation, self-reinforcement, self-defense, and leadership (Wehmeyer, 1999; Martin et al., 1995). According to another definition, self-determination is the body of skills, knowledge, and beliefs that enable the individual to engage in goal-oriented, self-regulating, and autonomous behaviors. To achieve self-determination, it is necessary that individuals know their strengths and limits as well as having the belief that they are capable and effective. When individuals have these skills, they may have more opportunities to control their own lives and to take on the role of successful adults in the society they live in (Field et al., 1998). Both environmental and individual characteristics contribute to the development of self-determination. Individual skills that affect learning and development, opportunities caught by environments and experiences, supports, and arrangements all affect the emergence of self-determination (Wehmeyer, 1997, 2003). According to Wehmeyer (2007), when individuals can use their self-determination skills, they become the primary guiding person of their own life.

Positive psychology involves the pursuit of understanding optimal human functioning and well-being and a prominent construct in positive psychology is self-determination (Deci and Ryan 2002). Research in self-determination in positive psychology has focused on the construct in the context of motivational psychology, and while research and theory in self-determination in special education was derived from Deci Ryan's early work, most of the theoretical perspectives within special education have focused more broadly on self-determination as, in essence, a personality construct and less specifically on motivational aspects pertaining to self-determination (Shogren et al., 2015). The topic of self-determination has been extensively studied in the education of students with special needs since the early 1990s (Shogren, et al., 2008). Teaching students with special needs how to achieve self-determination is considered the best practice possible (Field & Hoffman, 2002), and this teaching is extremely important, especially for adult life. However, there is evidence that individuals with intellectual disability can achieve self-determination when they are provided with adequate support (Wehmeyer et al., 2003). It is known that adequate supports and self-determination practices increase the academic performance (Konrad, Fowler,Walker, Test,&Wood, 2007; Raley, Shogren, & McDonald, 2018), make leisure time activities more qualified (Dattilo & Rusch, 2012) of students with special needs in the post-school period, and increase the quality of life of adults with special needs (Lachapelle et al., 2005).

Cultural differences

People become a part of the culture they live in, and this culture affects them directly or indirectly. According to Shogren (2011), people in eastern cultures may be more dependent on family goals rather than individual goals when pursuing self-determination. In Western cultures, on the other hand, more emphasis is placed on individuality. In western countries, for example, those in North America, Europe, and Australia, people's autonomy, personal space, and individual choices are more important (Wong et al., 2011). Based on this, it can be said that individuals with intellectual disabilities living in western countries have more cultural opportunities to develop self-determination skills compared to those with intellectual disabilities living in eastern countries. Although various measurement tools have been developed to measure self-determination skills in the field of intellectual disabilities, only the Arc's Self-Determination Scale, developed by Wehmeyer & Kelchner (1995), and the AIR, (Wolman et al., 1994), which is the measurement tool of American Research Institute, were designed to measure self-determination globally. The AIR Self-Determination Scale had previously been translated into Spanish (Mumbardó, Guàrdia Olmos, & Giné, 2018), Norwegian (Garrels, & Granlund, 2018), and Chinese (Wong, et al., 2017). However, there is not enough research on the appropriateness and application of self-determination skills to students with different linguistic and cultural backgrounds. For this reason, it is extremely important to use measurement tools that can determine the extent to which individuals with intellectual disabilities can employ their self-determination skills. With this purpose in mind, the Turkish adaptation study of the educator version of the AIR scale was carried out in this study. In addition, self-determination studies of individuals with special needs are currently very limited in Turkey (Orum-Çattık, 2020), and considering this limitation, it is thought that this study will contribute both to the field of special education and to new policies to be produced for individuals with intellectual disabilities.

Method

In this part of the study, detailed information on the study group, data collection, data collection tools, the process, and data analysis was presented.

Study Group

The study data were collected from special education teachers. In this context, the teachers were asked to answer questions by considering a student they were already teaching. Therefore, two different working groups can be mentioned. We can define these groups as the study group that the data were collected from and the group that was reflected by the data. Within the scope of the validity and reliability study of AIR SDS-TR, data were collected from seven different geographical regions of Turkey. The confirmatory factor analysis (CFA) of the scale, which was translated into Turkish and studied in terms of language validity, was carried out on 220 (46.8% female, 53.2% male) special education teachers. The age range of the participants in the study was between 25 and 59, and the mean age was 36.12 (*sd* ± 7.03). Sixty-four percent of the students reflected by the data in the study were female and thirty-six percent were male. According to the distribution of the disability groups, 24% of the students had autism and 76% had an intellectual disability. Demographic data are shown in table 1.

Table 1.
Demographic data on participants

	Teacher	Student
Women	46.8%	64%
Man	53.2%	36%
Age (Avg)	36,12	15,2%
Bachelor	97%	
MD	3%	
ID		76%
ASD		24%

Data Collection

During the data collection process, first, necessary permission was obtained for the use of the measurement tools in the study. For this purpose, Dr. Dennis Mithaug was contacted through the web site of the University of Oklahoma Zarrow Center regarding the measurement tool. In addition, ethical and legal approval of Nevşehir Hacı Bektaş Veli University was obtained to collect data. During the data collection process, an informed consent form was added to the data collection tool to inform the participants about the purpose and content of the study and to ensure the voluntary participation of all participants in the study. Also, a personal information form was used together with the measurement tools. The administration of data collection tools took an average of 10-15 minutes for each participant.

Data collection tools

The study data were collected using the AIR Self-Determination Scale- Educator Version (A) Turkish Version and a Personal Information Form. Detailed information about these data collection tools is given below.

The personal information form: This form was used to collect socio-demographic data about the participants and to obtain information about the study group. This form was created by the researchers to determine the sex, grade, and age of the teachers in the study group and the undergraduate program they graduated from.

The AIR Self-Determination Scale - Educator Version: There is evidence that self-determination skills are important for young people with special needs so that they can achieve more successful educational outcomes and reach adult life (Wehmeyer & Schwartz, 1997). Therefore, measuring self-determination skills is important. The AIR Self-Determination Scale was developed by Wolman, Campeau, DuBois, Mithaug, and Stolarski (1994). This scale was designed on three concepts: thinking, doing, and adjusting. It was stated that the evaluation results of this tool, which was developed by Wolman et al. to determine the level of self-determination in individuals with special needs, could reveal basic information for teachers as in individualized education programs of students. The AIR Self-Determination Scale is suitable for all students with and without special needs from primary school to university level. There are three versions of the scale, including educator form, parent form, and student form. The educator form consists of 30 questions that evaluate students' level of self-determination and self-determination characteristics. This form can also evaluate opportunities for self-determination provided by those with whom the student shares important relationships. In this study, the Turkish adaptation study of the educator version of the scale was conducted.

The Implementation Process of The Study

AIR SDS Educator Version is a tool that can be used by all educators. In the process of adapting AIR SDS-TR to Turkish, the scale was first translated into Turkish. The translation process was carried out in two stages. First, the scale was translated into Turkish by the researchers. Then, the items on the scale were translated independently by 7 experts, including 3 from the field of translation and interpretation, 2 from the field of Guidance and Psychological Counselling (GPC), and 2 from the special education field. The translations obtained at this stage were compared and those which were evaluated to best reflect the related scale items were determined. Next, a draft form was obtained and it was piloted to 10 participants (special education teacher) individually to test the intelligibility of the items on the scale. Finally, a consensus was reached on the final form of the Turkish form of the scale by the researchers for the language validity study.

Data Analysis

In the study process, first of all, analyses regarding the adaptation process of the measurement tool were conducted. Accordingly, descriptive statistics related to the demographic characteristics of the participants, and Confirmatory Factor Analysis (CFA) and Cronbach's Alpha (α) internal consistency coefficient analyses were employed for the validity and reliability values of the measurement tools. Prior to the study, missing values of the data set were entered by determining the average scores for the dimensions. Afterwards, the multivariate normality of data distribution was examined by Mardia's test. The result of analysis showed that the Mardia's Skewness was 93.53 (p <.001), and Mardia's Kurtosis was 35.11 (p <.001). That means the multivariate normality requirement was not met and data were not normally distributed. Since Maximum Likelihood estimation is recommended to utilize in the existence of multivariate normality (Kline, 2011), Maximum Likelihood Robust estimation was utilized throughout the present study. The data were analysed using the SPSS 24.00, RStudio (Version 1.4.1717), and LISREL 9.1 software packages. In RStudio, MVN package was used to run Mardia's test.

Results

A first-order CFA analysis was conducted in the first stage. The validity of the 30-item and 5- factor scale was tested with the confirmatory factor analysis. For the validity, first-order CFA was executed using the maximum likelihood robust estimation method in this phase, confirmatory factor analysis was carried out with the data set (n = 220) without making any modifications. After confirmatory factor analysis, acceptable fit indexes were obtained for the five-factor structure (Table 1)

Figure 1. Standard load values for AIR-S' correlated factors model

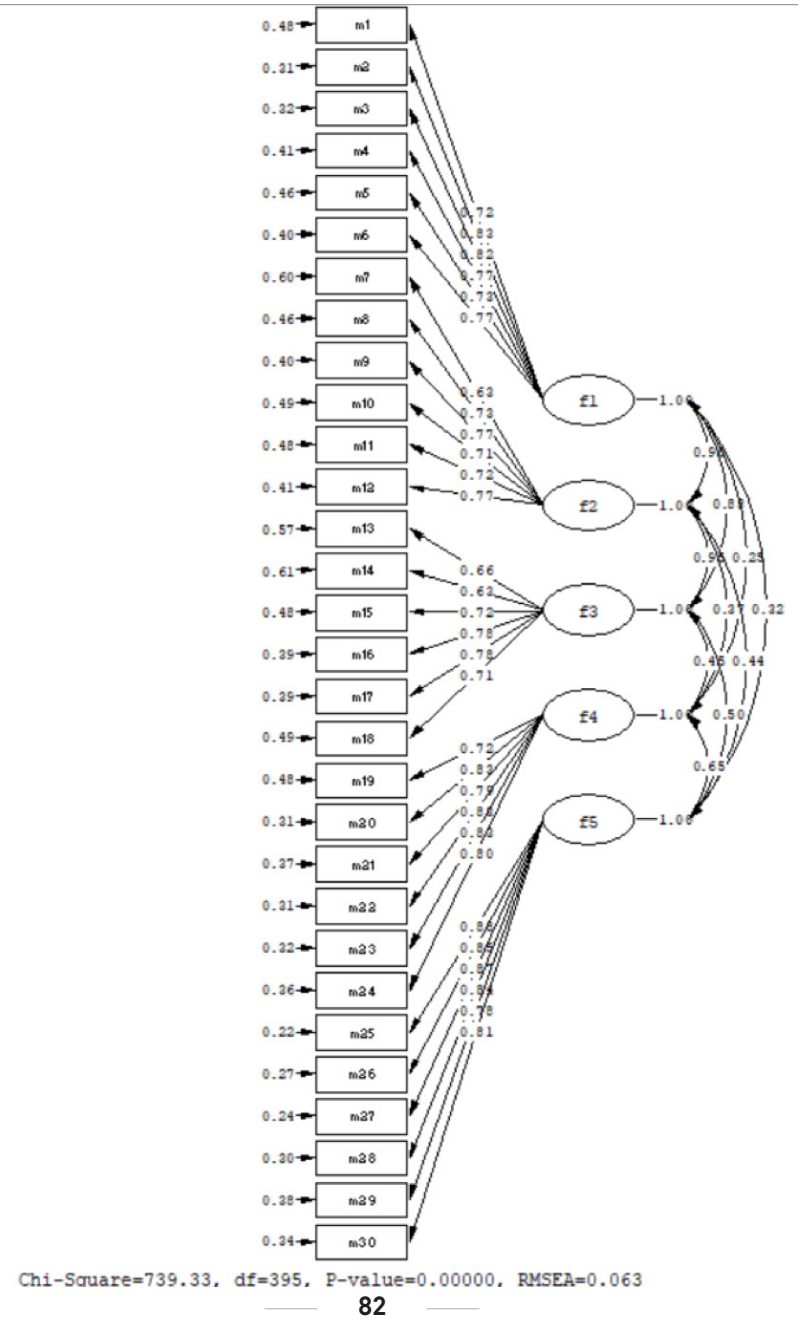

Table 1.
The goodness of fit indices obtained as a result of the correlated factors model

Indices	Acceptable fit	Model indices
χ^2/df	≤ 3 (Hair et. al., 2006)	1.87
RMSEA	≤.08 (Hair et. al., 2006)	0.06
SRMR	≤.08 (Hair et. al., 2006)	0.05
NFI	≥.90 (Hair et. al., 2006)	0.95
NNFI	≥.90 (Hair et. al., 2006)	0.98
CFI	≥.90 (Hair et. al., 2006)	0.98

Some of the fit values were taken as a reference to evaluate the statistical fit of the model. To determine the goodness of fit of the model in this study, the frequently used criteria, such as X^2 / df value, non-normed fit index (NNFI), the root-mean-square error of approximation (RMSEA), comparative fit index (CFI), and standardized root mean square residual (SRMR) were used. As seen in Table 1 and, according to the CFA results obtained without any modifications on the data, the fit indices were generally in the range of perfect fit values (Hair et. al., 2006). In addition, as can be seen in Figure 1, the standard load values for the items were at acceptable levels.

An important criterion that reveals the importance of the observed variable in terms of the latent variable is the R^2 value, which shows how much each observed latent variable can explain the variance in the variable (Tabachnick & Fidell, 2007). Standardized values and t and R^2 values of AIR Self-Determination Scale-Educator Version are given in Table 2. Finally, to reveal the reliability values of the scale, item-total correlations, average variance extracted (AVE), composite reliability (CR) and the Cronbach α values of the sub-dimensions were examined. These values are presented in Table 2.

Table 2.
Values for items and factors obtained as a result of the correlated factors model

		t	R^2	Item-Total Correlation	Cronbach α	AVE	CR
internal knowledge	M1	20.56	0.52	.67	.90	.60	,90
	M2	34.39	0.69	.80			
	M3	32.92	0.68	.78			
	M4	26.36	0.59	.71			
	M5	21.31	0.54	.68			
	M6	25.84	0.60	.71			
	M7	14.48	0.40	.56			
Skills	M8	21.44	0.54	.71	.87	.52	.87
	M9	25.62	0.60	.68			
	M10	19.72	0.51	.66			
	M11	20.60	0.52	.66			
	M12	25.45	0.59	.72			
	M13	16.04	0.43	.62			
	M14	14.34	0.39	.60			
Perception	M15	20.41	0.52	.70	.86	.51	.86
	M16	26.34	0.61	.69			
	M17	26.25	0.61	.67			
	M18	19.90	0.51	.66			
School opportunities	M19	20.48	0.52	.69	.91	.65	.92
	M20	33.42	0.69	.80			
	M21	27.76	0.63	.75			
	M22	33.32	0.69	.78			
	M23	32.99	0.68	.78			
	M24	29.18	0.64	.77			
Home opportunities	M25	49.42	0.78	.85	.94	.70	.93
	M26	40.48	0.73	.81			
	M27	46.31	0.76	.84			
	M28	36.54	0.70	.83			
	M29	27.77	0.62	.76			
	M30	32.01	0.66	.79			

As seen in Table 2, the examination of t values of the model indicated that all observed variables could be predicted by the latent variable at a significance level of .01 Also, as a result of the measurement model, the t values of the indicators in the measurement model were between 10.02 and 16.36 and R^2 values varied between .39 and .78. Cronbach's Alpha (α) internal consistency coefficient of the scale ranged between .86 and .94. The CR values of the sub-dimensions of the scale vary between .86 and .93, and CR value of whole scale was .89. The AVE values between .51 and .70.

