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Contact Address:

Prof. Dr. Nergüz BULUT SERİN
Editor in Chief
European University of Lefke
Lefke, Northern Cyprus TR-10 Mersin, Turkey, 99010

Message from the Editor,

I am very pleased to inform you that we have published the third issue in 2025. As an editor of International Online Journal of Primary Education (IOJPE), this issue is the success of our authors, very valuable reviewers who undertook the rigorous peer review of the manuscripts, and those of the editorial board who devoted their valuable time through the review process. In this respect, I would like to thank to all reviewers, researchers and the editorial board members. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to International Online Journal of Primary Education (IOJPE). For any suggestions and comments on IOJPE, please do not hesitate to send me e-mail. The countries of the authors contributed to this issue (in alphabetical order): Australia, Canada, Indonesia, Japan, North Cyprus, and Turkey.

Prof. Dr. Nergüz BULUT SERİN

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DAILY MEDITATION VERSUS EMOTIONAL FREEDOM TECHNIQUES: A PILOT AUSTRALIAN PRIMARY SCHOOL TRIAL

Peta STAPLETON
Professor, Bond University, School of Psychology, Australia
ORCID: https://orcid.org/0000-0001-9916-7481
pstaplet@bond.edu.au

Angela DOUGLAS
Department of Education, Australia
ORCID: https://orcid.org/0000-0002-8120-451X
adoug38@eq.edu.au

Matthew D. BLANCHARD
University of Sydney, School of Psychology, Australia
ORCID: https://orcid.org/0000-0001-5557-8617
matthew.blanchard@sydney.edu.au

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Abstract

This pilot study compared the effects of daily mindfulness meditation and Emotional Freedom Techniques (EFT) tapping on the emotional and behavioral regulation of 5-year-old children over a three-week period. Participants were divided into two groups, each receiving one of the interventions. Self-regulation, happiness, and life satisfaction were assessed weekly using validated measures. Results indicated that both interventions significantly improved self-regulation, however, no significant changes were observed in happiness and life satisfaction for either group. The findings suggest that while both mindfulness meditation and EFT tapping can enhance self-regulation in young children, longer intervention periods may be warranted for the other constructs. These results have implications for the implementation of mental health programs in early childhood education, highlighting the potential of both meditation and EFT practices to support emotional resilience from a young age.

Keywords: Meditation, emotional freedom techniques (EFT), children, emotional regulation.

INTRODUCTION

The early childhood years are critical for the development of emotional and behavioral regulation. During this period, children begin to form foundational skills that influence their future mental health and well-being. Given the increasing prevalence of stress and anxiety among young children, there is a growing interest in interventions that can support emotional resilience and mental health from an early age. Two such interventions that have gained attention are mindfulness meditation and Emotional Freedom Techniques (EFT) tapping.

Mindfulness meditation involves practices that cultivate present-moment awareness and emotional regulation through focused attention and breathing exercises. It has been shown to reduce stress, improve emotional regulation, and enhance overall well-being in various age groups, including young children (Zenner et al., 2014). Diamond et al. (2024) recently conducted a case study using mindfulness-guided visualization ("My Magical Garden") in a trauma-informed primary classroom and found improvements in emotional regulation and school reintegration over six months. A randomized controlled trial also reported that a classroom-based mindfulness program significantly improved executive function—including working memory, inhibition, and cognitive flexibility—in Year 2 students (Diéguez et al., 2024).

On the other hand, EFT tapping is a psychological acupressure technique that combines elements of cognitive therapy and exposure therapy with acupressure by tapping on specific meridian points on the body. EFT has been reported to reduce anxiety, improve emotional regulation, and enhance psychological well-being (Church et al., 2022). In primary school children "The Tapping Project" specifically investigated the use of EFT tapping with Year 5 and 6 students in four Northern Territory primary schools. The project found that a majority of students reported EFT tapping as effective, and it was linked to improvements in various areas like focus, concentration, and physical discomfort (Lambert, 2020).

This study is grounded in developmental and self-regulation theories that highlight early childhood as a sensitive period for acquiring emotional and behavioral regulation skills (Blair & Raver, 2015). According to self-regulation theory, the ability to manage attention, emotion, and behavior is foundational to mental health and adaptive functioning (Baumeister & Vohs, 2016). Interventions targeting these skills in early childhood may yield long-term benefits due to the heightened neuroplasticity of this developmental stage.

Mindfulness meditation supports self-regulation by enhancing attentional control and emotional awareness, with evidence showing it engages executive brain networks and reduces reactivity in the amygdala (Tang, et al., 2015; Zelazo & Lyons, 2012). EFT tapping, by contrast, combines cognitive reframing with somatic input, potentially calming the nervous system and reducing emotional intensity through bottom-up mechanisms (Feinstein, 2022).

Together, these frameworks suggest that both mindfulness and EFT tapping target complementary mechanisms of emotional regulation—cognitive control and physiological calming—making them particularly relevant and promising for young children. By comparing mindfulness meditation and EFT tapping, this study sought to identify whether the two interventions were comparable in supporting young children's emotional resilience.

Second, while both mindfulness meditation and EFT tapping have been shown to be beneficial in various populations, their comparative effectiveness in young children such as 5 year olds remains underexplored. However, a pilot Australian study has shown promising results for daily meditation (Stapleton et al., 2024). Understanding the relative benefits of these interventions can inform educators, parents, and policymakers about the most effective strategies for promoting mental health in early childhood settings.

Third, the practical implications of this study are significant. Schools and early childhood education centers are increasingly looking for evidence-based interventions to incorporate into their curricula. By providing empirical evidence on the effectiveness of mindfulness meditation and EFT tapping, this study can guide the implementation of mental health programs in educational settings, ensuring that children receive the most beneficial support.

Finally, this study addresses a critical need for accessible and non-invasive interventions that can be easily integrated into daily routines. Both mindfulness meditation and EFT tapping are low-cost, easy-to-implement practices that do not require extensive training or resources. Demonstrating their effectiveness can encourage wider adoption and provide children with valuable tools for managing stress and emotions from an early age.

This study aimed to contribute to the growing body of research on early childhood interventions by comparing the effects of daily mindfulness meditation and EFT tapping on the emotional and behavioral regulation of 5-year-old children. It was a large multi-school meditation trial (outcomes reported in Stapleton et al., 2025), but this paper represents a subset of the larger study where one school participated in the EFT intervention instead of meditation. It was hypothesized:

H1: Both mindfulness meditation and EFT tapping would result in significant improvements in emotional and behavioral regulation from baseline to the end of the intervention.

H2: Both mindfulness meditation and EFT tapping would result in significant improvements in happiness from baseline to the end of the intervention.

H3: Both mindfulness meditation and EFT tapping would result in significant improvements in life satisfaction from baseline to the end of the intervention.

METHOD

Prior to the commencement of the study, ethical approval was obtained from the university (PS00210). According to the Department of Education (DoE) guidelines for single-school, non-sensitive applications, approval was granted at the discretion of the respective school principals. Consequently, no gatekeeper approval from the DoE was necessary. Participation in the study was entirely voluntary. Three schools participated in the original study (Stapleton et al., 2025); however, this study represents a subset of those participants at two of the schools, across a 3-week period.

Research Model

This study employed a comparative intervention design to evaluate the effects of the two wellbeing programs—Smiling Mind (SM) meditation and EFT tapping—on primary school students' mental health and emotional outcomes. This quasi-experimental design enabled comparison between the two active interventions in a naturalistic school setting, allowing for ecological validity while maintaining structured intervention delivery. Both interventions were delivered during regular classroom time by teachers using digital resources to ensure consistent implementation. Teachers received basic instruction to standardise delivery across classrooms, and adherence was monitored through teacher logs or follow-up communication. Schools were not randomly assigned; rather, one class within a participating school was allocated to the EFT tapping intervention due to logistical and scheduling feasibility. The remaining classes followed the standard Smiling Mind program, consistent with existing school practice.

Participants

Students were currently enrolled in Year 1 at two primary schools and were 5-6 years.

Interventions

The study utilized the Smiling Mind (SM) Primary School Program, delivered via a digital application (https://www.smilingmind.com.au/smiling-mind-app), which has been implemented in Australian schools since 2016. SM is a mindfulness-based social and emotional learning program designed to enhance the mental wellbeing and emotional resilience of primary school students (Van Der Zant et al., 2024). The participating school in this trial had access to the freely available SM program and were instructed on which meditation to play each day and week. The meditation content was age-appropriate and identical across year levels as specified by the app. Table 1 outlines the meditations included in the program.

One school watched daily videos of the EFT tapping process, delivered by the lead author, instead of the meditations. For the students, four acupoints were stimulated with a two-finger tapping process, using both hands (see Figure 1). At this time the children spoke a short phrase such as "calm breath" to stay focused. The topics were matched to the meditation topics (see Table 1).

Table 1. Meditation and EFT topic by week.

Meditation Topic	EFT Topic
Lesson 1 The Bubble Journey	Lesson 1 Learning to Tap; tap and breathe
Lesson 2 Belly Breathing	Lesson 2 Tapping for focus and attention
Lesson 3 Exploring Sounds	Lesson 3 Tapping for worry, frustration and anger

Figure 1 shows the tapping points that were used by the students in that group. They used both hands during the process, and tapped approximately seven times on each point, while watching the video.

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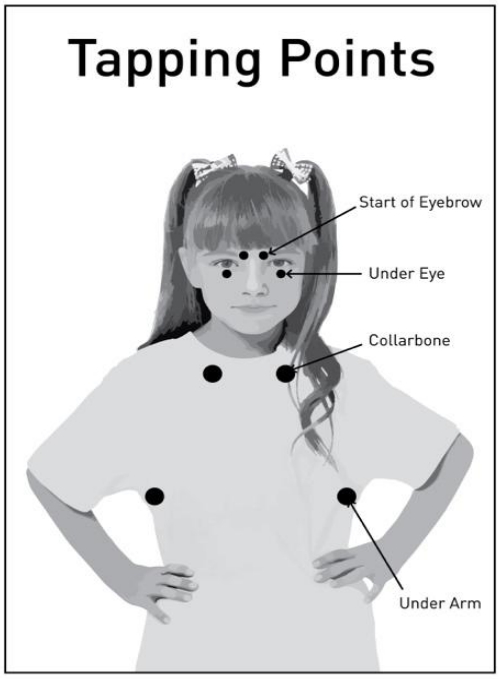

Figure 1. EFT Acupoints (copyright first author).

Measures

The Me and My Feelings Questionnaire (M&MF; Deighton et al., 2013) is a 16-item measure assessing children's self-regulation through emotional and behavioural difficulties subscales. Items are rated on a 3-point Smiley Face Likert scale from (0) never (happy face) to (2) always (sad face). Higher scores on the emotional difficulties subscale indicate lower emotion regulation, with potential scores ranging from 0-20, and for behavioural difficulties from 0-12. The original scale demonstrated good internal consistency (Deighton et al., 2013), convergent validity with the Strengths and Difficulties Questionnaire, and discriminant validity (Deighton et al., 2013). The emotional difficulties subscale has an internal consistency of $\alpha = .79$, and the behavioural difficulties subscale $\alpha = .78$ (Patalay et al., 2014).

To measure subjective happiness, a single-item questionnaire ("How happy do you feel?") was used. Responses were rated on a 5-point Smiley Face Likert scale from (1) not happy at all (angry face) to (5) very happy (happy face). This measure correlates with the Oxford Happiness Inventory (OHI; Argyle, Martin, & Lu, 1995; Hills & Argyle, 1998) and the Satisfaction with Life Scale (Diener et al., 1985; Pavot & Diener, 1993), demonstrating good concurrent and convergent validity.

The Cantril's Self-Anchoring Ladder (Cantril, 1965) was used as this visual ladder ranges from 0 to 3, where participants indicate their current life satisfaction. The ladder has been validated in preschool and adolescent samples (Emerson et al., 2017; Levin & Currie, 2014) and correlates strongly with the Satisfaction with Life Scale (Tov et al., 2022). It was adapted to a 3-point scale for this group with responses: I'm doing great; I'm doing well but I could do better; and I'm not doing my best.

Procedure

The study was conducted between July and September 2023, following ethical approval. The assessment package was created using Qualtrics, with a QR code provided for each age group at each school. Teachers received the study details and survey links. The survey was administered at 11 time points: before the trial started, every Friday of each week, and at the end of the trial. To ensure anonymity, no identifying data was collected. Students completed the surveys in the classroom each

Friday, using iPads to access the electronic link. Each survey took less than seven minutes to complete.

Teachers followed a schedule to play the SM meditations or EFT videos each morning of the school day, with each session lasting five to seven minutes. No additional activities within the app were required.

Data Analysis

Due to unequal group sizes resulting from varying participant numbers across the three schools and time points, analyses accounted for unbalanced data. Descriptive statistics (Table 2, Figure 2) were used to summarise participant numbers and outcome variables across the intervention groups (meditation vs. EFT tapping) over time. Internal consistency for the mental health measure was assessed using Omega total, appropriate for assuming unidimensionality without tau-equivalence. Consistency was generally strong (.80–.88), except for the baseline EFT tapping score (.66).

Linear regression was conducted to assess changes in self-regulation over time, with intervention type, week (0–3), and their interaction as predictors. Ordinal logistic regression was used to analyse changes in happiness and life satisfaction over time between groups. All analyses were conducted using standard statistical software, and significance was set at $p < .05$.

RESULTS

Because three schools participated in the larger trial, and only one class engaged in the EFT tapping intervention, the analysis was unbalanced due to different numbers of participants in each intervention group and at each time point. See Table 2 and Figure 2 for the participant numbers and the mean scores on each outcome variable over time for each intervention.

For the measure of mental health, Omega total (McDonald, 1999) was used to measure internal consistency since we assumed unidimensionality but not tau-equivalence. Internal consistency was excellent for both interventions across all weeks (ranging from .80 to .88) except the baseline measure for the tapping condition which was acceptable (.66). It was not possible to compute internal consistency for happiness and life satisfaction because they were measured using a single item.

Table 2. Number of year 1 students and descriptive statistics for the outcome variables by intervention and week.

Week	Intervention	N	ω_t	Self-Regulation Mean (SD)	Happiness Mean (SD)	Life Satisfaction Mean (SD)
0	Meditation	130	.80	9.62 (4.73)	4.13 (1.08)	2.70 (.48)
	Tapping	42	.66	11.02 (3.29)	3.88 (1.09)	2.45 (.50)
1	Meditation	266	.80	8.92 (4.61)	4.34 (.9)	2.65 (.51)
	Tapping	30	.80	9.67 (4.01)	3.83 (1.23)	2.37 (.56)
2	Meditation	154	.86	7.91 (4.98)	4.33 (.89)	2.73 (.47)
	Tapping	31	.87	8.42 (4.54)	4.16 (.93)	2.39 (.62)
3	Meditation	83	.86	7.77 (4.99)	4.31 (1.05)	2.69 (.49)
	Tapping	23	.88	7.04 (4.62)	3.91 (.90)	2.26 (.69)

Note. ωt = internal consistency measured using Omega total.

Figure 2 indicates the participant numbers and the mean scores on each outcome variable over time for each intervention.

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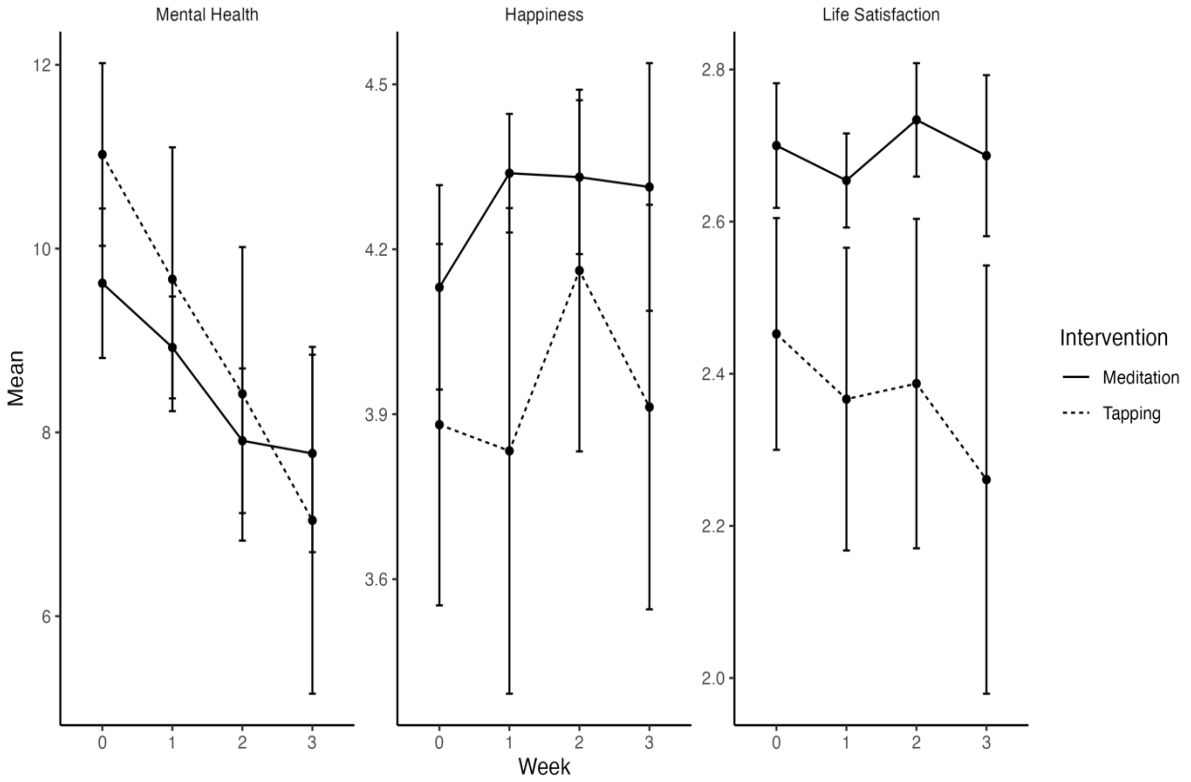

Figure 2. Comparison of mean scores for meditation and tapping for the outcome variables each week.

We compared the two interventions on our measure of self-regulation. We conducted a linear regression analysis with self-regulation as the dependent variable and included intervention (meditation vs. tapping), week (0-3), and their interaction as predictors (see Table 3 for results). There was no significant difference in self-regulation between the meditation and tapping groups at baseline ($b = 1.22$, $p = .14$), although this result approached significance. For the meditation group, self-regulation scores significantly decreased at week 2 ($\beta = -1.71$, $p < .01$) and week 3 ($\beta = -1.85$, $p < .01$) compared to the baseline, indicating an improvement in mental health. The interaction terms were not significant, suggesting that the decrease in self-regulation scores over time was similar for both interventions.

Next, we examined differences in happiness between the two interventions over time using an ordinal logistic regression (see Table 3). There was no significant difference in happiness between the meditation and tapping groups at baseline ($b = -0.51$, $p = .11$). None of the main effects for meditation or interaction effects were significant, indicating that there were no significant changes in happiness over time for either the meditation or tapping groups, and the interventions did not differ in their effects over time.

Lastly, we examined differences between the two interventions on life satisfaction using an ordinal logistic regression (see Table 3). At baseline, the meditation group reported significantly higher life satisfaction compared with the tapping group ($b = -1.03$, $p < .01$). None of the other parameters in the model were significant indicating that there were no significant changes in life satisfaction over time for either the meditation or tapping groups, and the interventions did not differ in their effects over time.

Table 3. Results of regression analyses comparing meditation and tapping for the outcome measures.

Predictor	Mental Health *b*	Happiness *b*	Life Satisfaction *b*
Intercept	9.62***	-	-
Intervention Baseline	1.40†	-.51	-1.00**
Week 1 Meditation	-.70	.35†	-.17
Week 2 Meditation	-1.71**	.31	.19
Week 3 Meditation	-1.85**	.46	-.05
Week 1 Interaction	-.66	-.34	-.08
Week 2 Interaction	-.89	.15	-.32
Week 3 Interaction	-2.12	-.52	-.49
R^2	.04***	.03**	.06***

***$p < .001$, **$p < .01$, † $p < .10$.

Table 3 presents the results of regression analyses comparing the effects of the meditation and EFT tapping interventions on mental health, happiness, and life satisfaction across three weeks.

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

This study compared the effects of EFL tapping and meditation interventions on mental health, happiness, and life satisfaction among first-year students over a three-week period. The analysis was conducted with an unbalanced sample size across different time points.

Our analysis revealed a notable trend in self-regulation scores for both intervention groups. While there was no significant difference between the meditation and EFL tapping groups at baseline, the meditation group exhibited significant improvements in self-regulation at weeks two and three compared to baseline. This finding aligns with previous research highlighting the positive effects of meditation on self-regulatory processes (Tang et al., 2015; Keng et al., 2011). Diamond et al. (2024) also demonstrated similar gains in emotional regulation using mindfulness-guided visualization in trauma-informed classrooms, and improvements in elementary students' interpersonal mindfulness and attentional focus have recently been noted (Lin et al., 2025). The mixed-methods trial in Australia with 138 primary school students found significant reductions in anxiety and improvements in wellbeing following EFT tapping sessions, similar to the outcomes in the present study (Lambert, 2020).

Interestingly, the lack of significant interaction effects suggests that both interventions may have similar trajectories in improving self-regulation over time. This finding is particularly noteworthy as it indicates that EFL tapping, a less studied intervention in this sample, may offer comparable benefits to meditation in enhancing self-regulatory capabilities. Future research should explore the underlying mechanisms through which both interventions affect self-regulation.

Contrary to our expectations, neither intervention demonstrated significant changes in happiness levels over the three-week period. This result is somewhat surprising; however, the mean score was 4 out of 5 at baseline suggesting a potentially happy sample. The relatively short intervention period may have been insufficient to elicit further measurable changes in happiness. Additionally, happiness as a construct may be more stable and resistant to short-term interventions compared to other mental health indicators (Lyubomirsky et al., 2005).

Our findings regarding life satisfaction present an intriguing picture. At baseline, the meditation group reported significantly higher life satisfaction compared to the EFL tapping group. This initial difference could be attributed to pre-existing group characteristics or participants' expectations about the interventions. While neither group showed significant changes in life satisfaction over the study

period, it is important to note that the baseline mean was approximately 2 out of 3 on the Cantrill Ladder indicating "I'm doing well but I could do better", thus the sample may not have been unduly dissatisfied.

The stability of life satisfaction scores across both groups may suggest that this construct, like happiness, requires more time or more intensive interventions to show measurable change. Alternatively, it may indicate that both interventions are equally effective (or ineffective) in influencing life satisfaction over a short period.

Nonetheless, these results have important implications for both research and practice. The comparable effects of meditation and EFL tapping on self-regulation suggest that EFL tapping may be a viable alternative for individuals who find meditation challenging or unsuitable. However, the lack of significant changes in happiness and life satisfaction underscores the need for longer-term studies to fully understand the impact of these interventions on broader well-being outcomes.

Limitations

Several limitations should be acknowledged. First, the study used a non-randomised design, and only one class received the EFT tapping intervention, limiting the ability to draw causal conclusions and increasing the potential for group differences at baseline. Second, the sample size was modest and unbalanced across groups and time points, which may have reduced statistical power and affected the reliability of some estimates. Third, the brief three-week duration of the intervention may not have been sufficient to capture changes in more stable constructs such as happiness and life satisfaction. Lastly, single-item measures were used for happiness and life satisfaction, which may have limited the sensitivity and depth of these assessments.

Recommendations

Future research should consider extending the intervention period, incorporating more frequent measurements, and exploring potential moderating factors such as participant characteristics or intervention adherence. Additionally, investigating the mechanisms through which these interventions affect different aspects of mental health could provide valuable insights for tailoring interventions to individual needs.

Practitioners implementing wellbeing programs in school settings may consider EFT tapping as a feasible and accessible alternative to meditation, especially for students who may struggle with traditional mindfulness practices. Given the observed improvements in self-regulation across both interventions, educators and school wellbeing staff could integrate either approach to support emotional regulation in the classroom. However, they should be mindful that short-term interventions may not be sufficient to impact broader constructs like happiness or life satisfaction, and ongoing support may be needed to sustain and deepen wellbeing gains.

In conclusion, while our study provides evidence for the potential benefits of both meditation and EFL tapping on self-regulation, it also highlights the complexity of influencing multifaceted constructs such as happiness and life satisfaction. These findings contribute to the growing body of literature on mind-body interventions and offer a foundation for further exploration of their comparative efficacy in promoting mental health and well-being.

Ethics and Conflict of Interest

All ethical rules were observed at each stage of the research. The author declares that he acted in accordance with ethical rules in all processes of the research. The first author declares she may receive financial compensation for keynote presentations and book royalties for her research expertise in EFT. The other authors declare that they do not have any conflict of interest with other persons, institutions or organizations.

Author Contribution

All authors contributed equally to the research.

Corresponding Author
Correspondence to Peta Stapleton, pstaplet@bond.edu.au

REFERENCES

Argyle, M., Martin, M., & Lu, L. (1995). *Testing for stress and happiness: The role of social and cognitive factors*. In C. D. Spielberger, I. G. Sarason, J. M. T. Brebner, E. Greenglass, P. Laungani, & A. M. O'Roark (Eds.), Stress and emotion: Anxiety, anger, and curiosity (pp. 173–187). Taylor & Francis.

Blair, C., & Raver, C. C. (2015). School readiness and self-regulation: A developmental psychobiological approach. *Annual Review of Psychology, 66*, 711–731. https://doi.org/10.1146/annurev-psych-010814-015221

Baumeister, R. F., & Vohs, K. D. (2016). Strength model of self-regulation as limited resource: Assessment, controversies, update. In J. M. Olson & M. P. Zanna (Eds.), *Advances in Experimental Social Psychology* (pp. 67–127). Elsevier Academic Press. https://doi.org/10.1016/bs.aesp.2016.04.001

Cantril, H. (1965). *The pattern of human concern*. Rutgers University Press.

Church, D., Stapleton, P., Vasudevan, A., & O'Keefe, T. (2022). Clinical EFT as an evidence-based practice for the treatment of psychological and physiological conditions: A systematic review. *Frontiers in Psychology, 13*, 951451. https://doi.org/10.3389/fpsyg.2022.951451

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Deighton, J., Tymms, P., Vostanis, P., Belsky, J., Fonagy, P., Brown, A., Martin, A., Patalay, P., & Wolpert, M. (2013). The Development of a School-Based Measure of Child Mental Health. *Journal of Psychoeducational Assessment, 31*(3), 247-257. https://doi.org/10.1177/0734282912465570

Diamond, K. (2024). Mindfulness as an intervention for self-regulation and school reintegration in a trauma-informed primary school post COVID-19 lockdown. *Mindfulness 15*, 2023–2037 (2024). https://doi.org/10.1007/s12671-024-02408-4

Diéguez, M.P., García, M.C., Asencio, E.N. et al. (2024). Executive function training through a mindfulness-based neuroeducational program in elementary school students. *Mindfulness* 15, 2739–2749. https://doi.org/10.1007/s12671-024-02474-8

Emerson, L.M., Rowse, G., & Sills, J. (2017). Developing a mindfulness-based program for infant schools: Feasibility, acceptability, and initial effects. *Journal of Research in Childhood Education, 31*(4), 465–477. https://doi.org/10.1080/02568543.2017.1343211

Hills, P., & Argyle, M. (1998). Positive moods derived from leisure and their relationship to happiness and personality. *Personality and Individual Differences, 25*(3), 523–535. https://doi.org/10.1016/S0191-8869(98)00082-8

Keng, S. L., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review, 31*(6), 1041–1056. https://doi.org/10.1016/j.cpr.2011.04.006

Lambert, M. (2020). *The tapping project: Introducing Emotional Freedom Techniques (EFT) to reduce anxiety and improve wellbeing in primary school students* (Doctoral dissertation). Charles Darwin University, Australia, https://researchers.cdu.edu.au/en/studentTheses/the-tapping-project

Levin, K. A., & Currie, C. (2014). Reliability and validity of an adapted version of the Cantril Ladder for use with adolescent samples. *Social Indicators Research, 119*(2), 1047–1063. https://doi.org/10.1007/s11205-013-0507-4

Lin L-J, Lin Y-H, Yu S-P, Liu T-H and Chen Y-L (2025) A cluster randomized controlled trial examining the effects of a four-week mindfulness-based practice on primary school students' interpersonal mindfulness, emotional intelligence, and attentional focus. *Frontiers in Psychology, 16*, 1539962. https://doi.org/10.3389/fpsyg.2025.1539962

Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 131*(6), 803–855. https://doi.org/10.1037/0033-2909.131.6.803

McDonald R. P. (1999). *Test theory: A unified treatment*. Mahwah, NJ: Lawrence Erlbaum

Patalay, P., Deighton, J., Fonagy, P., Vostanis, P., & Wolpert, M. (2014). Clinical validity of the Me and My School questionnaire: A self-repot mental health measure for children and adolescents. *Child and Adolescent Psychiatry and Mental Health, 8*(17), 1–7. https://doi.org/10.1186/1753-2000-8-17

Pavot, W., & Diener, E. (1993). Review of the satisfaction with life scale. *Psychological Assessment, 5*(2), 164–172. https://doi.org/10.1037/1040-3590.5.2.164

Stapleton, P., Dispenza, J., Douglas, A., Dao, V., Kewin, S., Le Sech, K., & Vasudevan, A. (2024). "Let's keep calm and breathe"—A mindfulness meditation program in school and its effects on children's behavior and emotional awareness: An Australian pilot study. *Psychology in the Schools, 61*(9), 3679–3698. https://doi.org/10.1002/pits.23249

Tang, Y. Y., Hölzel, B. K., & Posner, M. I. (2015). The neuroscience of mindfulness meditation. Nature reviews. *Neuroscience, 16*(4), 213–225. https://doi.org/10.1038/nrn3916

Tov, W., Wirtz, D., Kushlev, K., Biswas-Diener, R., & Diener, E. (2022). Well-being science for teaching and the general public. *Perspectives on psychological science: A Journal of the Association for Psychological Science, 17*(5), 1452–1471. https://doi.org/10.1177/17456916211046946

Van Der Zant, T., Dix, K., & Carslake, T. (2024). *Evaluation of the smiling mind primary school program 2023.* Australian Council for Educational Research. https://doi.org/10.37517/978-1-74286-745-8

Zelazo, P. D., & Lyons, K. E. (2012). The potential benefits of mindfulness training in early childhood: A developmental social cognitive neuroscience perspective. *Child Development Perspectives, 6*(2), 154–160. https://doi.org/10.1111/j.1750-8606.2012.00241.x

Zenner, C., Herrnleben-Kurz, S., & Walach, H. (2014). Mindfulness-based interventions in schools-a systematic review and meta-analysis. *Frontiers in Psychology, 5*, 603. https://doi.org/10.3389/fpsyg.2014.00603

About the Authors:

Peta Stapleton
Professor Peta Stapleton is a registered clinical and health Psychologist who embraces evidence-based and innovative techniques. Peta is a world-leading researcher in Emotional Freedom Techniques ('Tapping') and has been awarded many achievements including the 2014 Harvey Baker Research Award for meticulous research (Association of Comprehensive Energy Psychology, USA), the 2015 Global Weight Management Congress Industry Professional Award of Excellence, the 2015 Gold Coast Women in Business Women in Change Award and the 2018 Innovation and Technology Award Winner. In 2016 Peta was awarded the Most Contribution to the Field (energy psychology) and was named the 2019 and 2024 Research Supervisor of the Year at Bond University. In 2019 Peta was also named Psychologist of the Year (by the Australian Allied Health Awards). Peta is a featured EFT Tapping presenter on Gaia, SBS Warner Brother Myth vs Medicine research expert, yearly presenter on the international Tapping World Summit, and is featured on Prime USA (Chasing The Present Film). In 2024 Peta was awarded the Distinguished Contribution to Psychological Science Award from the Australian Psychological Society.

Angela DOUGLAS, PhD
PhD Angela Douglas is an Education Specialist/Researcher at the Queensland State Department of Education in Australia. She conducts research on educational policies, teaching methods, and improving student achievement. She researches and implements innovative approaches within the education system. She leads various projects to develop and implement educational strategies. She conducts research on student achievement and teaching effectiveness. Angela Douglas's publications have appeared in various academic journals related to education, presenting comprehensive research on educational policies and teaching strategies.

Matthew D. BLANCHARD
Matthew D. Blanchard is fascinated by the science of decision-making and how groups function. As a PhD candidate (about to be graduate) at the University of Sydney, his research explores the role of confidence and communication in group decisions. His other work explores our susceptibility to online propaganda, the impact of AI on student well-being, how collective intelligence can improve medical diagnoses, and the benefits of meditation.

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LANGUAGE LEARNING AND INTERCULTURAL AWARENESS: INSIGHTS FROM A PRIMARY SCHOOL SYNCHRONOUS VIRTUAL EXCHANGE

Shinji OKUMURA
Associate Professor, Faculty of Information and Communications, Bunkyo University, Kanagawa, Japan
ORCID: https://orcid.org/0000-0002-9131-6603
okumuras@bunkyo.ac.jp

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Abstract

This study examines the perceptions of Japanese primary school students during a synchronous cross-cultural virtual exchange (VE) with Australian peers. The participants included 152 sixth-grade Japanese students and 130 Australian students (63 in fifth grade and 67 in sixth grade). Using Google Meet, students shared information about their locations and the weather, practicing both Japanese and English language skills. Afterward, the Japanese students evaluated their Australian peers' English comprehension and reflected on their exchange experiences. Descriptive statistical methods were applied to the quantitative data, while qualitative responses were analyzed using KH Coder, a text-mining tool for linguistic and content analysis. The results were largely positive, with many Japanese students reporting that they understood the Australian students' English. The VE enhanced cross-cultural understanding by highlighting both similarities and differences. However, the study also identified challenges related to using and understanding a foreign language in real-time exchanges. These findings provide valuable insights for educators and policymakers, offering practical guidance for integrating VE into curricula to support language development, intercultural awareness, and effective teaching practices.

Keywords: Virtual exchange, cross-cultural communication, language learning, intercultural awareness, primary education.

INTRODUCTION

Globalization and technological advancements have profoundly reshaped education, creating unprecedented opportunities for intercultural interaction and collaboration. One innovative approach that has emerged in this context is virtual exchange (VE), which uses digital platforms to connect learners from diverse cultural and linguistic backgrounds. VE enables direct, real-time interactions that transcend geographical boundaries, offering an immersive and authentic learning environment. Unlike traditional methods of language or cultural study, VE fosters linguistic competence, cultural awareness, and global citizenship (Okumura, 2024a). As education systems strive to prepare students for a highly interconnected world, integrating VE into the curriculum has become essential for equipping learners with critical 21st-century skills (Sierra et al., 2022).

VE has shown significant potential across all educational levels, from primary schools to universities, by enhancing intercultural communicative competence and foreign language skills (Hagley & Cotter, 2019). Research highlights that the success of VE depends on thoughtful program design, technological proficiency, and consistent teacher collaboration (Okumura, 2024b). While large-scale VE initiatives demonstrate the feasibility of widespread adoption, challenges remain. Effective implementation requires careful planning, rigorous assessment, and adaptation to the specific needs of learners (Hagley, 2016).

Primary education is a pivotal stage for engaging young learners in VE, providing an ideal opportunity to foster language acquisition and cross-cultural understanding. However, research on students' experiences and perceptions of real-time cross-cultural interactions remains limited. This study addresses that gap by investigating a synchronous VE program involving primary school

students from Japan and Australia. It emphasizes the importance of understanding and improving this critical phase of learning.

Japan has historically lagged behind other countries in integrating information and communication technology (ICT) into education (OECD, 2019). To address this, the Ministry of Education, Culture, Sports, Science, and Technology (MEXT) launched the GIGA School Program in 2019, aiming to provide every student with a device under the slogan "One Device for One Student" (MEXT, 2022). This initiative has significantly impacted primary education, particularly during and after the COVID-19 pandemic, helping to reduce the digital divide. By focusing on the experiences of Japanese participants, this study explores the potential of VE to bridge cultural divides, enhance language learning, and foster mutual understanding. It also identifies challenges in implementing VE programs in primary schools, particularly in contexts where ICT for language education is still developing. This research addresses the following questions:

(1) To what extent do Japanese students feel that they understand the English spoken by their Australian peers in real-time communication?

(2) What insights do Japanese children gain about Australian culture and perspectives through real-time virtual interactions?

Review of literature

The Importance of Intercultural Competence in Digital Education

Intercultural competence (IC) refers to the ability to interact effectively with individuals from diverse cultural backgrounds. It involves not only understanding one's own cultural identity but also respecting and accepting others' values and perspectives (Byram, 1997). According to Byram (1997), IC comprises five key components. The first is knowledge of different cultures, which lays the foundation for understanding a range of worldviews. The second involves interpretative skills that help individuals grasp both their own and others' perspectives. The third component is the skills for discovery and interaction, enabling individuals to seek out and apply new cultural insights. The fourth is openness and curiosity, which reflect a genuine interest in engaging with unfamiliar cultures. Finally, critical cultural awareness equips individuals to reflect on and evaluate cultural practices—including their own—in an informed and thoughtful way.

Recent studies emphasize that IC is not a fixed ability but a dynamic process developed through ongoing intercultural interaction and self-reflection (Hang & Zhang, 2023). Language education plays a central role in cultivating IC. The integration of digital technologies allows learners to engage in interactive and immersive cross-cultural experiences (Minoia, 2019). Among these approaches, VE has gained attention as an effective method for promoting intercultural communication and global citizenship.

VE as an Innovative Educational Strategy

VE refers to structured educational programs that connect learners from different cultural and linguistic backgrounds through digital communication technologies. These include asynchronous formats (e.g., Padlet & Wakelet) and synchronous ones (e.g., Zoom and Google Meet). Both formats help bridge geographical and cultural distances, fostering collaboration, dialogue, and critical thinking (O'Dowd, 2018; Satar, 2021). Sims (2022) emphasizes VE's potential to foster empathy, tolerance, and respect for diversity.

Synchronous video conferencing, in particular, enables real-time, authentic communication and boosts learners' motivation and confidence in using foreign languages (Tran et al., 2024). These experiences provide dynamic, real-world learning opportunities that extend beyond traditional classroom settings. However, challenges such as differing language proficiency, peer pressure, and affective barriers may hinder learning outcomes. Therefore, teacher facilitation and mentoring play an essential role. Pintado Gutiérrez et al. (2023) report that students who receive teacher guidance show significant improvement in video conferencing and intercultural communication skills.