Discussion

This study aimed to confirm the Turkish version of the educator form of the AIR-Scale and to discover the differences in the distribution of sub-dimensions among children with special needs. The original form of the scale consists of 5 sub-dimensions named internal knowledge, skills, perception, school opportunities, and home opportunities. The findings obtained within the scope of the study revealed that the measurement model, which was consistent with the original factor structure, was also supported in the Turkish culture. In the adaptation study of the AIR-Scale Educator Form, it was observed that the five-dimensional structure of the scale was confirmed. The dimensions were named knowledge, skills, perception, school opportunities, and home opportunities, as in the original form.

Moreover, acceptable internal consistency values were obtained. When the absolute goodness of fit indices of the confirmatory factor analysis are examined, it will be seen that the X^2/df ratio is below 3. This indicates a very good model fit (Hair et. al., 2006; Kline, 2016). RMSEA was found to be 0.06. While Hair et al. (2006) state that this value should be less than or equal to .80. Similarly, according to Kline (2016), SRMR value less than or equal to .10 is considered sufficient. Tabachnick and Fidell (2007) and Hair et al. (2006) state that the SRMR value should be less than or equal to .08. The SRMR value of the scale complies with these criteria (SRMR<.08). GFI and AGFI values were also above .09 (Hair et. al., 2006; Kline, 2005). Similarly, when the relative fit indices (NFI, NNFI) are examined, it will be seen that the values are above .90. When all these findings are considered together, it will be seen that goodness of fit indices indicate good fit.

There are different opinions in the literature about how much the item-total correlation should be. While Büyüköztürk (2007) stated that this value should be above .30, Karasar (1995) stated that this value should be above .50. When the item-total correlations of the scale are examined, it will be seen that all of them are above .50. When the reliability values of the scale are examined, Cronbach's Alpha (α), AVE and CR values indicate that the scale is a reliable scale (Fornell & Larcker, 1981). When all these findings are considered together, it can be thought that the Turkish version of the educator form of the scale is a reliable and valid measurement tool.

A literature review indicated that the educator form of the scale, which was adapted to the Turkish language in this study, was not adapted to different languages. However, according to the literature, the student form of the AIR-Scale had previously been adapted to Turkish and the sub-dimensions had yielded results that were consistent with the original form (Arslan & Özmete, 2015). Similarly, it was found that the Spanish (Mumbardó, Guàrdia Olmos, & Giné, 2018), Norwegian (Garrels, & Granlund, 2018), and Chinese (Wong, et al., 2017) versions of the scale had also yielded results that were consistent with the original scale.

Limitations and further research

It should be kept in mind that the sample group is limited as the data set consists of a study group of 220 people. In addition, data were collected only from teachers of individuals with special needs. For this reason, necessary statistical analyses should be conducted so that the scale can be administered to individuals with typical development. It should be stated that the research only covers individuals with special needs, which is another important limitation.
In future studies, it will be useful to test the scale with individuals with typical development. Besides, the relationship between the self-determination levels of individuals with special needs and different variables can be analysed by using this scale. As far as it is known, the family form of the scale has not been adapted to Turkish culture, yet. It will be useful to conduct the adaptation study of this form in future studies, too.

Conclusions

In line with the research findings, it can be stated that it would be useful to use the Turkish form of the scale to evaluate the self-determination levels of the students of special education teachers. In addition, experimental studies can be conducted to reveal how much training programs to be developed can improve the level of self-determination. Furthermore, descriptive studies can be conducted to guide policymakers by conducting screening programs on self-determination in special education centers. Studies carried out for this purpose at micro and macro levels can contribute to the development of appropriate policies.

References

Arslan, D. T., & Özmete, E. (2015).Yetiştirme yurtlarında kalan ve ortaöğretime devam eden öğrencilerin self-determinasyon davranışları. *Sosyal Politika Çalışmaları Dergisi, 35*, 53-78.

Büyüköztürk, Ş. (2007). *Sosyal bilimler için veri analizi el kitabı.* 8. Basım. Pegem Yayıncılık

Field, S., & Hoffman, A. (2002). Development of a model for self-determination. *Career Development for Exceptional Individuals, 17,* 159-169. https://doi.org/10.1177/088572889401700205

Field, S., Martin, J., Miller, R., Ward, M., & Wehmeyer, M. (1998). *A Practical Guide for Teaching Self-Determination.* CEC Publications.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research, 18*(1), 39-50.

Garrels, V., & Granlund, M. (2018). Measuring self-determination in Norwegian students: adaptation and validation of the AIR Self-Determination Scale. *European Journal of Special Needs Education, 33*(4), 466-480. https://doi.org/10.1080/08856257.2017.1342420

Karasar, N. (1995). *Bilimsel araştırma yöntemi. Kavramlar, ilkeler, teknikler.* 3A Araştırma, Eğitim, Danışmanlık.

Karvonen, M., Test, D. W., Wood, W. M., Browder, D., & Algozzine, B. (2004). Putting self determination into practice. *Exceptional Children, 71,* 23-41. https://doi.org/10.1177/001440290407100102

Kline, R.B. (2016). *Principles and practice of structural equation modeling* (4th Edition). Guilford Press

Martin, J. E., & Marshall, L. H. (1995). Choice Maker: A comprehensive self determination transition program. *Intervention in School and Clinic, 30*(3), 147-56. https://doi.org/10.1177/105345129503000304

Mumbardó, C., Guàrdia Olmos, J., & Giné, G. (2018). Assessing self-determination in youth with and without disabilities: The Spanish version of the AIR self-determination scale. *Psicothema, 30*(2), 238-243.

Shogren K. A. (2011) Culture and self-determination: a synthesis of the literature and directions for future research and practice. *Career Development and Transition for Exceptional Individuals 34,* 115–27. https://doi.org/10.1177/0885728811398271

Shogren, K. A., Wehmeyer, M. L., Palmer, S. B., Soukup, J. H., Little, T. D., Garner, N., & Lawrence, M. (2008). Examining the relationship between the Arc's Self-Determination Scale the American Institutes for Research Self-Determination Scale. *Assessment for Effective Intervention, 33*(2), 94-107.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics.* Pearson.

Wehmeyer M. L. & Kelchner K. (1995) *The Arc's Selfdetermination Scale. Arc National Headquarters*, TX.

Wehmeyer, M. L., Abery, B. H., Mithaug, D. E., & Stancliffe, R. J. (2003). *Theory in self-determination: Foundations for educational practice.* Charles C Thomas Publisher.

Wehmeyer, M. (1997). Self-directed learning and self-determination. In M. Agran (Ed.), *Student-directed learning: teaching self-determination skills* (pp. 28-59). Brooks/Cole

Wehmeyer, M. L. (1992). Self-determination and the education of students with mental retardation. *Education and Training in Mental Retardation and Developmental Disabilities, 27,* 302-314

Wehmeyer, M. L. (1999). A functional model of self-determination: Describing development and implementing instruction. *Focus on Autism and Other Developmental Disabilities, 14,* 53-61. https://doi.org/10.1177/108835769901400107

Wehmeyer, M. L. (2003). A functional theory of self-determination: Model overview. In M. L. Wehmeyer. B. Abery, D. E. Mithaug, & R. StanclifFe (Eds.). Theory in self-determination: Foundations for educational practice. Charles C Thomas.

Wehmeyer, M. L. (2007). *Promoting Self-Determination in Students with Developmental Disabilities.* Guilford Press.

Wehmeyer, M. L., &. Schwartz, M. (1997). Self determination and positive adult outcomes: A follow-up study of youth with mental retardation and learning disabilities. *Exceptional Children, 63,* 245-255. https://doi.org/10.1177/001440299706300207

Wolman, J. M., Campeau, P. L., DuBois, P. A., Mithaug, D. E., & Stolarski, V. S. (1994). *AIR Self-Determination Scale and User Guide.* American Institutes for Research.

Wong P. K. S., Wong D. F. K., Schalock R. L. & Chou Y. C. (2011). Initial validation of the Chinese quality of life questionnaire – intellectual disabilities (CQOL-ID): a cultural perspective. *Journal of Intellectual Disability Research 55,* 572–80. https://doi.org/10.1111/j.1365-2788.2011.01412.x

Wong, P. K. S., Wong, D. F. K., Zhuang, X. Y., & Liu, Y. (2017). Psychometric properties of the AIR Self-Determination Scale: the Chinese version (AIR SDS-C) for Chinese people with intellectual disabilities. *Journal of Intellectual Disability Research, 61*(3), 233-244. https://doi.org/10.1111/jir.12343

Zhang, D., & Benz, M. R. (2006). Enhancing self-determination of culturally diverse students with disabilities: Current status and future directions. *Focus on Exceptional Children, 38*(9), 1–12.

Shogren, K. A., Wehmeyer, M. L., Palmer, S. B., Forber-Pratt, A. J., Little, T. J., & Lopez, S. (2015). Causal Agency Theory: Reconceptualizing a functional model of self-determination. *Education and Training in Autism and Developmental Disabilities, 50*(3), 251–263.

Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research.* Rochester, NY: University of Rochester Press.

Konrad, M., Fowler, C. H.,Walker, A. R., Test, D.W.,& Wood,W. M. (2007). Effects of self-determination interventions on the academic skills of students with learning disabilities. *Learning Disability Quarterly, 30*, 89-113.

Raley, S. K., Shogren, K. A., & McDonald, A. (2018). Whole-class implementation of the Self-Determined Learning Model of Instruction in inclusive high school mathematics classes. *Inclusion, 6*(3), 164-174.

Dattilo, J., & Rusch, F. (2012). Teaching problem solving to promote self-determined leisure engagement. *Therapeutic Recreation Journal, 46*, 91-105.

Lachapelle, Y., Wehmeyer, M. L., Haelewyck, M. C., Courbois, Y., Keith, K. D., Schalock, R.,. . . Walsh, P. N. (2005). The relationship between quality of life and self-determination: An international study. *Journal of Intellectual Disability Research, 49,* 740-744.

Orum-Çattık, E. (2020). *Young Adults with Autism Spectrum Disorder Preparing for Independence the Effects of the Self-Determınation Learning Model of Instruction.* Master diss., Anadolu University.

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First–Grade Students' Feelings and Perceptions Toward School

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Abstract

The purpose of this study is to examine first-grade students' feelings and perceptions toward school in three elementary schools with different socioeconomic status levels in Turkey. This qualitatively oriented multiple case study used students' drawings and semi-structured interviews as data collection methods. The findings of the study revealed that students perceived school as a playground, a happy place, a social environment, a physical environment, a learning or an unfriendly environment. In this study, several differences and similarities with respect to students' feelings and perceptions toward school are presented and discussed based on the schools from different socioeconomic levels. Implications and recommendations for teachers and school administrators are provided to promote the design of a school environment tailored to first-graders' needs and interests.

Keywords:

Drawings, Feelings Toward School, First Graders, Perception of School, School Perception, Socioeconomic Status

Introduction

Children attend school from an early age, and the school years are a very important part of their lives. Early school years play an important role in students' welfare and possible employment opportunities later in their lives (Ekstrand, 2015). More specifically, students' experiences in their early years can underpin their school adjustment and subsequent academic and social achievements, as well as their failures concerning their education (Ladd & Burgess, 2001; Stuhlman & Pianta, 2009). The first school year is particularly of importance, as it provides the basis for students' future educational experiences (Yamaç, 2014). Students' feelings, attitudes, and perceptions developed in the early school years can provide a basis for students' interpretation of their school experiences in subsequent years (Valeski & Stipek, 2001) and can be helpful indicators of students' likely future success (Brock et al., 2008). This study focused on first-grade elementary school students' feelings and perceptions toward school. As the conceptualization of focal terms in research is crucial (Cevikbas & Kaiser 2020), the concepts of *perception* and *feeling* are explicitly defined and explained in this study to prevent any misunderstanding or misinterpretation. Accordingly, perception is defined as "the process or result of becoming

aware of objects, relationships, and events by means of the senses, which includes such activities as recognizing, observing, and discriminating" (the American Psychological Association [APA] Dictionary of Psychology, 2021), and feeling is described as "a self-contained phenomenal experience. Feelings are subjective, evaluative and independent of the sensations, thoughts or images evoking them" (APA Dictionary of Psychology, 2021). Perception denotes what someone or something symbolizes to a person (Despagne, 2010), and feeling refers to a combination of complex, hidden emotions, real states, and thoughts affecting most of our attitudes (Andre, 2012).

Children's feelings and perceptions toward school may potentially affect several aspects, including their academic and social performance, participation in classroom activities, and achievement. Children who perceive school more favorably tend to make greater academic and social progress (Brock et al., 2008). Similarly, children who like school are likely to be more willing to engage in classroom activities (Valeski & Stipek 2001). When children like school, their academic competence is more likely to develop (Erath et al., 2008), while their achievement will also increase (Ireson & Hallam, 2005), and their motivation will be higher (Anderman, 2002; Summersett-Ringgold et al., 2015). In particular, children's feelings toward school during the early years may have several implications in the long run, impacting the degree to which children participate in the classroom activities and thereby promoting their further achievement (Ladd et al., 2000). It should also be noted that favorable perceptions of school are correlated with students' and schools' socioeconomic status (SES) (Summersett-Ringgold et al., 2015). Students from districts of high levels of poverty generally show poor achievement (Pogrow, 2006) and tend to like school less (Summersett-Ringgold et al., 2015). Similarly, schools with low SES may offer inadequate educational materials, extracurricular activities, and clubs serving students' interests, further contributing to negative perceptions of school (Summersett-Ringgold et al., 2015).

Feelings and perceptions toward school can be explored in various ways, such as surveys (Gray & McLellan, 2006), metaphors (Saban, 2008), and drawings (Yıldız 2012). Drawings can provide great insight into children's inner worlds and help them better express themselves (Malchiodi, 1998; Yavuzer, 2011). Drawings are considered one of the most common entertaining activities that children particularly enjoy the most, and children usually do not become bored while drawing. Students draw their pictures intuitively (Yolcu, 2009), and their drawings may reflect the characters, individuals, and values important to them and make their minds, thoughts, and experiences visible (Michael & Rajuan, 2009). In a wide range of studies, researchers have used students' drawings as a means of understanding children's perceptions of various topics, such as school concept (Yıldız, 2012), teacher-child relationship (Harrison et al., 2007), and school violence (Yurtal & Artut, 2010).

In this study, drawings were used as an important tool to gain insight into students' feelings and perceptions toward school, to reveal how students at three schools located in at three schools in Turkey with low, middle, and high SES perceived school and what their feelings about school were. Several studies have investigated students' approaches to school, such as whether they like school (Şahin-Sak, 2019), their feelings about school (Valeski & Stipek, 2001), and the association between perception of the school environment and SES (Shackleton et al., 2018). Also, a study conducted by Yildiz (2012) approached the concept of school and used drawings to determine primary school students' perceptions of school. However, limited studies have conceptualized the relationship between first-grade students' feelings and perceptions toward school and the schools' SES backgrounds, primarily by examining their drawings. This qualitative study aims to fill this research gap and is guided by the following research question:

What are first-grade elementary school students' feelings and perceptions toward school at three elementary schools with different levels of SES (low, middle, and high)?

In detail, based on the aforementioned research question, the similarities and differences of first graders' feelings and perceptions toward school are investigated by focusing on different levels of SES of the schools attended.

Methodology

Research Design

The study was designed as a qualitatively oriented multiple case study. In qualitative case studies, a "bounded system" (a case) or "multiple bounded systems" (cases) are investigated in depth (Creswell, 2013, p. 97). In particular, multiple case studies allow researchers to identify the similarities and differences between different cases (Stake, 1995). This study investigates first-grade elementary school students' feelings and perceptions toward school at three elementary schools with different SES levels (low, middle, and high) using their drawings and semi-structured interviews. The similarities and differences between each case were examined. Based on their SES characteristics, each of these schools was identified as a case.

Participants

The study data were collected primarily from first-grade elementary school students in three

elementary schools in Turkey. Convenience and maximum variation sampling methods were utilized to select the elementary schools and first-grade students. The maximum variation sampling method "documents unique or diverse variations that have emerged in adapting to different conditions and identifies important common patterns that cut across variations" (Patton, 2002, p. 243), and boosts the likelihood of reflecting differences and diverse perspectives (Creswell, 2013). The three elementary schools in one of Turkey's big cities were located in neighborhoods characterized by different SES levels (low, middle, and high), allowing for maximum variation. These schools were recruited among the districts based on the official report obtained from the General Directorate of Development Agencies in Turkey (Yılmaz et al., 2019). In this report, districts were classified into different levels depending on 32 variables of SES (e. g., demographics, employment, education, health, competitiveness, finance, and quality of life). The characteristics of schools are briefly detailed below.

School A

School A is a public school in a neighborhood mostly consisting of families with low or lower-middle SES backgrounds. The teachers reported that although some parents are high school graduates or have bachelor's degrees, for the most part, the parents are elementary school graduates, and in some cases, illiterate. Each class has approximately 20–25 students, and the school has a library, a science laboratory, and a conference hall.

School B

School B is a public school in a neighborhood comprising families with middle SES backgrounds. The teachers reported that most of the parents are high school graduates and some hold bachelor's degrees. Although there are other types of professions, the parents are generally civil servants. The school's classes are relatively crowded, with approximately 30–35 students in each class. The school has a workshop, a science laboratory, a computer laboratory, a gymnasium, and a conference hall.

School C

School C is a private school in a neighborhood consisting of families with high SES backgrounds. The teachers reported that almost all parents have bachelor's degrees and that some parents hold master's and PhD degrees. The parents are academics, soldiers, judges, and solicitors. Each class has 20 students, and the school has a computer laboratory, a science laboratory, a music classroom, a library, an art room, and a dining hall.

Overall, 40, 57, and 36 students from School A, School B, School C, respectively, participated in the study. They were asked to draw pictures reflecting their feelings and perceptions about school. Semi-structured interviews were, then, conducted with several students. The researcher conferred with the teachers, and, based on their perspectives, students who had drawn the most salient pictures and who were best placed to contribute to data richness were selected for interview. The researcher aimed to interview students who had drawn different aspects of school, disclosing various perspectives on school and addressing maximum variation. The selection process yielded 24 students from School A, 18 students from School B, and 10 students from School C who participated in semi-structured interviews. The distribution of participants by gender and school is presented in Table 1. Each student from School A, B, and C was named after A-S1, A-S2, ..., B-S1, B-S2, ..., C-S1, C-S2, ..., etc.

Table 1
Distribution of Participants by School and Gender

Schools	Female	Male	Total
School A	25	15	40
School B	37	20	57
School C	19	17	36

Data Collection Instruments and Procedure

The study used students' drawings and semi-structured interviews as the main data collection instruments. To expand on the importance of each data collection instrument for this study, in particular, students' drawings were acknowledged as productive and convenient with respect to eliciting younger children's feelings and perceptions, as drawings offered them the opportunity to express themselves precisely (Walker et al., 2009). Children may be reluctant to put what they feel and think into words; however, when children are allowed to both draw and describe their feelings verbally, they provide twice as much information as children who exclusively verbalize their thoughts (Gross & Hayne, 1998). The interview is a crucial instrument used in qualitative studies to determine the essential meaning that a particular experience carries (Merriam & Tisdell, 2016). To gain insight into first-grade students' feelings and perceptions about school as much as possible, the researcher drew both on students' drawings and responses to semi-structured interviews. The researcher developed a questionnaire to guide the interviews and revised it based on two experts' opinions. The interview questionnaire consists of short open-ended questions with respect to students' demographic information, the depictions in their drawings, and their feelings and perceptions about school. Prior to data collection, permission was obtained from the University's Ethics Committee to ensure that the instruments and their implementation were appropriate for the first-grade students' age

level and their psychological development. After the formal application, the Committee gave ethical approval for the instruments' application to the research context, and written permission from the school administrations and the participating students' parents was obtained. The data were collected toward the middle of the fall semester, which allowed the students to spend a certain amount of time at school and obtain their first experiences of the school environment to develop feelings and perceptions about school. The researcher then asked the first-grade students to draw the school image in their minds in the art lesson. Based on students' drawings and teachers' suggestions, students were selected for the interview.

Data Analysis

Two different data sources were used in this study: students' drawings and semi-structured interviews. To analyze the drawings, a rubric adapted from Cevikbas (2016) was used. In some recent studies, students' drawings have been used as a data collection source, and participants were asked to briefly clarify the objects they drew and the reasons why they drew these objects on the reverse of the paper to support the analysis of their drawings. This study's participants were not yet able to write similar explanations as it was their first semester at school, and they just began learning to read and write. The rubric used to analyze the students' drawings covered the following elements: lines, figures, body parts, emotions, and colors. Some examples from the rubric were exhibited as follows (see Cevikbas, 2016 for greater detail):

- Lines (e.g., round and unclosed lines refer to anxiety)
- Figures (e.g., light-colored, clouds, birds, and flowers suggest happiness; rain suggests sadness and anxiety)
- Body parts (e.g., arms extended on both sides indicate close relationships with other people)
- Emotions (e.g., drawing oneself isolated from others indicates feelings of rejection)
- Colors (e.g., black refers to negatively characterized figures)

To avoid misinterpretation of the students' drawings, interviews were used to clarify the meaning of their drawings in relation to school. For instance, regarding the use of color in drawings, Yavuzer (2011) reported that children mostly prefer colors that are attractive to them when drawing pictures. In other words, the use of color is individual to each child, and analysis of the colors used by children in their drawings is complex. As multiple data sources yield more comprehensive information than a single source about students' feelings and perceptions about school, the analysis of the students' drawings was additionally supported by the interviews.

To extract the data and reveal the key findings, the drawings were analyzed using content analysis (Yıldırım & Şimşek, 2008). The students' drawings were all scrutinized individually and in accordance with the rubric, and codes were determined (see Appendix A for an exemplar of the coding). Content analysis was performed to analyze the student interviews. The raw data from the interviews were initially transcribed verbatim, and codes were specified. Following completion of the coding, double coding was performed. The intercoder analyzed 30% of the data, and 90% reliability was found based on the use of the formula developed by Miles and Huberman (1994). Contradictory codes were specified and discussed until total agreement was attained. A sample analysis of a drawing and the researcher's interpretation is presented in Figure 1 to illustrate the analytical approach used in this study.

Figure 1

Drawing by C-S3 and Interpretation of the Drawing by C-S3

Detailed examination of the drawing showed that C-S3 described the classroom environment. There is a teacher figure standing before the board and there are some letters written on the board, indicating that the teacher is teaching something to the students in the classroom. These indicators demonstrated that C-S3 perceived school as a learning environment. In the interview with her, she stated that school was a place where she could learn how to read and write, and that learning new things at school made her happy.

Results

School as a Playground

The results indicated that several students from all three schools perceived school as a playground, based on their drawings and interviews. The students from School A (*f* = 40%), School B (*f* = 51%), and School C (*f* = 50%) included several indicators of playgrounds in their school drawings, including playing, balloons, balls, trees, schoolyard, break time, and hopscotch in the school garden. Most students drew both schoolyards and school buildings with students playing; however, several students drew just the schoolyard without the school building. Although small differences were found among the students who drew playground indicators, those indicators were more frequently detected in drawings by students from Schools B and C than those from School A.

Figure 2
Drawing Examples by A-S26, B-S48, C-S16

The drawing of A-S26

The drawing of B-S48

The drawing of C-S16

As Figure 2 illustrates, A-S26 drew herself and her friends playing together with happy faces. She drew one of her friends playing with a ball. B-S48 drew a school building with the schoolyard. She also drew students with balloons in their hands, a hopscotch game, and ringing bells as a representation of break time. C-S16 drew himself playing with his friends in the school. While other students drew themselves playing outside the school building, he painted the playing environment inside the school building.

In the interviews, more than half of the students from all three schools indicated that school was a place where they could perform diverse activities, such as dancing, playing with playdough, watching cartoons, playing basketball, and playing with friends during break time. The students at School C, in particular, highlighted their attendance at clubs, such as dancing and sports clubs, at school. Students remarked during the interviews that they felt happy while playing with their friends during their breaks and when they performed activities that included drawing pictures and playing with playdough. Several students from School A, in particular, found the time they spent at home quite boring; however, they found their time at school to be of good quality and enjoyable because of the positive environment there. Several quotations from student interviews that illustrate these findings are presented as follows.

> *"I feel happy at school because I play with my friends. We play tag and blind man's bluff. They are very entertaining." (A-S9)*
> *"I generally feel happy at school because I can play with my friends during breaks and learn lots of things at school." (B-S3)*
> *"The thing I like most at this school is attending student clubs. Thanks to these clubs, I can do what I want at school. For example, at the club for entertainment, I can play with balls. There are other clubs in which I can learn to play instruments, do sports, dance, etc." (C-S6)*

School as a Happy Place

Most students in the study perceived school as a happy place—that is, a place where students feel happy—and illustrated the school using bright and warm colors. The indicators used in the drawings to represent school as a happy place included happy faces, butterflies, flowers, birds, a smiling sun, rainbows, school with a red roof, bright, warm, and favorite colors, and elaboration of the school drawings with hearts and stars. Students from School A (f = 70%), School B (f = 75%), and School C (f = 65%) drew those indicators in their drawings. Although the results were relatively close, it was observed that slightly more students from schools A and B perceived school as a happy place than students from School C.

Figure 3

Drawing Examples by A-S14, B-S45, C-S13

The drawing of A-S14

The drawing of B-S45

The drawing of C-S13

The drawings in Figure 3 indicate that A-S14 used warm and bright colors, such as pink and green, to represent the school building in addition to including flowers. B-S45 chose his favorite soccer team's colors (red and yellow) to paint the school building and drew smiling, happy students. C-S13 used hearts, flowers, and shapes to decorate their school picture. Although black is used in the picture, it was observed that warm colors were dominant.

The interviews supported the analysis of the drawings. Approximately half of the students from School A, less than half of the students from School B, and several students from School C reported that they felt happy at school and liked school, particularly indicating their perceptions of the school's interior, the schoolyard, and the classroom. A-S5 shared her feelings as follows: *"I like school and feel happy at school since we can go to the schoolyard during the long breaks and I look at the trees there, which makes me very happy."* The students also described their happiness at school, describing it as colorful and big. To illustrate, B-S18 indicated: *"Our school and classroom are highly colorful, as I expected. Therefore, I feel very happy at my school."* Similarly, C-S9 emphasized this fact, saying, *"I like school and the school garden as it is big, and I can play in the schoolyard with my friends. I am happy to be at school."*

School as a Social Environment

The social environment embodies "the immediate physical surroundings, social relationships, and cultural milieus within which defined group of people function and interact" (Barnett & Casper, 2001, p. 465). The study considered the social environment as an environment where students can make friends and develop good relationships with their teachers and peers. Students from all three schools drew pictures representing their interaction with their teachers and peers. Three students from School A (f = 8%) and four students from School B (f = 7%) drew the teacher figures proportionately larger and smiling, indicating that they value their teachers highly. Several students—five from School A (f = 13%) and three from School B (f = 5%)—drew their teachers with arms extended at both sides and large eyes, perhaps as indicators of the teachers' close relationships with their students. Similar to the teacher figures in drawings, students mainly drew their peers with smiling faces, arms extended on both sides, and large eyes. The drawings clearly portrayed students' close relationships with their peers, which may indicate that school functions as a place in which they can make friends and maintain friendships.

Figure 4
Drawing Examples by A-S17, B-S35, C-S18

The drawing of A-S17

The drawing of B-S35

The drawing of C-S18

As shown in Figure 4, A-S17, B-35, and C-S18 illustrated their teachers larger with smiling faces and arms extended to either side. This may signify that they attach great importance to their teachers, and they consider them valuable in their lives and enjoy a close relationship with their teachers. For instance, A-S17 drew the teacher figure larger than the school building, and B-S35 drew the teacher figure almost the same height as the school building, which may mean either that the teacher is more important for the student than the school itself or that the teacher and school are of equal importance to them. The students also drew their peers with smiling faces and arms extended to both sides, which may signify their close relationships with their peers.

Students' interviews are in line with these findings. They reported that they perceived school as a social environment. More than half of the students at schools A, B, and C described school as a place where they can make friends, become socialized, and enjoy good relationships with their teachers and peers. Regarding their feelings about school, they stated that they liked school because their teachers liked them and did not get angry with them; they could make friends, had many friends at school, and had conversations with their friends. Examples from students' interviews are presented below.

> *"I like school because I have good friends and teachers at school. I talk to my friends and my teacher, and I learn many things thanks to my teacher." (A-S10)*
> *"I have a good relationship with my friends and my teacher. My teacher lets us play together and talk about things at school." (B-S9)*
> *"I feel happy when I have friends at school. I play games of ninja and robot with my close friends. We act out as in a movie, and we each have a role." (C-S5)*

School as a Physical Environment

Analysis of the students' drawings showed that students perceived school as a physical environment, drawing the schools' physical characteristics of the school and various parts, such as the school building itself, the schoolyard, the canteen, the gymnasium, the drama hall, and the classroom. The students from School A (*f* = 58%), School B (*f* = 84%), and School C (*f* = 72%) drew the school building itself to reflect the image in their minds.

While the school buildings drawn in more than half of the drawings resembled the students' actual school buildings, nearly half of the students drew school buildings that are different from their actual schools. Several students from schools A and B drew flags near the school building, while no students from School C included flags. Moreover, two students from School B drew their dream school, and another student from School B drew the school building to resemble her kindergarten.

All students drew the school building with a schoolyard. One student from School A, two students from School B, and five students from School C drew their classrooms. Several students from School B also drew canteens and gymnasiums, as these were present in their school environment.

Figure 5

Drawing Examples by A-S2, B-S7, C-S4

The drawing of A-S2

The drawing of B-S7

The drawing of C-S4

As illustrated in Figure 5, A-S2 drew the school building with the schoolyard illustrated with a flag nearby. Rather than the school building, B-S7 drew the classroom with a board, cupboards, and the teacher's table, and described their classroom environment. C-S4 drew the school building only to refer to the school image. The drawings illustrated that students from all three schools mostly painted their actual school and classroom environments in their drawings.

Apart from the various school departments — for instance, schoolyards, classrooms, and school buildings—six students from School A and two students from School C preferred to draw their homes, indicating that they perceived their schools as resembling their homes. Furthermore, one student from School C drew a castle because she associated school with a castle. Sample drawings are presented in Figure 6.

Figure 6

Drawing Examples by A-S24, C-S1

The drawing of A-S24

The drawing of C-S1

The student interviews generated several metaphors for the home figures drawn by students. Metaphors can leave traces of reflections of one's worldview and perceptions (Postman, 2011); they can serve as clues for the students' perceptions of school.

In the interviews, students revealed that their schools and homes were similar in various aspects, such as appearance. More than half of the students from schools A and B and nearly half of the students from School C in the interviews used a home metaphor for school. To illustrate, A-S3 expressed herself as follows: *"School is like our second home. I study and play both at school and home. They are alike."* Similarly, B-S4 pointed out that school was like her home, saying, *"The school is like our home, and I feel like I am at my home."* C-S3 came up with the same metaphor, stating, *"Our home comes to my mind in relation to school. In my opinion, school resembles our home."*

School as a Learning Environment

A comprehensive analysis of the data from students' drawings and interviews showed that several students perceived school as a learning environment. The students drew the classroom environment with desks, boards, letters on the board, and teacher figures teaching students as indicators of school as a learning environment. One student from School A (*f* = 2.5%), three students from School B (*f* = 5%,) and two students from School C (*f* = 5.5%) described school as a learning environment and drew accordingly. Although few differences were observed among the number of students drawing the learning environment indicators, more students from schools B and C perceived school as a learning environment. Sample drawings are presented in Figure 7.