Practices and Outcomes of Synchronous VE in Primary Education

Although VE has been widely studied in secondary and higher education, recent research has begun to explore its effectiveness in primary education (Okumura, 2020; Pennock-Speck & Clavel-Arroitia, 2022). These studies suggest that, with appropriate support, even young learners can actively participate in intercultural dialogue and language learning activities.

Kimura et al. (2020) examined an inquiry-based VE program conducted between Japanese and Australian primary schools. The program included three synchronous video call sessions using tablets, each designed to promote mutual cultural understanding. Pre- and post-exchange surveys assessed changes in students' communication skills, motivation, and intercultural awareness. The results—especially among Japanese students—showed significant improvements in their ability to communicate, process information, and engage with others. Teachers also noted that students became more proactive, asking questions and displaying greater openness. These findings suggest that repeated, well-structured VEs can effectively support the development of ICs at a formative age.

Shimizu and Kano (2020) conducted a year-long, Skype-based VE project involving Japanese and Taiwanese elementary students. Across five video call sessions, the students shared their hobbies, school experiences, and future aspirations. Post-exchange questionnaires, compared with pre-exchange responses, revealed that students found English more enjoyable and felt more confident using it. Their feedback also demonstrated strong emotional engagement, with remarks such as "I feel like I made a friend" and "I was happy they understood me," highlighting how meaningful interactions with peers from other cultures can enhance both language motivation and intercultural empathy.

Pennock-Speck and Clavel-Arroitia (2022) studied synchronous video conferencing between Spanish and French primary students. Although the two countries used different instructional approaches—greater learner autonomy in Spain and more teacher-led guidance in France—students in both settings showed high levels of excitement and engagement. Notably, Spanish students produced slightly more linguistic output, suggesting a potential link between autonomy and language use. Despite the pedagogical differences, students from both groups expressed genuine enthusiasm about interacting across borders, underscoring the emotional and motivational impact of VEs in bridging geographic and cultural divides.

Adding a more interaction-focused perspective, Wigham and Whyte (2024) explored a task-based VE activity (*Guess Who!*) involving 7–10-year-old learners from France and Spain. The study examined learner autonomy within a task-based learning teaching framework and analyzed 174 interaction turns. While teachers managed much of the technical and task-related setup, learners independently produced more utterances than those prompted by teachers—especially during the Q&A segments. Despite technical issues such as poor audio or camera quality, students demonstrated initiative and maintained sustained engagement. This study underscores how careful task design and flexible scaffolding can empower young learners to interact meaningfully with international peers, even in low-tech environments.

Extending the scope to reciprocal language use, Koyama and Konishi (2024) implemented an eTandem-style VE program between Japanese sixth graders and Australian secondary students. Participants alternated between Japanese and English, enabling each group to act as both learners and language models. Supported by Japan's GIGA School Program, the project also incorporated nonverbal communication, such as facial expressions and gestures, to enhance mutual understanding. Post-exchange surveys and classroom observations revealed increased motivation, linguistic confidence, and intercultural awareness. Even initially hesitant students began participating actively. However, the study also identified challenges, including technical constraints and the need for improved coordination among language teachers, homeroom instructors, and ICT staff. These findings underscore the importance of institutional support in maximizing the benefits of VE in primary education settings.

Together, these studies demonstrate that synchronous VE in primary education is both feasible and beneficial. When embedded within well-planned, scaffolded learning environments, VEs can enhance not only language skills and IC but also learners' emotional investment in global learning. VE thus offers a unique and powerful approach to helping young learners build bridges across geographical and cultural divides.

Building on these findings, the present study implements a cross-cultural VE program involving Japanese and Australian primary students. The following section outlines the methodology employed to design, facilitate, and evaluate this initiative.

METHOD

Background

The integration of online exchanges into language education fosters practical language use and intercultural understanding. In Japan, MEXT emphasizes the importance of such exchanges in English as a Foreign Language education to encourage interaction with both local and global communities (MEXT, 2016). Despite this, Japanese students often have limited opportunities to engage with English-speaking peers (Okumura & Uekusa, 2021). To address this gap, the GIGA School Program was introduced, aiming to provide every student with a device and advanced technology to bridge educational disparities, promote digital literacy, and enhance learning through interactive tools and online resources (MEXT, 2020). Similarly, in Australia, students learning Japanese as a foreign language face challenges due to limited interaction with native speakers, which hinders their cultural and linguistic connections. VEs with Japanese peers have been identified as a promising strategy to overcome this issue, boosting students' motivation and cultural understanding (Okumura & Uekusa, 2021).

Objectives

This project was designed with the following key objectives:

(1) To enable students to engage in meaningful and purposeful communication in the target language, fostering both fluency and confidence in real-world contexts.
(2) To provide learners with opportunities to apply the language they are studying in authentic scenarios, helping them appreciate the relevance and practicality of their learning.
(3) To promote cultural awareness and appreciation by facilitating direct interaction between students and peers from different cultural backgrounds. This direct engagement aims to broaden students' perspectives, foster empathy, and develop cross-cultural communication skills.

By aligning these objectives with the GIGA School Program's vision, the project seeks not only to enhance English language education but also to empower students to become globally minded, technologically proficient individuals who are well-prepared to thrive in an interconnected world.

Participants

The VE project served as an innovative platform connecting students from two geographically distant schools, fostering meaningful linguistic and cultural exchange. This collaboration involved the following participants:

The Japanese school: A group of 152 sixth-grade students, all novice English learners, participated under the guidance of an English specialist teacher. These students had been developing foundational English language skills and were eager to apply their knowledge in an authentic setting.

The Australian school: A cohort of 130 fifth- and sixth-grade students, all novice Japanese learners, participated under the supervision of a Japanese specialist teacher. These students had been developing beginner-level proficiency in Japanese and were eager for the opportunity to interact directly with native speakers.

Implementation

The exchange took place on June 5, 2023, using the Google Meet platform. Prior to the event, teachers from both schools met online to finalize the schedule. They worked together to assign time slots that allowed all students in each class to participate. The final schedule for the exchange is presented in Table 1 below. Variations in exchange durations were due to differences in class end times.

Table 1. Schedule for the exchange.

Session	Time	Class		Duration
		Japanese school	Australian school	Minutes
1st	9:05–9:25	6C	6-2	20
2nd	9:40–10:00	6C	6-1	20
3rd	10:55–11:20	6A	6-3	25
4th	11:40–12:00	5C	6-4	20
5th	13:55–14:20	5B	6-5	25

The content of the exchange was carefully aligned with the curricular goals of each school to ensure relevance and maximize educational outcomes. The topics covered during the exchange included the following:

Japanese Students:

(1) Practicing self-introductions in English, including sharing their names, ages, and hobbies.
(2) Describing their city and surroundings, highlighting local landmarks and cultural aspects.
(3) Sharing their favorite places, offering insight into what they value and enjoy within their community.

Australian Students:

(1) Discussing their cities, providing Japanese students with an understanding of Australian urban life and key features of their hometowns.
(2) Practicing weather forecasts, sharing real-time updates about the weather in their region, and explaining seasonal differences.

For both groups, the activity involved describing their city and surroundings, emphasizing local landmarks and cultural aspects. The exchange was conducted in the style of the Japanese *Karuta* game, a traditional Japanese card game adapted for English listening practice.

This well-structured format not only supported language skill development but also encouraged students to gain deeper insights into each other's cultures. By participating in this exchange, students moved beyond textbook learning to experience how language can serve as a bridge for building global connections and understanding diverse perspectives. The project proved to be an enriching experience, demonstrating the power of technology to create collaborative and immersive educational opportunities that transcend borders.

Data Collection and Analysis

This study focuses on the experiences of Japanese participants, specifically 152 sixth-grade students from M Elementary School. To gain a comprehensive understanding of their experiences, a mixed-methods approach was employed, integrating both quantitative and qualitative data. This methodology provided measurable outcomes alongside nuanced insights.

Quantitative Data

The quantitative component aimed to measure students' perceptions of their comprehension and engagement during the exchange. Students rated their understanding of Australian English using a structured 4-point Likert scale. This scale assessed their confidence in interpreting and interacting with the Australian accent and expressions, which differ from the standard English typically taught in their classrooms. These ratings provided clear numerical indicators of the students' self-assessed progress and confidence.

Qualitative Data

To complement the numerical data, qualitative insights were collected through open-ended questions that encouraged students to reflect on their experiences, adding deeper context to their Likert scale responses. Students explained their answers by responding to the prompt, "Why did you choose that answer? Please also write about how you felt at the time," a question posed in Japanese and translated into English. They also reflected on their discoveries during the exchange, including cultural similarities and differences, communication strategies, and unexpected learning moments, by answering, "Please write about what you discovered through this exchange (similarities and differences with Japan) and your impressions of the exchange."

Data Analysis

Quantitative survey data were numerically coded and analyzed using descriptive statistics to identify trends in self-assessed English comprehension. Qualitative responses were examined with KH Coder, a text-mining tool for linguistic and content analysis. This approach enabled systematic identification of recurring themes, such as improved listening skills, increased cultural awareness, and specific challenges. Additionally, it highlighted frequently mentioned words and phrases that reflected students' main points and the most engaging aspects of the exchange.

RESULTS, DISCUSSION, CONCLUSION, and SUGGESTIONS

Self-Perception of English Understanding

Japanese students' self-perception ratings of understanding English are presented in Figure 1.

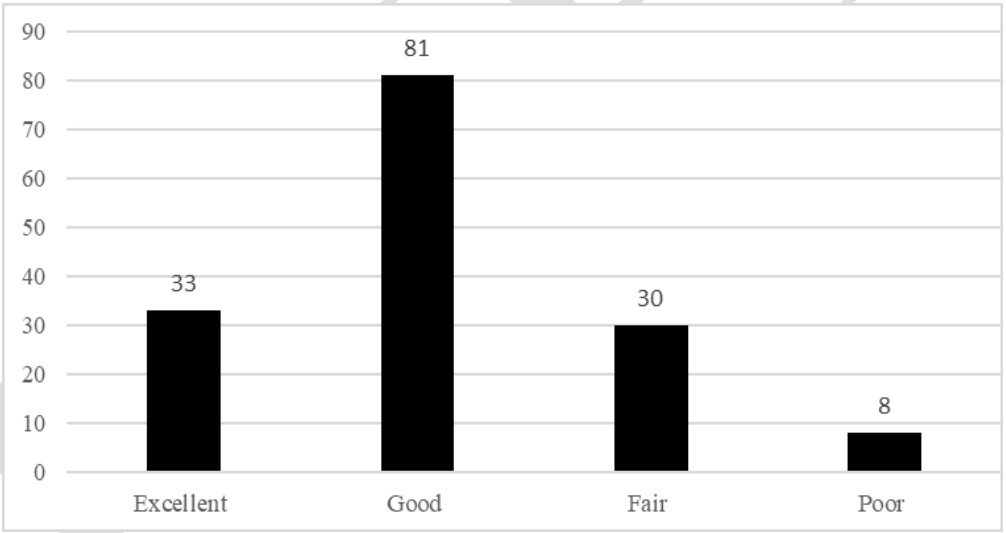

Figure 1. Japanese students' self-perception ratings of understanding English.

Figure 1 shows that a substantial majority of Japanese primary students expressed confidence in their understanding of English during a VE with Australian peers. Specifically, 81 students rated their comprehension as "Good" and 33 as "Excellent," together representing 75% of participants. In contrast, 38 students rated their comprehension as "Fair" or "Poor," indicating ongoing challenges for a notable portion of the group. Descriptive statistics reveal an average rating of 2.91 (on a 4-point scale) with a standard deviation of .79, indicating moderate variation in self-perceived comprehension and reflecting diverse individual experiences.

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Linguistic Perceptions and Keyword Insights

Top-appearing words are presented in Figure 2.

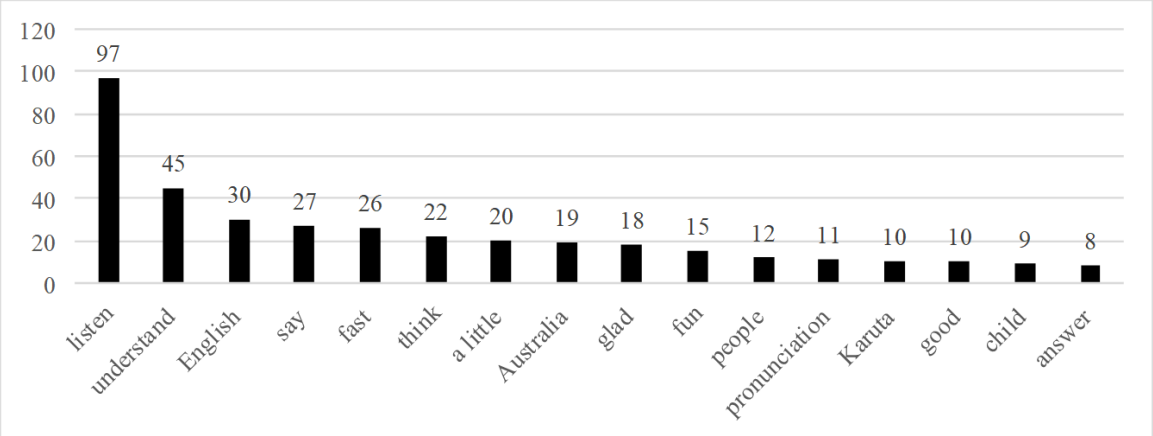

Figure 2. Explanation of their ratings: Top-appearing words.

Figure 2 displays the results of a content analysis of students' open-ended comments, showing frequent mentions of/with frequent mentions of "fast" (26 instances) and "pronunciation" (11 instances). These terms point to two primary linguistic challenges: the rapid pace of Australian English and pronunciation features that differ from classroom instruction. These findings align with Kimura et al. (2020), who observed that young learners often struggle with the rhythm and speed of authentic speech during real-time communication. Their recurrence here suggests that even in mediated settings like VE, such difficulties remain significant.

Beyond linguistic challenges, the analysis reveals clear patterns linked to students' self-assessed comprehension levels. Students who rated their comprehension as "Excellent" often described both clear understanding and emotional satisfaction:

> "I was happy that I could hear the English."
> "Because I understood the meaning."
> "The pronunciation was good and easy to understand."

These remarks highlight not only cognitive comprehension but also the emotional benefits of successful interaction—findings consistent with Shimizu and Kano (2020), who found that VE enhances enjoyment and confidence among young learners.

Students selecting "Good" typically expressed partial understanding along with a strong motivation to improve:

> "I understood the main idea, but they spoke too fast sometimes."
> "I was happy I could understand some words, but I want to get better."
> "Their pronunciation was good, but it was a little too fast to catch everything."

Such responses indicate growing learner autonomy and metacognitive awareness. As noted by Kimura et al. (2020), repeated VE participation can encourage reflective and proactive engagement with language learning.

Students who rated their comprehension as "Fair" or "Poor" described more specific difficulties, often related to speech rate or intelligibility:

> "They spoke too fast, so I couldn't understand."
> "I could only catch a few words, but it was still fun."
> "The pronunciation was very different from what we learn in class."
> "Even though I didn't understand much, I was happy to try."
> "I want to try again without getting nervous."

Despite limited comprehension, many expressed enjoyment and a willingness to participate again. This resilience supports findings by Pennock-Speck and Clavel-Arroitia (2022), who emphasize the central role of affective and motivational factors in successful cross-cultural exchanges. VE appears to foster curiosity and perseverance, even in the face of communicative challenges.

Across all proficiency levels, students encountered linguistic barriers, yet many found the experience rewarding. Their comments demonstrate how VE can facilitate not only language exposure but also emotional investment and intercultural growth—key components of communicative competence in young learners. Beyond individual linguistic experiences, the design of the exchange itself played a crucial role in supporting comprehension and engagement.

Interactive Task Design and Comprehension Support

A notable design feature of this VE was the inclusion of the *Karuta* game. In this activity, students listened closely to spoken English clues and raced to select the correct matching card, encouraging both focused listening and quick comprehension. The interactive nature of the *Karuta* game increased engagement and made the language activity more enjoyable. The game was mentioned in 10 student comments, including the following:

> "*Karuta* was fun—even if I didn't get the answer right, I could guess from their tone and expressions."

In addition to the game itself, gestures and facial expressions used during the exchange played a crucial role in aiding comprehension. Students reported that these nonverbal cues helped them understand the meaning more easily:

> "The gestures made it easier to understand."

Together, the interactive format of *Karuta* and the visual support provided by gestures helped reduce anxiety and sustain engagement, even when full comprehension was difficult. As Wigham and Whyte (2024) argue, scaffolded, task-based approaches can facilitate meaningful interaction—even in environments with technological limitations.

Technical and Environmental Barriers

Several students noted technical and environmental issues that disrupted communication, including poor audio quality, lag, and background noise:

> "There was audio distortion and lag."
> "It was hard to hear because it was through a screen."

These difficulties highlight the importance of robust infrastructure and coordination among teachers and ICT staff, as emphasized by Koyama and Konishi (2024). For VE to succeed, logistical reliability is as essential as pedagogical design.

Overall, this study supports the growing body of research affirming the feasibility and value of synchronous VE in primary education. While students faced challenges—especially regarding speech speed, pronunciation, and technical quality—their responses reveal emotional engagement, motivation to improve, and openness to future exchanges. Activities like *Karuta*, multimodal scaffolding, and peer interaction helped ensure that even limited comprehension resulted in meaningful and motivating experiences. When supported by thoughtful design and reliable infrastructure, VE offers young learners valuable opportunities to develop both linguistic skills and IC.

The linguistic insights from this exchange naturally lead to examining how students perceived cultural differences and similarities during their interactions with Australian peers.

Impact on Cultural Understanding

Japanese students' new insights (top-appearing words) are presented in Figure 3.

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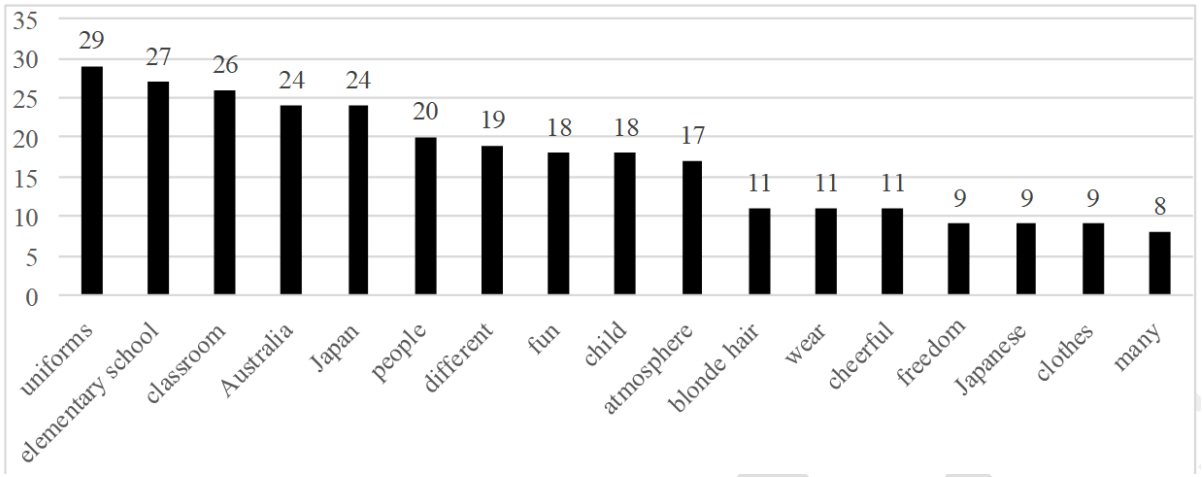

Figure 3. Japanese students' new insights: top-appearing words.

As shown in Figure 3, this VE fostered meaningful cultural awareness among the students. Through their engagement with different aspects of Australian school life, students demonstrated increasing sensitivity to cultural differences. Their reflections covered a range of elements, including school uniforms, classroom environments, interpersonal dynamics, classroom behavior, group structure, and even language use. These observations indicate that students not only noticed cultural distinctions but also began to interpret them in personally meaningful ways.

Noticing the Visible: Uniforms and Physical Environments

School uniforms emerged as a particularly notable feature, mentioned 29 times. Students expressed curiosity and positive impressions of the Australian students' matching attire:

> "They wore uniforms—it was cute!"
> "They were wearing something like a uniform."

Physical settings also attracted attention. The term "classroom" was mentioned 26 times, suggesting a strong interest in the spatial elements of the learning environment. Students noticed differences in lighting, layout, and overall appearance:

> "The Australian classroom had fluorescent lights like in Japan."
> "The Australian classroom was completely different from the Japanese one."

These comments suggest that visible cues—such as clothing and physical space—served as accessible entry points for cultural comparison, sparking deeper reflection on school practices and norms.

Interpersonal Atmosphere and Classroom Behavior

Students also responded to more subtle features of the learning environment, particularly the emotional tone and behavioral norms within the classroom. Compared to their own experience, many found Australian classrooms to be more relaxed, cheerful, and expressive:

> "The atmosphere seemed brighter and more enjoyable than in Japan."
> "Everyone was lively and funny."
> "It felt a bit freer compared to Japan, and I liked that."
> "Many students volunteered to speak, I thought."

Additionally, some students noticed unexpected behaviors—such as classmates bringing stuffed toys to school—that would typically be prohibited in Japanese classrooms. These observations led students to consider how classroom management and expression are shaped by cultural values and expectations. Their responses reflect an emerging understanding that "appropriate" behavior is not universal but culturally specific.

Group Dynamics and Educational Structures
Students also noted differences in classroom size and organization, commenting on how group work or presentations were conducted:

> "There weren't many students, and unlike in Japan, where we showed/viewed images digitally/shared digital images on screen, in Australia, we selected/chose the images physically from the classroom."

These reflections suggest that students were beginning to connect structural aspects of education—such as class size and instructional methods—to broader differences in how learning feels and functions.

Language Awareness and Perspective Shifting
In a notable shift toward introspection, some students began reflecting on the nature of their own language:

> "I learned that the Japanese language is surprisingly difficult for foreigners."

This comment points to the development of perspective-taking—a foundational element of IC. It indicates a growing ability to see familiar aspects of one's own culture through an outsider's eyes, thus fostering empathy and global-mindedness.

From Surface Noticing to Cultural Interpretation
Taken together, these comments reveal more than simple observation—they mark the beginning of interpretive insight. Students moved from noticing visible contrasts to questioning why such differences exist and how they relate to their own experiences. The exchange enabled many participants to reposition themselves in relation to cultural difference, initiating a process of self-reflection and meaning-making.

This shift reflects the early stages of intercultural learning, where learners start to question taken-for-granted norms and explore the cultural foundations of everyday practices. Even a single VE session can act as a catalyst for such growth when supported by opportunities for reflection and interpretation.

Cultural Framing and Emotional Response
Students' reactions also reflect the influence of their own cultural backgrounds. Many Japanese students expressed surprise at the perceived freedom and expressiveness of their Australian classmates—whether in tone of voice, classroom behavior, or the use of personal items. These contrasts highlight the typically structured, teacher-centered nature of Japanese classrooms, which likely shaped how students perceived and evaluated the VE experience.

This finding aligns with Wigham and Whyte (2024), who observed that learners from autonomy-oriented cultures (e.g., France, Spain) tend to produce more spontaneous output in VE. In contrast, Japanese students in this study appeared more sensitive to emotional tone and behavioral norms than to linguistic production itself. While Kimura et al. (2020) emphasized that repeated VE fosters student initiative over time, this study suggests that even a single VE can trigger strong affective responses and cultural insight.

Toward Deeper IC
Many student comments went beyond description, touching on underlying educational values—such as classroom rules, teacher-student interaction, and communication styles. This supports the view of Pennock-Speck and Clavel-Arroitia (2022), who argue that educational settings are deeply shaped by cultural norms, which in turn influence how learners behave and interpret others.

To move students from surface noticing to interpretive competence, post-exchange reflection is essential. Activities encouraging students to ask why cultural practices differ—and how these differences relate to their own assumptions—can deepen intercultural learning. When guided thoughtfully, students can progress from observation to exploring meaning, laying the foundation for more sophisticated intercultural understanding.

This study shows that well-designed VE experiences can promote cultural awareness and early interpretive thinking among young learners. Students observed visible differences, reflected on implicit norms, and, in some cases, began to reconsider perspectives on their own culture. Even a single, well-supported VE can nurture curiosity, empathy, and metacognitive growth. Ultimately, VE offers not only exposure to other ways of being but also a framework for thinking more deeply about one's place in an interconnected world.

These cultural insights were closely linked to changes in students' attitudes toward language learning and their motivation to continue developing their English skills.

Impact on Motivation and Learning

The VE significantly enhanced students' motivation to learn English. Many participants described the experience as both meaningful and enjoyable, supporting previous findings (e.g., Kimura et al., 2020) that emphasize the role of authentic, communicative tasks in fostering engagement—especially when learners use language in real, social contexts.

Student comments reflected both emotional satisfaction and a desire to improve:

> "I was happy that I could communicate with the students from overseas."
> "I want to improve my listening skills so I can win at *Karuta* next time."

These reflections suggest that VE not only made English learning more enjoyable but also inspired future-oriented goals, linking successful interaction with personal learning aspirations.

Cultural Dimensions of Motivation

While these findings align with studies on the motivational effects of real-world language use, they also raise questions about how motivation is shaped by cultural context. For example, Pennock-Speck and Clavel-Arroitia (2022) found that Spanish students became more motivated when given opportunities for autonomy and spontaneous expression. In contrast, Japanese students in this study appeared to draw motivation from emotional fulfillment, positive social interactions, and the novelty of international connection—rather than from language production or performance alone.

This suggests that VE programs should consider learners' cultural expectations and emotional drivers when designing activities to boost engagement across diverse educational contexts.

Enhancing Engagement Through Design

Despite some challenges—such as fast speech or limited comprehension—students remained positively engaged. Features such as clear pronunciation, nonverbal cues (e.g., gestures), and interactive tasks like *Karuta* helped reduce difficulties and sustain motivation.

These findings are consistent with research showing that VE supports not only linguistic development but also intercultural understanding and learner confidence, even at the beginner level (e.g., Hagley, 2016; Canals, 2020; Okumura, 2024a). However, ongoing barriers—such as language gaps and varying school structures—highlight the need for thoughtful and adaptable design. Scaffolding strategies that incorporate explicit communication, multimodal support, and peer collaboration can further enhance VE's effectiveness.

This study reinforces the growing body of evidence that VE can serve as a powerful catalyst for motivation in language learning. When carefully designed and paired with reflective practice, VE enables students to engage in meaningful communication, develop intercultural awareness, and set personal learning goals. By linking enjoyment with effort and purpose, VE fosters a dynamic learning environment that supports both linguistic and emotional growth—especially for young learners in culturally diverse settings.

Conclusion

This study underscores the transformative potential of VE in primary education, particularly in strengthening students' language proficiency, cultural awareness, and motivation. By connecting

learners across linguistic and cultural boundaries, VE enables meaningful, real-time communication that goes beyond textbook learning and nurtures empathy and global citizenship from an early age.

Although students encountered challenges—such as rapid speech, unfamiliar pronunciation, and technical limitations—many navigated these difficulties by relying on strategies such as clear pronunciation, gestures, and visual cues. These interactions promoted not only linguistic growth but also curiosity, intercultural reflection, and enjoyment of communication. Learners demonstrated a shift from surface-level observation to deeper cultural interpretation, reflecting the initial stages of IC.

To fully realize the benefits of VE, several practical considerations must be addressed. First, teacher preparation is essential. Both native and non-native speakers should receive guidance on adjusting their speech and incorporating nonverbal strategies to enhance comprehension, particularly for younger or less proficient learners. Second, institutional coordination plays a crucial role. VE initiatives require advance planning for scheduling, technological setup, and alignment of learning objectives. Clear communication among educators and early administrative approval are critical to ensuring smooth implementation and long-term sustainability. Third, pedagogical design should prioritize culturally relevant, interactive tasks—such as *Karuta*—that integrate verbal and visual elements. These activities help reduce anxiety, encourage participation, and foster students' reflection on their own cultural backgrounds. Such tasks have been shown to support motivation and learner autonomy, even among young students. Finally, curricular integration is key. Embedding VE within broader language or intercultural education frameworks—combined with structured opportunities for reflection—can turn even a single session into a lasting learning experience.

While technical difficulties and linguistic differences remain ongoing challenges, they can be mitigated through deliberate scaffolding, thoughtful design, and environmental preparation. In this way, VE becomes more than a language activity—it serves as a holistic educational approach that fosters communicative competence, intercultural sensitivity, and learner confidence.

VE offers a compelling and scalable method for preparing young learners for an increasingly interconnected world. By bridging classroom instruction with global interaction, VE enriches language education and fosters the skills, mindsets, and values students need to succeed in multicultural, collaborative environments. When thoughtfully implemented, it represents a promising pathway toward inclusive, future-oriented education.

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Corresponding Author
Correspondence to Shinji Okumura, okumuras@bunkyo.ac.jp

REFERENCES

Byram, M. (1997). *Teaching and assessing intercultural communicative competence*. Multilingual Matters.

Canals, L. (2020). The effects of virtual exchanges on oral skills and motivation. *Language Learning & Technology*, *24*(3), 103–119. http://hdl.handle.net/10125/44742

Hagley, E. (2016). Making virtual exchange/telecollaboration mainstream – large scale exchanges. In S. Jager, M. Kurek, & B. O'Rourke (Eds.), *New directions in telecollaborative research and practice: Selected papers from the second conference on telecollaboration in higher education* (pp. 225–230). Research-publishing.net. https://doi.org/10.14705/rpnet.2016.telecollab2016.511

Hagley, E., & Cotter, M. (2019). Virtual exchange supporting language and intercultural development: Students' perceptions. In F. Meunier, J. Van de Vyver, L. Bradley, & S. Thouësny (Eds.), *CALL and complexity – Short papers from EUROCALL 2019* (pp. 163–168). Research-publishing.net. https://doi.org/10.14705/rpnet.2019.38.1003

Hang, Y., & Zhang, X. (2023). Intercultural competence of university students in navigating their academic, social, and ethnic cultural transitions. *Journal of Further and Higher Education*, *47*(8), 1027–1041. https://doi.org/10.1080/0309877X.2023.2214790

Kimura, A., Kurogami, H., & Taniguchi, K. (2020). Syougakkou deno taburetto PC wo katsuyou shita kokusai kouryuu niyoru shisitsu nouryoku no hennyou [Development and effect of 'international exchange curriculum' utilizing tablet PC at elementary school]. *Japanese Journal of Educational Media Research*, *26*(2), 1–17.

Koyama, Y., & Konishi, M. (2024). Kooritsu shoogakkoo ni okeru bideo chatto o mochiita eetandemu onrain kokusai kooryuu no jissen: Kanagawa-ken no jirei [A practical study of eTandem online international exchange using video chat in public elementary schools: A case study from Kanagawa Prefecture]. *Tsuda Review*, 56, 157–183.

Ministry of Education, Culture, Sports, Science and Technology (MEXT). (2016). *Gaikokugo kyouiku niokeru ICT no katsuyou nitsuite* [The use of ICT in foreign language education]. Ministry of Education, Culture, Sports, and Technology of Japan. http://www.mext.go.jp/b_menu/shingi/chukyo/chukyo3/058/siryo/__icsFiles/afieldfile/2016/05/25/1371098_5.pdf

Ministry of Education, Culture, Sports, Science and Technology (MEXT). (2020). *Gaikokugo no shidou niokeru ICT no katsuyou nitsuite* [The use of ICT in teaching foreign languages]. Ministry of Education, Culture, Sports, and Technology of Japan. https://www.mext.go.jp/content/20200911-mxt_jogai01-000009772_13.pdf

Ministry of Education, Culture, Sports, Science and Technology (MEXT). (2022). *GIGA sukuuru no saishin no jyokyoo nituite* [Update on the GIGA School Initiative]. https://www.mext.go.jp/kaigisiryo/content/20210319-mxt_syoto01-000013552_02.pdf

Minoia, A. (2019). Intercultural awareness in language teaching: A systematic literature review. *Studies in Second Language Learning and Teaching*, *9*(2), 395–416. https://doi.org/10.14746/ssllt.2019.9.2.8

O'Dowd, R. (2018). From telecollaboration to virtual exchange: State-of-the-art and the role of UNICollaboration in moving forward. *Journal of Virtual Exchange*, *1*, 1–23. https://doi.org/10.14705/rpnet.2018.jve.1

Organisation for Economic Co-operation and Development (OECD). (2019). *TALIS 2018 results (Volume I): Teachers and school leaders as lifelong learners*. OECD Publishing. https://doi.org/10.1787/1d0bc92a-en

Okumura, S. (2020). Design and implementation of a telecollaboration project for primary school students to trigger intercultural understanding. *Intercultural Education*, *31*(4), 377–389.

Okumura, S. (2024a). Enhancing intercultural language learning through virtual exchange and technology-mediated task-based language teaching: A case between Japanese and Australian primary schools. In R. Vurdien & W. Chambers (Eds.), *Technology-mediated language learning and teaching* (pp. 61–92). IGI Global. https://doi.org/10.4018/979-8-3693-2687-9.ch003

Okumura, S. (2024b). Teachers' insights on the Japan-Australia primary school virtual exchange project. *Proceedings of Teaching and Educational Research Association (TERA)*. https://doi.org/10.20319/ictel.2024.215216

Okumura, S., & Uekusa, M. (2021). Oostoraria to nihon no kodomotachi wo tsunagu terekoraboreisyon purojekuto [A telecollaboration project among Australian and Japanese primary school students]. *The National Symposium on Japanese Language Education (NSJLE)* 2018.

Pennock-Speck, B., & Clavel-Arroitia, B. (2022). Virtual exchanges among primary-education pupils: Insights into a new arena. In A. Potolia & M. Derivry-Plard (Eds.), *Virtual exchange for intercultural language learning and teaching* (pp. 115–132). Routledge.

Pintado Gutiérrez, L., Gutiérrez, B. F., & Gómez Soler, I. (2023). Pedagogical mentoring in virtual exchange: Developing students' videoconferencing skills. *Journal of Virtual Exchange*, *6*, 37–59. https://doi.org/10.21827/jve.6.39199

Satar, M. (2021). Introducing virtual exchange: Towards digital equity in internationalisation. In *Virtual exchange: Towards digital equity in internationalisation* (pp. 1–13). Research-publishing.net. https://doi.org/10.14705/rpnet.2021.53.1285

Shimizu, Y., & Kano, M. (2020). Syougakkou gaikokugo katsudou de tsukaeru kaigai kouryuu wo kumikonda nenkan shidou keikaku to jissen. *CELES Journal*, *49*, 227–234.

Sierra, J., Yassim, M., & Suárez-Collado, Á. (2022). Together we can: Enhancing key 21st-century skills with international virtual exchange. *Education + Training*, *64*(9). https://doi.org/10.1108/ET-05-2021-0171

Sims, L. (2022). Teaching critical thinking and cultural intelligence via virtual exchange: A practice report on the utilization of research-based principles to support and assess learning outcomes. *Journal of Virtual Exchange*, *5*, 133–143. https://doi.org/10.21827/jve.5.38804

Tran, N., Hoang, D. T. N., Gillespie, R., Yen, T. T. H., & Phung, H. (2024). Enhancing EFL learners' speaking and listening skills through authentic online conversations with video conferencing tools. Innovation in Language Learning and Teaching. 1-11. https://doi.org/10.1080/17501229.2024.2334809

Wigham, C. R., & Whyte, S. (2024). Learner autonomy and engagement in task-based virtual exchange: A study of French and Spanish primary learners. *E-LIVE Project*, December, 2024.1-8.

About the Author:

Shinji Okumura
Shinji Okumura holds a Ph.D. in Applied Linguistics from Monash University, Australia, and serves as an Associate Professor in the Faculty of Information and Communications at Bunkyo University, Japan. His research focuses on technology-mediated task-based language teaching, virtual exchange, and intercultural education.

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EARLY CHILDHOOD EDUCATION STUDENT-TEACHERS EXPERIENCING VIRTUAL MATH MAKERSPACES: ORGANIZING PLAYFUL LEARNING ENVIRONMENTS

Anjali KHIRWADKAR
Assistant Professor, Brock University, Canada
ORCID: https://orcid.org/0009-0006-5705-4976
akhirwdkar@brocku.ca

Shannon WELBOURN
Assistant Professor/Tech Ed Program Coordinator, Brock University, Canada
ORCID: https://orcid.org/0009-0005-8119-6774
swelbourn@brocku.ca

Candace FIGG
Professor Emeritus, Brock University, Canada
ORCID: https://orcid.org/0009-0005-6409-6528
cfigg@brocku.ca

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Abstract

This study investigates the integration of makerspaces in early childhood education. It emphasizes the impact of play-based learning on children's cognitive development and attitudes towards learning. Quality early childhood learning encourages positive attitudes toward learning and school, fostering strength, confidence, and resilience. The study focuses on implementing makerspaces, defined as environments for creative exploration and cognitive engagement through play. Participants in a Bachelor of Early Childhood Education (BECE) program engaged in a virtual, mathematics-focused makerspace. This study aimed to understand participants' perceptions of makerspaces as effective learning environments for early learners. Participants were tasked with taking part in *making* activities like coding, beading, origami, and 3D construction, which connected mathematical concepts to real-world applications. Results indicated that makerspaces support the development of technological, pedagogical, and content knowledge (TPACK). Participants also found these environments promoted digital literacy, confidence, creativity, critical thinking, and fine motor skill development. The study further highlighted the role of makerspaces in building learning communities involving children, parents, and teachers, and the significance of incorporating technology in early childhood education.

Keywords: Math makerspace, early childhood education, TPACK.

INTRODUCTION

Ontario's Renewed Early Years and Childcare Policy Framework (2017) explains that early learning experiences have a long-lasting impact on a "child's language, literacy, and mathematics skills" (p. 9). The framework further states that quality early childhood learning experiences encourage children's positive attitudes towards learning and school and may also impact children throughout life by promoting the positive development of strength, confidence, and resiliency in the individual child (Alexander & Ignjatovic, 2012; Grieve 2012; Reynolds, Temple, & Ou et al., 2011). Furthermore, GGI Insights (2024) shares that current research indicates innovative approaches to teaching in early childhood education emphasizes learning through exploration, discovery, and play. Makerspaces are learning environments that are useful design structures for organizing these exploratory and innovative teaching and learning experiences. The nature of these quality learning experiences involves play-based, open-ended explorations that engage children in complex thinking, which occurs through play in which

children are "making connections and testing theories as they interact with their world. Nurturing this innate curiosity through high-quality relationships and experiences is key to their health and well-being" (Ontario's Renewed Early Years and Childcare Policy Framework, 2017, p. 10). Thus, preparing teachers of early learners to design and implement playful, creative learning spaces in which children participate as contributors, creators, innovators, and makers becomes an essential and necessary part of the educational system for early learners.