Figure 7
Drawing Examples by A-S40, B-S51, C-S6

The drawing of A-S40

The drawing of B-S51

The drawing of C-S6

While relatively few drawings reflected perceptions of school as a learning environment, more students in the interviews described school as an environment for learning new things. Several students from all three schools reported that school was a place for them to learn new things, such as reading, writing, counting, mathematics, important virtues like respect, studying, and doing homework. They also emphasized in the interviews that they liked school as they could learn new things, study, and do homework at school. A-S4, B-S2, and C-S3 reflected their feelings as follows:

> *"I like school as I learn everything at school. I learn to read and write the letters a and b." (A-S4)*
> *"I like school since we not only learn how to read and write but also learn to be respectful toward others." (B-S2)*
> *"I like school as I learn new letters and numbers and how to read and write there." (C-S3)*

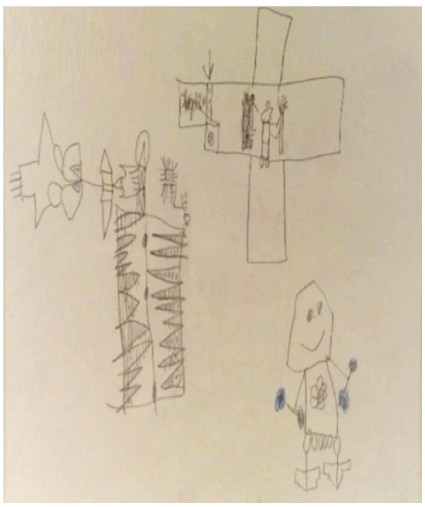
School as an Unfriendly Environment

Despite the predominance of positive perceptions of and feelings toward school, including school as a playground and a happy place, several indicators that students perceived school as an unfriendly environment were also disclosed. Indicators of feeling insecure, anxious, and lonely, and disliking school suggested that some students perceived school as an unfriendly environment. Grotesque figures like robots and human figures without arms, hands, legs, or feet in students' drawings indicated feelings of insecurity at school. Ten students from School A (*f* = 25%), 11 students from School B (*f* = 19%), and four students from School C (*f* = 11%) drew those indicators, suggesting that fewer students from School C experienced insecurity at school. As the sample drawings in Figure 8 show, A-S35 illustrated grotesque figures; similarly, B-S12 had some robot-like figures, and C-S2 drew some armless human figures.

Figure 8

Drawing Examples by A-S35, B-S12, CS2

The drawing of A-S35



The drawing of B-S12

The drawing of C-S2

Rain, students' anxious, shaded faces, figures without eyes, noses, or mouths in the students' drawings also indicated anxiety, sadness, and timidity at school. Five students from School A (*f* = 12.5), seven students from School B (*f* = 12%), and two students from School C (*f* = 5.5%) drew those indicators. For instance, A-S20 drew rain falling on the school, B-S27 drew two children with no nose or mouth near the school, and C-S9 drew children with shaded faces, as illustrated in Figure 9.

Figure 9

Drawing Examples of A-S20, B-S27, C-S9

The drawing of A-S20

The drawing of B-S27

The drawing of C-S9

Some students drew themselves alone without their mouths or noses and drew relatively tall buildings in some drawings as indicators of feeling lonely at school. A few students, two from School A (*f* = 5%) and two from School B (*f* = 3.5%), drew these indicators. None of the students' drawings in School C showed signs of feeling lonely. As shown in Figure 10, A-S36 only drew himself without a happy face in his drawings, and similarly, B-S50 drew herself without a happy face next to a relatively high school building. It is worth remarking that in those drawings, students drew themselves without a mouth and nose indicating that they feel both timid and alone at school.

Figure 10
Drawing Examples by A-S36, B-S50

The drawing of A-S36

The drawing of B-S50

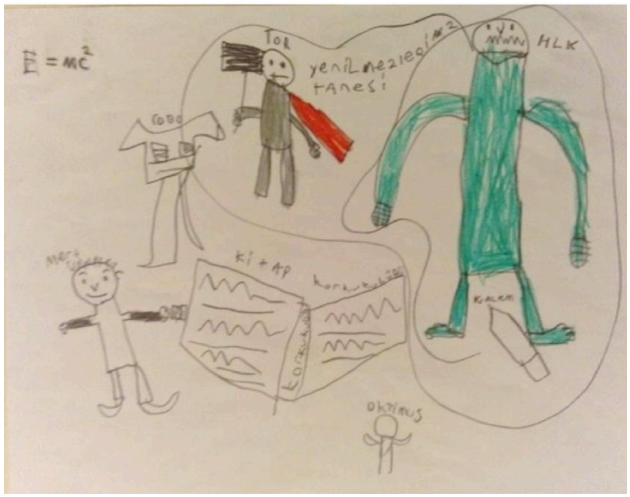
Finally, the interviews with the students revealed why they felt unhappy at school. Less than half of the students from all three schools expressed that being unsuccessful, being punished, and being exposed to peer violence, and teachers who are angry with students made them unhappy at school.

Moreover, some students from School A complained about the cold weather and walking to school. A-S8 stated, "*My home is far away from the school. I do not like this, and I do not want to walk to school every day. It is so exhausting.*" B-S7 complained about the timing of school, saying "*The school ends in the evening, and we have to go home in the dark. Therefore, I feel unhappy. I wish the school would end earlier.*" Although they mentioned their reasons for feeling unhappy, it is notable that C-S1 clearly expressed his dislike for school as follows:

> *"I do not like school, actually. Of course, there are some courses that I like, such as mathematics and computers. However, I do not like the courses except the ones I mentioned above. The Turkish course is the course that I do not like most because it is so boring."*

Interestingly, another student from School C included the superhero the Hulk in his drawing (see Figure 11). In the interview, he stated that he drew the Hulk so that the Hulk could destroy the school. Although the student did not clearly state that he did not like school, the drawing and his words offer some clues about why he might not like school and why he feels unhappy at school.

Figure 11
The Drawing of C-S7



Discussion and Conclusion

This study investigated first-grade elementary students' feelings toward and perceptions of school and compared the related results based on the school type in terms of SES background. The data were collected from three elementary schools with low, middle, and high SES levels in Turkey. Building on the importance of elementary education and, notably, first-grade education, the study revealed crucial findings with respect to feelings toward and perceptions of school during first graders' critical learning period. The main findings reveal that school was perceived positively by most of the first-grade students from all three schools, and this can be interpreted as leading to better academic and social performance for these students (Brock et al., 2008).

Correspondingly, the results indicated that the majority of the students liked school. In the literature, liking school is associated with willingness to engage in classroom activities (Valeski & Stipek, 2001), development in academic competence (Erath et al., 2008), increased achievement (Ireson & Hallam, 2005; Ladd et al., 2000), and motivation (Anderman, 2002; Summersett-Ringgold et al., 2015). However, fewer students perceived school more negatively and as an unfriendly environment. Perceiving school negatively can negatively affect academic and social performance of the students (Brock et al., 2008).

As part of the positive feelings toward and perceptions of school, the first-grade students in all three schools perceived school as a playground. The results showed that students generally drew themselves playing with their friends in schoolyards, and their drawings often reflected that they felt happy at school while playing with their friends. Playing with friends at school was one of the main reasons for first graders' happiness at school (Şahin-Sak, 2019).

In line with this result, Calp (2020) also reported that children felt happy at schools where they could both learn and play. Perceptions of school as a playground may be due to first-grade students' developmental characteristics. Snowman and Biehler (2006) stated that children of these ages are quite active and tend to engage in physical activities; thus, they may find it quite difficult and boring to study in the classroom instead of playing with their friends. Moreover, since they were accustomed to a preschool environment that was not very strict and where they were given more time to play, they might envisage school as more of a playground. Also, despite a few differences, more students attending the schools with middle and high SES backgrounds drew playground indicators, reflecting the better facilities and conditions that those schools enjoy. In particular, students from schools with high SES emphasized their attendance at clubs for dancing, acting, and playing sport in describing why they liked school. More clubs appealing to students' interests and extracurricular activities offered by schools may be associated with positive perceptions of school (Summersett-Ringgold et al., 2015).

Students also perceived school as a happy place. It was noted that more students from low and middle SES schools drew happy place indicators than those from the school with high SES, despite the latter's more desirable conditions. Interestingly, students from the schools with high SES did not see school as a happy place as much as students from the low and middle SES schools did, although more students from the schools with high SES perceived school as a playground. Many students especially from the low SES school, portrayed school as a happy place despite the school's weaker conditions than the other two schools. They saw school as a place where they felt happy, though the school had problems with cleaning. The study by Balcı (1999) presented consistent results regarding students' positive attitudes toward school despite the lack of water in toilets. This shows that some problems with respect to cleaning in schools may not be associated with perceptions of school as a happy place and feelings of happiness at school.

The results indicated that students perceived school as a social environment. Drawings by the students from all schools were similar to one another in that most described the school image by drawing themselves and their friends together having good relations with each other. Similarly, they expressed that they could make friends and contact each other every day at school. Schools can provide students with an environment for making friends and becoming socialized in districts composed of apartments. Students perceived school as a place where they could meet friends and said they enjoyed having friends and getting along well with their friends at school (Lahelma, 2002). Supporting this result, Booth and Sheehan (2008) also highlighted that developing good friendships and relations with peers can be associated with feeling happy and comfortable at school and being content with the school environment. The social environment embraces relations with teachers, and students' relations with their teachers may be decisive in a satisfactory school environment (Booth & Sheehan, 2008). In students' drawings, teachers were drawn with smiling faces and extending their arms on both sides, indicating good relationships between students and teachers. The interviews findings supported this result, and it is important to young children as favorable relations with teachers enhance children's positive feelings toward school in earlier grades (Valeski & Stipek, 2001).

Furthermore, school was perceived as a physical environment with respect to its physical qualities. The students' drawings showed that they mainly drew school buildings to reflect the school image in their mind; in particular, more students from schools with middle and high SES drew school buildings in their drawings. They tended to draw school buildings similarly to their school buildings, which may indicate the impact of the school's physical environment on school perception. Better physical qualities of middle and high SES schools may lead students in those schools to draw school buildings that reflect the actual conditions in their schools more often. Similarly, schools were often drawn with their actual physical qualities by primary school students (Yıldız, 2012), and this was interpreted as reflecting students' perceptions of the school as a formal structure. Interestingly, some students drew their homes to represent school. In their interviews, students used a "home" metaphor to reflect their perceptions (Postman, 2011), which suggests that they may associate school with their homes and see school as their second home. This may be because teachers and parents might introduce schools as a second home to students, and students might associate schools with their home as a building. Moreover, first-grade students perceived school as a learning environment in which literacy skills such as reading, writing, and computational skills are acquired. It was found that slightly more students from schools with middle and high SES drew learning environment indicators. The clues regarding perceptions of school as a learning environment were not found often in students' drawings; nonetheless, it was clearly seen in their statements that they felt happy because of learning new things at school. Several other studies also emphasized the school's role as a place of enlightenment and information (Balcı, 1999; Şahin-Sak, 2019). Learning new things at school was cited as one of the reasons for liking school, and students who like and enjoy school are likely to study harder, leading to better performance (Şahin-Sak, 2019; Valeski & Stipek, 2001). Still, in consideration of drawings as an effective means of becoming better informed about children's inner worlds (Malchiodi, 1998; Yavuzer, 2011), students' drawings can say a lot about how school was indeed perceived no matter what they mentioned in the interviews. Thus, as it was their first year, the school's role as a place to play with friends and make friends may mean more to them than its role as a place for learning new things.

Apart from the results pertinent to positive feelings toward and perceptions of school, the study findings also revealed that some students perceived school as an unfriendly environment and that some points, including failure, inability to do homework, peers' misbehaviors, such as bullying, and teachers' anger with students might bring about unhappiness at school. In particular, peers' bullying and violence were found to negatively impact feelings toward school and lead to perceptions of school as an unfriendly environment. Students who perpetrated and were exposed to bullying perceive the school climate more negatively (Harel-Fisch et al., 2011). It also emerged that few students from schools with low and middle SES and none of the students from high SES schools included indicators of loneliness in their drawings. This may be because their teachers are more caring and have closer relationships with their students. Experiencing loneliness and feeling lonely at school were found to account for disliking school to some extent (Harel-Frisch et al., 2011; Rönkä et al., 2017). Notably, the results suggest that only a few students from the school with high SES expressed a dislike for school. Considering that students' experiences at school at early years can have lasting effects on their school life and their future career (Alvidrez & Weinstein, 1999), negative experiences and perceptions in school climate are possible to get more negative in the course of time, especially among students with a low SES background (Conchas & Noguera, 2004), which may result in lower academic achievement (Johnson & Stevens, 2006). From the sociological and critical pedagogy perspectives, schools are castigated as places where social inequalities and class differences are reproduced (Althusser, 2016; Bourdieu, 1977; McLaren, 2000). In this sense, it is critical for students, in particular students from schools with low SES, to

have positive experiences and perceptions of school to establish a rigorous ground for their educational life.

The study produced important results regarding first-grade students' feelings toward and perceptions of school. The findings revealed that first-grade students largely perceived school as a happy place and playground and felt happy as they could play at school. Students also perceived school as a social environment where they could make friends, enjoy good relationships with their peers and teachers, and feel happy at school. Such findings suggest that the first year at school is important in children's lives, and the development of positive feelings and perceptions during this critical year is crucial. To this end, teachers and school administrators can create a school environment with the support of parents that will address first graders' needs and interests, and in which they can enjoy and learn, make friends, and do not feel bored. Also, undesirable circumstances, such as bullying, violence, victimization by peers, and the need to walk to school were found to play a role in negative perceptions of school and unhappiness at school. Overall, the school environment, facilities, and students' SES appear to play an important role in first-grade students' feelings toward and perceptions of school.

References

Althusser, L. (2016). *Ideoloji ve devletin ideolojik aygıtları* [Idelogy and ideological state apparatuses] (A. Tümertekin, Trans.). İthaki Yayınları. (Original work published 1970).

Altınköprü, T. (2003). *Çocuğun başarısı nasıl sağlanır?* (11. baskı). Hayat Yayıncılık.

Alvidrez, J., & Weinstein, R. S. (1999). Early teacher perceptions and later student academic achievement. *Journal of Educational Psychology, 91*(4), 731-746. https://doi.org/10.1037/0022-0663.91.4.731

Anderman, E. M. (2002). School effects on psychological outcomes during adolescence. *Journal of Educational Psychology, 94*(4), 795-809. https://doi.org/10.1037/0022-0663.94.4.795

Andre, C. (2012). *Feelings & moods.* Polity Press.

American Psychological Association. (2021). Feeling. In *APA Dictionary of Psychology.* Retrieved April 1, 2021, from https://dictionary.apa.org/feeling

American Psychological Association. (2021). Perception. In *APA Dictionary of Psychology.* Retrieved April 1, 2021, from https://dictionary.apa.org/perception

Balcı, F. A. (1999). *Metaphorical images of school: School perceptions of students, teachers, and parents from four selected school in Ankara* (Publication No. 82164) [Doctoral dissertation, Middle East Technical University]. YÖK Ulusal Tez Merkezi.

Barnett, E., & Casper, M. (2001). A definition of social environment. *American Journal of Public Health, 91*(3), 465.

Booth, M. Z., & Sheehan, H. C. (2008). Perceptions of people and place: Young adolescents' interpretation of their schools in the United States and the United Kingdom. *Journal of Adolescent Research, 23*, 722–744. https://doi.org/10.1177/0743558408322145

Bourdieu, P. (1977). *Outline of a theory of practice* (R. Nice, Trans.). Cambridge University Press.

Brock, L. L., Nishida, T. K., Chiong, C., Grimm, K. J., & Rimm-Kaufman, S. E. (2008). Children's perceptions of the classroom environment and social and academic performance: A longitudinal analysis of the contribution of the responsive classroom approach. *Journal of School Psychology, 46*, 129-149. https://doi.org/10.1016/j.jsp.2007.02.004

Burkitt, E., Barret, M., & Davis, A. (2005). Drawings of emotionally characterised figures by children from different educational backgrounds. *International Journal of Art & Design Education, 24*(1), 71-83.

Burns, R. C., & Kaufman, S. H. (1972). *Action, styles and symbols in kinetic family drawings (K-F-D): An interpretation manual.* Brunner/Mazel.

Calp, Ş. (2020). Peaceful and happy schools: How to build positive learning environments. *International Electronic Journal of Elementary Education, 12*(4), 311-320. https://doi.org/10.26822/iejee.2020459460

Cevikbas, S. (2016). *First grade elementary school students' feelings and perceptions of school* (Publication No. 439165) [Master's thesis, Middle East Technical University]. YÖK Ulusal Tez Merkezi.

Cevikbas, M., & Kaiser. G. (2020). Flipped classroom as a reform-oriented approach to teaching mathematics. *ZDM Mathematics Education, 52*(7), 1291–1305. https://doi.org/10.1007/s11858-020-01191-5

Conchas, G., & Noguera, P. (2004). Explaining the academic success of African American males. In N. Way & J. Chu (Eds.), *Adolescent development in context* (pp. 134–176). New York University Press.

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches.* Sage.

Despagne, C. (2010). The difficulties of learning English: Perceptions and attitudes in Mexico. *Canadian and International Education, 39*(2), 55-74. https://doi.org/10.5206/cie-eci.v39i2.9154

Di Leo, J. H. (1983). *Interpreting children's drawings.* Brunner/Mazel.

Ekstrand, B. (2015). What it takes to keep children in school: Research review. *Educational Review, 67*(4), 459-482. https://doi.org/10.1080/00131911.2015.1008406

Erath, S. E., Flanagan, K. S., & Bierman. K. L. (2008). Early adolescent adjustment: Associations with friendship and peer victimization. *Social Development, 17*(4), 853-870. https://doi.org/10.1111/j.1467-9507.2008.00458.x

Furth, G. M. (2002). *The secret world of drawings: A jungian approach to healing through art* (2nd ed.). Inner City Books.

Gray, J., & McLellan, R. (2006). A matter of attitude? Developing a profile of boys' and girls' responses to primary schooling. *Gender and Education, 18*(6), 651-672. https://doi.org/10.1080/09540250600980238

Gross, J., & Hayne, H. (1998). Drawing facilitates children's verbal reports of emotionally laden events. *Journal of Experimental Psychology Applied, 4*(2), 163-179. https://doi.org/10.1037/1076-898X.4.2.163

Harel-Fisch, Y., Walsh, S. D., Fogel-Grinvald, H., Amitai, G., Pickett, W., Molcho, M., Due, P., Matos, M. G., & Craig, W. (2011). Negative school perceptions and involvement in school bullying: A universal relationship across 40 countries. *Journal of Adolescence, 34,* 639-652. https://doi.org/10.1016/j.adolescence.2010.09.008

Harrison, L. J., Clarke, L., & Ungerer, J. A. (2007). Children's drawings provide a new perspective on teacher-child relationship quality and school adjustment. *Early Childhood Research Quarterly, 22,* 55-71. https://doi.org/10.1016/j.ecresq.2006.10.003

Ireson, J., & Hallam, S. (2005). Pupils' liking for school: Ability grouping, self-concept and perceptions of teaching. *British Journal of Educational Psychology, 75*, 297-311. https://doi.org/10.1348/000709904X24762

Johnson, B., & Stevens, J. J. (2006). Student achievement and elementary teachers' perceptions of school climate. *Learning Environ Res, 9,* 111-122. https://doi.org/10.1007/s10984-006-9007-7

Koppitz, E. (1968). *Psychological evaluation of children's human figure drawings.* Grune & Stratton.

Ladd, G. W., Buhs, E., & Seid, M.. (2000). Children's initial sentiments about kindergarten: Is school liking an antecedent of early classroom participation and achievement?. *Merrill-Palmer Quarterly, 46,* 255-279.

Ladd, G. W., & Burgess, K. B. (2001). Do relational risks and protective factors moderate the linkages between childhood aggression and early psychological and school adjustment? *Child Development, 72*(5), 1579-1601. https://doi.org/10.1111/1467-8624.00366

Lahelma, E. (2002). School is for meeting friends: Secondary school as lived and remembered. *British Journal of Sociology of Education, 23*(3), 367-381. https://doi.org/10.1080/0142569022000015418

Malchiodi, C. A. (1998). *Understanding children's drawings.* The Guilford Press.

McLaren, P. (2000). *Che Guevara, Paulo Freire, and the pedagogy of revolution.* Rowman & Littlefield Publishers.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey Bass.

Michael, O., & Rajuan, M. (2009). Perceptions of 'the other' in children's drawings: An intercultural project among Bedouin and Jewish children. *Journal of Peace Education, 6*(1), 69-86. https://doi.org/10.1080/17400200802658407

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Sage.

Paktuna-Keskin, S. (2003). *Çöp çocuk.* Boyut Yayın Grubu.

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Sage.

Pogrow, S. (2006). Restructuring high-poverty elementary schools for success: A description of the hi-perform school design. *The Phi Delta Kappan, 88*(3), 223-229. https://doi.org/10.1177/003172170608800323

Postman, N. (2001). *The end of education: Redefining the value of school.* Vintage Books.

Rönkä, A. R., Sunnari, V., Rautio, A., Koiranen, M., & Taanila, A. (2017). Associations between school liking, loneliness and social relations among adolescents: Northern Finland Birth Cohort 1986 study. *International Journal of Adolescence and Youth, 22*(1), 93-106. https://doi.org/10.1080/02673843.2015.1136659

Saban, A. (2008). Okula ilişkin metaforlar. *Kuram ve Uygulamada Eğitim Yönetimi, 55,* 459-496.

Shackleton, N., Allen, E., Bevilacqua, L., Viner, R., & Bonell, C. (2018). Associations between socio-economic status (including school- and pupil-level interactions) and student perceptions of school environment and health in English secondary schools. *British Educational Research Journal, 44*(5), 748-762. https://doi.org/10.1002/berj.3455

Snowman, J., & Biehler, R. F. (2006). *Psychology applied to teaching* (11th ed.). Houghton Mifflin.

Stake, R. E. (1995). *The art of case study research.* Sage.

Stuhlman, M. W., & Pianta. R. C. (2009). Profiles of educational quality in first grade. *Elementary School Journal, 109*(4), 323-342. https://doi.org/10.1086/593936.

Summersett-Ringgold, F. C., Li, K., Haynie, D. L., & Iannotti, R. J. (2015). Do school resources influence the relationship between adolescent financial background and their school perceptions?. *Journal of School Health, 85*(7), 413-422. https://doi.org/10.1111/josh.12267

Şahin-Sak, İ. T. (2019). Preschoolers' and first graders' reasons for liking or avoiding school. *Education 3-13, 47*(8), 889-905. https://doi.org/10.1080/03004279.2018.1537300

Valeski, T. N., & Stipek, D. J. (2001). Young children's feelings about school. *Child Development, 72*(4), 1198-1213. https://doi.org/10.1111/1467-8624.00342

Walker, K., Caine-Bish, N., & Wait, S. (2009). "I like to jump on my trampoline": An analysis of drawings from 8-to 12-year-old children beginning a weight management program. *Qualitative Health Research, 19*(7), 907–917. https://doi.org/10.1177/1049732309338404

Yamaç, A. (2014). Becoming a first grade teacher (a phenomenological study). *Elementary Education Online, 13*(2), 362-376.

Yavuzer, H. (2011). *Resimleriyle çocuk: Resimleriyle çocuğu tanıma.* Remzi Kitabevi.

Yıldırım, A., & Şimşek, H. (2008). *Nitel araştırma yöntemleri* (7. baskı). Seçkin Yayıncılık.

Yıldız, S. A. (2012). A qualitative analysis of school concept on primary school students. *Educational Sciences: Theory & Practice, 12*(2), 623-626.

Yılmaz, F., Acar, S., Kazancık, L. B., Gültekin, L., Meydan, M. C., Özsan, M. E., & Işık, M. (2019). *İlçelerin sosyo-ekonomik gelişmişlik sıralaması araştırması SEGE-2017.* Turkish Republic Ministry of Industry and Technology General Directorate of Development Agencies. https://www.bebka.org.tr/admin/datas/sayfas/89/Ice-sege-2017_1598265107.pdf.

Yolcu, E. (2009). *Sanat eğitimi kuramları ve yöntemleri.* Nobel Yayın Dağıtım.

Yurtal, F. & Artut, K. (2010). An investigation of school violence through Turkish children's drawings. *Journal of Interpersonal Violence, 25*(1), 50-62. https://doi.org/10.1177/0886260508329130

Appendix A

Codes and Desciptions

The exemplary codes for three categories and the related descriptions of codes are provided below. The coding schedule was prepared based on the literature on how to make sense of the students' drawings (Altınköprü, 2003; Burkitt, et al., 2005; Burns & Kaufman, 1972; Die Leo, 1983; Furth, 2002; Koppitz, 1968; Malchiodi, 1998; Paktuna-Keskin, 2003; Yavuzer, 2011)

Categories	Exemplary Codes	Brief Descriptions
School as a playground	toys and games	the desire to play games
	balls	the desire to play games
	school yard	the desire to play in the school garden
	hopscotch	the desire to play outside
	breaktime	the desire to play in the breaks
School as a happy place	balloons	fun and joy
	trees	joy and cheerfulness
	happy faces	feeling happy at school
	butterflies	seeking for love and beauty
	flowers	happiness
	birds	happiness
	a smiling sun	happiness
	rainbow	happiness
	school with a red roof	happy place
	bright and warm colors	happiness
	hearts and stars on the picture	feeling happy and liking school
School as an unfriendly environment	grotesque figures like robots	feeling insecure at school
	human figures without arms, hands, legs, or feet	feeling insecure at school
	rain	anxiety and sadness
	anxious and shaded faces	anxiety
	figures without eyes, noses, or mouths	anxiety and timidity
	drawing only the child himself	feeling alone
	tall buildings	reflection of tension and loneliness

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A Glance to Teachers' Work with Resources: Case of Olcay*

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Abstract

When examining success in mathematics education, it should be taken into consideration that it is important to examine teachers' work with their resources. In this study, it is aimed to examine this work through the processes of using and transforming the resources into documents. In this context, the "Documentational Approach to Didactics" is adopted as a theoretical framework. Reflective investigation method is used to analyse teacher's documentational genesis. The study is designed as a case study, with a primary mathematics teacher whom we named Olcay, who is very open to share her experiences that is important for the research. Various interviews with and observations of the teacher are made according to the requirements of the reflective investigation method. As a result, some of the schemes of the teacher to transform her resources into documents are revealed. It is seen that some of these schemes are similar to the ones discovered before and some of them are changeable according to the area where the teaching happened.

Keywords:

Didactic Material, Documentational Approach to Didactics, Documentational Genesis

Introduction

Teachers who open the path to building knowledge perform essential tasks that also provide information on learners' training (Altun et al., 2004; Cohen et al., 2003). These essential tasks include teachers' interaction with their resources. They interact with their resources for "selecting, modifying, collecting and creating new resources" as a daily work (Trouche et al., 2020). In this regard, it is thought that analyzing the resources and the documents that teachers integrate into their courses is crucial because it provides information on student learning and professional development (Adler, 2000; Hewson, 2004).

Teachers improve their courses by interacting with different resources over time and in parallel with the different resources they used (Ruthven, 2013). Teachers gather, select, transform, reorganize, share, implement, and revise resources within processes where design and enacting

are intertwined. The documentation encompasses all these interactions (Gueudet & Trouche, 2009a). It is important to analyze documentation processes that affect both their professional development and teaching processes in this perspective.

Teachers frequently use textbooks to ensure the students' learning (Pepin & Haggarty, 2001). Additionally, they also use digital resources, written or verbal resources. (Gueudet et al., 2018). There is a need for a theoretical approach that covers all the types of resources. "Documentational Approach of Didactics" (DAD) that helps analyze the resources and documents that teachers use comes to the fore at this perspective (Gueudet & Trouche, 2009a). In this study, all the concepts and processes are analyzed as part of the DAD. Thus, the term "resource" refers to any entity (notes, training, events, books, web pages etc.) from which the teacher obtains data to structure his/her teaching. Similarly, the term "document" refers to the teacher's resources that become ready to use. Although the meaning of "document" in the daily sense can be understood as a written source, the concept of the document mentioned in this study is the information in the final state of the teacher's knowledge obtained from the resources; it does not need to be written. Other specific terms of the theoretical framework are described in detail in the next section.

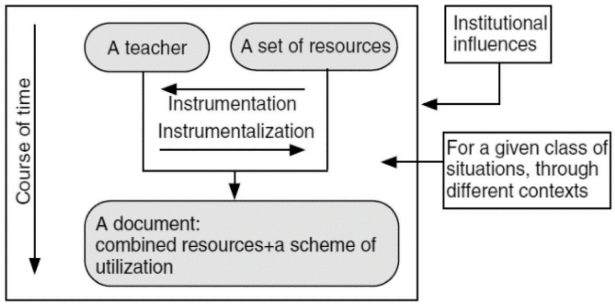
Documentational Approach of Didactics

The DAD is concerned with teachers' professional development by analyzing their interaction with resources (Gueudet & Trouche, 2009a). DAD contains its specific concepts as in French didactics tradition. While some of these concepts define objects such as resources and documents, others define processes like instrumentation and instrumentalization. These processes have been adopted from the instrumental theory (Guin et al., 2006). In the documentational approach, "instrumentation" refers to the teacher's process of adapting himself/herself to the characteristics of the particular resources while using them. "Instrumentalization" represents how teachers use particular resources and shape those resources according to their methods, and aim to use them. The documentation concept is also included within the scope of the DAD. It is defined by how teachers create schemes of utilization for the resources that they regard as necessary for particular situations. From this viewpoint, it can be said that in documentational genesis, the combination of resources and the utilization of the schemes for these resources take place. This combination may be expressed as follows:

Document= Resource + Utilization Scheme

The documentational genesis process examining such a representation may be thought to have a static structure. However, the documentational genesis process has a considerably dynamic structure. A document contains many interrelated resources and can create resources for many documents. As for utilization schemes, just as they may be a constant organization applied for particular situations, in other words, a set of fixed professional behaviors exhibited by the teacher for certain situations, they may also be recreated during the documentational genesis process. The documentational genesis process is shown in the theoretical framework in Figure 1.

Figure 1.
A representation of documentational genesis process (Gueudet & Trouche, 2009a, pg.206)



While examining teachers' transforming resources into documents, DAD also argues that this documentational genesis process is also effective on the teachers' professional development. It is necessary to examine all the documents created by the teacher and discuss his/her document system to understand a teacher's development. The resource system expresses a system created by the teacher from all the resources he/she uses, irrespective of his/her utilization schemes. However, the document system expresses a structured system in which the documents created by the teacher are correlated; in this system, the particular documents that are to be used for particular situations and the utilization of schemes of the resources are definite.