Makerspaces and Early Childhood Learning

Calderon (2018) explains that "children are natural makers, and Early Childhood teachers and caregivers have been providing opportunities to create, engineer and fabricate since before [the learning environment] was officially labeled as a "makerspace" (para. 2). Early childhood classrooms often contain learning centers where children can engage in open play or role-playing, building and making, or just exploration. These foundational experiences of open-ended explorations by the child promote meaningful learning – the child initiates the inquiry and explores to an extent. Daniels (2016) suggests that, in these learning centers, play is the leading activity, and Marsh et al. (2019) further add that play is useful as a learning event that can "foreground children's needs, motives, and interest, as well as their participation in diverse social and cultural practices" (p. 222).

Similarly, makerspaces are also learning environments where the young learner can utilize play for engaging cognitive processes in creative work, specifically including problem-solving, metacognition and creative practice (Wood, 2013). These cognitive processes are especially supported when children are incorporating a blend of tinkering, making, and engineering explorations in which they are "transform[ing] everyday tools, symbols, and meanings through individual and collective activity" (Marsh et al., 2019, p. 223). The term, *making*, is used to broadly encompass all types of activities that engage the learner in the acts of building using a variety of tools and materials (Click2Science, 2022). These *making* activities may include specific tinkering explorations where the process is more valued over the product, and where "tinkering refers to the kind of open-ended, hands-on, focused exploration of a variety of different materials that often leads to new ideas and discoveries" (Good2Know Network, 2021, para. 3). *Making* activities may also specifically target the learning of engineering-related activities, with the purpose of the exploration to "put their learning to work in solving a meaningful problem" (Click2Science, 2022, para. 10). In other words, makerspaces are especially useful as learning environments that encourage the development of budding mathematicians, engineers, and scientists. Calderon (2018) even further states that "when we allow young children to have these creative, open-ended makerspace experiences, we are enabling them to develop foundational skills for future careers in hardware or software architecting and development, engineering, coding, and so many other tech fields" (para. 19).

Makerspaces and Technological, Pedagogical and Content Knowledge (TPACK)

Technological, pedagogical and content knowledge (or TPACK) is the essential educator knowledge required to design and implement learning activities that integrate technology into education effectively (Mishra & Kohler, 2006). This knowledge is developed through a series of learning experiences, such as makerspaces, that provide teachers with the skills to design and teach using technologies (Figg & Jaipal, 2009, 2012; Harris, et al., 2009; Neiss, 2005). TPACK is pivotal in equipping Early Childhood Education students (ECEs), the university students specializing in early learning for ages 3-8 (PreK – Grade 3), to seamlessly incorporate technology within their own instructional approach.

Learning how to design makerspaces, and the various innovative *making* activities that match the curricular-based theme of the makerspace, supports the development of TPACK in teachers (Figg, Khirwadkar & Welbourn, 2020). Free exploration of makerspace activities as part of learning about makerspaces, and the design of the making activities, provides ECEs with opportunities to engage in pedagogical discussions about the design process while making connections to the curriculum. These experiences promote the skills educators need to be able to design and implement environments for early learners that include problem-solving, thinking critically, taking risks, and recognizing different cultural values and diversity, thus promoting real-world and daily life applications of the abstract

conceptual understandings of mathematics (Friederichs, 2016; Kafai & Proctor, 2022; Komanski & Black, 2016; Shively, 2017).

Makerspaces with a focus on math concepts provide a flexible learning space where early learners can connect math to the real world. Free-play exploration could include activities such as 3D construction, origami, beading, and coding (such as Code Your Family, Unplugged Coding, and Scratch Coding activities). All of these activities promote learning and understanding of mathematical concepts (Figg, Khirwadkar & Welbourn, 2020). Makerspaces enhance TPACK by preparing educators to meet evolving digital spaces in teaching and learning.

Makerspaces, Social Emotional Learning (SEL) Skills, and Communities of Learning

According to the Ontario Mathematics Curriculum 2020, social emotional learning (SEL) skills contribute to the overall development of a child, including their academic performance and progress. SEL skills support children's learning of mathematics by developing resilience, growth mindset, and perseverance in continuing working with a task (MOE, 2020). Halverson and Sheridan (2014) demonstrated that the creative autonomy of makerspace tasks provided stress relief and supported students in managing academic pressures, as hands-on, immersive activities allowed them to focus and cope effectively.

As well, the creative autonomy inherent in *making* provides the individual with the independence to engage in collaboration and exploration with others during the *making* process. Litts (2015) further explains that "makerspaces are places where *making* happens in community" (p. 1). Thus, *making* in an online environment within virtual makerspaces could contribute to the development of a learning community of students, parents/caregivers, and teachers, further promoting successful learning experiences (Loertscher, 2015).

The Study – Purpose and Significance

There is a need for ECEs to experience makerspaces and gain pedagogical knowledge about the design and implementation of this valuable informal learning space for early childhood learners. To address this need, *making* experiences were introduced into the math course for the ECEs in the Bachelor of Early Childhood Education (BECE) program at our university. As part of this math course, ECEs participated in a virtual, mathematics-focused structured makerspace while also serving as participants in this study, to investigate the perceptions they developed about the usefulness of makerspaces as a learning environment for early learners. With their help, we sought to answer these guiding questions about makerspaces and early childhood learning:

- In what ways do makerspace activities provide effective pedagogical practices for teaching with technology (TPACK)?
- How do makerspaces help to create positive learning experiences for early learners?
- In what ways can makerspaces support building learning communities consisting of children, parents/caregivers, and teachers?
- How do makerspaces empower children to be autonomous learners?

METHOD

The asynchronous, online nature of the BECE program courses made it necessary to organize math makerspace experiences virtually. Being the first virtual makerspace experience for early childhood teachers, the math makerspace developed skills and knowledge that can be transferred to their early childhood learning environments while collaborating with parents and caregivers. These makerspace experiences are rooted in the social constructivism of experiential learning, such as described by Dewey (1938), Piaget (1963), and Vygotsky (1981) while drawing from the TPACK framework for enhancing ECEs' beliefs about how to teach with technology (Donnelly et al., 2011; Ertmer et al., 2014). Recognizing the significance of this theoretical framework, we designed a qualitative study that honored the voice and perceptions of the participants and ensured that participants' perspectives were considered

central components of the study (Lincoln & Guba, 1985). Themes emerged from a constant comparative textual analysis (Creswell & Creswell, 2018).

Participants

Participants are in the final semester of the BECE program, which is an online Honours degree that follows the completion of a two-year Early Childhood Education Diploma program, or equivalent. Many of the students in this program are currently working in early childhood environments, such as preschools, play centres, and daycare facilities.

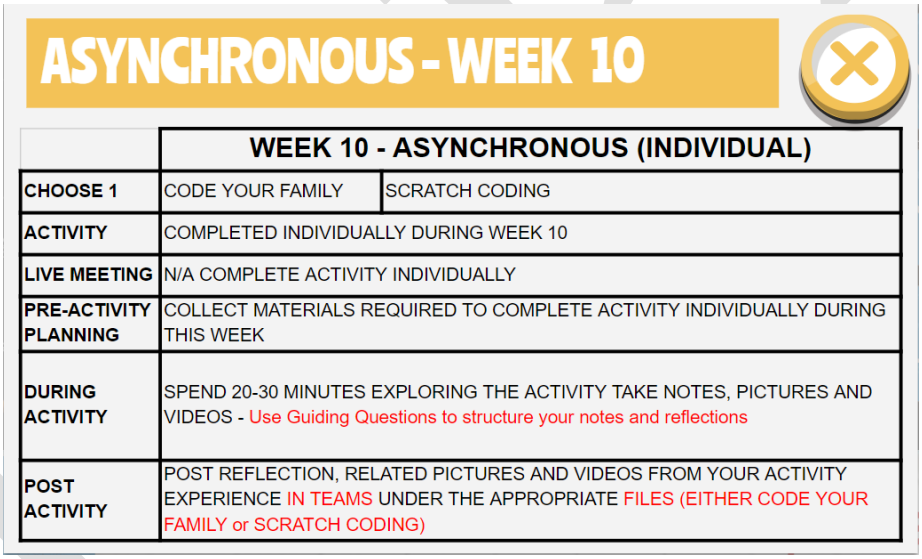
A purposive sampling technique, where the recruitment criteria drew study participants from university students enrolled in the Winter 2022-2023 BECE mathematics course, was used for recruiting the participants. There were 34 students who participated in this study.

Procedure

For the virtual makerspace experience, the procedure was replicated from the initial physical math makerspace experiences, which were studied previously (Khirwadkar & Figg, 2019). The virtual makerspaces took place in weeks 10 and 11 of the BECE mathematics course.

Week 10 Procedure

In Week 10, participants worked individually and asynchronously (see activities at http://bit.ly/BECE2223 or see Figure 1 for the slide presented to the participants of the checklist steps required for completing the makerspace activities for Week 10).



	WEEK 10 - ASYNCHRONOUS (INDIVIDUAL)	
CHOOSE 1	CODE YOUR FAMILY	SCRATCH CODING
ACTIVITY	COMPLETED INDIVIDUALLY DURING WEEK 10	
LIVE MEETING	N/A COMPLETE ACTIVITY INDIVIDUALLY	
PRE-ACTIVITY PLANNING	COLLECT MATERIALS REQUIRED TO COMPLETE ACTIVITY INDIVIDUALLY DURING THIS WEEK	
DURING ACTIVITY	SPEND 20-30 MINUTES EXPLORING THE ACTIVITY TAKE NOTES, PICTURES AND VIDEOS - Use Guiding Questions to structure your notes and reflections	
POST ACTIVITY	POST REFLECTION, RELATED PICTURES AND VIDEOS FROM YOUR ACTIVITY EXPERIENCE IN TEAMS UNDER THE APPROPRIATE FILES (EITHER CODE YOUR FAMILY or SCRATCH CODING)	

Figure 1. Week 10 makerspace activities checklist.

In week 10 ECEs worked individually and asynchronously by choosing one of the coding activities: (a) *Code Your Family*, or (b) *Scratch Coding*. For the *Code Your Family* coding activity, ECEs engaged in unplugged coding where they selected topics like moving their family members from one place to another place, going for a walk around the block, or going to the shopping mall, while considering sequencing, selection, and loop. They tried out the code and debugged their programs where necessary. They took pictures, made curriculum connections, and wrote reflective notes to share with their makerspace group about the process and any curriculum connections they made through their making. They also reflected on the guiding questions during their explorations with virtual makerspaces (See Figure 2).

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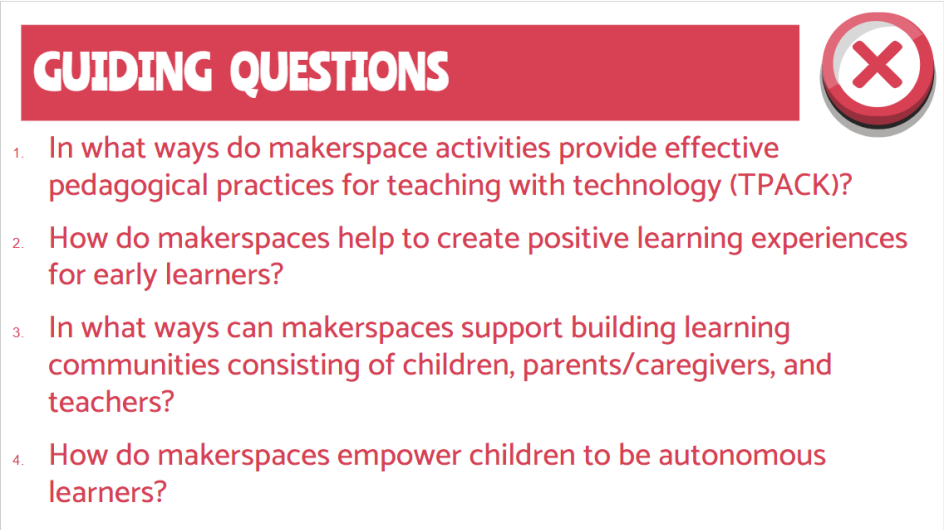
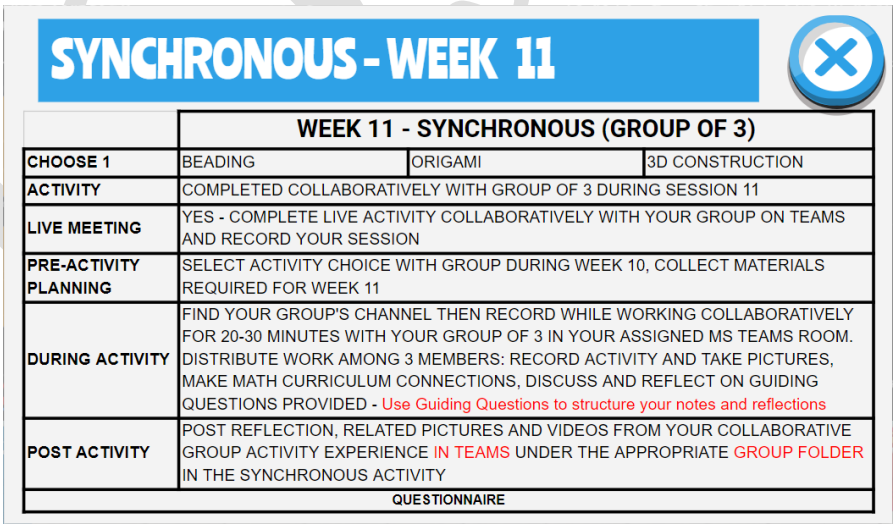


Figure 2. The guiding questions from the mathematics virtual makerspace.

These questions helped ECEs to reflect on their experiences in the asynchronous learning environment, as well as reflect upon what they had learned about engaging children with technology, thereby connecting their learning activities to coding.

Week 11 Procedure

In Week 11, ECEs worked in groups of three members and met synchronously using the MS Teams videoconferencing platform. They chose one of the station activities (Beading, Origami, and 3D Construction), gathered the materials needed for the activities, and met synchronously with their group members. They video-recorded their synchronous-making session and discussed pedagogical and curriculum connections about how they might use makerspaces in their professional practice. The ECEs reflected on their synchronous-making experiences using the guiding questions. See Figure 3 for the list of makerspace activities completed in Week 11.



	WEEK 11 - SYNCHRONOUS (GROUP OF 3)		
CHOOSE 1	BEADING	ORIGAMI	3D CONSTRUCTION
ACTIVITY	COMPLETED COLLABORATIVELY WITH GROUP OF 3 DURING SESSION 11		
LIVE MEETING	YES - COMPLETE LIVE ACTIVITY COLLABORATIVELY WITH YOUR GROUP ON TEAMS AND RECORD YOUR SESSION		
PRE-ACTIVITY PLANNING	SELECT ACTIVITY CHOICE WITH GROUP DURING WEEK 10, COLLECT MATERIALS REQUIRED FOR WEEK 11		
DURING ACTIVITY	FIND YOUR GROUP'S CHANNEL THEN RECORD WHILE WORKING COLLABORATIVELY FOR 20-30 MINUTES WITH YOUR GROUP OF 3 IN YOUR ASSIGNED MS TEAMS ROOM. DISTRIBUTE WORK AMONG 3 MEMBERS: RECORD ACTIVITY AND TAKE PICTURES, MAKE MATH CURRICULUM CONNECTIONS, DISCUSS AND REFLECT ON GUIDING QUESTIONS PROVIDED - Use Guiding Questions to structure your notes and reflections		
POST ACTIVITY	POST REFLECTION, RELATED PICTURES AND VIDEOS FROM YOUR COLLABORATIVE GROUP ACTIVITY EXPERIENCE IN TEAMS UNDER THE APPROPRIATE GROUP FOLDER IN THE SYNCHRONOUS ACTIVITY		
QUESTIONNAIRE			

Figure 3. Week 11 makerspace activities checklist.

After Week 11 Procedure

At the end of the Week 11 exploration, individual participants completed a final 'exit' ticket questionnaire which asked for specific examples related to the research questions.

Data Collection and Analysis

Textual qualitative data was collected from a variety of sources, including recorded conversations, reflections based on guiding questions from the ECEs working on their maker activities, and brief interviews. Participants also provided images, pictures, videos, and visual data documenting the creation of artifacts or participation in the making. Additionally, participants completed an exit questionnaire consisting of 13 questions, both open-ended and multiple-choice. These multiple sources resulted in three types of data being considered for this study: multiple-choice frequency data, textual, and images/pictures/videos/visual data documenting the creation of the artifacts. Trustworthiness of the data collection and analysis processes was ensured through three techniques (suggested by Erlandson et al., 1994; Creswell & Creswell, 2018): (a) triangulation, or the collection of data from multiple and diverse data sources, (b) purposive sampling of participants ensuring diversity and richness of the perspectives collected, and (c) the use of emergent coding of data to identify common themes from the multiple participants.

After data collection, the process of transcribing and coding data was conducted to look for emerging patterns and themes related to the research questions, as well as any common patterns that emerged from the analysis (Creswell & Creswell, 2018). An emergent coding process was used for the analysis of textual data, which began with unitizing the data or segmenting the text into codable units, a process explained by Reed et al. (2018) as representing "the smallest data component that is analyzed within interactions" (p. 208). Once the data was coded, the unitized data was sorted into categories based on similarities, patterns, or ideas, from which the themes emerged. The artifacts, images, videos, and other items shared by the participants were analyzed using a visual analysis process that Saldana and Omasta (2021) describe as the act in which researchers make "special note of items that seem to suggest particular meaning to either the researchers or the participants" (p. 74). These meanings were also categorized using emergent themes.

RESULTS

Overall, the participants in the study found value in learning about and through virtual makerspace learning environments in a similar fashion to the elementary preservice teachers in the face-to-face makerspaces of the original study (Khirwadkar & Figg, 2019). As well, four themes emerged that address the research questions.

First and foremost, the idea that mathematical concepts could be reinforced through makerspace activities and the use of technology for early learners was a common theme shared by participants throughout the data. By participating in the virtual learning environment, ECEs understood that they were building their own pedagogical knowledge for teaching with technology (TPACK). For example, participants commented, "Participating in both of the makerspace experiences made me see the value of using technology. I realize that it has a place in the classroom and can enhance children's learning" (J-9). Another stated, "I learned how to use technology to show students origami activities in a clear and concise manner. Not only could the students hear my instructions, but they could also see my steps on video" (J-14). Two others added:

> I learned that it can be extremely beneficial because, a lot of the time, you can complete it on your own time. As well it was extremely beneficial to see that we can still engage with hands-on activities with each other, but in multiple different ways. This has been extremely beneficial because now I have this knowledge for the future (J-12).
>
> Teaching with technology from exploring in a structured virtual makerspace has taught me that there is countless of effective possibilities to engage and support students virtual learning experience by implementing activities in a clear way utilising visuals and hands-on manipulatives; this could effectively engage children in the learning process and aid their mathematical skills (J-15).

Still, others made connections to the curriculum document mathematical standards in comments such as:

> After I showed the students how to fold paper into the object, I would let them try to fold their own objects and share with each other. Students could think creatively, build relationships and communicate effectively, which is from Strand A: Social-Emotional Learning Skills in Mathematics and the Mathematical Processes (Ministry of Education, 2020) (N-14).
>
> Using makerspace activities to teach mathematics can allow students to think critically and creatively, build positive relationships with peers and use mathematical communication effectively. Teachers can integrate multiple strands into activities with students and help them develop math skills (O-14).
>
> Makerspace activities could be very useful in elementary mathematics instruction. The activities actually get the children involved and help them make meaning of what they are learning about through exploration. It is also a great way for children to connect mathematical concepts to real-life situations (P-3).

Secondly, the data analysis provided insights into the theme that the makerspaces could help create positive learning experiences for early learners. One participant explained, "Using makerspace activities to teach mathematics can allow students to think critically and creatively, build positive relationships with peers, and use mathematical communication effectively. Teachers can integrate multiple strands into activities with students and help them develop math skills" (O-14). Another stated, "Makerspace activities are useful for young children which they provide diversity and fun way to engage children in the class. And it also lets students expand open-mindedness and exercise fine motor skills" (P-14). Others commented on how the activities supported the development of critical and creative thinking, such as stated by one of the students (I-4), who explained that students experienced mathematical concepts where they would "not expect perfection, [and] have an open mind. Ask the children to describe what they are thinking and doing. No idea is wrong." Another participant pointed out that, "Makerspaces can be extremely beneficial. It provides a space for children to engage in an activity in multiple different ways and have meaningful conversations with their peers and adults while they are engaged in their learning" (P-12). Still, other participants described the effectiveness of the virtual aspect of the learning environment in comments such as, "The virtual aspect of the makerspaces shows they can easily be implemented with children while they are learning at home. Children can use materials found around their house and create what they want" (I-9).

A third theme that emerged from the data analysis was the perception that parents/caregivers could be engaged in the learning environment as well as teachers and students, thereby promoting a sense of community in which teachers, students, and parents/caregivers were integral parts of the learning. Participants' comments included:

> I think that makerspaces can be extremely beneficial. It provides a space for children to engage in an activity in multiple different ways and have meaningful conversations with their peers and adults [including parents] while they are engaged in their learning (P-12).
>
> We discussed the differences between exploring a makerspace online and in person. As well, we discussed how we would implement a makerspace within the classroom such as providing instruction for parents to help them set up activities at home for online learning (I-12).

Finally, the participants addressed the fourth theme of how makerspaces might empower children to be autonomous learners. For example, one participant explained how the activities promoted multimodal learning, "I learned how to use technology to show students origami activities in a clear and concise manner. Not only could the students hear my instructions, but they could also see my steps on video" (J-14). Another explained how the activity engaged learners in self-regulation and communication experiences:

> We worked in the origami station, and we have found many great examples on how this activity is beneficial for children in the third grade. This is because children in this age have more comprehension and previous experience throughout the math domain; also, children in third grade are able to communicate and follow instructions well (L-4).

Another participant provided an example of how the activities promoted risk-taking, open-mindedness, and opportunities for working independently:

> I will be using origami in my teaching practice with children because it allows for them to strengthen their abilities to follow directions, it enhances their trial and error understanding, and it makes their brains and hands work in the same sequence. Also, have an open-mind, not all brains compute the same way and will respond differently from their peers/acquaintance when given instruction (M-4).

Other participants connected the learning experiences to opportunities for learners to engage in creativity, critical thinking, motor skills practice, and thinking for themselves. One participant explained,

> "I think I would bring beading and origami activities into the classroom because they stimulate students to think for themselves and be creative, develop critical thinking in math, and practice fine motor skills" (M-14).

The early childhood educators found the makerspace activities to be enjoyable and engaging for learning, but also noted some challenges, such as the importance of clearly communicating instructions and procedures. Additionally, some students noted difficulties with accessing the full experience of visualization in the virtual space. However, these early child educators will be promoting math learning through makerspace activities in an in-person delivery model with their early learners.

DISCUSSION, CONCLUSION, and SUGGESTIONS

Similar to previous studies with preservice teachers (e.g., Turakhia et al., 2024), this study has revealed that virtual makerspace activities are useful to early childhood educators as effective learning environments that promote digital literacy skill development and mathematical, conceptual learning for early learners. Digital tools find a place in early education play centres to engage children with the hands-on learning enhanced by technology. The experience gained by the ECEs, as they navigated the virtual learning environment, helped them to strengthen their TPACK knowledge to utilize in their own teaching practices to benefit early learners. Other research, such as Marsh et al. (2019), has shown the use of technology devices and technology-enhanced learning activities, like robotics or AI, supports the development of knowledge and skills needed in the future society, for the economic growth of societies.

Engaging in makerspace activities helps to create positive learning experiences and allows students to experience and manage a range of emotions, particularly when confronting challenges or failures. The iterative nature of design and creation in these spaces encourages students to view setbacks as learning opportunities, promoting emotional resilience. For instance, students participating in maker projects often encountered frustration during the problem-solving process, which helps them develop coping strategies and emotional regulation skills (Lister, 2019). The findings of the study were found to be useful in engaging children in a variety of makerspace activities, meeting their needs and readiness as per the universal design for learning principles for early years. This study also indicates that educators could organize makerspaces to encourage playful, exploratory learning environments, which helps educators assess children's knowledge and skills in a holistic way (Kay & Buxton, 2023).

The study further revealed that virtual makerspaces support collaboration with parents, engaging them in their child's development in the home environment. The active play-based learning environment created through makerspaces encourages children to take an active part in exploration, investigating ideas, and thereby taking charge of their own learning, while facilitating parents in being an active support in their child's development.

The findings of the study also indicate that makerspaces empower children to be autonomous learners, helping them to make decisions that drive their own learning through hands-on, creative activities. The autonomy and engagement inherent in maker activities enable students to immerse themselves in tasks, entering into unknown terrain taking risks, thereby engaging themselves in creative exploration (Halverson & Sheridan, 2014). This supports the development of effective coping mechanisms and a growth mindset as students navigate challenges in supportive and safe environments.

Thus, investigating the views of ECEs on the usefulness of *making* learning environments in Early Childhood Education programs contributes to foundational knowledge about the types of early childhood experiences that are most effective and beneficial for early learners. Also, the findings support the limited research about the effectiveness of virtual makerspaces as a learning environment in the lived experiences of young learners (Strawhacker & Bers, 2019), and effective ways in which early childhood education encourages the collaboration of children, teachers, parents/caregivers.

Ethics and Conflict of Interest
The authors of the study acted in accordance with ethical rules in all processes of the research. There are no individuals or financial relationships that could be perceived as potential conflicts of interest related to this study.

Author Contribution
All authors contributed equally to the research.

Data availability
The data that support the findings of this study are available on request from the corresponding author.

Corresponding Author
Correspondence to: Dr. Anjali Khirwadkar, akhirwadkar@brocku.ca

REFERENCES

Alexander, C., & Ignjatovic, D. (2012, November 27). *Early Childhood Education has widespread and long lasting benefits*. TD Economics Special Report. http://www.td.com/document/PDF/economics/special/di1112_EarlyChildhoodEducation.pdf

Calderon, M. (2018). *Makerspace in Preschool – It's not just for big kids!* Medium Publishing. https://medium.com/@marissacalderon/makerspace-in-preschool-its-not-just-for-big-kids-67ce0dad016e

Click2Science. (2022, March). *Making, tinkering & engineering: What's the difference?* https://click2sciencepd.org/resource/making-tinkering-engineering-whats-the-difference/

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publishing.

Daniels, H. (2016). *Vygotsky and pedagogy*. London, England: Routledge.

Dewey, J. (1938). *Experience and education*. Collier Macmillan.

Donnelly, D., McGarr, O., & O'Reilly, J. (2011). A framework for teachers' integration of ICT into their classroom practice. *Computers & Education, 57*(2), 1469-1483. https://doi.org/10.1016/j.compedu.2011.02.014

Erlandson, D. A., Harris, E. L., Skipper, B. L., & Allen, S. D. (1994). *Doing naturalistic inquiry: A guide to methods*. SAGE Publishing.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., & Tondeur, J. (2014). Teachers' beliefs and uses of technology to support 21st-century teaching and learning. International Handbook of Research on Teacher Beliefs. Routledge. http://hdl.handle.net/1854/LU-5815883

Figg, C., & Jaipal, K. (2009). Unpacking TPACK: TPK characteristics supporting successful implementation. In I. Gibson et al. (Eds.), Proceedings of the 20th International Conference of the Society for Information Technology and Teacher Education (SITE) (pp. 4069–4073). Chesapeake, VA: Association for Advancement.

Figg, C., & Jaipal, K. (2012). TPACK-in-Practice: Developing 21st century teacher knowledge. In P. Resta (Ed.), Proceedings of Society for Information Technology & Teacher Education International Conference 2012 (pp. 4683-4689). Chesapeake, VA: AACE.

Figg, C., Khirwadkar, A., & Welbourn, S. (2020). Making 'math making' virtual. *Brock Education Journal, 29*(2), 30-36. https://doi.org/10.26522/brocked.v29i2.836

Friederichs, E. (2016). Makerspaces expanding across campus, starting in the fall. Daily Tarheel. https://www.dailytarheel.com/article/%202016/04/makerspaces-expandingacross-campus-starting-in-the-fall

Good2Know Network. (2021, June 17). *What is tinkering? And how can it be used to encourage deeper learning?* https://www.good2knownetwork.org/g2k-info-hub/2021/6/17/what-is-tinkering-and-how-can-it-be-used-to-encourage-deeper- learning#:~:text=Defining%20Tinkering&text=But%2C%20generally%20speaking%2C%20tinkering%20refers,the%20physical%20properties%20of%20materials

GGI Insights. (2024, August). *Early childhood education research: Exploring the latest insights.* https://www.graygroupintl.com/blog/early-childhood-education-research

Grieve, J. (2012). Transforming early learning vision into action in Ontario, Canada. *International Journal of Child Care and Education Policy, 6*(2), 44-54

Halverson, E., & Sheridan, K. (2014). The maker movement in education. *Harvard Educational Review, 84*(4), 495–505. https://doi.org/10.17763/haer.84.4.34j1g68140382063

Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration refrained. *Journal of Research on Technology in Education, 41*(4), 393–416. https://doi.org/10.1080/15391523.2009.10782536

Kafai, Y. B., & Proctor, C. (2022). A revaluation of computational thinking in K-12 education: Moving toward computational literacies. *Educational Researcher. 51*(2), 146–151. https://doi.org/10.3102/0013189X211057904

Kay, L., & Buxton, A. (2024). Makerspaces and the Characteristics of Effective Learning in the early years. *Journal of Early Childhood Research, 22*(3), 343-358. https://doi.org/10.1177/1476718X231210633

Khirwadkar, A., & Figg, C. (2019). *Makerspaces for developing TPACK: A self-directed creative exploration for learning mathematics*. In K. Graziano (Ed.), Proceedings of Society for Information Technology & Teacher Education International Conference (pp. 2463–2468). Association for the Advancement of Computing in Education (AACE). https://www.learntechlib.org/primary/p/207996/

Komanski, C., & Black, H. (2016). A building community: Halls give students a space to show off their creative side. *Talking Stick: The Authoritative Source for Campus Housing, 33*(5), 24-26.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE Publishing.

Lister, H. (2019, September 25). *How makerspaces support social and emotional learning*. Ideas & Inspiration from Demco. https://ideas.demco.com/blog/makerspaces-support-social-and-emotional-learning/

Litts, B. K. (2015). *Making learning: Makerspaces as learning environments* (Unpublished doctoral dissertation). The University of Wisconsin-Madison. Available from ProQuest Dissertations & Theses Global. Retrieved from https://proxy.library.brocku.ca/login?url=https://www.proquest.com/dissertations-theses/making-learning-makerspaces-as-environments/docview/1651611969/se-2

Loertscher, D. V. (2015). The virtual makerspace: A new possibility? *Teacher Librarian, 43*(1), 50-67. Retrieved from https://proxy.library.brocku.ca/login?url=https://www.proquest.com/magazines/virtual-makerspace-new-possibility/docview/1721911282/se-2

Marsh, J., Wood, E., Chesworth, L., Nisha, B., Nutbrown, B., & Olney, B. (2019). Makerspaces in early childhood education: Principles of pedagogy and practice. *Mind, Culture, and Activity, 26*(3), 221–233. https://doi.org/10.1080/10749039.2019.1655651

Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Niess M. L. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. *Teaching and Teacher Education, 21*(5), 509–523. https://doi.org/10.1016/j.tate.2005.03.006

Ontario Ministry of Education (2020). *The Ontario Curriculum Grades 1-8 Mathematics*. King's Printer for Ontario.

Ontario Ministry of Education (2017). *Ontario's renewed early years and childcare policy framework*. Queen's Printer for Ontario.

Piaget, J. (1963). The attainment of invariants and reversible operations in the development of thinking. *Social Research, 30*(3), 283–299. http://www.jstor.org/stable/40969680

Reed, N., Metzger, Y., Kolbe, M., Zobel, S., & Boos, M. (2018). Unitizing verbal interaction data for coding: Rules and reliability. In E. Brauner, M. Boos & M. Kolbe (Eds.), *The Cambridge Handbook of Group Interaction Analysis* (pp. 208–226). Cambridge University Press. https://doi.org/10.1017/9781316286302.012

Reynolds, A. J., Temple, J. A., Ou, S., Arteaga, I.A., & and White, B.A.B. (2011). School-based Early Childhood Education and age-28 well-being: Effects by timing, dosage, and subgroups, *Science* 333(6040), 360–64. https://www.science.org/doi/10.1126/science.1203618

Saldana, J., & Omasta, M. (2021). *Qualitative research: Analyzing life* (2nd ed.). SAGE Publishing.

Shively, K. L. (2017). Reflections from the field: Creating an elementary living learning makerspace. *Learning Communities Research and Practice, 5*(1), 1–14. https://files.eric.ed.gov/fulltext/EJ1150377.pdf

Strawhacker, A., & Bers, M. U. (2019). What they learn when they learn coding: Investigating cognitive domains and computer programming knowledge in young children. *Educational technology research and development, 67*(3), 541-575.

Turakhia, D., Ludgin, D., Mueller, S. & Desportes, K. (2024). Understanding the educators' practices in makerspaces for the design of education tools. *Educational Technology Research and Development, 72*(1), 329-358. https://doi.org/10.1007/s11423-023-10305-1

Vygotsky, L. S. (1981). *The genesis of higher mental functions*. In Wertsch, J. V. (Ed. & Trans.), The concept of activity in Soviet psychology (pp. 144–188).

Wood, E. (2013). *Play, learning and the early childhood curriculum*. London, UK: Sage.

About the authors:

Anjali Khirwadkar
Anjali Khirwadkar is an Assistant Professor in the Faculty of Education at Brock University, Canada. Her research areas include mathematics education, teacher education, technology education and STEM education. Her research in math-focused makerspaces has contributed to introducing teacher candidates to teach math concepts using creative and engaging activities.

Shannon Welbourn
Shannon Welbourn is an Assistant Professor and Technological Education Program Coordinator in the Faculty of Education at Brock University, Canada. Her research explores makerspaces, mentorship, equitable assessment, trauma-informed practice, and adult learning. She focuses on supporting students transitioning from industry to teaching through hands-on STEM learning, instructional leadership, and curriculum innovation.

Candace Figg
Candace Figg is a Professor Emeritus in the Faculty of Education at Brock University, Canada. After teaching in Texas public schools for 15 years, she completed her doctoral work at the University of Texas, specializing in instructional design and technology. Her research interests include the development of Technological Pedagogical Content Knowledge (TPACK) in teacher candidates, the impact of technology leadership upon technology use in classrooms, the influence of digital technologies and learning environments (such as makerspaces) on 21stcentury teaching and learning, and the use of social network media to impact professional learning. She has co-authored the text, A Handy Guide to Teaching and Learning with Technology: Designs for Unpacking Technological Pedagogical and Content Knowledge (TPACK), and taught courses in instructional technology and instructional design. While serving as Chair of the Teacher Education program at Brock, she led the development and implementation of the extended teacher education program in Technological Education.

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THE FUTURE OF AI IN TURKISH LANGUAGE TEACHING FROM THE TEACHER'S PERSPECTIVE: WHAT HAPPENS IF TEACHERS TURN INTO AI?

Dilan KALAYCI ALAS
Dr., Eastern Mediterranean University, Famagusta, North Cyprus via Mersin 10, Türkiye
ORCID: https://orcid.org/0000-0002-2778-754X
dilan.kalayci@emu.edu.tr

Ahmet PEHLİVAN
Prof. Dr., Eastern Mediterranean University, Famagusta, North Cyprus via Mersin 10, Türkiye
ORCID: https://orcid.org/0000-0002-5987-6475
ahmet.pehlivan@emu.edu.tr

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Abstract

In this research, it is aimed to examine the opinions of teachers about the use of AI (artificial intelligence) and AI-supported tools in Turkish language teaching. The data for this qualitative study were collected through semi-structured interviews in Northern Cyprus context. The data were divided into codes, categories were formed from the codes, and the categories were grouped under four themes. At the end of the research, it was found out that Turkish language teachers have positive opinions about the integration of AI and AI-supported tools into Turkish language teaching. The teachers believe that artificial intelligence can be used effectively in measurement and evaluation, content creation, exercise development, reinforcement and application activities. Although attitudes are mostly positive, very few teachers have experienced AI-assisted language teaching tools in practice. At the same time, a minority of the teachers expressed concerns, especially about the suitability of AI for the structure of Turkish grammar, a potential decrease in creativity and a decrease in human interaction during learning. In conclusion, suggestions were presented.

Keywords: Turkish, language teaching, teacher, artificial intelligence.

INTRODUCTION

Turkish Language Teaching and Grammar

Language teaching is a structured cognitive process that involves the use of four core language skills, incorporating communicative competence, language structures, and various related abilities. In the context of Turkish, this teaching process enables individuals to understand and use the language accurately, effectively, and in accordance with linguistic rules. It can be examined under three main categories: teaching Turkish as a first language, as a foreign language, and as a second language.

Grammar, which provides the transition of the language between generations, raises individuals' awareness, and gives them the opportunity to use it effectively in written and oral communication. As a branch of linguistics, grammar studies the sounds, forms, and sentence patterns of a language and defines the rules that organize them. It is the guardian of language order, which teaches the art of using language well, helps us to understand and explain thoughts and feelings more properly and fully (Banguoğlu, 1990; Çeçen & Aytaş, 2008; Dolunay, 2010). The stage in which organized and programmed teaching is carried out in educational environments is called grammar teaching.

In grammar instruction, students are introduced to the sound patterns, word forms, and sentence structures of a language through different strategies, with the goal of developing their ability to use the language accurately and appropriately. Effective grammar teaching allows learners to strengthen their communication skills by exploring the structure and potential of their native language. It also

equips them with the understanding of the framework of a second language and reflecting on the similarities and differences with their own (Yağmur Şahin & Abacı, 2019; Çarkıt & Kara, 2023). The main goal is to understand the target language and adapt it to real life. In this context, Sağır (2002) argues that grammar teaching should be functional and states that it should be learned in accordance with interests and needs by establishing a relationship with daily life.

Ekşi, Kır, and Benzer (2021) stated in their research that grammar teaching should be related to daily life, increasing the quantity and quality of activities, making the subjects appropriate to the student level, and giving importance to practice. The following steps are taken as a basis in the applications of the language course (Erdem & Çelik, 2011):

i. To make the student understand the rule with examples, sentences and text,
ii. Providing information about the rule and definition to the student who senses the rule,
iii. Ensuring that the student who learns the rule converts what he has learned into a skill.