While obtaining schemes, operational invariants and action rules are taken into account. Two concepts describe operational invariants: the theorem-in-action and the concept-in-action. The theorem-in-action is the approach that an individual adopts when performing a behavior, which effectively does it. The concept-in-action is the concept that the individual acts according to and adopts. Action rules include the requirements for an individual to act. It is a set of rules that demonstrate how to act under certain conditions (Chevallard, 1985). Operational invariants and action rules together define the scheme, so, in this study, they are taken as determinatives for recognizing subtle organizations of the schemes.

In the literature, studies using DAD are focused on

examining teachers' schemes to reveal their content knowledge and mathematical concepts (Gueudet, 2017; Gueudet et al., 2013; Pepin et al., 2017; Poisard et al., 2011). Also, there are studies focusing on the metamorphosis of thinking and implementing static and dynamic resources, creating new balances between individual and collective work of teachers (Pepin et al., 2017). In these perspectives, DAD suggests to analyze teachers' work with resources in the lens of what they prepare for their classroom practices and what is renewed in these practices. The basis of the DAD is instrumental approach in the field of technology use in mathematics classrooms (Guin, et al., 2005). The concepts instrumentation and instrumentalization is also essential in the instrumental approach. Pepin and Gueudet (2018) explain the differentiation between digital curriculum resources and educational technology. Adler (2000) and Pepin et al. (2013) also suggests o think the resource as the verb re-source: "to source again or differently" (p.207). Ball et al. (2005) states in their study that teaching cannot be reduced to the work in class, but also includes planning. Also, Psycharis and Kalogeria (2018) studied on teacher educators' work with resources. Kock and Pepin (2018) also, studied on the students' interaction with students by using DAD. In this context, this research aims to analyze how teachers organize their resources by analyzing the schemes and processes that appear in the documentational genesis. The difference between this study and other studies in which DAD is used is that the teacher's schemes related to his/her instructional strategies are examined instead of just the mathematical concepts related to the course. The progress related to mathematical concepts in the context of pre-service and in-service training of teachers is very important, but what differentiates one teacher from another is the instructional strategies teacher utilizes. It is thought that this study will contribute to the field in this perspective.

Method

In this study, qualitative research methods were used because the aim was not to generalize the data to the universe but to deeply analyze the documentational genesis process (Creswell, 2017). The study was designed as a case study.

In the study, the reflective investigation method was used to select data collection tools and conduct data collection. This method is recommended for researchers that use the DAD by the creators of the theoretical framework. Its main principles are as follows:

> Long-term follow-up: Since documentational geneses are long-lasting processes and schemes develop during the process, this principle requires a detailed and long-term observation of the process. (in this study, duration is approximately six months)
>
> In- and out-of-class follow-up: The classroom is a significant environment where the teacher processes her lessons and applies the documents she creates. In addition, much of the interaction of teachers with resources takes place outside the classroom, at home, at school, in-service training courses. For this reason, it is essential to observe the teacher in these different places.
>
> Broad collection: It involves observing all the resources that the teacher has used in documentational genesis and what they have created in the process of documentational genesis.
>
> Reflective follow-up: It requires involving the teacher as much as possible in the data collection process. The teacher needs to be actively involved in examining the teacher's resource collection and following it in and out of the classroom. These parts can be understood only by the detailed explanations of the teacher (Gueudet et al., 2012, p. 27-28).

Concerning these principles, it is thought that the reflective investigation method is highly appropriate for such a study that investigates documentational work.

Participant Teacher: Olcay

This study aims to investigate the schemes that teachers have created in this process. In qualitative studies, when the investigation needs to go deeper, it is suggested to reduce the number of participants and increase the number of data collection sessions (Berg & Lune, 2015). In this context, the study was conducted with one participant teacher (Olcay).

Olcay is a primary mathematics teacher with ten years of experience in a public school in western Turkey. Previously, she completed the mathematics program at a university's science faculty in Turkey; then, she has taken pedagogical training to teach. She chose to work in a primary school instead of high school and completed the in-service training required. In addition, she completed the in-service training given within the scope of the FATİH project and thus, she was able to use the smartboard in the schools where she worked. Olcay mentioned that she benefited from technology by making smartboard and computer interaction in her previous school, but regretted that she could not use it due to lack of technological infrastructure.

She worked as a consultant teacher for the teacher candidates in the "Teaching Practice" internship. Olcay's behaviors about sharing her resources and her usage styles of the resources were very detailed. This situation made the researchers think that she was the most suitable for analyzing the documentational genesis process.

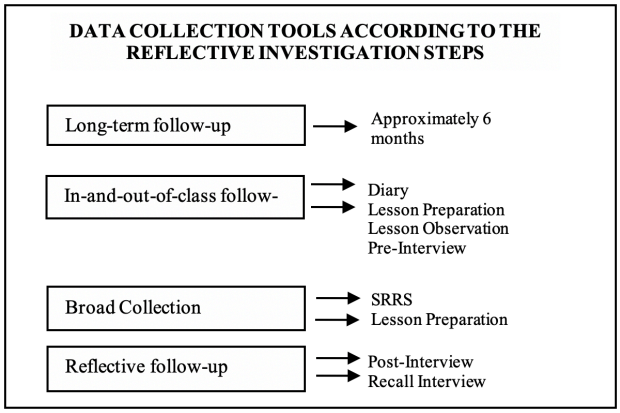
In the selection process of Olcay, the main point was not the excellent documents or the excessive amount

of resources she used. It was Olcay's ability to explain her resources, her usage of the resources and her development styles of her lessons to make us select her. Her approach about sharing resources, being open to explaining her lesson plans and being willing to share her documentational work affected our decision. Also, her 10-year teaching experience made us think that she has the broad constant organization needed for documentational genesis. Olcay has an interest in the studies in her branch and was willing to help in this study. Due to these reasons, this study was conducted with Olcay to analyze her documentational work deeply.

Data Collection Tools

Data collection tools are developed and edited in line with the reflective investigation method (Gueudet & Trouche, 2009b; Trouche et al., 2018; Trouche & Pepin, 2014). The steps of the reflective investigation and the data collection tools are shown in Figure 2.

Figure 2.
The selection of data collection tools in line with the reflective investigation steps



First of all, a "Personal Information Form" was utilized to get more information about the teacher. This form was also used and recommended by Gueudet and Trouche (2009b) using DAD. In this study, this form was translated into Turkish and used in the first visit to Olcay. The form took information about the schools that the teacher graduated from, the in-service training she received, the schools she worked at before, her perspective on technology, and the points she paid attention to in general when lecturing. In the study, the personal information form was translated into Turkish. Since the cultural aspects may differ from the previous study, the form analyzed by the specialists in mathematics education and some of the questions were eliminated because some aspects do not belong to the Turkish educational system. (For example, In France, mathematics teachers have an electronic portal to share their resources, but there is no such portal for mathematics teachers in Turkey. Moreover, the exam systems show the difference between the countries).

A semi-structured diary was utilized to ensure the "in and out-of-class" principle of the reflective investigation. It was mostly aimed at getting information about the out-of-class activities that led to changes in mathematics lesson preparation. (Olcay did not properly fill out the diary, so it is retracted.) Also, the teacher was observed in school between her lessons to see how she arranged her resources. In the study, the diary was planned as a semi-structured form. It was aimed to see the teachers' in and out-of-class ideas about her mathematics lesson. The semi-structured form was examined by the mathematics education academicians and a mathematics teacher, and its final version was completed according to their opinions.

The Schematic Representation of the Resource System (SRRS) was asked to see the teacher's resources and their relations. SRRS is a data collection tool that the teacher prepares independently from the researcher and mentions her resources and usage styles. The SRRS is an unstructured diagram intrinsically because it aims to let the teachers explain their resource systems as they prefer. The shape of the diagram is unstructured for the researchers, but structured for the participant. Because, the participant was free to draw the diagram. With the help of the diagram, it was aimed to see how she represented the relationship among her resources and the resources in detail. While giving information to Olcay about the SRRS diagram, it was stated that there is no right or wrong shape. This diagram aims to see the resources used in structuring the courses and the relationship between them.

A semi-structured interview was implemented to get detailed information about the teacher's resources, opinions about using resources and documents, and what aspects she considered while preparing a lesson. In the structured part of the semi-structured interview, questions were asked about the use of resources and documents to assist the teacher, what she paid attention to in the use of resources, whether she had certain resources for certain subjects, what resources she used and how she continued to use them and to explain the changes in the course and the application methods. The semi-structured interview form was created according to expert opinions of two experienced academicians (different than the authors) in mathematics education field and a pilot study was held with a five-year experienced mathematics teacher to see the view of a teacher. The final version was completed according to their opinions. During the interviews, according to the teacher's explanations, researchers asked additional questions to the teacher.

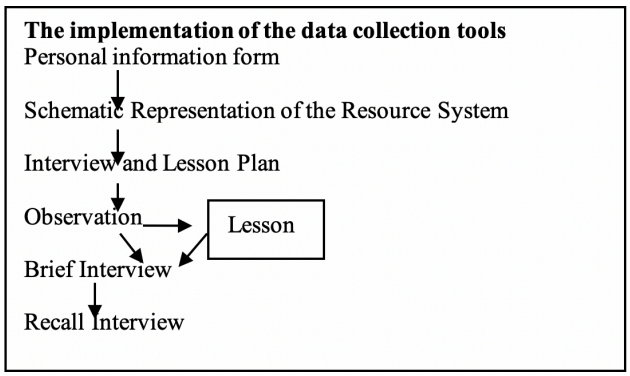
The lessons of the teacher were observed and video-recorded. Also, she was observed in the school between her lessons. Researcher notes were taken during the observations. The notes taken

were about the changes that Olcay made during the implementation of the course, which was out of her lesson plan. As Sabra (2016) mentioned, the cases mentioned in these notes were accepted as documentational incidents. After the lesson, according to the researcher's notes, brief interviews were conducted about the interesting points. Thus, the effect of the changes on the documentational genesis was confirmed by the teacher. For example, rather than making a hypothetical comment on the sudden changes the teacher made in class, the teacher was asked to explain the reasons for these changes. Thus, the validity and reliability of the observation data were increased. The observation was planned as unstructured. That's why the lessons were video-recorded to hinder the data loss and understand the important parts of the lesson using repetitive observations.

After the observations and the interviews, the researchers prepared a recall video from the recorded data. These records were selected, cut, and reunited by the researchers regarding the parts that included valuable data about the elements of the schemes. This new record was watched and interpreted by the teacher. In the recall interview, the previous lesson and the previous lesson's preparation process were seen and interpreted by the teacher. It was important in shedding light on the teacher's changes between the course preparation and the course. She was asked to comment reflectively. In this way, the teacher gained awareness about her decisions and the revisions of those decisions. It can be said that the recall interview had an intensifying effect on the validity and credibility of the SRRS, observations and interviews.

The data collection tools are implemented as in Figure 3.

Figure 3.
The implementation of the data collection tools



Validity and Reliability of the Study

First, the participant teacher was informed about the study topic before the study. Also, she was reminded that the interview and observation records would never be shared with any other person. Moreover, it was guaranteed that, in all the publications, a pseudonym would be used for the teacher.

Also, triangulation was utilized to ensure the validity and reliability of the study. The interview, observation and recall interviews were the components of the triangulation. In addition, the data collection process, details about the data collection tools and data analysis explained thoroughly to provide the reliability.

Data Collection Process

The personal information form was utilized in the first visit to Olcay to obtain information about her personal and professional history. After the personal information form, a semi-structured diary was given to Olcay to fill in day by day. (A semi-structured diary means a diary that includes the concepts we expect her to mention. But, she did not fill in the diary properly. So, the diary was not analyzed.) At the same time, SRRS that showed her resources and the relations between them was requested from Olcay. She asked questions about the diagram, and it was explained that there are no such true/false versions of the SRRS, and it can shape according to the teacher herself to share how she organizes her resources. It was aimed to make her complete the diagram more smoothly.

Two weeks later than the first interview, the semi-structured interview was done. The teacher's views on mathematical topics taught to her seventh-grade students and usage of resources were taken. At the same time, the topic of the lessons (pattern generalization and algebraic expressions) to observe was decided, and the time of the lesson preparation was determined.

A week later, lesson preparation was observed. During this observation, the researcher was involved in the process and asked questions simultaneously about the teacher's resources in the lesson.

In the following week, the lessons were observed and recorded by a video camera. During the observation, the researcher sat in the back seat and did not interfere with the courses. During the implementation of the lessons, notes were taken, and an interview was held according to the notes at the end of the lessons. During the interview, questions were raised about the points that attracted the researcher's attention at the lessons. Also, the researcher spent lots of time with Olcay, between her lessons, to understand her way of thinking about her lessons, students, and resources. So, the out-of-class observations were made from the beginning till the end of the research.

All the data were then transcribed and coded. Then, the proofs of schemes were identified, and they were combined to form parts of a recall video.

About three weeks after observing the lessons, a recall session with Olcay was made and discussed on the video. A three-week break was especially given because it was intended to forget the process a little so that the teacher could look like an outside eye on the lesson and lesson preparation she made.

Analysis of the Data

All the data from different data collection tools were analyzed and coded. After that, all the themes and codes were combined, and the overlapping and non-overlapping codes were specified. Then, shared themes and codes were created to reveal the schemes.

In the semi-structured diary, Olcay did not fill the diary as required. She just shared a few sentences about her experience with her daughter's homework (see in the second paragraph of the Findings section). So, the diary was not fully analyzed because of the data inadequacy. Just the sentences on her time with her daughter are utilized in the analysis.

The studies focusing on the interpretation of the SRRS diagram were considered in the examination of the SRRS diagram (Hammoud, 2012; Rocha, 2018). Firstly, the predictions were made according to earlier studies on SRRS, and the statements of Olcay supported the accuracy of the predictions.

The interviews with Olcay were audio-recorded and transcribed literally after the interviews. Camera recordings of the observation and the researcher notes were transcribed literally, and screenshots were taken where necessary. The transcripts of interviews and observations were subjected to content analysis together, and the themes and codes are revealed.

Finally, a recall video was prepared so that the teacher could explain the reasons for her behaviors more clearly. The data obtained from this recall session were also subjected to content analysis.

Findings

The data obtained from the personal information form was used to know Olcay more closely, and it was given in the part where she was introduced. This section presents findings from the semi-structured diary, SRRS diagram, interviews, lesson preparation, lesson observation, and recall interviews. All the data were analyzed together, schemes and themes and proofs of the schemes (codes) were revealed.

Olcay mentioned the mathematics exercises she had done with her daughter in her diary and drew conclusions for herself. Olcay expressed how she had made inferences in her work with her daughter as follows:

> *"My daughter is older than my students, and I noticed that she misunderstood some subjects from the previous years... So, I decided to increase my repetitions and examples about that issue in the class."*

Although Olcay had expressed things so briefly in her diary, she mentioned the subject later in the recall interview. She thought that repetitive examples could prevent misunderstandings. So, she had this theorem-in-action: "(in a different institution outside the classroom) if a misconception is found, extra repetitions should be done to avoid it." and the associated concept-in-action is: "misconception".

Olcay's SRRS diagram is given in Figure 4a and Figure 4b.

Figure 4a

Olcay's Schematic Representation of the Resource System (her original drawing)

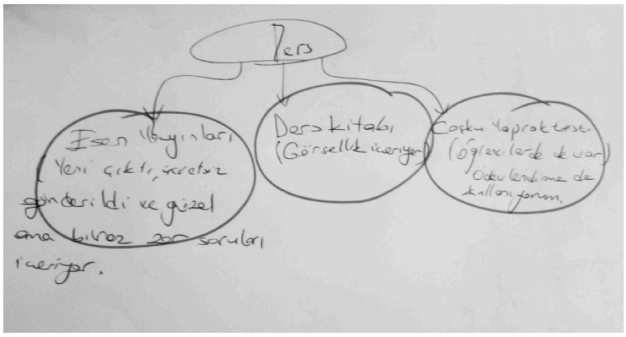
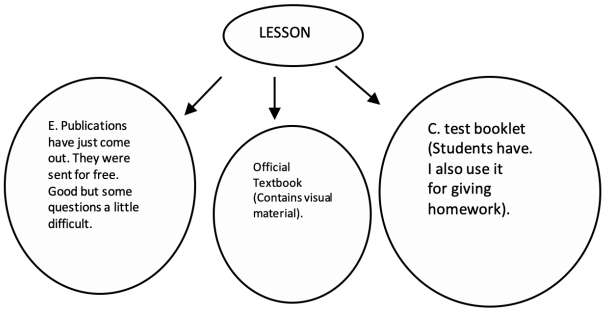


Figure 4b

The reconstructed version of Olcay's SRRS by the researchers



When the SRRS diagram is examined, two schemes are hypothesized. One of them is about the teacher's choice of homework resource. She chooses her homework from the resource that students also have access to, as she wrote in the description above the resource. Her theorem-in-action in this scheme is: "Homework should be given from a shared resource." Her concept-in-action related to the scheme is "equal access to homework resource". She also mentioned in the interview that she cared for equal access to homework in her lesson preparation. Accordingly, in her lesson, she only gave homework from the shared book she mentioned before.

She mentioned in SRRS that she chose some of the resources because they were newly published. Her theorem-in-action in this scheme is "New resources should be used to keep up with changing curricula and systems." The associated concept-in-action is "innovation". She also mentioned this situation in the interview about her resources.

The exam system had a direct effect on the variety of resources that Olcay integrated into her lessons. Considering that the exam system and the inadequacy of the official textbooks affected her choice of resources. She chose resources that would make up for the inadequacy of the official textbook or contain explanations aiming to familiarize students with the types of questions in exams. This shows that she had implemented the instrumentalization process. At the same time, if we were to treat the exams as a resource, we can say that they would greatly affect her teaching schemes. In this respect, since the teacher's adapting herself to the exams also comes into question, it is also possible to observe the instrumentation process.

Although Olcay stressed, in the interviews, that resources were critical in mathematics, she only identified two different resources from the official textbook in the SRRS diagram. Olcay expressed this situation in the following way:

> *"I used to examine every resource available to me, such as official textbooks, webpages, supplementary textbooks and video narrations. As I more or less know the content of those, I pay more attention to the main resources that contain the points I want to explain. These two books are satisfactory for me this year."*

In this statement, another scheme of Olcay can be gathered. She mentioned, "...I pay more attention to the main resources that contain the points I actually want to explain." Her theorem-in-action that constitutes the scheme is "When choosing a resource, the teacher decides according to her teaching method, model and belief."; the associated concept-in-action is "documentation in DAD".

This statement of Olcay also reveals the relationship between the time factor and documentational genesis, which is also included in DAD. Over time, Olcay had eliminated some of the resources, given preference to others, and made decisions thanks to the experience she had gained in this time, showing the effect of the time factor on documentational genesis.

The following statements made by Olcay reveal that she gave importance to making compilations and to using resources containing both easy and difficult questions, as required by the exam system:

> *"...One question from this resource and five questions from that resource...I always collected and composed like that. But this year, I am going through only one resource. I have dealt with two tests in addition. One of those two tests conforms completely with our curriculum. The other contains more selective questions. So, there is no need for me to resort to other resources. C publishing's test booklet is great, aimed at full learning outcomes. The other is A Publishing's intelligent homework test. There are not only multiple-choice questions but also word questions, as well. Filling in the blanks, completing tables... It makes learning more permanent, and there are more selective questions. Frankly, these two resources are sufficient for the students. But as well as these, for example, I ask additional award questions in the class. In addition, I point them towards one or two questions from more difficult textbooks. That is all."*

These comments of Olcay stress the institutional effects included in DAD. Being suitable for the curriculum published by the MoNE is important for Olcay. Besides this, she also wished to assess students with different types of questions. In conclusion, she chooses some of the resources according to the curriculum requirements and selects some of them according to the requirements of the examination system. While the curriculum adopts the constructivist approach and open-ended problems in Turkey, the national exam system comprises multiple-choice questions. This dilemma in the education system is reflected in Olcay's document system. In this case, the teacher's theorem-in-action: "When choosing a resource, both the curriculum and the examination system should be taken into consideration." And the concept-in-action is "The institutional effect in DAD".

It can be seen in Olcay's statements that when planning her teaching, she thought that textbooks including 'word problems, filling in the blanks and completing the tables' helps students' permanent and conceptual learning. Her theorem-in-action is "Word problems, filling in the blanks and completing the tables lead the information to be more permanent." And the related concept-in-action is "conceptual learning".

According to the interviews and the observations, it may also be said that Olcay supported the students in the matter of solving difficult questions by giving extra points. Olcay's associated theorem-in-action is "The resources with difficult questions should be used to reward students." And the concept-in-action is "motivation".

Olcay explained that when selecting and using her resources, she took care to act following the order of the curriculum, with these words:

> *"I include the learning outcomes directly in my lessons. After a topic has been taught, I give extra information where necessary... Let it be beneficial for next year, I say. Especially in the sixth grade."*

Although Olcay stated that she is conformed with the learning outcomes in the curriculum, she also stated that when the learning outcomes were completed, she also taught subjects that would belong to the outcomes of the following year. In this case, she did not avoid including topics outside the schedule because she considered these useful to students in future years. In such a situation, in which her teaching schemes have caused changes to a resource, foreseen as unchangeable like the curriculum, the instrumentation concept manifests itself. Olcay's theorem-in-action for this scheme is "If the part to be told that year is completed, the next year's topic can be told from the previous year." The associated concept-in-action: "Control of the didactic time".

Olcay stated that in choosing her resources, she also paid attention to visual material, as follows:

> *"...the reason why I use them is that there are visuals since we don't have projectors or computers. In the previous years, I used to introduce topics on the computer and show the visuals there. But here, as we don't have computers, I want them to see the visual materials in the books."*

Since the school's physical facilities were not adequate, Olcay, instead of sharing visuals that she could obtain from internet sources, tried to share visual materials included in her textbooks. Besides, both the elements of the concretization scheme of the teacher and the lack of facilities in the institution led to the implementation of concretization via the resources selected by the teacher. This statement of Olcay is important in that it reveals the instrumentation process in DAD. The theorem-in-action of Olcay is "Teachers should use visuals to make students concretize some subjects." The concept-in-action is "concretization".

Olcay explained that in choosing her resources, she preferred resources suited to her conceptions on mathematics teaching, particularly for order of topics, as follows:

> *"I think algebraic expressions should be explained first; then pattern generalization should be taught...In all the resources that I use, algebraic expressions are given first, pattern generalization comes after that. Because students haven't seen it before, when we give them the expression 3n, they cannot convert it into an algebraic expression, so they don't understand the topic."*

Olcay gave the example of the resources she used, and her choosing and adopting of those textbooks among many resources that came to her school shows that she was more prone to use books that were in parallel with her conceptions. Also, she had this scheme about the mathematical topic, that the theorem-in-action is "Algebraic expressions should be taught before pattern generalization." And the associated concept-in-action is: "ground preparation".

Although Olcay had stated in her previous comments that she reflected the learning outcomes in her teaching and that she did not make any changes to them, she admitted that she wanted to make changes in the order of learning outcomes. But she avoided doing so because it would go against the curriculum. Here again, it is possible to mention the institutional effects that are stated in DAD. Although the teacher's professional view was inclined towards changing the order of the learning outcomes, she behaved compliant to the curriculum defined by the institution.

On the other hand, it may be said that Olcay did not follow some of the collective decisions as to the curriculum. The dialogue given below that took place with another math teacher (MT) while Olcay was planning her lessons supports this thought:

> *"MT: In the group meeting, we said that while teaching the patterns, we would proceed as in the official textbook. You can start with this pattern made with matchsticks. I'm going to do it like that.*
>
> *Olcay: The rule for the pattern made with matchsticks is in the form of 2n+5. I think students will find it hard to understand. I think it would be better to start with patterns like 2n, 3n and 5n first.*
>
> *MT: Yes, that is easier but aren't we keeping to the textbook?*
>
> *Olcay: I'll follow it but not in the same order. I'll give the examples in the other books first. Then I'll move on to the official textbook."*

It may be said that for Olcay, the group effects stated in DAD are less effective than the institutional effects. Also, she has the scheme that the theorem-in-action is "First, the patterns in the multiplication form (2n, 3n) should be taught, then, the patterns that include plus form (2n+5) should be taught." The related concept-in-action is: "from easy to hard". In the lesson, she also warned the students to start from the examples she presented in the class and then wanted them to move on to the official textbook. Relying on her experience, she stressed the importance of proceeding in a definite order from easy to hard according to the topic she was to teach. She acted in the way she stated in her lessons:

> *"... We're already going to explain number patterns. Straight after this, I'll draw a table and the step number with the number corresponding to that step and have them discover how to find the rule. I'm planning to start with number patterns and then proceed to shape patterns. Then, I'll give problems that don't require a fixed term, followed by problems that require a fixed term. I did it as in the previous years because students would not understand in another way."*

Olcay planned her lessons based on her experience in a way from easy to difficult. Here, she also expressed the situation stated in the previous dialogue; she will shape her teaching according to her professional

viewpoint despite the mutual decisions. The easy-to-difficult principle possessed by Olcay affected her resource selection. Here, as she stated that she selected her resources according to her schemes, the instrumentalization process may be mentioned.

Resource sharing of Olcay was not the result of a decision made by herself, but rather due to the mutual decision, she made with her colleagues. However, in the case of those who do not want to use the resource they decided collectively, the teacher decides to use resources in the classroom.

> *"...If one student does not want it, I cannot use it in class. It is already forbidden. Even if I wish to share and use them in my lesson, I cannot show them in class. They may complain, or even if the administration sees it, there would be a problem. So, if there is a book I like, I examine it before and relate to the class in this way, or if I have to bring it to the class, I cover it in a way that the students can't see it."*

Even during the research, when Olcay stated her resources, she requested that books and websites be kept secret in particular. Even this reveals how powerful the institutional effect on the teacher is. The scheme associated with this situation becomes clear with the theorem-in-action "If there is a possibility that sanctions can be imposed on teacher's career by the institution, the use of the resource in the classroom can be put into the second plan." and the concept-in-action "institution rules".

Olcay stated that when she gave problems from the shared resources for homework, she solved them again in the class to make sure that they had been correctly solved:

> *"We give some of them for homework, and we also solve most of them in the class. Even if we give homework, we solve them again in class to check."*

These statements show that Olcay is sensitive about giving feedback. Here, the scheme is associated with the theorem-in-action "The problems in the assignment must be solved correctly." and concept-in-action "joint correction".

During the lesson, Olcay proceeded as she had planned. However, in some parts of the lesson, she diverged from her plan, solved additional examples, and gave additional explanations. She explained the reason for this as follows:

> *"...In the class, if we had given only one example as in the plan, n wouldn't have understood. As I was unsure whether they would find it, I felt the need to give a second example, to say that n is a variable, a representative number, the term sought. So n may be 15 or 50. A representative number. I wanted to stress that we are showing the number of steps. We even put an asterisk and wrote an explanation about that."*

Olcay described that the implementations she carried out in the lesson were different from her plan as she revised instantly in the lesson according to the students' level of understanding. Here, Olcay updated her documentation by adding new examples to her teaching. Her changes or arrangements to the resources that she used according to the students' level of understanding constitute an example of the instrumentalization process in this case. The teacher's scheme is associated with the theorem-in-action: "Course content should be based on class level." The concept-in-action is "Adaptation to the class".

Conclusion and Discussion

The schemes can be discussed as internal (particular to the teacher) and external schemes (such as institutional factors). The internal schemes particular to the teacher include schemes such as the teacher's content knowledge, pedagogical content knowledge, and acting by some approaches like easy-to-hard when organizing the lessons. The internal schemes particular to the teacher may be said to show similarity with the factors revealed by Gueudet and Trouche (2009b). However, differences were observed in external schemes like institutional factors and effects of the exam system.

In the study conducted by Pepin, Gueudet and Trouche (2013) related to sharing of resources by teachers, it was stated that teachers especially shared resources with their colleagues. In their study, the researchers revealed that the teacher shared resources with math teachers and physics teachers. She selected exercises that would also be suitable for physics lessons in structuring her lessons. There is no such evidence that Olcay shares resources with different branches in this study, but she shares resources with her colleagues.

As for the scheme related to documentation, there are also studies conducted in the literature about the teachers' selection of resources and classroom practices according to their beliefs and teaching methods (Shaw et al., 2008; İlter, 2018). Shaw et al. (2008) mentioned, in their study, that teachers' practices and the resources they use reflect the beliefs they have about teaching the course.

In the scheme related to the didactic time, it is mentioned in the literature that the teacher keeps the didactic time under control. In the literature, it is stated that especially experienced teachers tend to keep didactic time under control so that students can understand efficiently. Sometimes, they move on to the subjects of the following year (Maurice & Allégre, 2002; Calmettes, 2007). Chevallard (1985) has imposed a godlike character on them, considering that teachers can accurately predict students' understanding periods and the didactic time to be given to a subject (Margolinas, 2002).

The teacher's behavior, similar to the scheme obtained concerning concretization, has also been reported in the literature (Danesi, 2007; Presmeg, 2006; Presmeg, 2008; Usta et al., 2018; Rösken & Rolka, 2006). Danesi (2007), in his theoretical framework on conceptual metaphors, stated that teachers and students tend to concretize verbally given abstract mathematical issues to understand them. He reported that they did this by drawing the data of the given problem, trying to visualize it and making it into an equation. Similarly, Polya (1957, p.174) also emphasized concretization by expressing the path needed to solve a problem as "translating from one language into another".

According to students' level, the scheme of Olcay to structure the lesson is also reported in the literature (Dursun & Dede, 2004). Cohen et al. (2003) mentioned in their study that teachers consider the students' level of learning to make instant arrangements on the lesson plans.

Solving the problems that were given as homework and the wish to be sure the students give the right answer is also mentioned in the literature as a factor that should be considered while giving homework (Ilgar, 2005; Korkmaz, 2004; Schmitz & Baumert, 2002; Turkoglu et al., 2007). Turkoglu et al. (2007) mentioned homework correction techniques in their studies. One of the most important of these techniques is the common correction technique Olcay adopted.

The scheme about using new resources to adapt to changing curriculums and follow innovations is similar to Ozmantar et al.'s (2009) studies, and it is similar to the finding that change in curriculum necessitates a change in the classroom norms.

The institutional effects can be discussed in two aspects. The first one is seen as an element that affects kneading the resources during documentational genesis. In the second, it is seen as an element that interrupts this process. In the first case, it is possible to use resources appropriate for both approaches to eliminate the problems arising from the difference between the curriculum and the national exam system. In the second case, if the resource used will affect the teacher's career negatively by the institution, the use of the resource will be restricted.

Similarly, in the study of Butlen and Vannier (2010), determining the course content appropriate to the curriculum and exam system is regarded as respecting the student's rights for the teacher. It is considered the pressure by the institution. However, it affects the teacher's development of the document system. Similar to the second institutional effect mentioned, a study was conducted at the university level and discussed the impact of the changes in the exam system on the content of the exams (Gueudet & Lebaud, 2008). Although this study is related to the exams, the effect of the institution that limits the content and duration of the exam is more appropriate to the second situation.

Although it differs among schools, it is advised by the school administrators not to recommend any resources to students. It may be attributed to the fact that some students can easily access the resource, and some will not if there is a financial difference among the students in the school. However, the effects of this prohibition at school were observed once again because Olcay hesitated to share the resources with the researcher. It is also notable that the stress experienced by Olcay is also one of the reasons for the teachers' occupational stress and burnout in the psychology literature (Dinham, 1993; Kyriacou, 2001; Louden, 1987; Punch & Tuetteman, 1996; Pithers & Soden, 1999).