It is the function of language that is important in this century, hence traditional approaches are abandoned and functional approaches are adopted based on the actual needs of individuals (Güneş, 2013; Güven, 2013; Haykır & Ağrelim, 2022). Artificial Intelligence (AI) is one of the most important tools to meet the language learning needs of these people. Tools such as ChatGPT, Grammarly facilitate grammar learning, provide feedback and correction as well as personalized learning experiences (Lalira et al., 2024). However, it is said that the artificial tools available for Turkish need to be improved in terms of supporting verbal skills such as intonation, stress and pragmatic language use (Kaleli & Özdemir, 2025).

AI in Language Education

New approaches have been added to the 21st century technologies in teaching language or language rules. AI (Artificial intelligence) has become widespread with its use in many different disciplines, and it has finally shown itself in language education.

In the literature there are many attempts to teach native and foreign languages with AI tools (Ünveren, 2024; Chen at al., 2021; Liang, 2023; Karagöl & Bilgen, 2025). Hwang et al. (2020) state that AI-supported education can be divided into four categories as intelligent tutor, intelligent tutee, intelligent learning tools or partners, and policy-making advisor applications (Chen at al., 2021, p. 4). According to Jiang (2022), there are six primary applications of AI in the EFL (English as a Foreign Language) context: automatic evaluation systems, neural machine translation tools, intelligent tutoring systems (ITSs), AI-powered chatbots, intelligent virtual environments, and affective computing integrated into ITSs.

Nowadays, it is possible to see different uses of AI such as tutoring systems, adaptive personalization systems, and measurement and evaluation etc. applications in educational settings (Chen et al., 2020; 2024; Wang et al., 2024; Lalira et al., 2024; Ünveren, 2024; Jia-Cing et al., 2023, Kannan & Munday, 2018, Şen, 2023). Most of the research studies in the literature focus on AI-supported experiments, which are conducted in foreign language teaching and English language teaching to foreigners (Kessler, 2018; Kim, Cha & Kim; 2019; Bin & Mandal; 2019; Kim, 2019; Huang, et al., 2023; Jia-Cing et al., 2023, Jiang, 2022).

In addition to pedagogical dimensions, studies on language learning in the field of AI have started to focus on many dimensions such as language acquisition, language skills, grammar, vocabulary, pronunciation, and psychological factors (motivation, etc.), (Jia-Cing et al., 2023; Karagöl & Bilgen, 2025; Şen, 2023). Despite growing interest in AI, most research to date has primarily explored its implementation in language classroom settings (Huang et al., 2023). A certain number of these studies aimed at measuring students' performance in a particular language skill and grammar. Xu et al. (2019), found that intelligent tutoring systems (ITSs) had a greater impact on students' reading comprehension than traditional instruction. There are also studies on grammar in the context of language learning with AI. While some studies explore the direct influence of grammar teaching (Lo et al., 2004; Gaithi-Al & Behforouz, 2024; Mohammed & Ja'ashan, 2024), some others examine AI's

role in functions like parsing, correcting grammatical errors (e.g., misplacements), and identifying syntactic patterns (Jia-Cing et al., 2023). For example, the research of Fang et al. (2018) was concerned with developing a content-driven method for proposing personalized grammar questions using a parse key tree. On the other hand, Lo et al. (2004) attempted to find out the effects of a hypermedia-based HELP (Hypermedia-based English Language Learning system that provides remedial training for prepositions) according to student responses. The results of this study revealed that student confidence ratings (CR) and the provision of adaptive remedial instruction had significant effects on the learning of English prepositions in hypermedia-based courses. In another study, Pandarova et al. (2019) developed an ITS for practicing English tenses.

The use of AI in language learning not only improves students' performance but also provides guidance to teachers (Agarwal & Chakraborty, 2019; Deeva et al., 2020). Therefore, it is important to identify how AI applications are perceived by teachers. Huang et al, (2023) state that one of the challenges related to the use of AI in language learning is its approval by teachers and students. In a study, it was revealed that Turkish language educators could not fully benefit from AI due to their lack of motivation (Karagöl & Bilgen, 2025).

Consequently while developments in AI in language learning continue rapidly, concerns and questions about whether AI can improve learning methodology, make education more accessible, increase teacher effectiveness, or even replace the teacher are still unanswered (Kannan & Munday, 2018). Therefore, there is a need for more research, especially on the effectiveness of AI for teachers. These statements are especially important for Turkish language teaching (Karagöl & Bilgen, 2025, 35, Akkaya & Çıvğın, 2021). Research on AI applications in the Turkish language teaching literature is increasing (Ünveren, 2024; Tekeli & Yeşil, 2024). Despite this increase, it will be important to investigate teacher perceptions about the application of AI in Turkish language teaching (Karagöl & Bilgen, 2025; Banaz & Demirel, 2024; Elmas & Yücel, 2024; Köroğlu & Kana, 2025; Banaz & Demirel, 2024).

Research Aim and Research Questions

This study seeks to explore the following research questions:

1. How do Turkish language teachers residing in Northern Cyprus perceive the integration of AI-supported tools in teaching Turkish as a first language?
2. What are their views on the use of AI-assisted tools in teaching Turkish as a foreign language?
3. What are their perspectives on employing AI-based technologies in Turkish grammar instruction?
4. How do teachers evaluate the use of AI in language education in terms of potential concerns, their experiences, and on their professional roles?

METHOD

Research Design/Model

The research employed a qualitative approach in the processes of data collection, analysis, and interpretation. According to Yıldırım and Şimşek (2013), qualitative research involves the use of methods such as observation, interviews, and document analysis, carried out in a natural setting to ensure a holistic and realistic understanding of the subject matter.

Publication Ethics

The study was approved by the Scientific Research Ethics Committee of Eastern Mediterranean University (18/03/2024/ETK00-2024-0049) and by the Directorate of the General Secondary Education Department of the Ministry of National Education of Northern Cyprus (21/05/2024/GOÖ.0.00-174/06-24/E.8255).

Participants

In this research, teacher opinions regarding the use of AI and AI-supported tools in teaching Turkish language were examined. The sample of the research is composed of Turkish language teachers who were actively working in different middle schools in Northern Cyprus during the 2024-2025 academic year. Demographic information for the participants is shown in Table 1 below.

Table 1. Demographic information about participants.

Independent variables		n
Gender	Female	18
	Male	2
Age	< 30	1
	> 30	19

Data Collection and Analysis

A qualitative method was employed in this research, and a semi-structured interview comprising 10 questions was utilized as the data collection tool. Semi-structured interviews are flexible interviews in which the predetermined interview plan is applied exactly to the participant; in addition, new questions can be asked (Karasar, 2015). The questions are in a structure suitable for open-ended interpretation, and they were created by the researchers after reviewing the relevant literature. The interview was piloted by submitting it to three experts in the field and asking them to complete it and give feedback on it. This study, which was carried out with Turkish language teachers in a selected region, employed purposive sampling. Purposive sampling, an improbable sampling technique, is a type of sampling in which researchers deliberately select participants based on specific characteristics or criteria relevant to the research question (Syatriana & Jumiaty, 2025). In the present study, the researchers carried out the interviews in person. The data obtained during the interviews were recorded and then transcribed. "Researchers record the information in the interview by taking video footage, audio recording, or handwritten notes" (Creswell, 2016, p. 194).

The interviews were conducted face-to-face with teachers. Each interview lasted 15 minutes on average. Furthermore, the research findings were supported by directly quoting the teachers' responses to the interview questions. The data collected through the interviews were analyzed using the descriptive analysis method. In this approach, the data are organized and interpreted around pre-established themes, with frequent use of direct quotes to vividly convey the perspectives of participants (Yıldırım & Şimşek, 2013). Each participant was assigned a unique code labeled as "PC" (Participant Code).

RESULTS

The results obtained from the semi-structured interviews are presented in this section of the article. In this study, firstly, the data were divided into codes, categories were formed from the codes, and the categories were grouped under four themes.

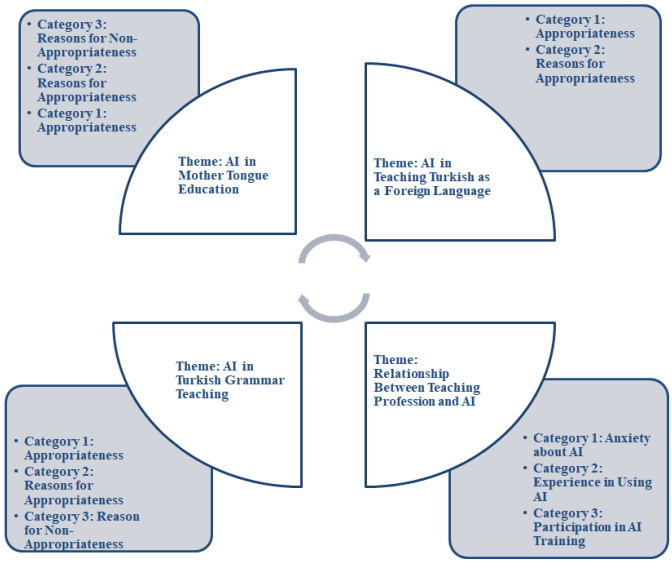

Figure1. Theme and category scheme.

The following are the results obtained from the first theme:

Theme: AI in mother tongue education

During the interviews, the teachers were asked questions about the use of AI in teaching Turkish as a native language. The teachers' answers to this question regarding the use of AI in teaching Turkish as a mother tongue are presented in Table 2, classified based on suitability and reasons.

Table 2. The suitability between AI and mother tongue teaching.

Codes	PC
AI is suitable for mother tongue teaching	P1, P5, P6, P7, P8, P9, P10, P11, P13, P14, P15, P18
AI is not suitable for mother tongue teaching	P4, P12, P19, P20
AI is partially suitable for mother tongue teaching	P2, P3, P16, P17

According to the data in Table 2, 12 participants found the use of AI in mother tongue teaching suitable. Four participants expressed a negative opinion, while another four provided a neutral comment within the framework of certain conditions. In this category the highest number of codes pertains to the appropriateness of its use.

The opinions of the teachers on the subject are as follows:

> P13: '…Yes, its use is definitely possible. Artificial intelligence can synthesize a lot of information at the same time.'
>
> P11: '…I think artificial intelligence can be used in mother tongue teaching. It can perform analysis and synthesis in composition writing, idea production, written expression, book summary creation.'
>
> P12: '…No, it's not possible because the language is Turkish.'
>
> P20: '…I do not find it appropriate to use Turkish as a mother tongue in teaching because I think it will dull creativity and accustom to readiness.'
>
> P17: '…I think it may be partially possible. Course contents can be provided for the student's learning needs.'

It is seen that teachers have diverse perspectives regarding the use of AI in mother tongue education. While some participants (P13, P11) emphasize AI's capacity for information synthesis and support in composition and idea development, others (P12, P20) express concerns that AI might negatively affect students' creativity and readiness skills. The view of P17, who considers AI partially appropriate depending on the student's needs, reflects a conditional and flexible approach. These opinions indicate that teachers do not evaluate AI as a uniformly applicable tool but rather assess its appropriateness based on specific pedagogical goals and student profiles. Teachers who view AI as supportive generally focus on technical aspects of language use, while those who are skeptical emphasize deeper cognitive skills such as creativity. This diversity highlights the importance of teacher awareness and pedagogical reasoning in integrating AI into language teaching.

Table 3 presents the reasons for whether AI is suitable for mother tongue teaching. While six codes relate to the appropriateness of using artificial intelligence in mother tongue teaching, four codes highlight its inappropriateness. The category with the highest number of codes pertains to the appropriateness of its use.

Table 3. The case of appropriateness and inappropriateness of the use of AI in mother tongue teaching.

Codes for non-appropriateness	PC	Codes for appropriateness	PC
Insufficient in theory	P4	Sufficient in practice	P10
Contrary to the structure of Turkish	P12	Assistant resource	P1, P6, P8, P15
Contrary to the ability of creative thinking	P20	Easy teaching of concrete concepts	P5
Eliminates interaction	P19	Exercise development	P7, P13
		Essay writing	P11, P14
		Teaching vocabulary	P9, P18

The opinions of the teachers on the subject are as follows:

P18: '…Yes, It can be used to learn the meaning of a word.'

P5: '…It will help in acquiring the subtleties of language and abstract concepts.'

P19: '…It is not possible because I think it will not provide active interaction.'

P4: '…No, it will be insufficient in the theory of grammar.'

The teachers' opinions reflect both supportive and critical perspectives on the role of AI in language teaching. Participants like P18 and P5 emphasize AI's practical contributions, such as facilitating vocabulary acquisition and supporting the understanding of abstract concepts. On the other hand, P19 and P4 highlight AI's limitations, especially in providing interactive learning environments and addressing theoretical aspects of grammar. These differing views suggest that while AI can serve as a useful complementary tool for enhancing certain language skills, its limitations in fostering interaction and deep grammatical understanding should not be overlooked.

Theme: AI in teaching Turkish as a foreign language

During the interviews, the teachers were asked a question about the use of AI in teaching Turkish as a foreign language. The teachers' answers to this question regarding the use of AI in teaching Turkish as a foreign language are presented in Table 4, categorized based on suitability and reasons.

Table 4. The use of AI in teaching Turkish as a foreign language.

Codes	PC
AI is suitable for teaching Turkish as a foreign language	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20
AI is not suitable for teaching Turkish as a foreign language	-

According to the data in Table 4, all the participants found the use of AI in teaching Turkish as a foreign language suitable. There were no participants who expressed a negative opinion. The quotations of the teachers on the subject are as follows:

P3: '…Yes, it can be used because it allows mutual conversation.'

P17: '…I say yes because it will offer different learning materials.'

It is understood that teachers view AI as a highly suitable tool for teaching Turkish as a foreign language. Participants (P3, P17) emphasize AI's potential in providing interactive communication opportunities and offering diverse instructional materials, which are essential in foreign language learning. The absence of negative opinions indicates that the teachers perceive AI as an effective way to overcome certain challenges in foreign language instruction, such as limited exposure and practice opportunities. This positive perspective also shows that the teachers associate AI with flexibility and resource diversity in the foreign language learning process.

Table 5. The case of appropriateness of the use of AI in teaching Turkish as a foreign language.

Codes for appropriateness	PC
Using mutual conversation	P3
Teaching idioms and proverbs	P5
Easy teaching of concrete concepts	P10
Using applications	P2, P4, P9, P11
Content specific to level differences	P13, P17
Use in translation	P15, P16, P18, P19, P20
Accepted as appropriate without reason	P1, P6, P7, P8, P12, P14

Table 5 presents the reasons for whether AI is suitable for foreign language teaching. The seven codes are related to the appropriateness of using AI in foreign language teaching. The number of participants who found it suitable without providing any reason is higher.

Theme: AI in Turkish grammar teaching

In another question during the interview, the teachers were asked to express their opinions re the use of AI in Turkish grammar teaching. The two categories, suitability and justifications, are presented in Table 6 below.

Table 6. The use of AI in Turkish grammar teaching.

Codes	PC
AI is suitable for Turkish grammar teaching	P1, P2, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20
AI is not suitable for Turkish grammar teaching	P3

As seen in Table 6, all participants except for one found the use of AI in Turkish grammar teaching suitable for various reasons. The quotations of the teachers on the subject are as follows:

> P1: '…I think it can be used at every stage of the lesson. It presents a lecture, prepares questions, makes evaluations, analyzes in line with errors.'

> P3: '…I don't think grammar can be used effectively in the learning process. I do not believe that artificial intelligence can provide accurate information.'

It is observed that most teachers consider AI appropriate for teaching Turkish grammar, highlighting its practicality in lesson delivery, assessment, and error analysis, as stated by P1. This shows that the teachers focus on AI's potential to streamline instructional processes and provide instant feedback. However, the critical perspective of P3, who questions AI's accuracy and effectiveness in grammar instruction, points to concerns about content reliability and the need for human oversight.

Table 7. The case of appropriateness and inappropriateness of the use of AI in Turkish grammar teaching.

Codes for non-appropriateness	PC	Codes for appropriateness	PC
Incompatibility with the grammar of Turkish	P3	Measurement and evaluation	P1, P2, P4, P5, P9, P10, P14, P15, P17, P19
		Repetition of the topic	P13, P16, P18
		Creating an exercise and ideas	P1, P11
		Post-learning reinforcement	P6, P10
		Shortening the educational process	P20
		Accepted as appropriate without reason	P7, P8, P12

As can be seen in Table 7, the use of AI in Turkish grammar teaching was deemed unsuitable due to the unique grammatical structure of Turkish. However, it was considered suitable for reasons such as assessment and evaluation, content creation, and reinforcement teaching.

The opinions of the teachers on the subject are as follows:

> P5: '…It can be used effectively in the measurement and evaluation process.'

P5 highlights AI's effectiveness in measurement and evaluation processes, indicating its potential for providing timely and objective feedback.

> P20: '…Yes, it can shorten the learning process.'

P20 focuses on AI's role in accelerating the learning process, suggesting that AI applications may help simplify and streamline grammar instruction.

> P10: '…Yes, it can be used. More to consolidate learning in the learning process, to make it concrete'.

Similarly, P10 emphasizes AI's contribution to reinforcing learned content and making abstract grammar rules more concrete for students.

Theme: The relationship between the teaching profession and artificial intelligence

Towards the end of the interview, the participants were asked a question regarding the relationship between the teaching profession and artificial intelligence in Turkish language education. Based on the responses obtained from the participants, concerns about artificial intelligence were first categorized into two as shown in Table 8 below.

Table 8. Anxiety about using AI working as a Turkish teacher**.**

Codes	PC
Not worried	P2, P3, P4, P5, P6, P7, P8, P9, P11, P14, P15, P16, P17, P18, P19
Worried	P1, P10, P12, P13, P20

As can be seen in Table 8, the number of teachers who expressed concerns about AI is lower than those who did not. Only five participants expressed concern that AI would take over the profession. The opinions of the teachers on the subject are as follows:

> P15: '…No, I'm not worried and I find the education-training model that is being maintained at the moment too primitive.'

Participant P15's statement reflects a view that current educational practices have significant room for improvement and that AI's current role is still limited.

> P2: '…I don't have any concerns because I know that artificial intelligence is not perfect at this stage.'

Similarly, P2's comment shows an awareness of AI's current limitations. This realistic appraisal suggests that some teachers critically evaluate AI's capabilities and therefore do not feel threatened, which is important for balanced integration of technology into teaching.

> P14: '…No, there will not be an area that artificial intelligence cannot reach at every point in the years to come.' In contrast, P14's view expresses an acknowledgment of AI's rapid and far-reaching growth.

This perspective reveals a cautious anticipation of future challenges, highlighting the need for ongoing teacher preparedness and adaptation in the face of technological advancement.

> P10: '…Yes, I am worried because artificial intelligence like the Internet, the phone, attracts the attention of students more.'

> P13: '…Yes, it is worrying that the teacher will be replaced. The lack of emotion in artificial intelligence will cause many problems in the educational process in the future.'

Teachers P10 and P13 bring attention to more affective and practical concerns. These concerns underscore the importance of maintaining a human-centered approach in education, where technology supports rather than supplants teacher-student interaction.

> P1: '…Yes, I'm worried. I think that a defense and control system such as human conscience control should be applied to an artificial intelligence system. Otherwise, malicious people can use it for their malicious intentions.'

This indicates a teacher's awareness of potential risks and the necessity for responsible governance in deploying AI in educational contexts.

Table 9. Experience of using AI in Turkish teaching.

Codes	PC
Experienced	P10
Not experienced	P1, P2, P3, P4, P5, P6, P7, P8, P9, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20

Table 9 presents findings on whether the participants have used AI-based applications in the classroom in any form. Although the number of participants who do not have concerns about AI is high, the number of those who have experienced it in the classroom is extremely low.

The quotations of the teachers on the subject are as follows:

> P10: '…Yes, I have had experience. I have set my own rules about the grammar topics I have taught, I have created events and games in my own way. It attracted a lot of attention from the students.'

This teacher's initiative in customizing AI applications to suit specific grammar lessons and designing interactive activities suggests a process-oriented mindset focused on student engagement and personalized learning. P10's experience shows that when teachers take ownership of AI integration by adapting the tools to their pedagogical goals, AI can become a valuable resource that enhances motivation and participation. However, the fact that only a few teachers share such experiences points to potential barriers such as lack of training, resources, or confidence in using AI technologies.

Table 10. The idea of participating in training on the use of AI in Turkish teaching.

Codes	PC
Consider	P1, P2, P4, P5, P6, P8, P9, P10, P11, P12, P13, P14, P15, P16, P17, P18, P20
Not consider	P3, P7, P19

Table 10 presents the participants who expressed their satisfaction or preference for attending in-service training on AI and language teaching. It is observed that the majority of the participants responded positively to this question.

The opinions of the teachers on the subject are as follows:

> P17: '…Yes, I'll think about it. Apart from content narration, I would like to be able to use artificial intelligence for events and different level groups.'

P17's statement reflects a forward-thinking and differentiated approach. The teacher aims not only to deliver content but also to utilize AI to create interactive, varied learning experiences tailored to diverse student needs, indicating an instructional focus on inclusivity and engagement.

> P4: '…Yes, I'll think about it. I would like to improve myself at every point where I can help students by using technology.'

P4's positive comment emphasizes continuous self-improvement and student-centeredness. This suggests that some teachers view AI training as a means to enhance their pedagogical skills and better support student learning through technology.

> P18: '…Yes, I'll consider joining. Because it is essential to comply with the developing and renewed era.'

P18's remark demonstrates an understanding of the necessity to keep pace with technological advances, highlighting adaptability as a key professional competence in contemporary education.

> P19: '…No, I won't think about it. I am in favor of the teaching that we make eye contact.'

> P4: '…No, I don't think it's so necessary to use artificial intelligence.'

These views (P19 and P4) underscore the value placed on human interaction and traditional pedagogical methods, reminding us that emotional connection and direct communication remain central to education for some teachers.

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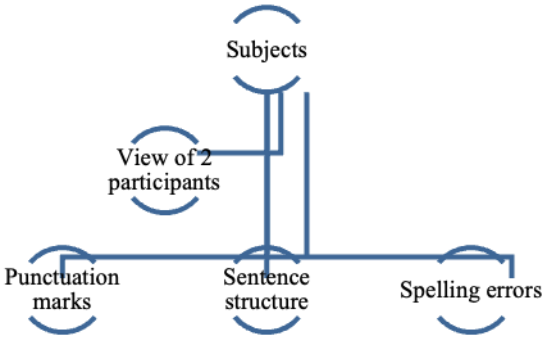

Figure 2. Suitable subjects for the use of AI in Turkish grammar.

Figure 2 shows that the grammar topics where AI can be used in mother tongue Turkish teaching include 'punctuation marks, sentence structure, and spelling errors'. Only two participants expressed their views on this issue.

DISCUSSION, CONCLUSION, and SUGGESTIONS

AI has become a part of life in many areas. One of these areas is language teaching. AI applications in both native and foreign language teaching have started to spread rapidly. In this context, teachers who are practitioners of education should get acquainted with AI. The opinions of teachers on this issue are important for the successful integration of AI applications into language teaching.

This study investigated Turkish language teachers' opinions on the use of AI in Turkish L1 instruction. The findings of the study revealed that the majority of the teachers viewed AI integration positively, particularly in areas such as measurement and evaluation, content creation, exercise development, and reinforcement teaching. Although some participants raised concerns regarding the compatibility of AI with the unique structure of Turkish language and its potential impact on creativity and human interaction, these reservations were relatively limited in number. Similar results have been found in the literature, and it has been stated that very few teachers have the same concerns when teaching Turkish to foreigners (Çangal, Çelik, & Başar, 2025). Karagöl and Bilgen (2025) found that AI provides benefits in content production, course material preparation, reducing teachers' workload in teaching Turkish as a native language, but teachers cannot fully benefit from this technology due to their lack of motivation. However, the participants have concerns about ethics, promoting simplicity and information reliability.

The acceptance of AI was even more pronounced in the context of teaching Turkish as a foreign language, where all participants acknowledged its usefulness, citing benefits such as facilitating mutual conversation, offering content for various proficiency levels, and supporting translation activities. Nowadays, many applications related to the use of AI in foreign language teaching – especially English teaching- have been developed (Jia-Cing, 2023; Kanan & Munday, 2018; Mohammed & Ja'ashan, 2024, Winaitham, 2022). The research results show that AI has various positive contributions to foreign language teaching. Natural language processing (NLP), machine learning, and deep learning applications make a great contribution to English language teaching (Lalira et al., 2024). Diversity and complexity in English language learning and teaching, including the levels of English teachers and students, could be the basis of the language industry in the future according to Winaitham (2022). It is stated that AI provides powerful tools to improve personalized learning experiences in foreign language learning, increase student participation, provide feedback and correction, improve teaching methods for teachers, monitor student development, and facilitate administrative responsibilities (Agrawal, 2024). In a study conducted in Indonesia, EFL teachers at a university stated that AI is especially effective in developing students' skills of structuring their ideas more effectively (Lalira et al., 2024). Kardoğan and Kardaş (2025, p. 161) argued that the use of artificial intelligence in educational activities can provide positive contributions to educators.

In some of the studies on Turkish, the purpose of AI is to produce texts according to different levels (Tekeli & Yeşil, 2024; Kastı & Can, 2024). It has been concluded that AI increases the motivation of the student in teaching Turkish to foreigners, contributes to individual learning, and supports the development of language skills. Trainers have stated that they usually use AI tools to develop materials that offer interactive content and to create text, image and even audio files (Çangal, Çelik, & Başar, 2025). Zileli (2023) investigated the applicability of CHATGPT in teaching Turkish to foreigners in subject areas such as dialogue formation, the meaning of words, sentences and texts, translation and feedback, pronunciation, narration with examples and preparation of exercises. In grammar teaching specifically, most participants affirmed AI's potential for improving learning processes through assessment, topic reinforcement, and shortening the educational timeline. When examining the views on the use of AI tools for learning Turkish, positive effects are highlighted in terms of learning words and meanings, learning speed, learning by gamification, learning grammar rules and practice (Küçük & Solak, 2025; p. 15).

In the studies on the effect of AI on grammar teaching, it has been revealed that teaching using AI tools has an effect on student performance (Kim, 2019; Chang et al., 2021; Schmidt-Fajlik, 2023). In these studies, it has been concluded that AI tools, especially Grammarly and ChatGPT, improve grammar ability in various academic programs (Lalira, et al., 2024, Fitria, 2022; Shloul et al., 2024). In another study that measures the effectiveness of interactive Chatbox application in grammar teaching, the findings were found out to be in favor of the experimental group (Kim, 2019). Also, Fitria (2022) revealed that Grammarly application can be used to evaluate students' writings in terms of both grammatical and mechanical (spelling, punctuation and capitalization) errors. Intelligent teaching systems can identify grammatical errors, help students learn the rules, and facilitate the evaluation process of teachers (Ni & Cheung, 2023; Yeşilyurt, 2023). A study conducted in Saudi Arabia showed that the feedback of AI is open, constructive and very useful for grammar learning. In addition, the application enabled students to consolidate their learning, increased their participation levels and motivation (Winaitham, 2022). In a study conducted with Turkish teacher candidates, similar results were reached to those in the world. Although teacher candidates state that AI can lead to incorrect learning and weaken the language-culture relationship, they believe that it would facilitate grammar teaching, contribute to material preparation, and make learning processes interesting (Köroğlu & Kana, 2025).

Despite the generally positive attitudes, the present study also highlighted a gap between perceptions and actual classroom practices, as only a small number of teachers had practical exposure to using AI tools. Nevertheless, a significant majority expressed interest in receiving in-service training on AI integration into language education, signaling a readiness to adapt to technological advancements. In a study conducted on teaching Turkish to foreigners, in contrast to this study, it was found that more than half of the teachers used AI tools. It is stated that the reason for not using AI in the mentioned study is due to lack of information, as in this study (Çangal et al., 2025). At this point, providing in-service training to teachers on AI will increase usage. In a study where educational opinions about the use of AI in Turkish teaching were taken, it is pointed that the use of AI has both potentials and limitations. It has been stated that AI will contribute to the development of language skills and can enrich individualized learning (Karagöl & Bilgen, 2025). However, similar concerns to those of some teachers have emerged in studies conducted on academicians, teachers and teacher candidates. Serious concerns have been expressed on issues such that AI can lead to laziness and create ethical problems, lack of emotions, and lead to incorrect learning (Karagöl & Bilgen, 2025; Köroğlu & Kana, 2015). In research, it has been found that teachers cannot make full use of this technology due to their lack of motivation, so there is a need for in-service training (Karagöl & Bilgen, 2025). Overall, the findings suggest that while Turkish language teachers recognize the transformative potential of AI in grammar and Turkish teaching, successful implementation will require addressing concerns related to linguistic nuances and the preservation of critical human-centered educational values. Future research could further explore long-term effects of AI use on language acquisition and teacher-student interaction dynamics in Turkish language education.

In the context of this study, the results can be summarized as follows:

- The most Turkish language teachers have positive views about the integration of AI and AI-supported tools in grammar teaching.
- Teachers believe that AI can be effectively used in measurement and evaluation, content creation, developing exercises, reinforcement and practice activities.
- A minority of teachers expressed concerns, especially about AI's compatibility with Turkish grammar structure, potential reduction in creativity, and decrease in human interaction during learning.
- All the participants agreed that AI is very beneficial in teaching Turkish as a foreign language, highlighting points such as: support for speaking and conversation practice, content provision across different proficiency levels, and assistance in translation tasks.
- In grammar instruction, teachers emphasized that AI could enhance the evaluation of student learning, strengthen topic reinforcement, shorten the time needed for effective grammar teaching.
- Although attitudes are mostly positive, few teachers have actually experienced AI-supported grammar teaching tools in practice.
- The majority of teachers expressed a strong desire to receive in-service training about using AI in language education.
- There are also those who have concerns about AI among teachers and are still likely to use AI.

Suggestions

Systematic and practical in-service training programs should be developed to increase Turkish language teachers' competence and confidence in using AI technologies in grammar teaching. Moreover, AI-supported educational tools should be designed with sensitivity to the unique structural and morphological characteristics of the Turkish language to ensure linguistic accuracy and educational effectiveness. Also, educational practices should emphasize a balanced integration of AI tools with teacher-student interaction, in order to preserve creativity, critical thinking, and interpersonal communication skills. Finally, further longitudinal studies should be conducted to investigate long-term effects of AI use on students' grammar proficiency, motivation, and overall language competence. The research can also be carried out with different sample groups.

Ethics and Conflict of Interest

The research was approved by the Scientific Research Ethics Committee of Eastern Mediterranean University (18/03/2024/ETK00-2024-0049) and by the Directorate of the General Secondary Education Department of the Ministry of National Education of Northern Cyprus (21/05/2024/GOÖ.0.00-174/06-24/E.8255). The authors declare that they acted in accordance with ethical rules in all processes of the research. The authors declare that they have no conflict of interest.

Author Contribution

All authors contributed equally to the research.

Data availability

The data that support the findings of this study are available on request from the corresponding author.

Corresponding Author

Correspondence to Dilan Kalaycı Alas, dilan.kalayci@emu.edu.tr

REFERENCES

Agrawal, P. (2024). Role of artificial intelligence in teaching and learning English language. *International Journal for Multidisciplinary Research*, *6*(3), 1-6. https://doi.org/10.36948/ijfmr.2024.v06i03.22148

Akkaya, N., & Çıvğın, H. (2021). Artificial intelligence in Turkish education. *The Journal of International Education Science, 8*(29), 308-322. https://doi.org/10.29228/INESJOURNAL.53915

Banguoğlu, T. (1990). *Türkçenin grameri* [in Turkish]. Ankara: Türk Dil Kurumu Yayınları

Banaz, E., & Demirel, O. (2024). Investigation of artificial intelligence literacy of prospective Turkish teachers according to different variables. *The Journal of Buca Faculty of Education, 60*, 1516-1529. https://doi.org/10.53444/deubefd.1461048

Bin, Y., & Mandal, D. (2019). English teaching practice based on artificial intelligence technology. *Journal of Intelligent & Fuzzy Systems, 37*(3), 3381-3391. https://doi.org/10.3233/JIFS-179141

Chang, T., Li, Y., Huang, H., & Whitfield, B. (2021). Exploring EFL students' writing performance and their acceptance of AI-based automated writing feedback. ICEDS '21: Proceedings of the 2021 2nd International Conference on Education Development and Studies. https://doi.org/10.1145/3459043.3459065

Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. IEEE Access, 8, 75264–75278. https://doi.org/10.1109/access.2020.2988510

Chen, X., Zou, D., Xie, H., & Cheng, G. (2021). Twenty years of personalized language learning: Topic modeling and knowledge mapping. *Educational Technology & Society, 24*(1), 205-222.

Creswell-John, W. (2016). *Research design*. Trans. Ed.: Selçuk Beşir Demir. Ankara: Eğiten Kitap.

Çangal, Ö., Çelik, M. E., & Başar, U. (2025). Yabancılara Türkçe öğretiminde yapay zekâ kullanımına yönelik öğretici görüşleri [Instructors' perspectives on the use of artificial intelligence in teaching Turkish as a foreign language]. *Aydın Tömer Dil Dergisi, 10*(1), 57-97.

Çeçen, M. A., & Aytaş, G. (2008). Metne dayalı dil bilgisi öğretiminin sekizinci sınıf öğrencilerinin dil bilgisi başarısına etkisi [Impact of teaching grammar through text on 8th grade students' grammar achievement]. *Van Yüzüncü Yıl University Journal of Education, 5*(1), 133-149.

Dolunay, K. S. (2010). Dil bilgisi öğretiminin amacı ve önemi [The aim and the importance of grammar teaching]. *Journal of Turkology Research, (27*), 275-284.

Ekşi, S., Kır, N., & Benzer, A. (2021). Dil bilgisi öğretimine ilişkin öğretmen ve öğrenci görüşleri [Teachers' and students' opinions on grammar teaching]. *Recep Tayyip Erdoğan University Faculty of Education Journal, 1*(1), 58-79.

Elmas, Y., & Yücel, D. (2024). Yabancı dil Türkçe öğretiminde istem mühendisliği teknikleriyle sohbet robotlarının kullanımı [The use of chatbots with prompt engineering techniques in teaching Turkish as a foreign language]. *Journal of Criminology Sociology and Law, 5*(9), 54-83.

Erdem, İ., & Çelik, M. (2011). Dil bilgisi öğretim yöntemi üzerine değerlendirmeler [Evaluations on grammar teaching methods]. *Electronic Turkish Studies, 6*(1), 1057-1069. http://dx.doi.org/10.7827/TurkishStudies.1988

Fang, L., Tuan, L. A., Hui, S. C., & Wu, L. (2018). Personalized question recommendation for English grammar learning. *Expert Systems, 35*(2), e12244. http://dx.doi.org/10.1111/exsy.12244

Fitria, N., T. (2022). Identifying grammatical and mechanical errors of students' writing: Using "Grammarly" as an online assessment. *Lingua Didaktika, 16*(2), 169-184. http://dx.doi.org/10.24036/ld.v16i2.116824

Gaithi-Al, A., & Behforouz, B. (2024). The use of an interactive Chatbot in grammar learning. *Journal of Education Online, 21*(4), 1-10.

Güneş, F. (2013). Dil bilgisi öğretiminde yeni yaklaşımlar [New approaches in teaching grammar]. *Journal of Language and Literature, 2*(7), 71-92.

Güven, A. Z. (2013). Dil bilgisi konularının öğretim sorunları [Problems of teaching linguistics subjects]. *Journal of Language and Literature Education, 2*(6), 1-10. https://www.ajindex.com/dosyalar/makale/acarindex-1423875300.pdf

Haykır, H. A., & Ağrelim, H. T. (2022). Türkçe ders kitaplarındaki dil bilgisi etkinliklerinin dil bilgisi öğretim yöntemleri bakımından incelenmesi [Analysis of grammar activities in Turkish textbooks in terms of grammar teaching methods]. *Kırşehir Ahi Evran University Faculty of Education Journal, 23*(2), 1691-1734. http://dx.doi.org/10.29299/kefad.1028371

Huang, X., Zou, D., Cheng, G., Chen, X., & Xie, H. (2023). Trends, research issues and applications of artificial intelligence in language education. *Educational Technology & Society, 26*(1), 112-131. https://doi.org/10.30191/ETS.202301_26(1).0009

Jiang, R. (2022) How does artificial intelligence empower EFL teaching and learning nowadays? A review on artificial intelligence in the EFL context. *Front. Psychol., 13*,1049401. https://doi.org/10.3389/fpsyg.2022.1049401

Liang, J. C., Hwang, G. J., Chen, M. R. A., & Darmawansah, D. (2023). Roles and research foci of artificial intelligence in language education: an integrated bibliographic analysis and systematic review approach, *Interactive Learning Environments, 31*(7), 4270-4296, https://doi.org/10.1080/10494820.2021.1958348

Kaleli, A., & Özdemir, C. (2025). Yapay zekâ destekli dil öğretiminde yeni bir yaklaşım: Türkçenin yabancı dil olarak öğretiminde yapay zekâ uygulamaları [A new approach to AI-assisted language teaching: Artificial ıntelligence applications in Teaching Turkish as a foreign language]. *International Journal of Social Sciences and Academic Research, 2*(3), 77-91. https://doi.org/10.52096/issar.02.03.05

Karagöl, E., & Yıldırım Bilgen, D. (2025). Türkçe eğitiminde yapay zekâ kullanımı: Türkçe eğitimcileri yapay zekâ hakkında ne düşünüyor? [The use of artificial ıntelligence in Turkish language education: What do Turkish language educators think About AI?]. *Journal of Mother Tongue Education, 13*(2), 356-374. https://doi.org/10.16916/aded.1611540

Kardoğan, M., & Kardaş, N. (2025). Türkçeyi yabancı dil olarak öğreten eğitimcilerin yapay zekâ uygulamalarına ilişkin görüşleri [Opinions of educators teaching Turkish as a foreign language on artificial ıntelligence applications]. *Mediterranean Educational Research Journal, 19*(52), 159-180.

Karasar, N. (2015). Bilimsel araştırma yöntemi [in Turkish]. Ankara: Nobel Publications.