Examining the research by Gueudet and Trouche (2009b), it can be seen that the teachers filled in their diaries in the way that was explained to them. Yet, in this study, Olcay filled in her diary similarly to the class notebook she used in the class. Although Olcay included the developing experiences that she considered mathematical in her diary, these sections made up only a small part of her full diary. It is hypothesized that the semi-structured diary given to the teacher reminded her of the schools' class notebook in form. Such a situation did not arise in other studies examining documentational genesis because class notebook concepts did not exist. Even if there were such concepts, they did not resemble the diary in form. Moreover, it was reported in the literature that in the use of a diary as a data collection tool, people had difficulty expressing themselves in a diary in writing (Bolger et al.,2003).

Unlike Gueudet and Trouche's (2009b) research, the participant teacher stated rather few resources in her SRRS diagram. In Gueudet and Trouche's study, the teachers also included internet sources in their SRRS diagrams. Yet, in this research, Olcay did not show these in her SRRS diagram, despite stating that internet resources influenced her lessons in the interview. This situation may be interpreted as although Olcay examined internet resources, she did not regard them as a basic resource influencing her lessons this year. Also, such a concept as "resource book" in Turkey may influence the teacher to mention only the resources in the textbook format in her SRRS diagram. In addition, in the literature, when the resource is mentioned, besides the other meanings of the resource, some studies take the books as the "classic and the usual" version of resources (Drijvers et al., 2013, Maschietto & Soury-Lavergne, 2013; Ruthven, 2013).

Furthermore, when representing her resources in the diagram, Olcay used arrows led from the lesson to the

resources. But, she stated during the interviews that she had tried to explain that the resources and the lesson have a mutual effect on this representation. (Hammoud, 2012; Rocha, 2018). Also, she placed the lesson in the center of the diagram. It may because she considered the lesson itself as the main resource.

In Turkey, there are many schools with different views regarding resource sharing. This situation caused a conflict between the internal and external schemes possessed by Olcay. In France, where the Authors carried out their study, there isn't such an exam system in Turkey, which may be why factors related to the exam system differed. It can be said that the national exam, which the students were expected to do well in at the end of middle school, considerably affected Olcay's documentational genesis process.

Recommendations for Further Researches

It was observed during the research that teachers were worn out between the curriculum and the exam system. While the approach adopted in the curriculum was process-oriented, the evaluation method was result-oriented, which was an important factor in creating a dilemma for the teachers. For this reason, it is suggested that a study should be conducted to determine how teachers manage the items that are compatible and incompatible with the curriculum and the exam system in future studies and how these differences affect the process of the documentational genesis.

Considering that teachers draw on their previous experience and the questions that have been used in exams from the previous years, it may be said that the exam questions also have the characteristic of being a resource for teachers. In this study, the documentational genesis processes of teachers were examined in the case in which the curriculum outcomes and the exam system did not match. It is considered that it may be important to carry out studies that demonstrate how resources from the national exam system affect the documentational genesis process in matching with the outcomes of the curriculum.

Moreover, if a diary is to be used in the studies carried out with teachers in the Turkey sample, the design of the semi-structured diary should be different as much as possible from the class notebook. In this way, the negative situation that arose in this study can be avoided, and more productive data can be collected from the diaries. The literature also recommended that the information given to teachers about diaries should be detailed, and the diaries should be checked at every stage (Bolger et al., 2003).

For closer and more detailed analyses of the documentational genesis process, longitudinal qualitative studies can be held. Also, this study was conducted with only one teacher. With the increase in the number of such studies, different situations and schemes can be seen, or various situations can be identified that show similar schemes.

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References

Adler, J. (2000). Conceptualising resources as a theme for teacher education. *Journal of Mathematics Teacher Education, 3*, 205–224.

Altun, M. (2015). *Ortaokullarda matematik öğretimi (5, 6, 7 ve 8. Sınıflar için)* [Mathematics teaching in primary schools (For grades 5, 6, 7 and 8)] Alfa Aktüel Press.

Altun, M., Arslan, C., &Yazgan, Y. (2004). Lise matematik ders kitaplarının kullanım şekli ve sıklığı üzerine bir çalışma. [A study on the usage and frequency of high school math textbooks.] *Uludag Universitesi Egitim Fakultesi Dergisi, 17*(2),131-147.

Ball, D. L., Hill, H. C., & Bass, H. (2005). Knowing mathematics for teaching. Who knows mathematics well enough to teach third grade, and how can we decide? *American Educator, 30*(3), p. 14–17, 20–22, 43–46.

Berg, B. L., & Lune, H. (2015). Sosyal Bilimlerde Nitel Araştırma Yöntemleri, Çev. Ed: Hasan Aydın, [Qualitative research methods in the social sciences], (Hasan Aydın trans.) *Eğitim Yayınevi.*

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual review of psychology, 54*(1), 579-616.

Butlen, D., & Vannier, M. P. (2010). Un exemple de situation pour la formation ASH (option D). [An example of a situation for ASH training (option D)] *Proceedings of the 37th COPIRELEM conference.* La Grande Motte.

Calmettes, B. (2007). Formation d'enseignants débutants à la mise en place d'une démarche d'investigation en classe. *In Actualité de la Recherche en Éducation et en Formation,Strasbourg 2007* [Training of novice teachers in setting up an investigative process in the classroom. In News on Research in Education and Training, Strasbourg 2007] https://halshs.archives-ouvertes.fr/halshs-00278598/document

Chevallard, Y. (1985) La transposition didactique, [Didactic transposition] La Pensée Sauvage.

Cohen, D. K., Raudenbush, S. W., & Ball, D. L. (2003). Resources, instruction, and research. *Educational evaluation and policy analysis, 25*(2), 119-142.

Cresswell, J.W. *Araştırma deseni: Nitel, nicel ve karma yöntem yaklaşımları.* [Research Design: Qualitative, Quantitative and Mixed Methods Approaches] Translation editor: S. B. Demir. Eğiten Kitap.

Danesi, M. (2007). A conceptual metaphor framework for the teaching of mathematics. *Studies in philosophy and education, 26*(3), 225.

Dinham, S. (1993). Teachers under stress. *Australian Educational Researcher, 20*(3), 1–16.

Drijvers, P., Tacoma, S., Besamusca, A., Doorman, M., & Boon, P. (2013). Digital resources inviting changes in mid-adopting teachers' practices and orchestrations. *ZDM, 45*(7), 987-1001.

Dursun, Ş., & Dede, Y. (2004). Öğrencilerin matematikte başarısını etkileyen faktörler: Matematik öğretmenlerinin görüşleri bakımından. [The Factors Affecting Students' Success in Mathematics: Mathematics Teachers' Perspectives]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi, 24*(2).

Gueudet, G. (2017). University teachers' resources systems and documents. *International Journal of Research in Undergraduate Mathematics Education, 3*(1), 198-224.

Gueudet, G., & Lebaud, M. P. (2008). Quelle évaluation à l'université en mathématiques?. *In Questions de pédagogie dans l'enseignement supérieur* [Which university assessment in mathematics?. In Questions of pedagogy in higher education].p. 289-299. Télécom.

Gueudet, G., Pepin, B., Restrepo, A., Sabra, H., & Trouche, L. (2018). E-textbooks and connectivity: proposing an analytical framework. *International Journal of Science and Mathematics Education, 16*(3), 539-558.

Gueudet, G., Pepin, B., & Trouche, L. (Eds.). (2012). *From text to'lived'resources: Mathematics curriculum materials and teacher development* (Vol. 7). Springer.

Gueudet, G., Pepin, B., & Trouche, L. (2013). Collective work with resources: an essential dimension for teacher documentation. *ZDM, 45*(7), 1003-1016.

Gueudet, G., & Trouche, L. (2009a). Teachers' work with resources: Documentational geneses and Professional geneses. In Gueudet, G., Pepin, B. & Trouche, L. (Eds.), *From text to lived resources.* p.23-43

Gueudet, G., & Trouche, L. (2009b). Towards new documentation systems for mathematics teachers? *Educational Studies in Mathematics, 71,* 199–218.

Guin, D., Ruthven, K., & Trouche, L. (Eds.) (2006). *The didactical challenge of symbolic calculators: turning a computational device into a mathematical instrument.* New York: Springer.

Hammoud R. (2012). *Le travail collectif des professeurs en chimie comme levier pour la mise en œuvre de démarches d'investigation et le développement des connaissances professionnelles. Contribution au développement de l'approche documentaire du didactique.* [The collective work of chemistry professors as a lever for the implementation of investigative approaches and the development of professional knowledge. Contribution to the development of the documentary approach to didactics.] Doctoral Dissertation, Lyon 1 University.

Hewson, P. W. (2004). Resources for science learning: tools, tasks, and environment. *International Journal of Science and Mathematics Education, 2*(2),201-225.

Ilgar, Ş. (2005). Ev odevlerinin ogrenci egitimi acısından onemi. [The importance of homework for student education.] *Hasan Ali Yücel Egitim Fakultesi Dergisi, 2*(1).

Ilter, I. (2018). Oğretmenlerin sosyal bilgiler derslerinde ögretim yontemleri ve uygulamaları üzerine bir degerlendirme. [An evaluation on teaching methods and practices of teachers in social studies lessons.] *Journal of Theoretical Educational Science, 11*(1), 1-29.

Kock, Z.-J., & Pepin, B. (2018). Student use of resources in Calculus and Linear Algebra. Presentation at *INDRUM conference*, Kristiansand April 2018.

Korkmaz, I. (2004). Ogrencilerin basarılarını artırmada kullanılan ögretim stratejileri. [Instructional strategies used to increase students' success.] In Proceedings of Contemporary Trends in Personal Development Symposium, pp.327-336.

Kyriacou, C. (2001). Teacher stress: directions for future research. *Educational Review, 53*(1),27–35.

Louden, L.W. (1987). Teacher stress: summary report of the joint committee of inquiry into teacher stress appointed by the minister for education and planning in W.A.Perth, Govt. Printer.

Margolinas, C. (2002). Situations, milieux, connaissances: analyse de l'activité du professeur. *Actes de la 11ème Ecole d'Eté de Didactique des Mathématiques,* [Situations, environments, knowledge: analysis of the teacher's activity. Proceedings of the 11th Summer School of Mathematics Didactics]La pensée sauvage, pp.141-156.

Maschietto, M., & Soury-Lavergne, S. (2013). Designing a duo of material and digital artifacts: the pascaline and Cabri Elem e-books in primary school mathematics. *ZDM, 45*(7), 959-971.

Maurice, J. J., & Allégre, E. (2002). Invariance temporelle des pratiques enseignantes: le temps donné aux élèves pour chercher. [Temporal invariance of teaching practices: the time given to students to research.]*Revue française de pédagogie*, 115-124.

Ministry of National Education (MoNE) (2018). Mathematics Curriculum (Primary and Secondary Schools for the 1, 2, 3, 4, 5, 6, 7 ve 8 th grades).

Ozmantar, M. F., Bingolbali, E., Demir, S., Saglam, Y., & Keser, Z. (2009). Degişen ögretim programları ve sınıf ici normlar. [Changing curriculum and classroom norms.].*Uluslararası İnsan Bilimleri Dergisi 6* (2).

Pepin, B., Gueudet, G., & Trouche, L. (2013). Re-sourcing teachers' work and interactions: A collective perspective on resources, their use and transformation. *ZDM, 45*(7), 929-943.

Pepin, B., Gueudet, G., & Trouche, L. (2017). Refining teacher design capacity: Mathematics teachers' interactions with digital curriculum resources. *ZDM, 49*(5), 799-812.

Pepin, B., Choppin, J., Ruthven, K., & Sinclair, N. (2017). Digital curriculum resources in mathematics education: foundations for change. *ZDM Mathematics Education, 49*(5), 645- 661.

Pepin, B., & Gueudet, G. (2018) Curriculum resources and textbooks in mathematics education. In Lerman, S. (ed.) *Encyclopedia of Mathematics Education.* Springer.

Pepin, B.& Haggarty, L. (2001). Mathematics textbooks and their use in English, French and German classrooms: A way to understand teaching and learning cultures.*ZDM,33*(5), 158–175.

Pithers, R.T. & Soden, R. (1999). Person-environment fit and teacher stress. *Educational Research,41*(1), 51–61.

Presmeg, N. C. (2006). Research on visualization in learning and teaching mathematics. *In Handbook of research on the psychology of mathematics education,* 205-235, Sense Publishers.

Presmeg, N. (2008). An overarching theory for research in visualization in mathematics education. *In ICME 11 Proceedings Book.*

Poisard, C., Bueno-Ravel, L., & Gueudet, G. (2011). Comprendre l'intégration de ressources technologiques en mathématiques par des professeurs des écoles. *Recherches en didactique des mathématiques,* [Understand the integration of technological resources in mathematics by school teachers.] *31*(2), 151-189.

Polya, G. (1957). *How to Solve It*? (2 nd ed.). Princeton University Press.

Psycharis, G., & Kalogeria, E. (2018). Studying the process of becoming a teacher educator in technology-enhanced mathematics. *Journal of Mathematics Teacher Education, 21*(6), 631 660. https://doi.org/10.1007/s10857-017-9371-5

Punch, K.F. & Tuetteman, E. (1996). Reducing teacher stress: the effects of support in the workenvironment. *Research in Education,56*, 63–72.

Rocha, KDM. (2018). Uses of online resources and documentational trajectories: the case of Sésamath. In: Authors (eds) Research on mathematics textbooks and teachers' resources: advances and issues, 235–258, Springer.

Rösken, B., & Rolka, K. (2006). A picture is worth a 1000 words–the role of visualization in mathematics learning. In *Proceedings PME-30,* Vol. 4, 457-464.

Ruthven, K. (2013). From design-based research to re-sourcing 'in the wild': reflections on studies of the co-evolution of mathematics teaching resources and practices. *ZDM Mathematics Education, 45,* 1071-1079.

Sabra, H. (2016). L'étude des rapports entre documentations individuelle et collective: incidents, connaissances et ressources mathématiques. [The study of the relationship between individual and collective documentation: incidents, knowledge and mathematical resources] *Rech Didactique Mathématiques, 36*(1):49–95.

Shaw, D. M., Barry, A., & Mahlios, M. (2008). Preservice teachers' metaphors of teaching in relation to literacy beliefs. *Teachers and teaching: theory and practice, 14*(1), 35-50.

Schmitz, B.&Baumert, J. (2002). Do homework assignments enhance achievement? A multilevel analysis in7th-grade mathematichs. *Contemporary Educational Pyschology 27,* 26-50.

Trouche, L., Gueudet, G., & Pepin, B. (2018). Documentational approach to didactics. *Encyclopedia of Mathematics Education. NY: Springer. doi, 10,* 978-3.

Trouche, L., & Pepin, B. (2014). From instrumental to documentational approach: towards a holistic perspective of teachers' resource systems in higher education. *Research in Mathematics Education, 16*(2), 156-160.

Trouche, L., Gueudet, G. & Pepin, B. (2020). The documentational approach to didactics. *arXiv preprint arXiv:2003.01392.*

Turkoglu, A., Iflazoglu, A.& Karakus, M.(2007). *Ilkogretimde Odev.* [Homework in primary education]Morpa Kültür Press.

Usta, N., Yilmaz, M., Kartopu, S., & Kadan, Ö. F. (2018). Impact of visuals on primary school 4th graders' problem-solving success. *Universal Journal of Educational Research, 6*(10), 2160-2168.

Vergnaud, G. (1994). Le rôle de l'enseignant à la lumière des concepts de schème et de champ conceptuel. [The role of the teacher in the light of the concepts of schema and conceptual field.] In *Vingt ans de didactique des mathématiques en France,* 177-191, La Pensée Sauvage.