Kannan, J., & Munday, P. (2018). New trends in second language learning and teaching through the lens of ICT, Networked Learning, and Artificial Intelligence. In: Fernández Juncal, C. and N. Hernández Muñoz (eds.) Vías de transformación en la enseñanza de lenguas con mediación tecnológica. Círculo de Lingüística Aplicada a la Comunicación 76, 13-30. http://dx.doi.org/10.5209/CLAC.62495

Katı, T. N., & Can, U. (2024). Usability of texts generated by artificial intelligence for reading skills in teaching Turkish as a foreign language: the example of ChatGPT-3.5, *Inonu University Journal of the Faculty of Education, 25*(2), 538-569. http://dx.doi.org/10.17679/inuefd.1415303

Kessler, G. (2018). Technology and the future of language teaching. *Foreign Language Annals, 51*(1), 205-218. https://doi.org/10.1111/flan.12318

Kim, Y-N. (2019). A study on the use of artificial intelligence Chatbots for improving English grammar skills. *Journal of Digital Convergence, 17*(8), 31-46. https://doi.org/10.14400/JDC.2019.17.8.037

Kim, N. Y., Cha, Y., & Kim, H. S. (2019). Future English learning: Chatbots and artificial intelligence. *Multimedia-Assisted Language Learning, 22*(3), 32-53. https://doi.org/10.15702/mall.2019.22.3.32

Köroğlu, A., & Kana, F. (2025). Türkçe öğretmeni adaylarının dil öğretiminde yapay zekâ kullanımına ilişkin görüşleri [Turkish teacher candidates' views on the use of artificial intelligence in language teaching]. *Journal of Bayburt Education Faculty, 20*(45), 1-37. https://doi.org/10.35675/befdergi.1560034

Küçük, E., & Solak, Ö. (2025). Yabancı dil olarak Türkçe öğretiminde yapay zekâ kullanımına dair öğrenici görüşleri [Learners' perspectives on the use of artificial intelligence in teaching Turkish as a foreign language]. *Avrasya Dil Eğitimi ve Araştırmaları Dergisi, 9*(1), 1-22.

Lalira, E. J., Yopie, A. T., Pangemanan, Y., T.,A., Scipio, E. J., Lumi, S., Merentek, C.,T., & Tumuju, N. (2024). Evaluating the impact of AI tools on grammar mastery: A comparative study of learning outcomes. *VELES Journal, 8*(3), 701-713. http://dx.doi.org/10.29408/veles.v8i3.27856

Lo, J., Wang, M., H., & Yeh, S-W. (2004). Effects of confidence scores and remedial instruction on prepositions learning in adaptive hypermedia. *Computers & Education, 42*(1), 45-63. https://doi.org/10.1016/S0360-1315(03)00064-2

Mohammed, S. M. G., & Ja'ashan, H., N. M. M. (2024). Exploring the effect of AI-driven contextual conversations on EFL grammar learning at university level in Saudi Arabia. *Journal of Ecohumanism, 3*(8), 11909-11924. https://doi.org/10.62754/joe.v3i8.5790

Ni, A., & Cheung, A. (2023). Understanding secondary students' continuance intention to adopt AI-powered intelligent tutoring system for English learning. *Education and Information Technologies, 28*(3), 3191-3216. https://doi.org/10.1007/s10639-02211305-z

Pandarova, I., Schmidt, T., Hartig, J., Boubekki, A., Jones, R. D., & Brefeld, U. (2019). Predicting the difficulty of exercise items for dynamic difficulty adaptation in adaptive language tutoring. *International Journal of Artificial Intelligence in Education, 29*(3), 342-367. https://doi.org/10.1007/s40593-019-00180-4

Sağır, M. (2002). *İlköğretim okullarında Türkçe dil bilgisi öğretimi* [in Turkish]. Ankara: Nobel Publications.

Schmidt-Fajlik, R. (2023). ChatGPT as a grammar checker for Japanese English language learners: A comparison with Grammarly and ProWritingAid. AsiaCALL *Online Journal, 14*(1), 105–119. https://doi.org/10.54855/acoj.231417

Shloul, T. A., Mazhar, T., Abbas, Q., Iqbal, M., Ghadi, Y. Y., Shahzad, T., Mallek, F., & Hamam, H. (2024). Role of activity-based learning and ChatGPT on students' performance in education. *Computers and Education Artificial Intelligence, 6*, 100219. https://doi.org/10.1016/j.caeai.2024.100219

Syatriana, E., & Jumiaty, A. A. (2025). The impact of cultural factors on reading anxiety of EFL students. *Professional Journal of English Education, 8*(4), 937-942.

Şahin, E. Y., & Abacı, O. (2019). Dil bilgisi öğretiminin önemi, amaçları ve ilkeleri: Bir literatür özeti [The importance, objectives and principles of language teaching: Summary of a literature]. *Journal of Education, Theory and Practical Research, 5*(3), 286-294.

Şen, E. (2023, September). Türkçenin köken dili, anadili, yabancı dil olarak öğretiminde yapay zekâ araçları [in Turkish]. In *International Symposium on Teaching Turkish as A Heritage and Foreign Language* (p. 35). Brussels/ Belgium 26-27 September 2023 https://isohtel.com/ISOHTEL_2023_ABSTRACTS.pdf#page=36

Tekeli, M., & Yeşil, Y. (2024). Yabancılara Türkçe öğretiminde geleneksel ve yapay zekâ destekli metin sadeleştirmenin toplum dilbilimsel açıdan incelenmesi: Muallim Naci'nin Ömer'in çocukluğu örneği [A sociolinguistic analysis of traditional and artificial ıntelligence supported text simplification in teaching Turkish to foreigners: The example of muallim Naci Ömer'in çocukluğu]. *TURKAV Public Administration Institute Social Sciences Journal, 4*(1), 195-230. https://doi.org/10.5281/zenodo.11577561

Ünveren, D. (2024). Dil eğitiminde yapay zeka ve teknoloji: Bibliyometrik bir analiz [in Turkish]. *Journal of Language Education and Research, 10*(2), 218-242. https://doi.org/10.31464/jlere.1463861

Yesilyurt, Y. E. (2023). *AI-enabled assessment and feedback mechanisms for language learning*. In Kartal, G. (Eds.). Transforming the language teaching experience in the age of AI. (pp. 25–43). IGI Global. https://doi.org/10.4018/978-1-6684-9893-4.ch002

Yıldırım, A., & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri* [in Turkish]. Ankara: Seçkin Publishing.

Wang, S., Wang, F., Zhu, Z., Wang, J., Tran, T., & Du, Z. (2024). Artificial intelligence in education: A systematic literature review. *Expert Systems With Applications, 252*, 124167. https://doi.org/10.1016/j.eswa.2024.124167

Winaitham, W. (2022, October). The scientific review of AI functions of enhancement English learning and teaching. In 2022, *13th International Conference on Information and Communication Technology Convergence (ICTC)* (pp. 148-152). IEEE. https://doi.org/10.1109/ICTC55196.2022.9952632

Xu, Z., Wijekumar, K., Ramirez, G., Hu, X., & Irey, R. (2019). The effectiveness of intelligent tutoring systems on K-12 students' reading comprehension: A meta-analysis. *British Journal of Educational Technology, 50*(6), 3119–3137. https://doi.org/10.1111/bjet.12758

Zileli, N., E. (2023). ChatGPT example in learning Turkish as a foreign language. *International Journal of Karamanoğlu Mehmetbey Educational Research, 5*(1), 42-51. https://doi.org/10.47770/ukmead.1296013

About the authors:

Dilan Kalaycı Alas, Dr.
She is a doctoral faculty member at Eastern Mediterranean University, Faculty of Education, Department of Classroom Education. She teaches undergraduate courses at her affiliated university. Her research interests include Turkish language teaching, basic language skills (listening, speaking, reading and writing) and AI in Turkish teaching. In this regard, she incorporates her findings on the four basic language skills in Turkish language teaching, the use of artificial intelligence, and Turkish language teacher training into her academic studies through contemporary approaches.

Ahmet Pehlivan, Prof.Dr.
He is a Professor in the Department of Turkish Language Education at the Faculty of Education, Eastern Mediterranean University. He teaches undergraduate and graduate courses at his affiliated university. His research interests include Turkish language education and Turkish grammar instruction. He evaluates the findings obtained from his studies in these areas with a focus on the linguistic features and grammar of Turkish, as well as the education of prospective Turkish language teachers.

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eTWINNING AS A COLLABORATION PLATFORM IN EDUCATION: eTWINNING PROJECTS IN LANGUAGE EDUCATION IN THE CONTEXT OF TEACHERS' VIEWS

Aslı MADEN
Assoc.Prof.Dr., Bayburt University Faculty of Education, Bayburt, Türkiye
ORCID: https://orcid.org/0000-0002-3336-0198
aslimaden@bayburt.edu.tr

Mevhibe Kübra HANÇER
Teacher, Bayburt Science High School, Bayburt, Türkiye
ORCID: https://orcid.org/0009-0002-6992-3009
mevhibe_kubra@hotmail.com

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Abstract

The eTwinning activities carried out through the European School Education Platform are an exemplary model of integrating technology and curriculum in education. This platform, which the European Commission supports, fosters collaboration between educators and students at both national and international levels. Through this platform, students encounter diverse cultures and enhance their language skills. Using project-based learning in this context fosters the acquisition of 21st-century skills, including critical thinking, creativity, collaboration, and communication. However, research focusing on the role of eTwinning projects in language education is limited. The present study aims to examine the effects of eTwinning projects (a network-based learning environment supported by the European Union) on language education, based on teachers' views. The research utilised the case study method, a qualitative research design. The study's participants included 48 English language educators working within the city center of Bayburt. The study's findings were collected using semi-structured interviews, providing a comprehensive overview of the participants' perceptions. The analysis of the findings showed that most respondents found eTwinning projects to be effective in the context of language education. Consequently, the study findings suggested organizing seminars on new research and regulations, coordinating eTwinning projects, making planning announcements, and ensuring curricula compliance.

Keywords: European Union, eTwinning, language education, teacher.

INTRODUCTION

Today, the rapid advancement of technology has caused fundamental changes in the field of education and reshaped the learning-teaching processes. Many variables affect educational systems and teaching practices. Technology has a special place among these. Technological developments affect human life entirely and change every element of the education ecosystem. The speed of technology has caused radical changes in every field, from educational programs to materials, from environment design to teacher training, and has reshaped the learning-teaching processes. With the change experienced, different approaches and methods were needed in educational environments. As a result of this need, traditional education methods have been replaced by innovative teaching methods where technology can be used actively. According to Gündüz-Çetin and Gündoğdu (2022), considering the rapidly increasing technological innovations in the age we live in, it is a necessity for education to adapt to these innovations. With these innovative teaching methods, education has become more interactive and accessible. Heafner (2004) emphasized that technology empowers students by involving them in learning. According to Külekçi (2023), teachers must have the necessary knowledge and skills to introduce students to current educational tools properly.

Literature Review

As in every field of education, language teaching also experiences technological integration. The use of digital tools in teaching mother tongue and foreign languages is rapidly becoming widespread. In the context of distance learning, Web 2.0 tools, and artificial intelligence applications, there is an integration in language education (Maden & Önal, 2020; Maden & Önal, 2022; Maden, Avşar, & Misir, 2024; Maden & Yetişensoy, 2024). Technology's innovative tools and applications have made learning more accessible, personalized, and fun in language education. According to Demirekin (2023), educational technology tools contribute to increasing the active participation of language learners and maximizing positive language learning results. Again, according to Demirekin (2023), thanks to technology-supported educational applications, students can focus more on learning a specific language skill. The digital tools and platforms used in this process make it easier for students to access information while offering teachers more creative and flexible teaching methods. The technological transformation in education has also affected the policies and practices of international institutions and organizations. The European Union has taken important steps in this regard. The European Union has established a network that includes the Ministries of Education in its member and candidate countries to ensure standardization and cooperation in education. The name of this network is European Schoolnet. This formation provides technical and operational support for projects carried out in member countries' schools and other educational institutions. In addition, European Schoolnet manages cooperation activities for the cooperation between schools and the professional development of teachers. One of the most prominent of these activities is the eTwinning projects.

eTwinning events, which have been carried out since 2022 through the European School Education Platform (ESEP), are an important example of the effective use of technology in education. eTwinning is an educational community and collaborative learning platform for teachers and students in Europe, launched by the European Commission in 2005, and is an action for schools funded by the European Commission within the scope of Erasmus + (Ministry of National Education [MNE], 2023). eTwinning is a secure internet platform that offers a range of activities for schools at national and international levels, such as joint projects, collaboration spaces, and professional development opportunities for teachers (Kearney, 2016). This platform provides online tools for teachers to find partners, create projects, share ideas, exchange best practices, and start working together immediately using various customized tools in the system (MNE, 2025). eTwinning is supported by the European Commission and brings teachers and students together. This platform aims for students to meet different cultures, develop their language skills, and gain 21st-century skills such as critical thinking, creativity, collaboration, and communication through project-based learning. According to the eTwinning Activity Booklet (MNE, 2019, p. 10), eTwinning activities are Europe's largest eTwinning platform where teachers work on projects with their students, increase their personal and professional development, and share knowledge and skills by working collaboratively. eTwinning projects allow students to develop not only their academic knowledge but also their social and cultural skills.

In Turkey, eTwinning activities have been carried out under the Ministry of National Education's Directorate General of Innovation and Educational Technologies since 2009. Under the coordination of this unit, teachers all over the country, together with their students, carry out projects with domestic and international partners and increase their personal and professional development. The most important elements of eTwinning projects include teachers, students, and schools. While teachers work on projects for their students, they also have the opportunity to see the work of other colleagues in Europe (Çınar, Avaroğlu, Tunç, & Taşkaya, 2024). In addition, eTwinning projects provide a substantial communication opportunity between partners, encouraging creativity and entrepreneurship (Gençtürk-Erdem et al., 2021). eTwinning improves the use of information technologies by teachers and students, ensures technology integration in education, uses innovative teaching methods and techniques, and increases education quality by benefiting from national and international examples.

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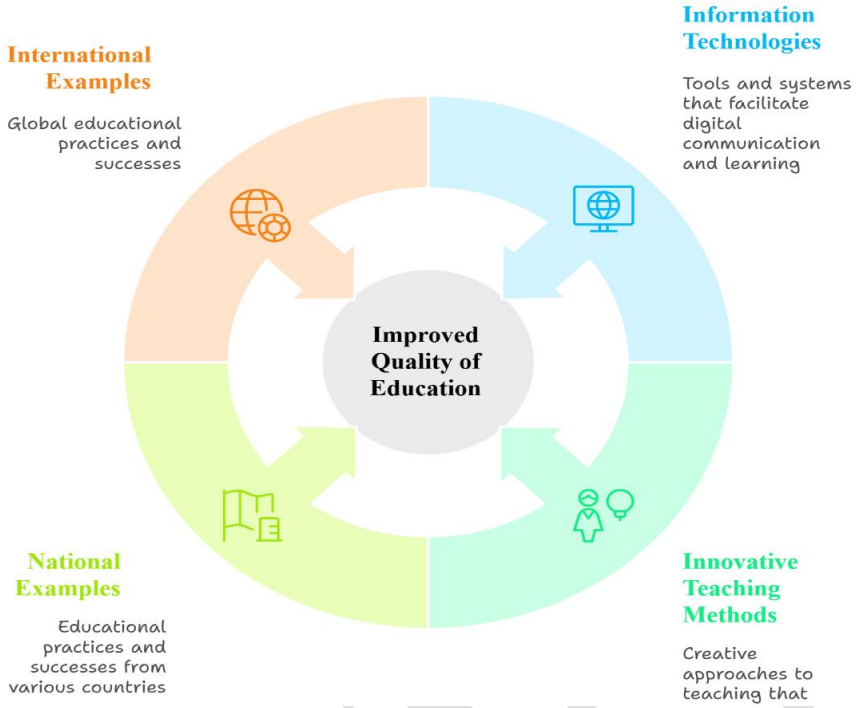

Figure 1. eTwinning educational enhancement cycle.

In 2022, eTwinning was integrated with the School Education Gateway and Teacher Academy under the European School Education Platform (ESEP) umbrella. The EU Login portal, the European Commission's electronic identity authentication service, allows access to platforms managed by the European Commission using a single email address and password (MNE, 2023). The eTwinning process starts with a project idea. In this process, which starts with a project idea, teachers first register on this platform and search for partners by presenting their project ideas through the tools and forums offered on the platform. For the projects to be realized, at least two teachers prepare a draft project and volunteer teachers who want to participate in the project are brought together through the partner-finding forums on the portal (Karataş & Öztay, 2023). After establishing the project partnership, students must also be added to the system in line with e-security measures. Digital literacy and e-security are important criteria in eTwinning projects (Gençtürk-Erdem et al., 2021). In the project workspace called TwinSpace, permission must be obtained from parents before sharing information about students, and the necessary e-security measures must be taken to share (MNE, 2023). In this way, partners can carry out their projects as student-teacher collaboration with the help of various web tools. Students communicate with both Turkish and foreign peers.

eTwinning from Student and Teacher Perspectives

eTwinning projects are that they encourage students to produce solutions to basic academic subjects and real-life problems. For this purpose, they adopt an interdisciplinary and collaborative approach. According to Uslu-Kaplan and Alkan (2023), although eTwinning has advantages in many different areas, its most significant impact is the adaptation of information technologies to courses and the interdisciplinary approach to education. In addition to their primary purpose, these projects improve students' communication skills in foreign and native languages, increasing their digital literacy and technology use competencies. For example, within the scope of an eTwinning project, students from different countries collaborate on a common digital platform to research a specific subject and share their findings. This process contributes to both students' academic competencies and language and digital skills development.

eTwinning projects also have many benefits for teachers. They provide important opportunities for teachers' professional development. Teachers discover innovative teaching methods through these

projects and increase their technology use competence. In addition, eTwinning projects allow teachers to participate in international collaboration networks, expand this network, and learn about different education systems. Teachers actively use various Web (2.0) tools while carrying out their projects on the platform. This increases teachers' professional motivation and makes bringing innovative educational practices to their classes easier. Teachers stand out from their colleagues thanks to the student-centered, active, and collaborative methods and web tools they use. In this way, they increase both their individual development and the quality of teaching in the classroom.

When the relevant literature is examined, it is revealed that eTwinning projects improve the skills of teachers and students in using foreign languages, information technologies, and Web 2.0 tools in addition to academic development. In his study on the subject, Gajek (2018) emphasizes that eTwinning applications have an integrative role in ensuring curriculum integration at the international level. Camilleri (2016) stated that these projects effectively teach students 21st-century skills. In his research, Crisan (2014) identified that eTwinning projects contribute to students' use of ICT in teaching and learning, socio-constructivism, establishing interdisciplinary connections, student-centeredness, and introducing new methods and strategies. In the Karataş and Öztay (2023) study, teachers stated that participation in eTwinning projects also contributes to students' foreign language development. Again, in the same study, it was observed that students socialized by meeting different cultures and that their academic success increased. In Fazlı, Köse, and Fazlı (2024) research, eTwinning projects also improve students' collaborative learning, digital, and modeling skills. In their research, Çetin-Cengiz and İzci (2021) agreed that eTwinning projects raise students' awareness of every subject, offer the opportunity to learn with fun, and increase their interest in technology. Demir et al. (2023) also believed these projects provide teachers with innovation, experience, and a different perspective. Huertas-Abril and Muszynska (2022) also determined in their research that eTwinning tools provide multimodal communication and the development of new social applications and social learning strategies between them. eTwinning projects significantly benefit students in 21st-century multicultural Europe by improving language skills, enhancing digital competencies, providing active practical experience and exposing them to different educational and cultural contexts (Çetin & Gündoğdu, 2022; Şahin et al., 2024; İnce & Çelik, 2024). In addition to these academic benefits, eTwinning projects can provide a multicultural and disciplined educational environment for students and teachers. They also promote individual and institutional engagement, tolerance, and responsibility. eTwinning projects are also considered to strengthen teachers' professional competencies (Huertas-Abril et al., 2025; Uslu-Kaplan & Alkan, 2023). It is anticipated that the research will enhance awareness of eTwinning projects among teacher training institutions and educators. It is also anticipated that these projects will be given greater importance and that these platforms will be utilised more widely across disciplines for various purposes. In addition, eTwinning projects have been demonstrated to be effective in developing individuals who are well-equipped and active in the skills required for the 21st century. It is imperative to acknowledge the significance of this feature within the context of school culture, and to direct attention towards its effective integration and utilisation. On the other hand, it is seen that research focusing on the role of eTwinning projects in language education is limited. In this direction, it is envisaged that a study evaluating the effects of eTwinning projects in the context of language education from the perspective of students and teachers will be useful in filling the gap in the field.

The research examines the effects of eTwinning projects, which are network-based learning environments implemented and supported by the European Union, on language education based on teachers' views. In line with this purpose, the following sub-problems were sought in the research:

1. Are eTwinning projects effective in language teaching?
2. Which language skills (listening, speaking, reading, writing) of teachers and students are developed more through eTwinning projects?
3. Are the language education projects on the eTwinning portal followed?
4. Are Web 2.0 tools utilised in eTwinning projects?

METHOD

Research Design

A qualitative research approach was adopted in this study, which examines the effectiveness of eTwinning projects in language education. The research is a descriptive case study. Merriam (2013) defines a case study as an in-depth description and examination of a limited system. In addition, Creswell (2007) explains a case study as a researcher's in-depth examination of one or several situations limited in time using data collection tools (observations, interviews, audiovisuals, documents, reports) containing multiple sources. Accordingly, in the study, the opinions of language teachers who participated in eTwinning projects on the effectiveness of these activities in language teaching were sought, and in line with their opinions, the process was tried to be evaluated comprehensively in terms of impact aspects, awareness, and use of technology.

Working Group

The research study group consists of 48 English teachers working in the central district of Bayburt province. The study group consisted of 38 female and 10 male teachers. Thirty-five of the participating teachers had over 10 years of experience, 10 had 7-9 years, and 3 had 1-5 years. Since eTwinning projects are mostly carried out with international groups, it aimed to obtain teachers' opinions in the context of foreign language education. For this reason, English teachers from branches that are commonly involved in projects in the country were selected for the study group. Since the research group included teachers working in different schools, it was decided to choose the purposive sampling method.

Data Collection Tools

The study data was collected using the Teacher Interview Form for eTwinning Projects. The semi-structured interview form was applied with two short-answer questions about personal information and four open-ended questions about the research purpose. To ensure the validity of the interview form, the opinions of Educational Sciences field experts (n=3) and English teachers (n=2) were sought. In line with the opinions of the experts and teachers, the form was subjected to a pilot application (on 10 English teachers). The draft interview form was created with 6 questions. After the pilot application, it was decided to apply it with 4 questions by removing 2 questions due to similarity in terms of scope. The interview form created in this direction was delivered to the teachers in the study group who voluntarily participated in the research via electronic media (Google forms), email, social media tools, WhatsApp, etc. Similarly, a one-week response time was allocated, and responses were to be submitted digitally.

Data Analysis

Qualitative data analysis techniques were used to analyze the data. In this context, descriptive and content analysis were used together to analyze the study data. The descriptive analysis process uses coding, classification, and definition processes (Glesne, 2012). The content analysis process includes the processes of bringing together similar data/data sets under certain concepts, categories, and themes and interpreting the data in a way that the reader can understand (Yıldırım & Şimşek, 2013). In this context, in the research, firstly, the teachers' opinions about the effects of eTwinning projects on language education were classified in a general framework with descriptive analysis. Content analysis was used to examine the described opinion themes, coding them and dividing them into subcategories. The effectiveness of eTwinning projects was analysed, with opinions being categorised as *positive* or negative. In addition, data on contributions to language skills was analysed under the themes of *listening, speaking, reading, writing*, and *all skills*. Furthermore, the responses pertaining to the utilisation of Web 2.0 tools were categorised into binary themes of *positive* and *negative* responses. In addition, the frequencies of the opinions obtained during the coding process were determined, and numerical data supported the categories created in this way.

Reliability

A series of procedures were carried out to ensure the reliability of the findings obtained in the research. The reliability of a research is possible by ensuring its invariance over time, agreement between independent experts or raters, and internal consistency (Baxter & Jack, 2008). In this context, how consistently the categories were coded during the research process was examined, and whether any data was overlooked over time. To determine this, the teacher opinions obtained in the research were read and coded twice by 2 different coders 2 weeks apart. In addition, the researchers checked whether the coding made in different periods was consistent. In addition, coding was done with the help of an expert during the data analysis process. It was determined that the consistency between the codings was .90 according to the reliability formula of Miles and Huberman (1994, p. 64). To ensure the internal reliability of the research, the English teachers in the study group were coded as T1, T2, and T3… and direct transfers were made in addition to indirect transfers. Attention was paid to the transparency of the research by realistically and in detail explaining how the data set was created and what the processes were in the data analysis process. In addition, tables/visuals were included to make the presentation of the research findings understandable, and sample views and frequency values were used.

RESULTS

eTwinning projects in language education are shown below in Table 1, Table 2, Table 3, and Table 4 and with sample opinions.

Teachers' Views on the Effectiveness of eTwinning Projects in Language Teaching

English teachers' opinions on the effectiveness of eTwinning projects in language education are shown in Table 1.

Table 1. Findings on the effectiveness of eTwinning projects in language education.

Category	Code	*f*	Participants	Opinions
Positive Aspects	Communication Skills-Practice-Active Use	22	T5, T6, T7, T10, T16, T17, T18, T19, T20, T22, T25, T26, T27, T30, T31, T33, T38, T39, T40, T43, T45, T46	"It is effective and helps to establish and develop the ability to communicate with foreign partners in the target language." (T6) eTwinning project carried out with partners from abroad is effective in language teaching as it provides students with natural speaking environments." (T20)
	Development of Language Skills	14	T1, T4, T11, T13, T14, T15, T19, T23, T24, T29, T34, T41, T42, T48	" Students' communication with each other in projects with foreign partners improves their four language skills. " (T41)
	Affective Elements (Love of language-self-confidence-attitude-awareness-motivation)	11	T1, T2, T3, T8, T12, T16, T19, T21, T32, T34, T37	"… I must say that students have a different perspective towards both the mother tongue and the foreign language and that these projects contribute to language teaching." (T34)
	Cultural Interaction	3	T1, T17, T19,	"… students' motivation increases as they explore different cultures and perspectives." (T1) "Meeting different cultures and being able to communicate encourages students to learn languages." (T19)
Negative Aspects	Time and Planning Issues	7	T1, T22, T28, T35, T44, T45, T47	"Yes, according to the project content. Especially with the last change, one of the founding partners will not be able to get a label unless it is from a different country, which has increased this situation." (T22) "eTwinning projects also have some negative aspects. Project management and communication can sometimes be difficult, especially between partners located in different time zones. There are also risks that projects sometimes do not proceed as planned and the targeted learning outcomes are not achieved. " (T1)

Category	Code	*f*	Participants	Opinions
	Technological Barriers	2	T27, T43	"…currently, the use of artificial intelligence translation tools may hinder necessary progress." (T43)
	Administrative / Career Barriers	1	T27,	"… the effort and work you put in is not seen by the administration and the Ministry of Education. After a while, it feels empty. (T27)
	Language Difference	2	T30, T44	" The negative aspect is that if your foreign partner uses their language instead of English, you may have problems with communication. You may have problems finding the exact foreign language equivalent of the subject you want to talk about in the activity you are doing or the application you are using." (S30) "They use the language in a foreign language depending on the subject and level, but I do not think they learn anything new in terms of the foreign language." (T44)

Table 1 shows that teachers expressed their views that the activities carried out within the scope of the eTwinning project have both positive and negative effects on language education. According to the findings, it was determined that most of the teachers thought that eTwinning projects have positive effects on language education (*f*=25), while some of them expressed their views that they will have negative effects (*f*=12).

eTwinning projects are examined, a comprehensive picture is formed in which the communication skills of students and teachers can be improved with exercises and active participation in language use, basic language skills can be developed with the activities in these projects, emotional awareness can be gained regarding the language and cultural interaction can be achieved. According to the table, 22 of the teachers in the study group think that eTwinning projects have a positive effect in terms of communication skills, exercises, and active language use; 14 in terms of the development of language skills; 11 in terms of gaining emotional awareness regarding the language and 3 in terms of cultural interaction. This finding shows that eTwinning projects have a positive effect on language education. It also indicates that these projects can provide more qualified learning environments thanks to the interaction with individuals from different language and cultural environments.

When the data regarding the opinions shared by teachers within the scope of negative impact are examined, it is understood that situations based on the organization, planning, success, and disruptions experienced in the process of eTwinning projects are shared. However, negativities related to language differences are among the issues that will directly affect the language education process of the project. On the other hand, opinions regarding planning, management, career, and the effects of technological developments can prevent the projects in question from achieving their goals in general.

Teachers' Views on the Contribution of eTwinning Projects to Language Skills

English teachers' views on which language skills eTwinning projects contribute most to the development are shown in Table 2.

Table 2. Findings regarding which language skills eTwinning projects contribute the most.

Category	Code	*f*	Participants	Opinions
All Language Skills	Supporting the Development of Language Skills	16	T1, T3, T6, T7, T8, T14, T15, T16, T18, T19, T22, T23, T25, T30, T35, T42	"1. Listening: During the project process, students can improve their understanding of different accents and language structures by listening to other students' presentations, videos, and audio recordings. 2. Speaking: Students improve their speaking skills while communicating with project partners and other students. They experience the practical use of the language by communicating with people from

Category	Code	*f*	Participants	Opinions
				different cultures. 3. Reading: Reading materials such as sharing, blog posts, and presentations made within the project's scope can improve students' reading skills. In addition, conducting research during the project supports reading skills. 4. Writing: Students develop their writing skills by writing various texts such as messages, reports, and Blog posts during the project process. In addition, they reinforce their writing skills by providing written feedback to other students and teachers." (T1) "This may vary depending on the design of the project. For example, while writing and reading skills develop in a Pen Pal project, speaking and listening skills may also develop in meetings held according to the project's purpose." (T3) "All of them develop. Listening and speaking skills develop in online meetings, writing and reading skills develop while doing the given tasks." (T14)
Speech	Supporting Speaking Skills	26	T2, T5, T9, T10, T12, T13, T14, T17, T20, T21, T24, T25, T26, T27, T28, T29, T34, T36, T37, T38, T39, T40, T45, T46, T47, T48	"Since there is constant communication with project partners, it enables the development of four basic language skills, especially speaking." (T25)
Writing	Supporting Writing Skills	16	T4, T11, T12, T13, T14, T24, T29, T31, T32, T37, T39, T41, T43, T44, T45, T48	"Writing because sharing is mostly done through writing." (T43)
Listening	Supporting Listening Skills	12	T5, T7, T14, T17, T20, T26, T33, T37, T38, T40, T46, T47	"It especially supports speaking and listening skills. Students communicate by hearing and speaking during the project process." (T5)
Reading	Supporting Reading Skills	8	T2, T4, T11, T14, T31, T32, T41, T48	"Since it comes to producing product reviews, reading and writing skills are neglected more." (T31)

Table 2 shows which language skills teachers think eTwinning projects contribute most to. According to the table, the activities carried out in eTwinning projects have a multifaceted contribution to foreign language education. As can be seen in Table 2, it is understood from the teachers' views that these projects contribute to the development of speaking (*f*=26), writing (*f* =16), listening *f* =12) and reading (*f* =8) skills. On the other hand, when the teachers' opinions about eTwinning projects are examined, it is thought that all language skills, regardless of language skill, are positively affected by these activities, and development is achieved in different ways. The opinions of the teachers who participated in the research that eTwinning projects contribute to developing all language skills (*f* =16) are also considerable. This finding shows that the teachers have positive thoughts and motivation that their and the students' language skills will develop in these projects. Again, according to the findings, it is noteworthy that the teachers think that eTwinning projects contribute more to speaking than writing skills. However, a speaking and writing-focused view may dominate since eTwinning activities are carried out digitally and with visual and audio materials via various web tools. This is not the case for reading. When the environment and tools used in eTwinning activities are considered, there is a suitable environment for reading skills. On the other hand, the fact that teachers share few views on reading skills necessitates the analysis of this finding with different variables.

Teachers' Views on Following eTwinning Projects for Language Education

English teachers' views on following language education projects on the eTwinning portal are shown in Table 3.

Table 3. Findings regarding the status of the following language education projects on the eTwinning portal.

Category	Code	*f*	Participants	Opinions
Yes, I'm following	Having information about projects	25	T1, T2, T4, T5, T6, T7, T8, T14, T15, T17, T21, T22, T23, T24, T25, T26, T29, T31, T32, T36, T39, T40, T42, T45, T48	"eTwinning There are language education projects on the portal, especially projects that improve English speaking skills." (T1)
	Project examples	14	T1, T2, T4, T5, T6, T14, T15, T17, T22, T23, T29, T31, T39, T42	"L@ngu@ges4all!" (T4) "Bridging language and culture bridges, Word Hunt: Discovering the Treasure of Our Language, The wealth of Our Language" (T5) "English 4U" (T14) "English to Gather and Get eTwinning called Better project." (T42)
	Can't remember the project name	11	T7, T8, T21, T24, T25, T26, T32, T36, T40, T45, T48	" There are. But I can't remember their names." (T7) "I am not sure because I did not do any projects this year" (T48)
No, I don't follow	Lack of project knowledge	21	T3, T9, T11, T12, T16, T18, T19, T20, T27, T28, T30, T33, T34, T35, T37, T38, T41, T43, T44, T46, T47	"I have no idea." (T9) "I have no information about current projects" (T20) "I do not know about this." (T34)

Table 3 shows teachers' opinions on the extent to which they follow projects on language education on the eTwinning portal. According to the table, most teachers (*f*=36) are informed about projects on language education on the eTwinning portal. Some teachers (*f=14)* who follow the eTwinning portal are informed about language education projects and are aware of sample projects. In addition, it was observed that some followed the portal but could not give an example of a language education project or remember it (*f*=11). However, a significant portion (*f*=21) do not follow and are not informed.

As shown in Table 3, the teachers participating in the study were asked to follow projects related to language education on the eTwinning portal and to list sample projects from the portal along with their own projects. Considering that all teachers who shared their opinions participated in eTwinning projects, the data has striking findings. Because some of the teachers participating in the study must not follow the eTwinning portal and are unaware of the language education projects on this portal. This finding can be explained as a significant portion of the teachers participating in eTwinning projects not internalizing the process or not having enough information. It can also be added that the sustainability of eTwinning projects is weak.

Teachers' Views on The Use of Web 2.0 Tools in eTwinning Projects

English teachers' views on using Web 2.0 tools in eTwinning projects are shown in Table 4.

Table 4. Findings on the use of Web 2.0 tools in eTwinning projects.

Category	Code	*f*	Participants	Opinions
Yes, I use it	Writing	19	T1, T3, T7, T11, T12, T14, T18, T19, T23, T26, T27, T29, T32, T33, T37, T41, T42, T47, T48	"Blogger or WordPress: Provides students with the opportunity to blog to improve their writing skills." (T1) "Padlet and Storyjumper help students improve their writing skills." (T24)
	Speaking	17	T1, T2, T5, T6, T11, T12, T14, T15, T19, T26, T28, T29, T41, T42, T43, T44, T47	"Flipgrid or Vocaroo: Provides students with the opportunity to leave voice messages or make short presentations to improve their speaking skills." (T1)

Category	Code	*f*	Participants	Opinions
				"Voki contributes to the development of speaking skills." (T11)
				"Tools like Voki and Flipgrid are effective in improving speaking skills." (T19)
	Listening	4	T2, T7, T39, T42	"LyricsTraining: listening." (T7)
	Reading	8	T3, T7, T15, T19, T33, T34, T44, T48	"Zumpad Web 2.0 tool can serve writing and reading skills. A user creating an original story and other users continuing it is effective in developing reading and writing skills." (T3)
				"Storyjumper and BookCreator contribute to the development of reading skills." (T30)
	Vocabulary	6	T1, T7, T9, T18, T43, T48	"Quizlet is a great tool to increase students' vocabulary skills." (T1)
				"Mentimeter: word cloud, word learning" (T7)
				"Padlet, Canva, Story Camp applications develop their vocabulary through menus." (T9)
	Grammar	2	T1, T43	"Kahoot or Quizizz: Provides interactive quizzes to test grammar and vocabulary." (T1)
	Tools That Contribute to All Language Skills	13	T4, T5, T8, T13, T17, T20, T21, T24, T30, T31, T35, T36, T38, T39, T40, T45	"Kahoot, Quizzes, Storyjumper, Socrative, Storybird, Blogspot" (T5)
				"Quizizz, Padlet, Wordwall are effective Web 2.0 tools that can be used to help students gain the desired skills." (T8)
				"Tools like Kahoot, Mentimeter, and Wordwall can be used to improve all language skills." (T24)
No, I don't use it.	Lack of knowledge of Web 2.0 tools	4	T10, T16, T22, T46	"I don't know." (T10)
				"I haven't used it for a long time" (T16)

Table 4 shows the opinions of teachers regarding the use of Web 2.0 tools in eTwinning projects. According to the findings, it is seen that most teachers use Web 2.0 tools in eTwinning projects. 13 of the teachers prefer to use Web 2.0 tools for all language skills in eTwinning projects. Again, 19 of the teachers use Web 2.0 zero tools that will contribute to the writing, 17 to speaking, 8 to reading, and 4 to listening skills. In addition, it was also shared that teachers attach importance to developing vocabulary and teaching grammar in language activities in eTwinning projects and use Web 2.0 tools accordingly.

Some of the teachers who participated in the study (*f*=4) stated that they did not use Web 2.0 tools in eTwinning project activities and that they did not know about them. Based on the findings in Table 4, it is understood that almost all of the language teachers who participated in eTwinning projects used Web 2.0 tools and could use these tools in activities according to different language skills and subjects. This finding shows that teachers have a competence appropriate to the nature of the mentioned projects and the implementation process. The Web 2.0 tools preferred and presented as examples by teachers who participate in eTwinning projects and use Web 2.0 tools in their activities can be listed as follows: Blogger, Book Creator, Canva, Flipgrid, Kahoot, LyricsTraining,

Mentimeter, Padlet, Quizizz, Quizlet, Socrative Storybird, Storyjumper, Vocaroo, Voki, WordPress, Wordwall, and Zumpad.

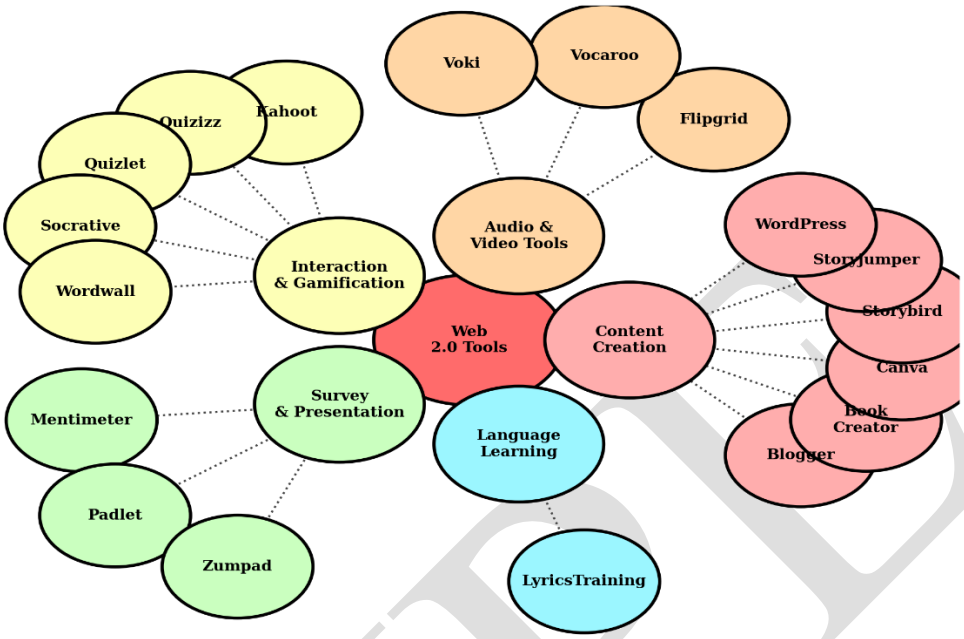

Figure 2. Web 2.0 tools used in eTwinning projects.

The finding in Figure 2 reveals that the Web 2.0 tools used more in eTwinning activities depend on preferences such as language, content creation, audio and video production, gaming, research, and presentation.

DISCUSSION, CONCLUSION and SUGGESTIONS

eTwinning projects on language education based on teachers' opinions, has reached the following conclusions:

In the study, it was determined that most of the teachers think that eTwinning projects have a positive effect on language education. It was observed that the teachers in the study group have the opinion that eTwinning projects will have positive effects in terms of improving communication skills in language education with practice and active participation, developing basic language skills, gaining emotional awareness about the language, and being in cultural interaction. In the research of Karataş and Öztay (2023) on eTwinning projects; it was reached that students contribute to digital development, language-communication, cooperation, self-confidence, and self-expression skills, and teachers make great differences in their profession. In the study of Erzurum et al. (2023), it was seen that students have skills and abilities under the themes of communication, cooperation, personal development, and teachers have gains under the themes of digital skills, communication and cooperation, professional development and leadership. According to Çavuş, Balçın and Yılmaz (2021), eTwinning projects arouse curiosity in students and offer the opportunity for active participation and concretization. Gündüz-Çetin and Gündoğdu (2022) found that these projects had positive effects on students, similar to the research, in the form of increasing motivation for learning. In the study by Fazlı, Köse, and Fazlı (2024), it was seen that eTwinning projects had positive effects on students in terms of collaborative learning, digital skills and modeling skills. In the metaphorical examination of the subject by Demir et al. (2023) from the teachers' perspective, it was determined that eTwinning projects provide teachers with innovation, experience and different perspectives, and increase their cooperation and communication skills. This result can be explained as eTwinning projects can create more qualified learning environments thanks to the interaction with individuals

from different language and cultural environments. On the other hand, some of the teachers who participated in the research think that eTwinning projects will have more negative effects than positive ones. When the views shared by the teachers within the scope of negative effects are evaluated, views were obtained based on the disruptions experienced in the process such as organization, planning, and the success of the projects in reaching their goals. In addition, views on the negativities that the language difference will create also show that the project will have a direct negative effect on the language education process. In the research of Çavuş et al. (2021), the suggestions of the teachers that the time allocated for the project should be longer, more activities should be included and communication between colleagues should be stronger in the process support the findings regarding the negative effects. In addition, Avcı (2021) obtained teachers' views in his study that the eTwinning platform was not usable and was not easy to operate and use. Among the findings regarding the negative effects, planning, technology, administrative, and career-oriented views have the potential to prevent eTwinning projects from achieving their goals in general. Avcı (2021) also made suggestions in his research regarding disseminating eTwinning projects, providing in-service training, registering projects in MEBBİS, and increasing information and announcements to support these activities by school administrators and parents.

The study found that eTwinning projects have multifaceted contributions in terms of language skills within the scope of language education. Teachers in the study group think that these projects contribute more to speaking skills. Then, it is understood from the teachers' views that they contribute to developing writing, listening and reading skills. In addition, many teachers think that eTwinning projects contribute to language education regardless of language skills. Huertas-Arigil and Muszynska (2022) also concluded in their study that these projects provide students with multifaceted communication skills. This result shows that eTwinning projects can improve students' and teachers' language skills in language education and that they will acquire a positive attitude in terms of communication thanks to the projects. The findings in the studies of Karataş and Öztay (2023) and Erzurum et al. (2023) are consistent with this result. On the other hand, in the study by Demirci-Özer and Çalık-Uzun (2024) examining postgraduate theses related to eTwinning projects, the fact that the prepared theses are gathered under such purposes as the effect on students' skills, the contribution to the professional and personal development of teachers, and the contribution to school culture increases the value of the results achieved in language education.

eTwinning projects contribute more to speaking and writing skills because the activities are carried out in a digital environment and with visual and auditory materials via various web tools. In the same environment, a similar reading development is expected. However, the results obtained are in the opposite direction. When the environment and tools used in eTwinning activities are considered, it can be seen that there is a suitable environment in terms of reading skills. Therefore, the fact that teachers express that they make a limited contribution to reading skills indicates that this finding needs to be analyzed with different variables.

In the research, it has been determined that teachers largely follow projects on language education on the eTwinning portal and that most of them are aware of the projects on this platform. In addition, some of the teachers who follow the eTwinning portal have also stated sample projects. The projects that teachers follow on the eTwinning portal and present as examples are: English 4U, Gentle Grammar with Gentle Kids, We Feel Well with English, Effective English, Believe in Yourself and Just Speak, Happy Free Day Happy Kids, Focus on English, English Club, Friendship Academy, Same World Same Aim, Sustainable Poetry, English to Gather and Get Better.

On the other hand, almost half of the teachers stated that they were unaware of the projects on this portal regarding language education and that there were no projects they were aware of. However, all teachers in the sample received training on the eTwinning process or had project experience. Therefore, it is noteworthy that there is a group that is not aware of the projects. This result shows that the organization of eTwinning projects and the process follow-up are not going well and that the participating teachers cannot internalize the process. In addition, this result can be interpreted as the

sustainability of quality education activities regarding eTwinning projects is weak. However, in studies on eTwinning (Demirci-Özer & Çalık-Uzun, 2024), the examination of the issues of students' development, teachers' contribution to their professional and personal development, and contribution to school culture also shows that awareness of these projects in terms of language education is low. The findings suggest that while school administrators and teachers have become acquainted with eTwinning, their awareness and support remains inadequate. It is evident that there is a necessity for more systematic information and planned efforts regarding eTwinning projects at all levels of education.

In the research, it was determined that almost all teachers in eTwinning projects prefer to use Web 2.0 tools. Some prefer to use Web 2.0 tools to develop all language skills in eTwinning projects. It was also observed that some use Web 2.0 tools that will contribute to writing, speaking, reading and listening skills. In addition to language skills, Web 2.0 tools are used to increase vocabulary and grammar success. This result shows that teachers can use Web 2.0 tools in the project process according to different language skills and subjects, and that teachers have a competence appropriate to the nature of the projects and the implementation process. Crisan (2014) also concluded the research on the subject that these projects support the skills of using information and communication technologies. Examples of Web 2.0 tools that teachers prefer to use in eTwinning projects are as following: Blogger, Book Creator, Canva, Flipgrid, Kahoot, LyricsTraining, Mentimeter, Padlet, Quizizz, Quizlet, Socrative Storybird, Storyjumper, Vocaroo, Voki, WordPress, Wordwall, and Zumpad. In the metaphorical study of Demir et al. (2023) on the subject, it was concluded that using Web 2.0 tools in eTwinning projects provides convenience and application opportunities. In the study of Çetin-Cengiz and İzci (2021) on the technological competencies of students participating in eTwinning projects, it was stated that these projects contributed to the development of teachers and students in many subjects and also improved the level of technology use and competence. In addition, it was also reached that 4 participants in the study group did not use Web 2.0 tools in eTwinning projects and did not know. This result can be explained by the teachers' sensitivity, competence, and resistance to technology. However, in the study of İnci and Çelik (2024) on eTwinning projects, it was emphasized that these projects aimed to provide students with digital competence and offered the opportunity to use digital tools and information communication technologies effectively.

As a result, it was determined in the research that the majority of teachers found eTwinning projects effective in language education and thought that they would be useful in the development of language skills, vocabulary, and grammar. For this reason, it was concluded that teachers preferred to use Web 2.0 tools to develop different skills in the eTwinning process and that they also followed the project portal intensively. On the other hand, it was also stated that the planning and time management of eTwinning projects, administrative processes, and language differences would hurt the success of language education.

Suggestions

Based on the research findings, the following recommendations can be made to researchers and educator politicians:

Suggestions for researchers

- ✓ The contributions of eTwinning projects across different subject areas can be identified. However, it is crucial to identify the needs these projects will address in advance. Therefore, needs analysis research is crucial.

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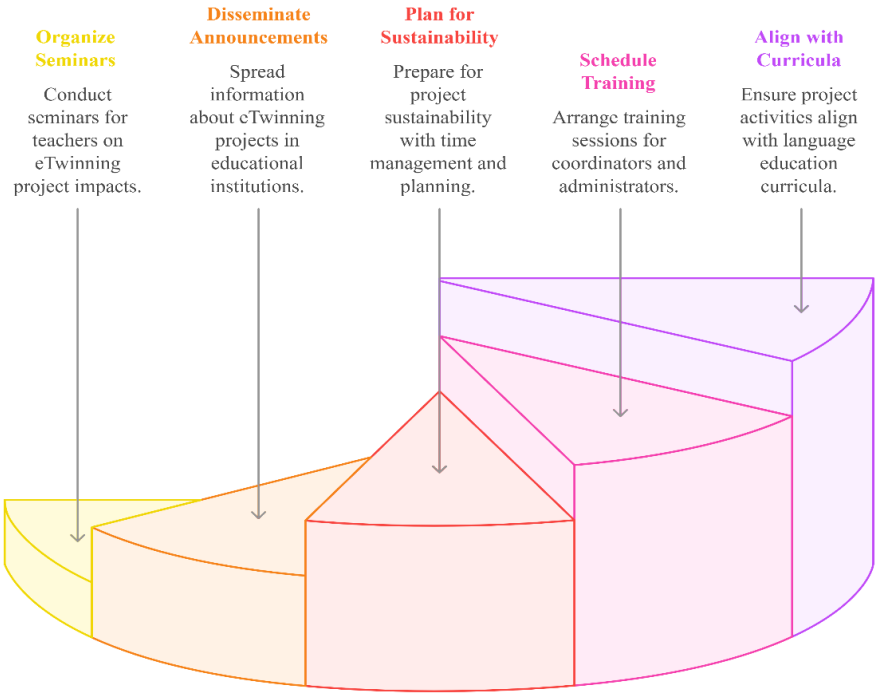

Figure 3. Recommendations.

Suggestions for practitioners

- ✓ Seminars on the effects of eTwinning projects on language education can be organized for mother-tongue and foreign language teachers.
- ✓ Furthermore, announcements can be disseminated in educational institutions and other media to facilitate the ongoing monitoring of eTwinning projects.
- ✓ To increase the sustainability of eTwinning projects, preparations can be made taking into account issues such as time management, administrative planning, and language differences. To this end, training sessions should be scheduled for eTwinning coordinators and school administrators.
- ✓ Finally, it is possible to ensure that the activities carried out in eTwinning projects are compatible with language education curricula. This ensures the positive effects of the projects on language education can be made sustainable.

Ethics and Conflict of Interest

All the rules in the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed in this study. None of the actions specified in the second section of the relevant directive titled "Actions Contrary to Scientific Research and Publication Ethics" were taken. Ethical approval was given for the research by the Bayburt University Ethics Committee with the decision number 125 dated 09.04.2025 [The research was approved by the Scientific Research Ethics Committee of Bayburt University (E-79126184-050.99-268315)]. The authors declare that they acted in accordance with ethical rules in all processes of the research. The authors declare that they have no conflict of interest.

Author Contribution

All authors contributed equally to the research.

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Data availability
The data that support the findings of this study are available on request from the corresponding author.

Corresponding Author
Correspondence to Aslı Maden, aslimaden@bayburt.edu.tr

REFERENCES

Avcı, F. (2021). Çevrim içi bir öğrenme ortamı olarak eTwinning platformuna ilişkin öğretmenlerin görüş ve değerlendirmeleri [Teachers opinions and assessments on the eTwinning platform as an online learning environment]. *Cumhuriyet International Journal of Education, 10*(1), 1-22. https://doi.org/10.30703/cije.663472

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The qualitative report*, *13*(4), 544-559.

Camilleri, R. (2016). Global education and intercultural awareness in eTwinning. *Cogent Education*, *3*(1), 1-13. https://doi.org/10.1080/2331186X.2016.1210489

Creswell, J. W. (2007). *Qualitative inquiry & research design: choosing among five approaches*. SAGE Publications.

Cavus, R., Balcin, M. D., & Yilmaz, M. (2021). Fen bilimleri öğretmenlerinin eTwinning proje süreçlerindeki deneyimlerine yönelik görüşleri [The opinions of science teachers about their experiences in eTwinning project processes]. *Cumhuriyet International Journal of Education, 10*(1), 246-272. https://doi.org/10.30703/cije.714843

Çetin, İ. G., & Gündoğdu, K. (2022). eTwinning proje uygulamalarına ilişkin öğretmen algıları [Teacher views related to eTwinning project practices]. *Electronic Journal of Social Sciences, 21*(81), 76-90. https://doi.org/10.17755/esosder.981142

Çetin-Cengiz, D., & İzci, E. (2021). Parent perceptions of the development of technological competences of students participating in eTwinning projects. *Dialectologist - International Journal of Social Sciences, 28*, 89-108

Çınar, E., Avaroğlu, N., Tunç, N., & Taşkaya, S. (2024). An analysis of the impact of twinning projects on teachers and students in terms of teachers' views. *International Journal of Education and New Approaches, 7*(1), 1-9. https://doi.org/10.52974/jena.1358931

Demir, G., Taş, Z., Danişment, T., Coşkun, Z., Göksu, U., & Darakcı, A. (2023). E-twinning projesinin öğretmenler üzerindeki yenilikçi etkilerinin analizi [in Turkish]. *Socrates Journal of Interdisciplinary Social Researches, 9*(36), 95–112. https://doi.org/10.5281/zenodo.10395268

Demirci-Ozer, S., & Calık-Uzun, S. (2024). Review of national postgraduate theses on eTwinning projects. *Studies in Educational Research and Development, 8*(2), 170-189.

Demirci-Özer, S., & Çalık-Uzun, S. (2024). E Twinning projelerine yönelik ulusal lisansüstü tezlerin incelemesi [in Turkish]. *Studies in Educational Research and Development, 8*(2), 170-189.

Demirekin, M. (2023). Dil öğretiminde güncel yeni teknolojiler [Current new technologies in language teaching]. *Academic Journal of History and Idea, 10*(3), 627-641. https://doi.org/10.46868/atdd.2023.278

Erzurum, Y., Demir, A., Yildiz, F., & Gezer, E. (2023). eTwinning proje uygulamaları konusundaki öğretmen görüşleri [Teachers' views on eTwinning project applications]. *Ulusal Eğitim Dergisi (ULEDER), 3*(9), 1564-1583. https://doi.org/10.5281/zenodo.10058330

Fazlı, B., Köse, R., & Fazlı, E. (2024). eTwinning proje faaliyetlerine yönelik öğrenci görüşleri: Hayatımız modelleme eTwinning projesi örneği [Student opinions on eTwinning project activities: The case of our life modelling eTwinning project]. *İnönü University Journal of the Faculty of Education, 25*(2), 713-731. https://doi.org/10.17679/inuefd.1391036

Gajek, E. (2018). Curriculum integration in distance learning at primary and secondary education levels in the example of eTwinning projects. *Educ. Sci. 8*, 1-15. http://doi.10.3390/educsci8010001

Gençtürk-Erdem, E. G., Başar, F. B., Toktay, G., Yayğaz, İ. H., & Küçüksüleymanoğlu, R. (2021). eTwinning projelerinin öğretmenlerin dijital okuryazarlık becerilerine katkısı [Contribution of eTwinning projects to digital literacy skills of teachers]. *International Journal of Social Sciences and Education Research, 7*(3), 204-219. https://doi.org/10.24289/ijsser.901129

Glesne, C. (2012). *Introduction to qualitative research*. (Trans. Ed. A. Ersoy & P. Yalçınoğlu). Ankara: Anı Publishing.

Gündüz-Çetin, İ. G., & Gündoğdu, K. (2022). eTwinning proje uygulamalarına ilişkin öğretmen görüşleri [Teacher views related to eTwinning project practices]. *Electronic Journal of Social Sciences, 21*(81), 76-90. https://doi.org/10.17755/esosder.981142

Heafner, T. (2004). Using technology to motivate students to learn social studies. *Contemporary Issues in Technology and Teacher Education, 4*(1), 42-53.

Huertas-Abril, C., & Muszynska, B. (2022). The role of eTwinning tools in social and curriculum ıntegration using multimodal communication. *Teaching English with Technology, 22*(3-4), 63-84.

Huertas-Abril, C. A., Palacios-Hidalgo, F. J., & Guardeño-Carrasquilla, M. A. (2025). eTwinning ambassadors' perceptions about the use of eTwinning as a collaborative platform to improve english as a foreign language skills. *rEFLections, 32*(1), 356–373. https://doi.org/10.61508/refl.v32i1.280207

İnce, P., & Çelik, K. (2024). eTwinning projelerinin sürdürülebilir eğitimdeki rolü ve önemi [The role and importance of eTwinning projects in sustainable education]. *Journal of Management and Educational Sciences, 3*(4), 380-400. https://doi.org/10.5281/zenodo.14639284

Karataş, F. R., & Öztay, E. S. (2023). Öğretmen ve Öğrencilerin eTwinning proje uygulamalarına ilişkin görüşleri [Teacher and student opinions on eTwinning project implementations]. *IBAD Journal of Social Sciences*, (14), 105-120. https://doi.org/10.21733/ibad.1190441

Külekci, D., Eliküçük, Ö., Demir, Y., & Durmaz, M. (2023). Sınıf öğretmenlerinin öğrenme-öğretme süreçlerinde teknoloji kullanımına yönelik görüşleri [in Turkish]. *Ulusal Eğitim Dergisi (ULEDER), 3*(8), 1120-1135. https://doi.org/10.5281/zenodo.8312715

Maden, S., & Önal, A. (2020). Eğitim bilişim ağı (EBA) içerik modülündeki Türkçe dersi ile ilgili dokümanların değerlendirilmesi [Evaluation of documents on the Turkish course in education information network (EIN) content module]. *Journal of Educational Technology Theory and Practice (ETTP), 10*(1), 25-50. https://doi.org/10.17943/etku.553517

Maden, S., & Önal, A. (2022). Uzaktan (çevrim içi) metin işleme süreci ile ilgili Türkçe öğretmenlerinin görüşleri [Opinions of Turkish teachers on online text processing process]. *Journal of Mother Tongue Education, 10*(2), 418-439. https://doi.org/10.16916/aded.1072324

Maden, S., Avşar, A., & Misir, E. (2024). Trends in postgraduate theses on Web 2.0 tools and mobile applications in teaching Turkish as a foreign language. *Route Education and Social Science Journal, 89*, 174-182. https://doi.10.17121/ressjournal.3602

Maden, S., & Yetişensoy, O. (2024). İkinci dil öğretiminde Chatbot teknolojisinin kullanımına yönelik çalışmalardaki genel eğilimler [General trends in studies on the use of Chatbot technology in second language teaching]. *Kocaeli University Journal of Education*, 7(1), 273-288. https://doi.org/10.33400/kuje.1407998

Merriam, S. B. (2013) *Qualitative research: a guide to design and implementation*. John Wiley & Sons Inc.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis*. USA: SAGE Publications.

Ministry of National Education (2019). *eTwinning activity booklet*. MEB Publications. URL: https://etwinning.meb.gov.tr/wpcontent/uploads/2023/03/eTwinning_Faaliyeti_Tanitim_Kitapcigi.pdf Retrieved Date: 21.03.2025

Ministry of National Education (2023). *eTwinning 2023-2024 innovation and education*. MEB Publications. URL: https://etwinning.meb.gov.tr/wp-content/uploads/2024/01/2023-2024-Yenilik-ve-Egitim_mobil.pdf Retrieved Date: 21.03.2025

Ministry of National Education (undated). *What is eTwinning?* https://etwinning.meb.gov.tr/ Retrieved Date: 21.03.2025

Şahin, G., Gökçe, H., Karabulut, H., & Afşin Kariper, I. (2024). Learning community eTwinning: A literature review. *Discover Education*, 3(185). https://doi.org/10.1007/s44217-024-00298-1

Uslu-Kaplan, N., & Alkan, M. F. (2023). eTwinning projelerinin mesleki yeterliklere katkısına yönelik öğretmen görüşlerinin incelenmesi [Investigation of Teacher Views on the Contribution of eTwinning Projects to Professional Competencies]. *Erciyes Journal of Education, 7*(2), 58-78. https://doi.org/10.32433/eje.1257787

Yıldırım, A., & Simşek, H. (2013). *Qualitative research methods in social sciences*. Seçkin Publishing.

About the authors:

Aslı Maden
She is an associate professor specialising in teaching Turkish as a native and foreign language. She works in the Department of Turkish Education at Bayburt University's Faculty of Education. Her research interests include language education, the use of technology in language education, active learning, children's literature, digital dictionaries, and vocabulary.

Mevhibe Kübra Hançer
She is an English teacher at Bayburt Science High School. She is also the Bayburt eTwinning Provincial Coordinator. She also works as a teacher trainer on the English Together, Technology Education in Innovative Classrooms, CEFR, and Canva projects. She has worked as a trainer on national and international projects. She is currently pursuing a Master's degree in Turkish Language Education.

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INVESTIGATION OF THE EFFECT OF PARENTAL SUPPORTED PRIMARY SCHOOL PREPARATION PROGRAM

Nilüfer YİĞİT
Dr., Independent Researcher, Samsun, Turkey
ORCID: https://orcid.org/0000-0002-9370-970X
nilali-yigit@hotmail.de

Elif MERCAN UZUN
Assist.Prof.Dr., Ondokuz Mayıs University, Samsun, Turkey
ORCID: https://orcid.org/0000-0001-9069-1375
elfmercan@gmail.com

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Abstract

The aim of this research is to evaluate the effects of the "Parental Supported Primary School Preparation" program, which is designed to increase the school adaptation levels of foreign children. The sample consists of foreign children aged 5-6 who attend preschool education in official independent kindergartens and kindergartens in the central districts of Samsun province and are expected to start primary school the following year. A total of 49 foreign children participated in the study. Parents and teachers of the participating children were also included in the research process. As part of the study, the researcher implemented the "Parental Supported Primary School Preparation" program consisting of 28 activities, delivered two days a week for nine weeks, to the foreign children in the experimental group. The children's parents also received training once a week. Peabody Picture and Vocabulary Test, Child Peer Relations Teacher Evaluation Scale, Social Skills Evaluation Scale, Developmental Primary School Readiness Scale, Primary School Readiness Scale, and School Adjustment Teacher Evaluation Scale were used to collect data in the study. At the same time, interviews were held with the parents and teachers who participated in the training program. The data were analyzed using the SPSS 21.0 package program. It was found that the "Parental Supported Primary School Preparation" program, designed to increase children's school readiness and adaptation levels, significantly improves children's primary school readiness levels. It was also concluded that the program has a positive effect on children's language skills.

Keywords: Adaptation, primary school, foreign nationality, parental support.

INTRODUCTION

Migration which has now reached global dimensions, is one of the most pressing issues affecting societies worldwide. While some instinctive drives such as the pursuit of improved living conditions and security are among reasons that trigger migration, one of the most fundamental motivating factors is the search for better economic conditions. Economic hardships can compel individuals to regions or countries with greater stability and prosperity. In addition to economic factors, other reasons for migration include natural disasters, climate change, and armed conflicts**.** According to the International Organization for Migration report, approximately 281 million people live outside their country of origin. This rate, which corresponds to approximately 3.6 of the world's population, reveals the extent of migration crisis today (International Organization for Migration [IOM], 2024; Şimsek-Ademi & Aslan, 2024)**.**

The civil war that began in Syria in 2011 had significant consequences for Turkey as a neighboring country. Welcomed large numbers of foreign nationals migrating masse (Fansa, 2021a). Mass migrations to Turkey took place in the five years following the Syrian war. As of 2024, there are 3.099.524 foreign nationals under temporary protection, and over one million foreign nationals are granted residence permits in Turkey. It is noteworthy that the number of foreign nationals currently residing in Turkey is over four million. 98% of those holding residence permits are concentrated in 10

provinces. Samsun being among them (Directorate of Immigration Administration, 2024; Sağıroğlu et al., 2021). The number of migrants living in Turkey is substantial and irregular and forced migration have resulted in certain difficulties in various areas. Migration affects not only the displaced population, but also the host country in several ways. The economy and the social structure of the host country are particularly affected by migration. Job seeking process, labor force participation, and social integration efforts affect both the immigrants and the native residents of the country (Başar et al., 2018).

Although migration is defined in the most general sense as a displacement movement. It is a phenomenon with multiple dimensions affecting various structures of society (Özdemir, 2008). Irregular and forced migration pose challenges across multiple domains, including education. Indeed, the number of foreign-born school-age children is substantial. According to the General Directorate of Migration Management, there are over one million migrant children of school age in Turkey. As of January 2022, 935.731 of these children have been registered in schools. Migration affects both adults and children in distinct ways. Children's adaptation to school in their new environment involves unique dynamics. Studying in a different country presents specific adaptation challenges for foreign national children.

Studies examining the adaptation of foreign children to school show that children experience challenges such as language barriers, difficulties in socializing with their peers, behavioral problems, problems arising from cultural differences, and problems originating from teachers' attitudes. It is also seen that the lack of communication between the teachers and the families of foreign children in terms of school-family cooperation makes it difficult for children to adapt to school. Moreover, foreign children who occasionally encounter negative attitudes displayed by other children or teachers at school may be exposed to peer bullying, marginalization, or social exclusion. In addition, children can experience difficulties in communication due to barriers. When such challenges accumulate, they paint a deeply concerning picture in terms of migrant children's adaptation process (Alkalay et al., 2021; Avcı, 2019; Başar et al., 2018; Delen & Ercoşkun, 2019; Dolapcı, 2019; Özdoğru et al., 2021; Sağlam & İlksen Kanbur, 2017). To address these challenges, developing intervention programs starting from the preschool period is crucial, as the majority of school-aged foreign children attend preschool and primary school, encompassing early childhood (Ministry of Education, 2022).

Especially at the first-grade level where children begin learning to read and write, foreign born children face distinct problems that hinder the acquisition of these foundational skills. Language barriers are major determinant of academic performance. So much so that language problems in the classroom environment are reflected in the relationships of foreign children with both their teachers and their peers (Fansa, 2021b; Telsaç et al., 2022). Teachers have reported that foreign children experience exclusion and behavioral problems in terms of socializing with their peers (Baysal & Çimşir, 2020; İmamoğlu & Çalışkan, 2017; Sarıer, 2020). In their study on the challenges faced by foreign children in primary schools, Selbes & Selbes (2023) revealed that children experience reluctance to participate in social activities, difficulties in adapting to school culture, and problems related to self-confidence. Similarly, Delen and Ercoşkun (2019) conducted a study on the children who exhibited such behaviors where also experiencing academic and communication problems. In this context, it is also important to highlight the role of parental support, particularly in relation to homework.

At the first-grade level, parental support is especially important for helping children acquire foundational literacy skills compared to other grade levels. Teachers who work with foreign children at the first-grade level can encounter challenges such as the inability to communicate with families and the disinterest of parents in school activities. Studies have shown that migrant families face various challenges related to school cooperation, particularly due to the lack of school-family communication (Akgöz & Dağyar, 2023; Doğan & Özdemir, 2019; İmamoğlu & Çalışkan, 2017; Kaya, 2022; Koşak & Atasoy, 2022; Sarıtaş et al., 2016; Sılgan, 2022; Turan & Polat, 2017; Yıldız Yılmaz & Demir, 2021). Many factors such as the low level of education of foreign families, poverty,

lack of access to social security, and cultural differences make it difficult for their children to establish a firm relationship with their schools (Ereş, 2015). In addition, families often refrain from participating in the school-family cooperation due to factors such as cultural differences and language barriers (Güngör & Şenel, 2018). It is essential for foreign nationals to learn the Turkish language in order to adapt to both public and social life in Turkey.

When viewed from the perspective of parents a range of difficulties become evident, such as lack of motivation due to limited communication, not being able to receive the guidance and counseling services needed due to language barriers, inability to express themselves well, exclusion, peer bullying, loss of self-confidence, and inadequate communication with teachers (Chuang et al., 2011). In addition to the stress caused by migration and the problems experienced within the family, the aforementioned difficulties also negatively affect their children's education. The economic conditions of families are a significant stress factor within the household and can directly or indirectly affect the child. Furthermore, parents' low education level is also a negative influence on children's academic performance (Telsaç et al., 2022).

As is the case for every child, early childhood is a critical period during which certain acquisitions are more easily achieved for foreign-born children. It is a well-established fact that experiences and achievements gained at these ages significantly influence the child's future academic life. Studies have shown that a child's adaptation to school affects his/her attitude towards school, social-emotional adjustment and consequently, his/her future academic success (Baker, 2006; Birch & Ladd, 1997; Buhs, 2005; Erten, 2012; Jimenez et al., 2009; Ladd & Price, 1987; Murray et al., 2008; Perry & Weinstein, 1998).

Therefore, the purpose of this study is to facilitate the transition to primary school, which is a turning point for children. It is also important to evaluate the effectiveness of the Parental Supported Primary School Preparation program implemented to foreign-born children starting from the preschool period. In addition to enhancing children's readiness for primary school, the program aims to foster the development of their peer relationships, language skills and social skills. Furthermore, the study aims to provide foreign parents with information on various topics, such as how they can support different aspects of their children's development, the Turkish education system, and school-family cooperation.For this purpose, the study seeks to answer the following research question: Does the Parental Supported Primary School Preparation program significantly improve the school readiness, language skills, social skills, and school adjustment of foreign national children?

METHOD

Research Design

The study was designed using the mixed method approach, which uses both qualitative and quantitative research techniques. The convergent parallel design was chosen in this study is to give equal emphasis to both qualitative and quantitative methods and to allow these two methods to complement each other, thereby obtaining stronger findings. To understand the effects of the Parental Supported Primary School Preparation program on the adaptation of 5–6-year-old foreign children to primary school, an experimental design involving pretest, posttest and retention measurement was employed. In the qualitative dimension of the study, interviews were conducted with the parents and teachers of the foreign children to explore the education program's effects. Quantitative and qualitative data were obtained compared and interpreted to provide a comprehensive understanding of the program's outcomes (Creswell, 2017).

Experimental research allows researchers to go beyond mere explanation and prediction. The effects of the independent variable on participants are examined across both experimental and control groups. Similarly, pretests and posttests are administered to both groups to measure changes. While the training program is implemented with the experimental group, no action is taken in the control group (Ocak, 2019). In order to assess the long-term effects of the program, retention tests were later conducted with both the experimental and control groups.

Population and Sample

The population of the research consisted of foreign children aged 5-6 who were enrolled in their preschool education in official independent kindergartens and nursery classes in the central districts of Samsun province in the 2022-2023 academic year and who were expected to begin primary school the following year. A total of 49 foreign children, along with their parents and teachers, were included in the sample. While determining the sample, the criterion sampling method, which is a type of purposeful sampling, was used. The criterion sampling method involves selecting individuals and cases based on certain predefined criteria. Accordingly, only those individuals and cases that met the established criteria were included in the scope of the research (Büyüköztürk et al., 2017). While selecting the sample, information was obtained from the Provincial Directorate of National Education regarding schools with a high concentration of foreign children. Information about the number of foreign children and their school attendance was obtained by interviewing the school administrators and teachers. The schools with the highest concentration foreign children and verified attendance of these children were selected. The findings concerning the demographic characteristics of the foreign children included in the research sample are presented in Table 1.

Table 1. Distribution of demographic characteristics of foreign national children in the experimental and control groups.

		Experimental Group		Control Group	
		n	**%**	**n**	**%**
Gender	Girl students	12	44.40	11	50.00
	Boy students	15	55.60	11	50.00
	Total	27	100	22	100
Age	65-70 months	10	37.00	10	45.50
	71 months and above	17	63.00	12	54.50
	Total	27	100	22	100
Number of Siblings	1 Sibling	13	48.10	7	31.80
	2 Siblings	7	25.90	8	36.40
	3 Siblings	3	11.10	4	18.20
	4 and above Siblings	4	14.80	3	13.60
	Total	27	100	22	100
Where he came from country	Iraq	27	100	22	100
	Total	27	100	22	100
To school continue	1 year	13	48.10	10	45.50
	2 years	14	51.90	12	54.50
	Total	27	100	22	100
Mother's education status	Illiterate	10	37.00	6	27.30
	Primary School/Secondary School	16	59.30	16	72.70
	High school and above	1	3.7	-	-
	Total	27	100	22	100
Father's education status	Illiterate	8	29.60	3	13.60
	Primary School/Secondary School	12	44.40	12	54.50
	High school and above	7	25.90	7	31.80
	Total	27	100	22	100
Income	0-10.000	8	29.60	8	36.40
	10.001-20.000	15	55.60	10	45.50
	20.001-25.000	4	14.80	4	18.20
	Total	27	100	22	100

Approximately half of the children participating in the study were girls (44.40%) and half were boys (55.60%). Regarding the ages of the children participating in the study, it was observed that most of the children were 71 months or older (63.00%), while the others were 65-70 months old (37.00%).

When examining the number of siblings, it was found that most of the children (48.10%) have one sibling. From the other half, 25.00%, have two siblings. All of the children came from Iraq. Approximately half of the children (51.90%) had attended kindergarten for two years, while the other half (48.10%) had attended for one year. More than half of the mothers participating in the study (59.30%) had completed primary or secondary school education, while 37% were illiterate. Less than half of the fathers (44.40%) had completed primary or secondary school education, while the other half, 29.90%, were illiterate, and 25.90% had attained high school degree or higher. Most of the families (85.20%) have low or very low income, while 14.80% have middle income status.

Data Collection Tools

Demographic Information Form

Information regarding the children's age, gender, nationality, school starting age, and the date of arrival in Turkey collected through a demographic information form. Personal information about parents and teachers was obtained verbally at the outset.

Peabody Picture Vocabulary Test (4-12 Years Old)

The Peabody Picture and Vocabulary Test implemented to assess the language competence and vocabulary skills of the children included in the study. In this test, the extent of children's language development and vocabulary knowledge are measured through picture-based prompts. The child is asked to identify words associated with the picture cards they are presented with. The child is given a word, and must point to the picture that best represents that word and is awarded one point for each correct response. If the child answers six out of the last eight questions incorrectly, the test is discontinued. The total number of correct answers by one child constitutes the raw score. The test consists of two different forms: A-Form for under eight years of age (100 items) and B-Form for children over eight years of age (150 items). For each item, the child is presented with a word that corresponds to one of four pictures on the card and is scored based on the total number of correct answers.

Child Peer Relations Teacher Rating Scale (4-6 years old)

The Child Peer Relations Teacher Rating Scale was used to evaluate the peer relationships of children in early childhood, specifically those aged 4 to 6. The scale was adapted to Turkish by Atış-Akyol & Karaman (2021), and developed by conducting a Teacher Checklist of Peer Relationships (TCPR) study. The scale consists of 18 items and three sub-dimensions (Peer Relations, Aggression, Social Skills). The items are rated on a 5-point Likert-type as "1-Never true", "2-Rarely true", "3-Sometimes true", "4-Often true", "5-Always true". The lowest possible score is 18, and the highest is 90. The Peer Relations sub-dimension consists of six items and its internal consistency coefficient is .85. The Aggression sub-dimension consists of five items and its internal consistency coefficient is .88. The Social Skills sub-dimension consists of eight items and its internal consistency coefficient is .94 (Atış-Akyol & Karaman, 2021). The Cronbach Alpha coefficient calculated for the entire scale using the data obtained in this study is .82.

Social Skills Assessment Scale (4-6 years old)

The Social Skills Assessment Scale was used to assess the social skills of preschool children. The scale was developed by Avcıoğlu (2007) through a literature review and consultations with experts, and it consists of 62 items and nine sub-dimensions. The items are rated on a 5-point Likert-type scale "5-Always does it", "4-Very often does it", "3-Usually does it", "2-Very rarely does it" and "1-Never does it". The lowest possible score on the scale is 62, and the highest is 310. A low score indicates that the child does not possess sufficient social skills, while a high score reflects well-developed social skills. The Interpersonal Skills (IS) sub-dimension consists of 15 items and its internal consistency coefficient is .95. The Skills of Controlling Anger Behavior and Adapting to Change (KDKEDUSB) sub-dimension consists of 11 items and its internal consistency coefficient is .94. The Skills for Coping with Peer Pressure (CPP) sub-dimension consists of 10 items and its internal consistency coefficient is .92. The Verbal Explanation Skills (VES) sub-dimension consists of seven items and its internal consistency coefficient is .91. The Self-Control Skills (SCC) sub-dimension

consists of four items and its internal consistency coefficient is .85. The Goal Setting Skills (GFS) sub-dimension consists of three items and its internal consistency coefficient is .95. The Listening Skills (LS) sub-dimension consists of five items and its internal consistency coefficient is .87. The Task Completion Skills (TSC) sub-dimension consists of three items and its internal consistency coefficient is .78. The Skills for Accepting Consequences (SKEB) sub-dimension consists of four items and its internal consistency coefficient is .88. The Cronbach Alpha internal consistency coefficient for the entire scale is .98 (Avcıoğlu, 2007). The Cronbach Alpha coefficient calculated for the entire scale using the data obtained in this study is .87.

Developmental Elementary School Readiness Scale (44-69 months)

The Developmental Elementary School Readiness Scale was created by Sak and Yorgun (2020) based on High Scope basic development indicators and a literature review. The scale consists of 59 items and eight sub-dimensions. The items are rated on a 4-point Likert -type scale: "4-Very good", "3-Good", "2-Bad" and "1-Very bad". The lowest possible score is 59 and, the highest is 236. A low total score indicates that the child's primary school readiness levels are low, while a high score indicates that their primary school readiness levels are high. The Learning Approach sub-dimension consists of six items and the internal consistency coefficient is .95. The Social and Emotional Development sub-dimension consists of seven items and the internal consistency coefficient is .93. The Physical Development and Health subdimension consists of eight items and the internal consistency coefficient is .96. The Language, Literacy and Communication subdimension consists of seven items and the internal consistency coefficient is .95. The Mathematics subdimension consists of 12 items and the internal consistency coefficient is .97. The Creative Arts subdimension consists of five items and the internal consistency coefficient is .93. The Science and Technology subdimension consists of seven items and the internal consistency coefficient is .96. The Social Sciences subdimension consists of seven items and the internal consistency coefficient is .94. The total reliability coefficient calculated for all items of the scale is .96 (Sak & Yorgun, 2020). The Cronbach Alpha coefficient calculated for the entire scale using the data obtained in this study is .94.

Primary School Readiness Scale (1st Grade)

The Primary School Readiness Scale was used to measure the readiness levels of first grade primary school children. The scale was developed by Canbulat and Kırıktaş (2016) based on a literature review. The scale consists of 33 items and four sub-dimensions. The items are rated on a 5-point Likert-type scale: "Completely-sufficient=5, Sufficient=4, Moderately sufficient=3, Partially sufficient=2, and" Not sufficient=1". The lowest possible score is 33, and the highest is 165. A higher score indicates greater level of school readiness among children. The Cognitive Skills sub-dimension consists of 17 items and its internal consistency coefficient is .98. The Affective Skills sub-dimension consists of eight items and its internal consistency coefficient is .97. The Psychomotor Skills sub-dimension consists of three items and its internal consistency coefficient is. .96. The Self-Care Skills sub-dimension consists of five items and it's .96. The total internal consistency coefficient of the scale is .99 (Canbulat & Kırıktaş, 2016). The Cronbach Alpha coefficient calculated for the entire scale using the data obtained in this study is .86.

School Adjustment Teacher Evaluation Scale (5-6 years old)

The School Adjustment Teacher Evaluation Scale was used to assess the school adjustment of children aged 5 to 6 years. The scale was developed by Önder and Gülay (2010) through an adaptation study and it consists of 25 items and four sub-dimensions (Liking School, Cooperative Participation, Avoiding School, Self-directedness). The items are rated on a 3-point Likert-type scale: "1-Not Appropriate," "2-Sometimes Appropriate," and "3-Completely Appropriate." The lowest possible score is zero and the highest score is 50. Higher scores indicate a greater, level of school adjustment. The Liking School subscale consists of five items and its internal consistency coefficient is .81. The Cooperative Participation sub-dimension consists of eight items and its internal consistency coefficient is .84. The Avoiding School sub-dimension has five items and its internal consistency coefficient is .73. The Self-directedness sun-dimension consists of 7 items and its internal consistency coefficient is .67. The Cronbach Alpha internal consistency coefficient of the entire scale

is .70 (Önder & Gülay, 2010). The Cronbach Alpha coefficient calculated for the entire scale using the data obtained in this study is .74.

Teacher Interview Form

Interviews were conducted with teachers in order to examine the effects of the Parental Supported Primary School Preparation program as observed in the classroom. Interview questions were prepared based on the literature review and needs analysis. Teachers were asked questions about their professional experiences with foreign children, the adaptation of foreign children to school, school-family cooperation, and the education program.

Parent Interview Form

Interviews were conducted with the parents in order to examine the effects of the Parental Supported Primary School Preparation program. Interview questions were prepared based on the literature review and needs analysis. Parents were asked questions regarding their knowledge of the education system, school-family cooperation, their children's adaptation to school, and the education program.

Data Collection

Upon the submission of the research proposal, the necessary application was made to the Ethics Committee of the Ondokuz Mayıs University Institute of Social and Human Sciences. Following the permission issued by the Ethics Committee of the Ondokuz Mayıs University Institute of Educational Sciences, a permission was requested from the Samsun Provincial Directorate of National Education. After the permission process was completed, the necessary meetings were held with the Provincial Directorate of National Education to identify schools with the highest number of foreign children. Among these, the school with the large population of foreign children was selected for the study.

Prior to the implementation, an introductory brochure and invitation translated into Arabic about the program were distributed to the parents of foreign. Parents were invited to the school for an orientation and information meeting. During this meeting, the parents were introduced to the program, and an informative presentation lining educational content of the program was held. The presentation was prepared in both Turkish and Arabic. In addition, an Arabic speaking translator participated in the process throughout the education program to provide interpretation where necessary. At the initial meeting, the parents were asked to fill out the “Parent Consent Form”. Both parents and teachers were informed about the purpose of the study and the measurement tools to be used. In the following weeks, the education program was implemented for both parents and children. The program lasted a total nine weeks. In the final week, certificates were presented to the parents of the participating children in a small ceremony.

The curriculum of the program consisted of the following main topics: Introduction, My Body/Features, Family/Home, My School/Classroom, Food/Drinks, Weather/Seasons, and Games. Four subtopics are listed under each main topic. Activities were carefully designed to support various areas of development. However, as it was became evident during the program that children particularly needed to be supported in their language development and social skills, a greater number of activities were designed and incorporated these areas. The curriculum was implemented over nine-week period, including an “Introduction" week at the beginning and a "Closing" week at the end.

Analysis of Data

In the study, the triangulation method was employed. Qualitative data were analyzed through content analysis. Content analysis is the process of assigning common labels to consistent segments of data. The coding process includes segmenting, examining, comparing, conceptualizing, and correlating the data (Strauss & Corbin, 1998). Initially, codes were generated based on the raw data. These codes were then grouped into main themes and categorized according to their frequency of occurrence. Findings were derived the data obtained through the analyses. To enhance internal reliability, direct quotes from participants were included.

To examine the effects of the Parental Supported Primary School Preparation program on children’s school adaptation, the ANOVA test was conducted. Quantitative data of the study were analyzed

using the SPSS 20.0 statistical software package. In the analysis of the data, the normality of the distribution of the scores obtained from the experimental and control groups was first determined using the Kolmogorov Smirnov and Shapiro Wilk tests. The result of normality analyses, indicated that the data were normally distributed. An independent samples t- test was conducted to determine the differences in pretest scores between two groups. In order to determine whether there was a significant difference among the pretest, posttest and retention test scores of the children in the experimental and control groups, a one-way repeated measures ANOVA test was performed.

Validity and Reliability

The study aimed to accurately reflect the existing situation, without bias. The principle of flexibility was taken into consideration and additional questions were included in the interviews in order to verify the information obtained when necessary. In addition, the collected data were systematically reported to obtain findings and to ensure that the findings formed a meaningful whole both internally and within in their contextual environment in which they were obtained. The triangulation method was employed to enhance the validity of the research, and the data obtained in the quantitative part of the research was supported with qualitative findings.

To strengthen the, internal reliability, direct quotes from participants were included, these quotations, were coded based on the frequency of parent responses. Themes were then developed based on the identified codes. The participating children and their parents were observed throughout the implementation of the education program, and detailed notes were taken. In order to ensure the external validity of the research, comprehensive descriptions regarding the participants interviewed, the role of the researcher, and data collection and analysis methods were provided (Yıldırım & Şimşek, 2016).

RESULTS

Results of Unrelated Samples t-Test Based on Pretest Scores for All Tests

There was no significant difference between the scores the children received on the School Adjustment Test [$t_{(47)}$=.87, p>.05)], Developmental Primary School Readiness Test [$t_{(47)}$=-.21, p>.05)], Peabody Picture and Vocabulary Test [$t_{(47)}$=.56, p>.05)], Peer Relations Test [$t_{(47)}$=.79, p>.05)], and Social Skills Test [$t_{(47)}$=-.18, p>.05)]. Therefore, it can be concluded that the experimental and control groups were statistically equivalent. The analysis results are given in Table 2.

Table 2. Pretest scores of experimental and control groups

Pretest	Group	n	Mean	Std.Dev.	df	t	p
Adaptation to School	Experiment	27	26.33	5.08	47	.87	.38
	Control	22	24.95	5.89			
DPSR	Experiment	27	148.29	38.91	47	-.21	.83
	Control	22	150.40	28.96			
Peabody Picture and Vocabulary Test	Experiment	27	27.51	8.88	47	.56	.57
	Control	22	26.13	7.99			
Peer Relationships	Experiment	27	53.25	8.07	47	.79	.43
	Control	22	51.36	8.69			
Social Skills	Experiment	27	198.63	25.70	47	-.18	.85
	Control	22	200.18	32.29			

*p<.05

Results of Paired Samples t-Test for School Adjustment and Developmental Primary School Readiness Scale

When the scores for the School Adjustment Scale were examined, a significant increase was observed in the experimental group [$t_{(47)}$=-10.65, p<.05)] and the control group [$t_{(47)}$=-10.09, p<.05)]. The effect size indicates that the difference is very large for both the experimental group (d=2.05) and the control group (d=2.15). When the total scores of the children on the Developmental Primary School Readiness Scale are examined, a significant increase is observed for both the experimental group [$t_{(47)}$=-20.08, p<.05)] and the control group [$t_{(47)}$=-9.45, p<.05)]. The calculated effect size shows that

this difference is very large for both the experimental group (d=3.86) and the control group (d=2.01). The analysis results are given in Table 3.

Table 3. Experimental and control group school adjustment and developmental primary school readiness pretest posttest scores

Test / Scale	Group	n	Pretest Mean	Posttest Mean	df	t	P
Adjustment to School	Experiment	27	26.31	31.55	26	-10.65	.00
	Control	22	24.95	27.00	21	-10.09	.00
DPSR	Experiment	27	148.29	178.07	26	-20.08	.00
	Control	22	150.40	156.54	21	-9.45	.00

*p<.05

The ANOVA Results Conducted on Comparison of Pretest - Posttest - Retention Test Scores

When the results of the Peabody Picture and Word test were examined, it was observed that the assumption of homogeneity of variances of the difference between scores (sphericity assumption) was not met in the experimental group (Mauchly's W=.47, p<.05). In this case, Greenhouse-Geisser correction was applied. In the control group (Mauchly's W=.84, p>.05), it was observed that the assumption of homogeneity of variances for the differences between scores (sphericity assumption) is met. The analysis results are given in Table 4.

Table 4. Peabody picture and vocabulary test

Group	(1) Pre-test Mean	Std.Dev.	(2) Post-test Mean	Std.Dev.	(3) Retention-Test Mean	Std.Dev.	df	F	p	Significant difference
Experiment	27.51	1.71	38.37	2.12	43.03	2.37	26	314.16	.00	1-2/, 1-3/, 2-3
Control	26.13	1.70	30.04	1.66	33.50	1.94	21	290.50	.00	1-2/, 1-3/, 2-3

*p<.05

According to the results of the repeated measures ANOVA with Greenhouse-Geisser correction, there was a statistically significant difference between the scores of the experimental group [$F_{(1.30-34.04)}$=253.78, p<.05]. Similarly, there was a statistically significant difference between the scores of the control group [$F_{(2-42)}$=114.58, p<.05]. The calculated effect size for the experimental group (η^2=.90) indicates 90% of the difference. The calculated effect size for the control group (η^2=.84) indicates 84% of the difference. When the means of the experimental group are compared, a significant increase is observed between the pretest and posttest, pretest and retention test, as well as between posttest and retention test. In the control group, a significant increase is observed between the pretest and posttest, pretest and retention test, as well as posttest and retention test environments.

Peer Relationship Pretest – Posttest - Retention Test

When the results of the Peer Relationship test were examined, it was observed that the assumption of homogeneity of variances of the differences between scores (sphericity assumption) was not met in the experimental group (Mauchly's W=.62, p<.05) and control group (Mauchly's W=.50, p<.05). In this case, the Greenhouse-Geisser correction was applied. The analysis results are presented in Table 5.

Table 5. Peer relationship test pretest, posttest and retention test scores of children

Group	(1) Pre-test Mean	Std.Dev.	(2) Post-test Mean	Std.Dev.	(3) Retention-Test Mean	Std.Dev.	df	F	p	Significant difference
Experiment	53.25	1.55	63.74	1.48	64.14	1.34	26	2019.02	.00*	1-2/, 1-3
Control	51.36	1.85	54.81	1.82	54.59	2.17	21	863.84	.01*	1-2

*p<.05

According to the results of the repeated measures ANOVA with Greenhouse-Geisser correction, there was a statistically significant difference between the scores the experimental group [$F_{(1.47-38.20)}$=75.69, p<.05] and the control group [$F_{(1.34-28.16)}$=4.82, p<.05]. The calculated effect size (η^2=.74) indicates 74% of the difference for the experimental group. The calculated effect size for the control group (η^2=.18) indicates 18% of the difference. When the means of the experimental group are compared, a significant increase is observed between the pretest and posttest, as well as between pretest and retention test. In the control group, a significant increase is observed between the pretest and posttest environments.

Social Skills Pretest - Posttest - Retention Test

When the results of the Social Skills test were examined, it was observed that the assumption of homogeneity of variances of differences between scores (sphericity assumption) was met in the experimental group (Mauchly's W=.91, p>.05). In the control group (Mauchly's W=.55, p<.05), it was observed that the assumption of homogeneity of variances of differences between scores (sphericity assumption) was not met. In this case, Greenhouse-Geisser correction was applied. The analysis results are given in Table 6.

Table 6. Social skills test pretest, posttest and retention test scores of children

	(1) Pre-test		(2) Post-test		(3) Retention-Test					
Group	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**df**	**F**	**p**	**Significant difference**
Experiment	198.63	4.94	224.07	4.70	231.33	4.69	26	2111.67	.00*	1-2/, 1-3/, 2-3
Control	200,18	6.88	204.86	6.65	208.72	6.57	21	934.13	.00*	1-2, 1-3/, 2-3

*p<.05

According to the results of the repeated measures ANOVA with Greenhouse-Geisser correction, there was a statistically significant difference between the scores of the experimental group [$F_{(2-52)}$=470.16, p<.05]. There was a significant difference between the control group scores [$F_{(1.38-29.08)}$=49.45, p<.05]. The calculated effect size for the experimental group (η^2=.95) indicates 95% of the difference. The calculated effect size for the control group (η^2=.77) indicates 77% of the difference. When the means of the experimental group are compared, a significant increase is observed between the pretest and posttest, pretest and retention test, as well as posttest and retention test. In the control group, a significant increase is observed between the pretest and posttest, pretest and retention test, as well as posttest and retention test environments. It the control group there is a significant increase.

Results of Unrelated Samples t-Test for Comparison of Pretest and Posttest Scores of Children in Experimental and Control Groups Implemented with Parental Supported Primary School Preparation Program

The t-test for unrelated samples was used to compare the pretest and posttest scores of the children's primary school readiness. The analysis results calculated as a result of the test are given in Table 7.

Table 7. School readiness scores

Test / Scale	**Group**	**n**	**Mean**	**df**	**t**	**P**
To Primary School	Experiment	27	92.44	47	2.25	.02*
Readiness	Control	22	76.27			

*p<.05

The Primary School Readiness Test were examined, a significant difference was observed between the mean scores of the experimental group (Mean=92.44) and the control group (Mean=76.27).

Views of Parents Participating in the Parental Supported Primary School Preparation Program

The findings from the interviews with parents are categorized under the following headings: Parents' awareness of the Turkish education system, Parents' awareness of the importance of preschool education, Problems experienced by foreign national children in adapting to school, School-family collaboration, and Contributions of parent-supported education program.

a) Parents' Awareness of the Turkish Education System

When the parents who participated in the study were asked to share their general knowledge about the Turkish education system, all stated that they did not have any prior understanding of the education system in Turkey before their children started school. Some of the parents particularly emphasized the attention their children received in schools in Turkey and noted the lack of kindergartens in their country of origin:

> "No, I didn't know. The education system there and the one here are very different. They take care of the children here and teach everything better. There was no kindergarten there." (K6)

b) Parents' Awareness of the Importance of Preschool Education

The findings regarding parents' awareness of the importance of preschool education were categorized under the themes of the language acquisition, socialization, and preparation for primary school.

Language acquisition: Parents reported that their children are learning the Turkish language and that they are socializing with their peers. This was expressed as follow:

> "He improved significantly in Turkish. He used to be very shy, but now he's more confident. I also benefited a lot. He did not have any friends at home, he has them here." (K9)

Socialization: Parents mostly sent their children to preschool for socialization:

> "He didn't have any friends. I sent him to kindergarten so that he can have friends. He can mingle with the children, play games, make friends, and learn Turkish." (K13)

Preparation for primary school: Some of the parents expressed that it is important to enroll their children in preschool education in terms of preparation for primary school:

> "The most important thing is for him to be prepared for primary school. I will be enrolling him to the first grade so that he can learn to read and write more easily." (K3)

c) Problems Experienced by Foreign National Children in Adapting to School

Parents who participated in the study stated that the most common problems they experienced in terms of their children's adaptation to school were language-related. The vast majority of parents who participated in the study stated that their children did not have a good command of the Turkish language:

> "It is difficult to not know Turkish. When my son started school, I could not understand what the teacher was saying. There is a Turkish class but I cannot attend because I have children. I do not go out alone." (K2)

Parents who had some prior knowledge of Turkish stated that they did not have any difficulty with the language when their children started school:

> "We are Turkmens; we know and understand Turkish. It was good for us to know Turkish. It would have been very difficult if we didn't. Children need support with their homework. "(K1)

d) School-Family Collaboration

The majority of parents participating in the study stated that they had problems supporting their children at home due to limited language proficiency and literacy skills:

> "My sister-in-law helps me and my son. She translates. That's how I do my child's homework." (K3)

Parents who spoke Turkish, on the other hand stated that they were able to support their children at home:

> "We play games, spend time together, I speak Turkish. When I have difficulty, the teachers help, I come to them and talk." (K15)

Literacy: Some of the parents had difficulty supporting their children because they were illiterate:

> "I wish I could read and write. Children need support with their homework. When the teacher gives homework, I check the WhatsApp group on my phone. It would be better if I had more information about school." (K1)

> "I need help with the language. I can read and write Arabic, but I don't know Turkish. We learned Arabic at school." (K3)

The parents stated that they received support from their relatives in obtaining information:

Relatives: It is observed that most of the parents who stated that they received support from their relatives in terms of obtaining information were parents who did not know Turkish well:

> "My father and sister came before us. It's been 10 years. They helped us. When the children started school, I didn't have much difficulty." (F9)

Contacting the teacher: Almost all of the parents who participated in the study stated that they contacted their children's teachers via WhatsApp groups. All but one parent stated that teachers provided support:

> "We have a WhatsApp group, we talk there. We communicate with the teacher there. The teacher helps us from there when we have questions. There is also a translator, who is one of the mothers." (K3)

One person expressed that they had no communication with the teacher as follows:

> "No. We just bring my child and pick him up. Sometimes we talk., but there is no cooperation with teachers. For example, teachers do not help with homework." (K1)

e) Contributions of Parent-Supported Education Program to Parents

Child-parent communication: The vast majority of parents who participated in the training program stated that the program had positive effects on their communication with their children. Similarly, the vast majority of parents reported that they socialized with other parents thanks to the training program and that the training program contributed to learning the Turkish language:

> "I learned to play games with my child. He says let's do homework together. He wants to do homework with me. We learn new words. I got to know other parents in the course as well." (K1)

Socialization: Some of the parents stated that the education program enabled them to socialize with other parents:

> "I didn't know the other mothers at all, but now I have met them. We had a good time with them." (K1)

> "I made friends here that I didn't know before. I would like the program to continue." (K18)

Learning the Language: Some of the parents expressed that the education program contributed to their acquisition of the Turkish language with the following statements:

> "It helped me to speak Turkish. I learned about preschool education here. It helped me to communicate with my child. We did homework together." (K7)

Teachers' Views on the Parent-Supported Education Program

The findings from the interviews with teachers are categorized under the following headings: Findings related to foreign children, foreign parents, teachers and the education program.

f) Findings Regarding Foreign National Children

Number of foreign children in the classroom: All teachers emphasized to the number of foreign children in their classrooms:

> "The reason that there are more foreign children than Turkish children in my class is that there are many foreign families living in our region. It is better for us teachers if the number of children were more balanced." (T1)

> "At first, the Afghan children were a minority. We could integrate them. This year, there were suddenly 10 children, more than the Turkish children. Their numbers increase every year, but this year it was even more intense." (T2)

Adaptation of foreign children: The problems experienced by foreign children during adaptation can be categorized under language problems and behavioral problems:

> "When they first arrived, we had problems due to the language barrier. They speak the language they speak at home. Almost all of the children in my class were born in Turkey. That's why they don't know the country they came from. They know their country from their elders. In the past, those who came had behavioral problems such as hitting and breaking things because of the war environment they witnessed." (T1)

> "The most difficult thing for me while working with foreign children was that they did not know the language. It was difficult not being able to communicate with them. They learned it at school. They are generally well-adjustment now." (T2)

g) Findings Regarding Foreign Parents

School-family collaboration: All teachers expressed that they had difficulties in terms of school-family collaboration with the following words:

> "They cannot provide much support because they cannot read or write. We are trying to solve this by sending them voice messages, explaining the content of the homework and asking them to do it accordingly." (T2)

h) Findings Regarding Teachers

Education status: Teachers did not participate in any training:

> "No, I didn't participate in prior training. The children came seven years ago. We all learned something together as we went along. Unfortunately, there was no preparation for this" (T2).

> "We had no prior knowledge. We did not know how to communicate with the parents. If we had received training on foreign children, it could have been different. We would have known how to communicate with the parents." (T3)

ı) Findings on the Contributions of the Parental Supported Primary School Preparation Program

Teachers stated that the training program contributed to both the socialization of parents and the improvement school-family cooperation, with the following words:

> "Parents were also given the opportunity to socialize in the education program. Many parents especially mothers, have limited social engagement. I think at least now they have managed to socialize and get along with people from their own culture. Before they could not get along well, because they only met when they came to the door to pick up their children. Now, I observe that they communicate more." (T1)

> "I had never expected that there would be so much participation in this program you introduced. They are very happy. Their communication with each other has improved significantly. This also reflects positively on me as a teacher. They share this with me and try to communicate more. I see that they have learned how to take better care of their children. The children are also happier. Thanks to the program, we have now been able to manage the undesirable behaviors that were exhibited at the school year. I also observed that they are now more interested in their children." (T3)

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

According on the findings of the study, it can be concluded that the curriculum positively impacted the primary school readiness and adjustment levels of foreign-born children. The fact that the activities and materials used within the program were geared towards foreign-born children was a key factor in the program's effectiveness. In their study on teaching Turkish as a second language during the preschool period, Arslantaş and Aktürkoğlu (2023) revealed that the challenges faced by teachers were primarily due to the absence of a program specifically tailored for foreign national children. The lack of visual and audio materials and the insufficient of family participation were identified a major

obstacle encountered in language education. In order to address these issues, the education program implemented in this study, incorporated visual and audio materials specifically designed for foreign children. Furthermore, the vocabulary introduced to the children participating in the education program was simultaneously shared with their parents, who also received weekly activity files to complete with children at home. It is believed that conducting the education program in classes composed solely of foreign children is more effective in supporting the development of their language skills. During the implementation of the training program, it was observed that the foreign children were able to communicate comfortably with the researcher. All of the children, including those who had difficulty speaking Turkish, communicated with the researcher using body language. In the study conducted on the problems encountered by preschool teachers in the education of foreign children, Özoruç and Dikiçi Sığırtmaç (2022) identified the language barrier as a major obstacle to children's adaptation to school. However, they emphasized that this problem should be addressed not only in the education of children, but also in that of their parents.

Linguistic and cultural differences can lead to exclusion, and the most fundamental factor contributing to exclusion in education is the language barrier (Dinler & Hacıfazlıoğlu, 2020). Foreign born children are known to face language-related challenges, particularly in terms school readiness. Language barriers affect not only school readiness of foreign children but also their social adaptation. Research has shown that the education program introduced in this study contributed to the positive development of peer relationship among foreign-born children. It is believed that this achievement is due the education program being designed to focus not only on developing the language skills of foreign children, but improving their social skills as well in the program, particular emphasis was placed on outcomes related to social development. Existing studies indicate that the majority of foreign national children face challenges related to language and social skills. In the study conducted by Aydeniz and Sarıkaya (2021), in which they documented the opinions of teachers regarding the problems they encountered in the education of foreign national children, it is concluded that foreign national children experience communication problems due to language barriers, negatively impacting their social skills leading to exclusion by peers. Baysal and Çimşir (2020), on the other hand, reached the conclusion that foreign national children often experienced problems with their peers such as being mocked, disturbed, and excluded. These findings suggest that difficulties experienced by foreign national children such as not being able to communicate with their peers due to language barriers, misunderstandings, and exclusion are critical factors affecting the development of their social skills

The inclusion of parents in the education program is a crucial factor. In the interviews conducted before the implementation of the program, teachers stated that they had difficulties in communicating with the parents of foreign-born children. However, at the end of the education program, they remarked that they observed more cooperative behaviors among parents. In addition, the teachers stated that the self-confidence of foreign children increased remarkably by at the end of the education program. It is believed that this is due to the activities involving the parents as well as the children. Studies conducted both in Turkey and internationally, have emphasized the importance of involving parents in the education of foreign-born children (Kruse & Kueß, 2022; Ovalı, 2023).

Şahan (2015), who examined the factors influencing the academic success of foreign children, found that family structure, parental education level, parental employment status, language proficiency, well-being, academic self-efficacy, attitudes towards school and school-family cooperation have significant effects on the academic performance of foreign children. Therefore, the effects of each factor mentioned here on the academic success of foreign children should be considered essential. In his study on the psychological resilience of foreign children, Bozdağ (2020) stated that as the social support received from the family, the frequency of social contact, and the level of the sense of belonging to the school increase, the psychological well-being of foreign children also increases.

In addition, considering that all the parents participating in the study had low levels of education, with some being illiterate, it is believed that the participation of parents in the education program played an

important role in informing them about educational resources. Through the education program, illiterate parents had the opportunity to learn about literacy and language courses offered by public education centers. In a similar study, it was concluded that parents who participated in the PAT program implemented abroad learned about language courses through their involvement to the program (Friedrich et al, 2009).

It has been concluded that teachers generally hold positive attitudes towards foreign children. Previous studies examining teacher attitudes towards foreign children also, indicate a generally positive outlook (Çifçi et al., 2019). In the present research, teachers stated that they did not receive any training specifically aimed at the education of foreign children. It is noteworthy that despite the lack of formal training, the teachers did not approach children with prejudice and maintained positive attitudes toward them. Similarly, in the research conducted by Köse et al. (2019), it was concluded that teachers had positive attitudes despite the absence of training specific to the education of foreign children. Similar findings were also reported in the research conducted by Barbarics (2019).

Some studies, have shown that teachers who have not received training in educating foreign children tend to hold more prejudiced attitudes towards them, compared to those who have, highlighting the importance of providing such training (Krüger Potratz, 2007). Another noteworthy finding in this study is that in all of the classes included in the study, the number of foreign children is higher than the number of Turkish children. The teachers included in the study stated that this imbalance was challenging for them, and that they had problems with adaptation and social grouping with foreign children. Similarly, Bucak (2021) concluded in his study, which the perspective of the administrator and teacher, that foreign children were concentrated in certain schools which contributed to the problem of social grouping.

To conclude, the challenges faced by foreign children, particularly as a result of the mass migration that has taken place in recent years, have become increasingly evident and undeniable. The education of foreign children is essential for their integration and harmonious coexistence within society in their future lives. The difficulties experienced by foreign children in schools are influence by many interrelated factors, including migration experiences, educational experiences, the socioeconomic status of the family, as well as the proficiency in the language of the country of destination (Dewitz, 2016). The adaptation of foreign children to primary school during early childhood should be carried out in close cooperation with their parents, who are their primarily caregivers. In addition to foreign children, integrating their parents, especially their mothers, into society plays a crucial role in this process. Only through such a collaborative approach can the effect of educational institutions, and consequently, of teachers, be rendered more effective. Integration a process that extends over a long period of time and influences the education of children beginning in the preschool period and extending into their future academic endeavors. If the educational challenges encountered particularly in the first grade of primary school are not effectively addressed, they many evolve into more complex issues in the later stages of education.

Recommendations

In Turkey, there is a lack of programs that involve foreign parents in the education of their children starting from the preschool level. Considering the contributions of the education program introduced in this study to the development and integration of foreign children, it is important to expand the implementation of similar initiatives. In this context, the research can be replicated with larger groups. Measurement tools like language proficiency, social adaptation specifically designed for foreign children can be developed. Further studies can be conducted on the implementation of educational practices for foreign children. To work better with foreign children, the needs of teachers can be identified, and target training programs can be organized accordingly. Teachers with extensive professional experience with foreign children can be given more active roles. Projects focusing on the education and well-being of foreign children can be supported. For this, the number of support classes can be increased in schools where foreign children are awareness.

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This study includes a part of the author's doctoral thesis titled Investigation of the effect of Parent Supported Primary School Preparation program on the school adjustment of foreign children.

Limitations of the study
One limitation of the study is that it was conducted with 60–72-month-old foreign children attending preschool education in the central districts of Samsun province. The sample size could be expanded to include children from different age groups and regions. The data is limited to the responses of teachers and mothers of foreign children attending preschool and primary schools. Furthermore, to assess long-term effects, the study could be extended over a longer period. Another limitation is that most of the participating children have been attending preschool for only one year. The study could be conducted with foreign children who have been attending preschool for a longer period of time. Due to language barriers, a translator was used during the data collection process. Future research could be conducted using scales developed for foreign children.

Ethics and Conflict of Interest
Parents and teachers who participated in the program were provided detailed information regarding the purpose of the study. The participation of both parents and teachers in the study was voluntary, and written informed consent was obtained from the children's parents prior to their children's involvement. The personal information of parents, children and teachers was kept confidential and was not disclosed to any third parties. The necessary application was made to the Ethics Committee of the Ondokuz Mayıs University Institute of Social and Human Sciences on 31.12.2021 with the decision number 2021-1031. The authors declare that the research was complied with ethical principles and that they have no conflict of interest.

Author Contribution
The first author contributed 80% of the work and the second author contributed 20%. The first author was responsible for the study design, literature review, data collection, analysis, and manuscript writing. The second author contributed to the interpretation, and critical revision of the manuscript.

Data availability
The data that support the findings of this study are available on request from the corresponding author.

Corresponding Author
Correspondence to Nilüfer Yiğit, nilali-yigit@hotmail.de

REFERENCES

Akgöz, A. A., & Dağyar, M. (2023). Yabancı öğrencilerin eğitimde yaşadığı sorunlara yönelik bir meta sentez çalışması [A meta-synthesis study on the problems faced by foreign students in education]. *International Anatolian Journal of Social Sciences, 7*(2), 386-404. https://doi.org/10.47525/ulasbid.1269657

Alkalay, G., Kıral, B., & Erdem, A. R. (2021). İlkokul yönetici ve sınıf öğretmenlerine göre Suriyeli sığınmacı öğrencilerin yaşadıkları sorunlar ve çözüm önerileri [According to primary school administrators and classroom teachers Syrian refugee student's problems and their solutions]. *Muğla Sıtkı Koçman University Journal of Education Faculty, 8(1), 231-249.* https://doi.org/10.21666/muefd.809182

Arslantaş, T., & Aktürkoğlu, B. (2023). Okul öncesi öğretmenlerinin Türkçenin yabancı dil olarak öğretiminde karşılaştıkları sorunlar ve çözüm önerileri [Problems faced by preschool teachers in teaching Turkish as a foreign language and solution suggestions]. *Turkish Educational Sciences Journal, 21(2), 603-625. https://doi.org/10.37217/tebd.1199214*

Atış-Akyol, N., & Karaman, N. G. (2021). Çocukların akran ilişkileri öğretmen değerlendirme ölçeğinin geçerlilik ve güvenilirlik çalışması [Validity and reliability study of teacher's checklist of children's peer relationships]. *Cumhuriyet Journal of International Education, 10*(3), 1066-1084. https://doi.org/10.30703/cije.811946

Avcı, F. (2019). Okul öncesi eğitim kurumlarına devam eden mülteci öğrencilerin sınıf ortamında karşılaştıkları sorunlara ilişkin öğretmen görüşleri [Teachers' opinions on the problems faced by the refugee students in preschool education institutions]. *Language Teaching and Educational Research, 2*(1), 57-80. https://doi.org/10.35207/later.537817

Avcıoğlu, H. (2007). Sosyal becerileri değerlendirme ölçeğinin geçerlik ve güvenirlik çalışması (4-6 yaş) [in Turkish]. *Abant İzzet Baysal University Journal of Education Faculty, 7* (2), 93-103.

Aydeniz, S., & Sarıkaya, B. (2021). Göçmen çocukların eğitiminde yaşanan sorunlar ve çözüm önerilerine ilişkin öğretmen görüşleri [Teachers' views on problems and solution suggestions in the education of migrant children]. *Journal of National Education, 50* (1), 385-404. https://doi.org/10.37669/milliegitim.959700

Baker, J. A. (2006). Contributions of teacher child relationships to positive school adjustment during elementary school. *Journal of School Psychology, 44*(3), 211- 229. https://doi.org/10.1016/j.jsp.2006.02.002

Barbarics, J. (2019). Kinder mit Fluchterfahrung: Ankommen in der Kita [in German]. *Sozial Extra, 43(1), 64-68.*

Başar, M., Akan, D., & Çiftçi, M. (2018). Mülteci öğrencilerin bulunduğu sınıflarda öğrenme sürecinde karşılaşılan sorunlar [Learning-teaching process issues in classrooms with refugee students]. *Kastamonu Education Journal, 26*(5), 1571-1578. https://doi.org/10.24106 /kefmagazine.427432

Baysal, Z. N., & Çimşir, S. (2020). Türkiye'ye göç ile gelen uluslararası ilkokul öğrencilerinin kendi perspektiflerinden okulda arkadaşlarıyla yaşadıkları sorunlar ve çözüm önerileri [Turkey migration of incoming elementary school students problems with their friends at school and suggested solutions]. *Akdeniz University Faculty of Education Journal, 3*(2), 71-87.

Birch, S. H., & Ladd, G. W. (1997). The teacher-child relationship and children's early school adjustment. *Journal of School Psychology, 35*(1), 61-79. https://doi.org/10.1016/S0022-4405(96)00029-5

Bozdağ, F. (2020). *Mülteci çocukların psikolojik sağlamlıkları ve kültürlenme stratejileri* [Psychological resilience and acculturation strategies of refugee children] (Unpublished doctoral dissertation). Hacettepe University, Ankara, Turkey.

Bucak, M. (2021). *Mülteci çocukların devam ettikleri ilkokulların yönetiminin okul yöneticisi, öğretmen ve mülteci veli bakış açısıyla değerlendirilmesi* [Evaluation of the administration of primary schools attended by refugee children from the perspectives of school administrators, teachers and refugee parents] (Unpublished master's thesis). Nevşehir Hacı Bektaş Veli University, Nevşehir, Turkey.

Buhs, E. S. (2005). Peer rejection, negative peer treatment, and school adjustment: Self concept and classroom engagement as mediating processes. *Journal of School Psychology, 43*(5), 407–424. https://doi.org/10.1016/j.jsp.2005.09.001

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö., Karadeniz, Ş., & Demirel, F. (2017). *Bilimsel araştırma yöntemleri* [in Turkish]. Ankara: Pegem Academy.

Canbulat, T., & Kırıktaş, H. (2016). İlkokula hazır bulunuşluk ölçeği'nin geliştirilmesi: Geçerlik ve güvenilirlik çalışması [The development scale of readiness primary school: Validity and reliability studies]. *Academia Journal of Educational Research, 1*(1), 26-35.

Chuang, S. S., Rasmi, S., &Friesen, C. (2011). *Service providers' perspectives on the pathways of adjustment for newcomer children and youth in Canada. Immigrant children: Change, adaptation, and cultural transformation*. Lexington Books.
https://www.researchgate.net/publication/259294249_Service_Providers'_Perspectives_on_the_Pathways_of_Adjustment_for_Newcomer_Children_and_Youth_in_Canada

Creswell, J. W. (2017). *Araştırma deseni. Nitel, nicel ve karma yöntem yaklaşımları* [Research design: Qualitative, quantitative and mixed methods approaches]. (Trans. Demir, S.B.). Educational Book, Ankara, Turkey.

Çifçi, T., Arseven, İ., Arseven, A., & Orhan, A. (2019). Öğretmenlerin mülteci öğrencilere yönelik tutumlarının çeşitli değişkenler açısından incelenmesi, Sivas ili örneği [Investigation of teachers' attitudes towards refugee students based on certain variables (The case of Sivas province)]. *Cumhuriyet International Education Journal, 8*(4), 1082-1101. http://dx.doi.org/10.30703/cije.581407

Delen, A., & Ercoşkun, M. H. (2019). Yabancı uyruklu öğrencilerin bulunduğu ilkokullarda istenmeyen öğrenci davranışlarının nitel açıdan incelenmesi [The qualitative investigation of the undesirable student behaviors in the primary schools where there are foreign students]. *Journal of National Education, 48*(223), 572-599. https://doi.org/10.33437/ksusbd.649281

Dewitz, N. V. (2016). *Neu zugewanderte Schüler_innen - Ausgangslage und schulische Einbindung. In: Jungkamp, B.; John-Ohnesorg, M. (ed.): Flucht und Schule. Integration von geflüchteten Kindern und Jugendlichen* [in German]. Friedrich Ebert Foundation. https://library.fes.de/pdf-files/studienfoerderung/12837.pdf

Dinler, C., & Hacıfazlıoğlu, Ö. (2020). Mülteci çocukların ilköğretime uyum süreçleri: Tekirdağ ilinin bir okulundaki öğretmenlerin ve yöneticilerin deneyimleri [Primary school adaptation process of refugee children: experiences of administrators and teachers in a school at Tekirdağ province]. *Anemon Muş Alparslan University Journal of Social Sciences, 8*(6), 1717-1728. https://doi.org/10.18506/anemon.671367

Directorate of Immigration Administration (2024). *İstatistikler.* TC. İçişleri Bakanlığı Göç İdaresi Başkanlığı [in Turkish]. Ministry of Interior Migration Management Presidency]. https://www.goc.gov.tr/uluslararasi-koruma-istatistikler

Doğan, S., & Özdemir, Ç. (2019). Sivas ilinde öğrenim gören yabancı uyruklu öğrencilerin okul iklimine etkisinin incelenmesi [Investigating the effect on school climate of foreign students in the province of Sivas]. *Electronic Journal of Social Sciences, 18* (69), 124-14. https://doi.org/10.17755/esosder.411180

Dolapcı, E. (2019). *Öğretmenlerin çok kültürlü özyeterlik algısı ve okul iklimi ile mülteci öğrencilere yönelik tutumları arasındaki ilişkilerin incelenmesi* [The examination of the relationships among teachers' multicultural self efficacy, school climate and teachers' attitudes towards refugee students] (Unpublished master's thesis), Kastamonu University, Kastamonu, Turkey.

Ereş, F. (2015). Türkiye'de göçmen eğitimi sorunsalı ve göçmen eğitiminde farklılığın yönetimi [Problematic of migrant education and diversity management for immigrant education in Turkey]. *Çankırı Karatekin University Social Sciences Institute Journal, 6*(2), 17-30.

Erten, H. (2012). *Okul öncesi eğitime devam eden 5-6 yaş çocuklarının sosyal beceri, akran ilişkileri ve okula uyum düzeyleri arasındaki ilişkilerin izlenmesi* [Following relations of 5-6 year-old children, who attend preschool education, in terms of social skills, peer relationships and school adjustment levels] (Unpublished master's thesis), Pamukkale University, Denizli, Turkey.

Fansa, M. (2021a). Kimim ben? Göçmen, sığınmacı, mülteci, yabancı, vatansız ve geçici koruma: Türkiye'deki Suriyeliler [Who am I? Migrant, asylum seeker, refugee, foreigner, stateless and temporary protection: Syrians in Turkey]. *Antakiyat, 4*(2), 289-306.

Fansa, M. (2021b). *Türkiye'deki bir geçici barınma merkezinde Suriyeli çocukların yaşamı: İlkokul eğitimi üzerine etnografik bir çalışma* [The life of Syrian children in a temporary shelter center in Turkey: an ethnographic study on primary school education], (Unpublished doctoral dissertation), Anadolu University, Eskisehir, Turkey.

Friedrich, L., Siegert, M., & Schuller, K. (2009). *Förderung des Bildungserfolgs von Migranten: Effekte familienorientierter Projekte; Abschlussbericht zum Projekt Bildungserfolge bei Kindern und Jugendlichen mit Migrationshintergrund durch Zusammenarbeit mit den Eltern* [in German]. Federal Office for Migration and Refugees. https://www.ssoar.info/ssoar/bitstream/handle/document/25876/ssoar-2009-friedrich_et_al-forderung_des_bildungserfolgs_von_migranten.pdf?

Güngör, F., & Şenel, E. A. (2018). Yabancı uyruklu ilkokul öğrencilerinin eğitim–öğretiminde yaşanan sorunlara ilişkin öğretmen ve öğrenci görüşleri [Teachers and students views in problems of the foreign primary school students in education process encountered]. *Anadolu Journal of Educational Sciences International, 8*(2), 124-173. https://doi.org/10.18039/ajesi.454575

International Organisation for Migration, IOM (2024). *World Migration Report 2024*. The UN Migration Agency. https://publications.iom.int/system/files/pdf/pub2023-047-l-world-migration-report-2024_13.pdf

İmamoğlu, H. V., & Çalışkan, E. (2017). Yabancı uyruklu öğrencilerin devlet okullarında ilkokul eğitimine dair öğretmen görüşleri: Sinop ili örneği [Opinions of teachers on the primary education of foreign students in public schools: The case of Sinop province]. *Karabük University Journal of Social Sciences Institute, 7*(2), 529-546.

Jimenez, L., Dekovic, M., & Hidalgo, V. (2009). Adjustment of school-aged children and adolescents growing up in at risk families: Relationships between family variables and individual, relational and school adjustment. *Children and Youth Services Review, 31*(6), 654–661. https://doi.org/10.1016/j.childyouth.2008.12.007

Kaya, A. (2022). Suriyeli öğrencilerin eğitim-öğretim faaliyetlerinde karşılaştıkları zorluklar [Difficulties encountered by Syrian students in educational activities]. *Journal of Multidisciplinary Studies in Education, 6*(3), 89-99.

Koşak, M. A., & Atasoy, R. (2022). Suriyelilerin temel eğitim sistemine entegrasyonunda Şanlıurfa ili özelinde okul yöneticilerinin karşılaştığı sorunlar [The problems that school administrators encounter with the integration of Syrians to the basic education system specific to Şanlıurfa province]. *Harran Maarif Journal, 7*(2), 150-178. https://doi.org/10.22596/hej.1144890

Köse, N., Bülbül, Ö., & Uluman, M. (2019). Sınıf öğretmenlerinin mülteci öğrencilere yönelik tutumlarının çeşitli değişkenler açısından incelenmesi [Investigation attitudes towards refugee students of class teachers' in terms of several variables]. *Journal of Continuous Vocational Education and Training, 2*(1), 16-29.

Kruse, M., & Kueß, N. (2022*). Eltern stärken und einbeziehen. Niedersächsisches Institut für frühkindliche Bildung und Entwicklung* [in German]. https://lpr.niedersachsen.de/fileadmin/user_upload/redaktion_lpr/Dateien_zur_kommunalen_Praevention__CTC_und_Mitglieder__Baum_/WIRkt/Zusammenarbeit_mit_Eltern_online.pdf

Krüger Potratz, M. (2007). *Ethnische und soziale Vielfalt gestalten: Interkulturelle Konzepte in der Schule* [in German]. Friedrich Ebert Foundation. https://library.fes.de/pdf-files/asfo/04689.pdf

Ladd, G. W., & Price, J. M. (1987). Predicting children's social and school adjustment following the transition from preschool to kindergarten. *Child Development, 58*(5), 1168-1189. https://doi.org/10.2307/1130613

Ministry of Education (2022). *2021-2022 eğitim öğretim yılı verileri. Millî Eğitim Bakanlığı Hayat Boyu Öğrenme Genel Müdürlüğü* [in Turkish]. Department of Migration and Education in Emergencies. https://hbogm.meb.gov.tr/meb_iys_dosyalar/2022_01/26165737_goc2022sunu.pdf

Murray, C., Murray, K. M., & Waas, G. A. (2008). Child and teacher reports of teacher–student relationships: Concordance of perspectives and associations with school adjustment in urban kindergarten classrooms. *Journal of Applied Developmental Psychology, 29*(1), 49–61. https://doi.org/10.1016/j.appdev.2007.10.006

Ocak, G. (2019). *Eğitimde bilimsel araştırma yöntemleri* [in Turkish]. Ankara: Pegem Academy.

Ovalı, E. (2023). *İlkokulda yabancı uyruklu öğrencilere ikinci dil olarak Türkçe öğretiminin kapsayıcı eğitim açısından incelenmesi* [A study on teaching Turkish as a second language to foreign students in primary schools in terms of inclusive education] (Unpublished master's thesis), Necmettin Erbakan University, Konya, Turkey.

Önder, A., & Gülay, H. (2010). 5-6 yaş çocukları için okula uyum öğretmen değerlendirme ölçeği'nin güvenirlik ve geçerlik çalışması [Reliability and validity of the teacher rating scale of school adjustment for 5-6 years of children]. *International Online Journal of Educational Sciences, 2*(1), 204-224.

Özdemir, M. (2008). *Türkiye'de içgöç olgusu, nedenleri ve Çorlu örneği* [Immigration case in turkey, causes and Çorlu sample], (Unpublished Master's Thesis), Trakya University, Trakya, Turkey.

Özdoğru, A. A., Dolu, F. N., Akan, A., &Aldemir, S. (2021). Öğretmenlerin çok kültürlü eğitime ve mülteci öğrencilere yönelik tutumları [Teachers' attitudes towards multicultural education and refugee students]. *Dicle University Ziya Gökalp Faculty of Education Journal, 1*(40), 111-122.

Özoruç, N., & Dikici Sığırtmaç, A. D. (2022). Okul öncesi öğretmenlerinin mülteci çocukların eğitim sürecinde karşılaştıkları sorunlara ilişkin görüşleri [Opinions of pre-school teachers on the problems faced by refugee children in the education process]. *Journal of National Education, 51*(233), 237-258. https://doi.org/10.37669/milliegitim.779155

Perry, K. E., & Weinstein, R. S. (1998). The social context of early schooling and children's school adjustment, *Educational Psychologist, 33*(4), 177-194. https://doi.org/10.1207/s15326985ep3304_3

Sağıroğlu, A. Z., Ünsal, R., & Özenci, F. (2021). *Türkiye göç ve insan hareketlilikleri yıllık raporu, 2021* [in Turkish]. Ankara Yıldırım Beyazıt University. https://aybu.edu.tr/GetFile?id=1c168fe4-c95c-447f-b3eb-8ab7d312794c.pdf

Sağlam, H. İ., & İlksen Kanbur, N. (2017). Sınıf öğretmenlerinin mülteci öğrencilere yönelik tutumlarının çeşitli değişkenler açısından incelenmesi [Investigation attitudes towards refugee students of class teachers' in terms of several variables]. *Sakarya University Journal of Education, 7*(2), 310-323. https://doi.org/10.19126/suje.335877

Sak, R., & Yorgun, E. (2020). Gelişimsel ilkokula hazırbulunuşluk ölçeğinin geçerlik ve güvenirlik analizi [Validity and reliability analysis of developmental primary school readiness scale]. *Iğdır University Journal of Social Sciences, (24),* 495-526.

Sarıer, Y. (2020). Türkiye'de mülteci öğrencilerin eğitimi üzerine bir meta-sentez çalışması: sorunlar ve çözüm önerileri [Student education for refugees in turkey on the meta-synthesis study: problems and solution suggestions]. *Journal of New Approaches in Education, 3*(1), 80-111.

Sarıtaş, E., Şahin, Ü., & Çatalbaş, G. (2016). İlkokullarda yabancı uyruklu öğrencilerle karşılaşılan sorunlar [Problems faced with foreign students in primary schools]. *Pamukkale University Social Sciences Institute Journal, 2*(1), 208-229.

Selbes, C. G., & Selbes, M. (2023). İlkokulda yabancı uyruklu öğrencilerin yaşadığı sıkıntılar ve çözümleri üzerine öğretmen görüşleri [Teachers' opinions on the difficulties experienced by foreign students in primary school and their solutions]. *Academic Social Resources Journal, 8*(51), 3080-3089. https://doi.org/10.29228/ASRJOURNAL.71062

Sılgan, Y. (2022). *Okul yöneticileri ve öğretmenler gözüyle Suriyeli öğrencilerin eğitimde yaşadıkları sorunların incelenmesi* [Examining the problems of Syrian students in education from the perspective of school administrators and teachers], (Unpublished master's thesis), Maltepe University.

Strauss, A., & Corbin, J. (1998). Basics of qualitative research techniques. Basics_of_Qualitative_Research__Techniques_and_Procedures_for_Developing_Grounded_Theory-libre.pdf

Şahan, G. (2015). Eine analyse der faktoren, die erfolge der Grundschüler mit türkischer Migrationshintergrund in Deutschland beeinflussen: Meinungen der Erziehungsberechtigten [An analysis of factors, which influence Turkish students at primary schools in Germany: According to opinions of the families]. *Journal of World of Turks, 7*(3), 137-158. http://hdl.handle.net/11772/1278

Şimşek-Ademi, A., & Aslan, Ö. F. (2024). Uluslararası zorunlu göç kapsamında Türkiye'de ikamet eden yabancı profili verilerinin istatistiki analizi [Statistical analysis of foreigner profile data residing in turkey within the scope of forced

international migration]. *The Journal of Turk-Islam World Social Studies, 11*(40), 292-306. https://doi.org/10.29228/TIDSAD.74983

Telsaç, Ö. Y., Karagöz, S., & Telsaç, C. (2022). The educational problems of migrant children: Findings and recommendations. *International Journal of Educational Research Review*,*7*(4) 345-354.

Turan, M., & Polat, F. (2017). Türkiye'de öğrenim gören yabancı uyruklu ilköğretim öğrencilerinin karşılaştıkları sorunlar ve çözüm önerileri [Problems encountred by the foreign elementary school students in turkey and possible solutions from the perspective of teachers]. *Qualitative Studies, 12*(4), 31-60.

Yıldırım, A. Y., & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri* [in Turkish]. Ankara: Seçkin Publishing.

Yıldız Yılmaz, N., ve Demir, E. (2021). Sınıf öğretmenlerinin yabancı uyruklu öğrencilere ilişkin sorunları ile çözüm önerilerinin değerlendirilmesi [Evaluation of classroom teachers' problems related to foreign students and suggestions for solutions]. *Kalem Education and Human Sciences Journal, 11*(2), 535-55.

About the authors:

Nilüfer YİĞİT
She completed her doctorate degree at the Faculty of Education, Department of Classroom Education at Ondokuz Mayıs University. She continues her work as a post-doctoral independent researcher. Her research interests include disadvantaged children, immigrant children, and educational programs. Focusing on language and social development, the research examines how a parent-supported education program supports school adjustment.

Elif MERCAN UZUN
She is a doctoral faculty member at Ondokuz Mayıs University, Faculty of Education, Department of Primary Education, Department of Preschool Education. She/he teaches undergraduate and graduate courses at her affiliated university. Her research interests include preschool education, school readiness and disadvantaged children.

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DETERMINING FACTORS IN THE UTILIZATION OF ARTIFICIAL INTELLIGENCE: PERCEPTIONS AND BEHAVIORS OF PROSPECTIVE PRIMARY SCHOOL TEACHERS IN COMPLETING SCIENCE ASSIGNMENTS

Thoriqi FIRDAUS
Yogyakarta State University,
Faculty of Mathematics and Natural Sciences, Department of Natural Science Education, Indonesia
ORCID: https://orcid.org/0009-0005-2340-8468
thoriqifirdaus.2023@student.uny.ac.id

Noura Aulya DAMAYANTI
Trunojoyo Madura University,
Faculty of Education, Department of Primary School Teacher Education, Indonesia
ORCID: https://orcid.org/0009-0005-5100-898X
220611100009@student.trunojoyo.ac.id

Rika Nur HAMIDA
Trunojoyo Madura University,
Faculty of Education, Department of Primary School Teacher Education, Indonesia
ORCID: https://orcid.org/0009-0003-8027-1336
220611100011@student.trunojoyo.ac.id

Roukhil Ummu HANI
Trunojoyo Madura University,
Faculty of Education, Department of Primary School Teacher Education, Indonesia
ORCID: https://orcid.org/0009-0009-5695-0789
220611100024@student.trunojoyo.ac.id

Najwa Salma Khoirun NISA
Trunojoyo Madura University,
Faculty of Education, Department of Primary School Teacher Education, Indonesia
ORCID: https://orcid.org/0009-0002-4638-2924
220611100002@student.trunojoyo.ac.id

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Abstract

Artificial Intelligence (AI) holds significant potential to transform education, particularly in teaching methodologies and task completion. This study aims to identify the factors influencing the perceptions and behaviors of elementary education students in utilizing ChatGPT and Gemini to complete science-related assignments. The research design employs a quantitative approach with both descriptive and causal methodologies. Data testing and analysis are conducted using Structural Equation Modeling (SEM), P-value, and Prediction-Oriented Segmentation (POS). Path analysis results reveal that perceived benefits significantly impact perception (.403) and behavior (.406). AI effectiveness significantly affects perception (.303) but minimally influences behavior (.018). Preference for AI usage positively influences behavior (.305), whereas dependence on AI negatively impacts perception (-.050). Restrictions on AI usage reduce perception (-.077) but increase behavior (.115). The p-value analysis indicates that the perceived benefits of AI use significantly influence behavior (.000) and perception (.000), supporting the hypothesis that perceived benefits play a crucial role in enhancing AI adoption and fostering positive attitudes toward its use. Conversely, AI effectiveness significantly affects perception (.000) but not behavior (.862). Dependence, restrictions, and the impact of AI show no significant effects on either behavior or perception, except for AI usage preferences,

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which significantly influence behavior (.033). Segment analysis reveals that perceived benefits influence behavior in Segment 1 (.510) and perception in Segment 2 (.493). AI effectiveness negatively impacts behavior in Segment 2 (-.633) but shows moderate effects in Segment 1 (.214). Preferences for AI usage exert a more substantial influence on behavior in Segment 2 (.614), while the effects of dependence and restrictions vary across segments. The perceived benefits of AI encourage technology adoption among students, while dependence and restrictions introduce complexities in formulating AI-based educational policies.

Keywords: Artificial intelligence, ChatGPT, gemini, behaviors.

INTRODUCTION

The utilization of artificial intelligence (AI) technology across various aspects of life has undergone remarkable advancements over the past decades, offering transformative potential to replace human tasks and activities in numerous fields (Dwivedi et al., 2021). In the realm of education, the paradigm has shifted significantly with the advent of digital learning (Firdaus, 2023). Among the most widely adopted AI applications are generative language models such as ChatGPT and Gemini AI (World Bank, 2024), which leverage machine learning algorithms to interact with users via text, generate responses, and solve specific problems (Alsajri et al., 2024; Imran & Almusharraf, 2024). The integration of AI into education has increasingly extended to the learning process, including completing academic assignments, such as science tasks (Firdaus et al., 2024). This phenomenon is particularly evident among elementary education students utilizing ChatGPT and Gemini AI to complete assignments. Consequently, understanding the factors influencing perceptions and behaviors regarding the use of these AI tools in completing science tasks is essential.

Knowledge of AI technology is pivotal in effectively leveraging these applications in educational settings. Perceptions of the effectiveness and benefits offered by ChatGPT and Gemini AI play a critical role in shaping decisions to adopt this technology in learning processes (Baskara, 2025; Bayer et al., 2024). Knowledge about AI is a key driving factor for its adoption in education, as sufficient understanding enables individuals to utilize the technology optimally (Arora et al., 2024; Gao, 2023). Moreover, research has shown that students with excellent AI knowledge tend to demonstrate more positive perceptions of its use (Gao, 2023).

Student behavior in utilizing AI to complete science tasks is another crucial factor to consider. According to Choi et al. (2023), user behavior towards AI technology heavily depends on its efficiency and effectiveness factors. Students who perceive that ChatGPT and Gemini AI accelerate task completion are likelier to consistently adopt these tools (Nikolic et al., 2024). However, usage restrictions and dependence on these technologies can also influence behavior. Usage restrictions, whether technical (e.g., limited access or capacity) or ethical (e.g., concerns about plagiarism), may reduce students' willingness to rely on these technologies (Tripathi & Thakar, 2024; Rane et al., 2023).

The impact of AI usage in education requires a more profound analysis. Several studies suggest that the use of AI in learning can have positive effects, such as enhancing conceptual understanding and learning efficiency (Wang et al., 2024). Research by Luckin (2018) indicates that AI implementation in education can improve students' learning experiences by providing faster and more accurate feedback. However, concerns have been raised regarding potential negative impacts, such as excessive dependency on technology or limitations arising from a lack of understanding of AI's operations. Negative consequences may include over-reliance on technology, which could diminish students' critical thinking abilities in problem-solving (Zhai et al., 2024; Calzada, 2024). Critical thinking, however, is one of the key benchmarks for student success in the current learning era (Firdaus, 2022). Therefore, it is crucial to explore how students perceive the impact of AI use in supporting education.

Students' preferences in selecting technology to support learning and their views on AI technology's potential benefits and risks are relevant variables in this study. Research by Alam & Mohanty (2023) emphasizes that individual preferences for technology are often influenced by ease of use, accessibility, and effectiveness in completing academic tasks. Hence, the primary issue in this research focuses on

understanding the factors influencing the utilization of Artificial Intelligence (AI), specifically ChatGPT and Gemini AI, among elementary education students in completing science-related tasks.

The use of AI among students is increasing alongside technological advancements; however, its impact on students' perceptions and behaviors in completing educational tasks has not been extensively discussed in the literature. Previous studies indicate that perceptions of new technology significantly influence how individuals interact with and adopt such technologies (Venkatesh et al., 2003). Students' perceptions of AI usage's effectiveness, benefits, and impacts are key determinants in its adoption. The effectiveness of these technologies relates to students' ability to complete science tasks more efficiently and effectively, while perceived benefits influence how frequently students use these technologies in their learning process (Davis, 1989). Research by Hwang et al. (2020) examines how acceptance of AI affects its effectiveness in learning contexts, showing that students with excellent knowledge of AI are likelier to utilize the technology effectively.

Furthermore, the potential limitations and dependency on AI usage may significantly influence students' behavior. Several studies have indicated that excessive reliance on technology can diminish critical thinking skills and independence (Carr, 2011). Restrictions on access to or use of AI also emerge as critical factors, as not all students have equal access to this technology, whether in terms of devices or internet connectivity (Hochschild, 2017). This approach is essential to understanding the opportunities and challenges of integrating AI technology into education, particularly in the context of science teaching and learning.

One of the reasons why this research is important is that AI holds immense potential to revolutionize learning processes, both in teaching and in completing tasks. The effectiveness of AI usage in education, as described by Popenici and Kerr (2017), can facilitate more personalized teaching, accelerate access to information, and reduce students' cognitive load. Analyzing the variables of ChatGPT and Gemini AI's effectiveness will provide insights into how students perceive these tools in completing assignments and whether they find them helpful or disruptive to the learning process. As Atchley et al. (2013) noted, students tend to be more enthusiastic about using technology if they perceive significant benefits, such as easier access to information or time efficiency. However, these benefits are not universally experienced by all individuals, influencing their behavior toward adopting such technologies. Additionally, students' preferences for using AI to support their learning are another critical aspect to consider. As Lai (2021) explains, users' preferences for adopting educational technology are heavily influenced by personal experiences and perceptions of the technology.

Although some research has explored the impact of AI technology in education, few studies have combined the analysis of psychological factors, such as students' perceptions and behaviors, in the context of completing specific tasks, such as science assignments. The research gap lies in the lack of in-depth investigation into factors influencing AI utilization, including variables such as usage limitations, dependency on technology, and students' preferences in choosing AI to support the learning process. This study aims to address this gap by conducting a comprehensive analysis using SEM models to identify the factors affecting the perceptions and behaviors of elementary education students in utilizing ChatGPT and Gemini AI to complete science assignments.

METHOD

Research Design

The research design employs a quantitative approach with both descriptive and causal methodologies. The descriptive approach is utilized to depict students' perceptions and behaviors regarding the use of AI in completing science assignments. In contrast, the causal approach is applied to identify cause-and-effect relationships between various variables, such as the benefits, effectiveness, impacts, and preferences for AI usage on students' behaviors and perceptions.

This study examines the relationships between variables and explores the factors influencing AI utilization using Structural Equation Modeling (SEM), with SmartPLS 4 as the analytical tool.

Additionally, student segments with varying responses to AI are identified through Prediction-Oriented Segmentation (POS) to analyze variations in the influence of variables based on the differing characteristics of students.

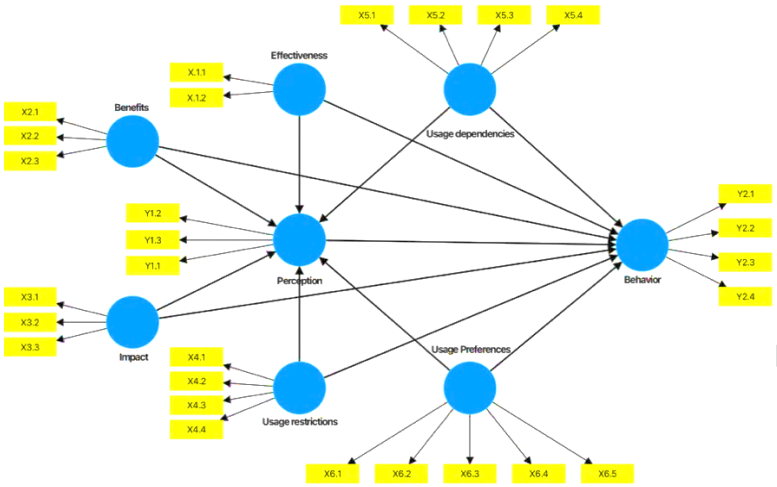

Figure 1. Research framework.

Populations and Sampling Techniques

The population used in this study consists of all fifth-semester Elementary Education students at Trunojoyo University, Madura, enrolled in science courses and using or having knowledge of ChatGPT and Gemini AI as elements of the learning process. Although they have not received specific training on AI, Elementary Education students are familiar with the use of digital tools. This study used a purposive sampling technique, which selects students who meet certain criteria (Ritchie et al., 2013). This study used 100 samples obtained based on the qualifications of students who actively participate in science courses, have knowledge and experience in using AI (especially ChatGPT and Gemini AI) during learning, and are willing to participate in the study. The number of participants consisted of 55% female and 15% male and the majority had good access to computers and the internet. The purpose of this sampling was to determine that the study focuses on students with the appropriateness of the research topic and their direct experience in using AI in academic activities.

Research Instrument

The questionnaire was constructed using a Likert scale to measure students' attitudes and perceptions toward the use of artificial intelligence, ranging from 1 (Strongly Disagree) to 4 (Strongly Agree). This instrument was pre-tested to ensure its validity and reliability before being used in data collection. The questionnaire was designed to measure the variables involved in this study. This measurement instrument was developed by the researcher based on several literature reviews on user perceptions and behaviors toward artificial intelligence in academic contexts in the world of education. Instrument development began with identifying appropriate indicators from the literature, which were then formulated into statement items. The questionnaire was structured to measure the variables involved in this study, which include:

X1: Effectiveness of using ChatGPT & Gemini AI

X2: Benefits of using ChatGPT & Gemini AI

X3: Impact of using ChatGPT & Gemini AI

X4: Restrictions on the use of ChatGPT & Gemini AI

X5: Dependency on the use of ChatGPT & Gemini AI

X6: Preferences and use of AI in supporting learning

Y1: Perception

Y2: Behavior

Data Collection Procedure

The questionnaire was developed based on appropriate theoretical foundations regarding the use of technology in education and the variables to be measured in this study. Prior to distribution, the questionnaire instrument underwent a pilot test on a small sample to identify and identify potential issues and ensure the clarity of each question. The questionnaire was then distributed online to students selected using a purposive sampling technique. Students were instructed and asked to complete the questionnaire independently, answering each question based on their personal experiences and perspectives on the use of artificial intelligence in science learning.

Data collection was conducted over a two-month period, with respondents completing the questionnaire online through a secure and confidential survey platform, Google Forms. Researchers ensured the honesty and accuracy of responses by including a research ethics statement at the beginning of the questionnaire, explaining that there were no right or wrong answers, that participation was voluntary, anonymous, and would not affect the academic grades of the elementary education students participating in the questionnaire. Furthermore, respondents were asked to complete the questionnaire based on their personal understanding and experiences without any influence from other parties. Researchers also reviewed the submitted results to ensure completeness and consistency of responses to maintain data quality. Respondents who did not meet the criteria or showed inconsistent response patterns were eliminated from the final data analysis

Data Analysis

The collected data was analyzed descriptively to provide a general overview of the respondents' characteristics, including the frequency distribution, mean value, and standard deviation of each measured variable. This descriptive analysis was used to understand each respondent's response patterns and to identify and determine general trends in education students' perceptions and behaviors toward the use of artificial intelligence. Data validity and reliability were ensured through several stages. Prior to the main analysis, the construct validity and internal reliability of the instrument were checked using confirmatory analysis within a Structural Equation Modeling (SEM) framework. Outer loadings, average variance extracted (AVE), and composite reliability (CR) were analyzed to ensure adequate validity and reliability for each construct. Items with loadings below the threshold value (.7) were considered for removal. The relationships between variables in the model were tested using Structural Equation Modeling (SEM) with the aid of SmartPLS 4 software. SEM was used to measure the direct and indirect effects between research variables and to assess the extent to which the proposed theoretical model explained the observed data.

The p-value was used to test the significance of the relationships between variables. If the p-value is <.05, the relationship is considered significant (Vidgen & Yasseri, 2016). This approach is used to test whether the data can support the hypothesis proposed in the study. Furthermore, to simplify the high-dimensional data and identify the main variables that explain the greatest variation in the data, Principal Component Analysis (PCA) was applied. The results of the PCA revealed the core components that influence student AI utilization. Next, Prediction-Oriented Segmentation (POS) was used to examine the variation in responses between student groups regarding AI use. The purpose of this method is to identify student segments with significantly different patterns of perception and behavior, thereby providing a deeper understanding of the determining factors in AI utilization in the context of completing science assignments.

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RESULTS

Path Analysis

Based on Figure 2, it is evident that the variable Benefits significantly influences both students' perceptions and behaviors. The perceived benefits of using AI tools such as ChatGPT and Gemini enhance students' knowledge and encourage more active utilization in academic tasks. The path coefficients are notably high, at .403 for perception and .406 for behavior. The benefits of AI usage have been proven to be a key factor influencing students' attitudes and actions toward adopting this technology.

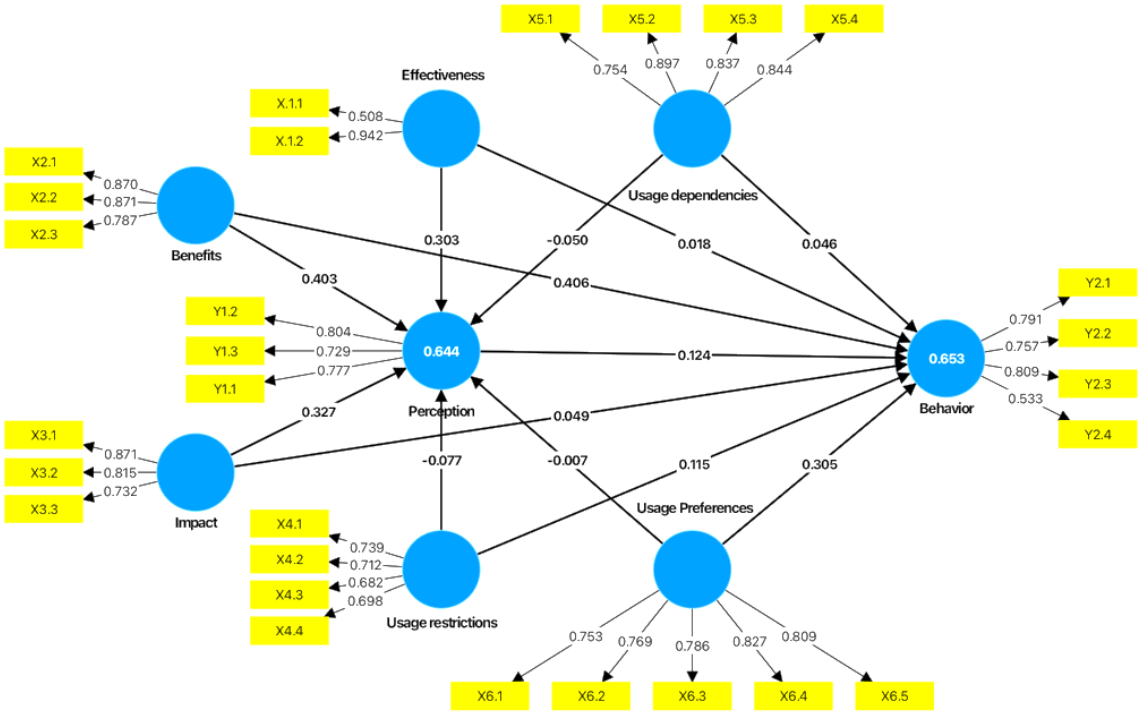

Figure 2. Path analysis.

The Effectiveness of AI usage positively impacts students' perceptions (.303) but has a minimal effect on behavior (.018). It indicates that while AI is effective in assisting, it is not sufficient to significantly drive behavioral changes or increase AI usage in the context of science tasks. Similarly, the Impact of AI usage, though felt by students (.327 for perception), shows a negligible effect on behavior (.049). It suggests that while the positive impact of AI may improve knowledge, it is not enough to induce significant behavioral changes.

Students' Perception of AI, influenced by its benefits and impact, positively affects their behavior (.124). It indicates that students with a better understanding of AI are more likely to use it in completing assignments. However, the influence of Preferences for AI usage and Dependence on AI remains relatively low. Students' preferences for using AI in learning show only a slight positive influence on behavior (.305), while dependence on AI even negatively influences students' perceptions (-.050). Excessive dependence on AI may diminish awareness or understanding of the technology's potential.

Moreover, Restrictions on AI usage negatively affect students' perceptions (-.077), meaning that the more restrictions imposed on AI usage, the lower students' perception of its utility and potential. However, these restrictions have a small yet positive effect on students' behavior (.115). This result suggests that despite AI usage limitations, students continue using these tools for task completion, albeit within the constraints imposed.

Construct Validity and Reliability

The analysis results in Table 1 highlight various indicators related to the validity and reliability of constructs within the research model. Each construct was tested using multiple measurement items evaluated based on loadings, weights, and various statistical indices such as Composite Reliability (CR), Cronbach's Alpha (CA), Average Variance Extracted (AVE), and Variance Inflation Factor (VIF).

Table 1. Construct validity and reliability.

Constructs	Items	Loadings	Weights	CA	CR	AVE	VIF
Effectiveness	X.1.1	.508	.342	.703	.818	.535	1.037
	X.1.2	.942	.877				1.037
Benefits	X2.1	.870	.445	.798	.881	.712	1.772
	X2.2	.871	.402				1.919
	X2.3	.787	.334				1.551
Impact	X3.1	.871	.482	.319	.711	.573	1.643
	X3.2	.815	.401				1.536
	X3.3	.732	.347				1.322
Usage Restrictions	X4.1	.739	.378	.734	.849	.653	1.325
	X4.2	.712	.373				1.266
	X4.3	.682	.356				1.254
	X4.4	.698	.306				1.336
Usage dependencies	X5.1	.754	.382	.659	.814	.594	1.374
	X5.2	.897	.293				3.368
	X5.3	.837	.290				2.555
	X5.4	.844	.244				2.834
Usage Preferences	X6.1	.753	.328	.852	.892	.623	1.467
	X6.2	.769	.154				1.987
	X6.3	.786	.254				1.826
	X6.4	.827	.228				2.231
	X6.5	.809	.304				1.878
Perception	Y1.1	.777	.453	.856	.902	.697	1.268
	Y1.2	.804	.458				1.339
	Y1.3	.729	.383				1.261
Behavior	Y2.1	.791	.422	.669	.801	.501	1.435
	Y2.2	.757	.327				1.447
	Y2.3	.809	.353				1.610
	Y2.4	.533	.251				1.135

Based on the results in Table 1, the construct of effectiveness is measured using X.1.1 and X.1.2. Item X.1.1 has a loading of .508 and a weight of .342, which, although relatively low, is acceptable. Item X.1.2 shows a very high loading value (.942), indicating that this item highly represents the effectiveness construct. The CA value (.703) and CR value (.818) demonstrate good reliability for this construct, although the AVE value (.535) suggests room for improvement in capturing the variance explained by the construct. The VIF value for this construct is 1.037, indicating no significant multicollinearity issues.

The construct of benefits is measured using three items: X2.1, X2.2, and X2.3. All items show high loading values, with X2.1 loading of .870, X2.2 reaching .871, and X2.3 at .787. These results indicate that the items are highly relevant and effectively reflect the benefits construct. The CA value (.798) and CR value (.881) indicate excellent reliability, while the AVE value (.712) demonstrates that this construct explains a substantial proportion of variance. The VIF values, ranging from 1.551 to 1.919, show no significant multicollinearity issues among the items measuring this construct.

The construct of impact is measured using three items (X3.1, X3.2, and X3.3), with loading values of .871 for X3.1, .815 for X3.2, and .732 for X3.3. While X3.3 has a slightly lower loading value, all items are acceptable. The CA value (.319) and CR value (.711) indicate moderate reliability, while the AVE

value (.573) suggests sufficient variance explanation, though there is room for improvement in this construct. The VIF values, ranging from 1.322 to 1.643, indicate no significant multicollinearity issues.

The construct of usage restrictions is measured using four items (X4.1 to X4.4). All items demonstrate sufficiently high loading values, with X4.1 loading of .739, X4.2 at .712, X4.3 at .682, and X4.4 at .698. The CA value (.734) and CR value (.849) indicate good reliability, and the AVE value (.653) suggests that the construct explains a significant portion of the variance. The VIF values for this construct are within acceptable limits, ranging from 1.254 to 1.336.

The construct of dependency on usage is measured using four items (X5.1 to X5.4). X5.1 shows a loading of .754, X5.2 reaches .897, X5.3 is .837, and X5.4 is .844. These items are highly representative of the dependency construct. The CA value (.659) and CR value (.814) indicate good reliability, with an AVE of .594, suggesting room for improvement in this construct. The VIF for X5.1 is 1.374, indicating no multicollinearity issues, although X5.2 and X5.3 have higher VIF values (3.368 and 2.555), which may suggest potential multicollinearity concerns.

The construct of usage preference is measured using five items (X6.1 to X6.5). The loading values for these items range from .753 (X6.1) to .809 (X6.5), demonstrating good consistency in measuring this construct. The CA value (.852) and CR value (.892) indicate excellent reliability, with an AVE of .623, which is also relatively high. The VIF values for this construct range from 1.467 to 2.231, indicating no significant multicollinearity issues.

The construct of perception is measured using three items (Y1.1 to Y1.3). All items exhibit high loading values, with Y1.1 loading of .777, Y1.2 at .804, and Y1.3 at .729. The CA value (.856) and CR value (.902) indicate excellent reliability, with an AVE of .697, suggesting that this construct explains a substantial proportion of the variance. The VIF values for these items range between 1.261 and 1.339, showing no significant multicollinearity issues.

The construct of behavior is measured using four items (Y2.1 to Y2.4). The loading values range from .533 (Y2.4) to .809 (Y2.3), showing generally acceptable loading values. The CA value (.669) and CR value (.801) indicate good reliability, although the AVE (.501) is slightly lower compared to other constructs, suggesting room for improvement. The VIF values for these items range from 1.135 to 1.610, indicating no significant multicollinearity issues.

Model Fit

The results presented in Table 2 provide information regarding the model fit used in this study, both for the saturated and estimated models. Several indicators were employed to evaluate the model's goodness-of-fit, including SRMR (Standardized Root Mean Square Residual), d_ULS (Squared Euclidean Distance), d_G (Geodesic Distance), Chi-square, and NFI (Normed Fit Index).

Table 2. Model fit.

	Saturated model	Estimated model
SRMR	.106	.106
d_ULS	4.560	4.560
d_G	1.569	1.569
Chi-square	769.254	769.254
NFI	.575	.575

SRMR (Standardized Root Mean Square Residual) is an indicator that measures the difference between the observed covariance matrix and the one predicted by the model. Lower SRMR values indicate better model fit. The SRMR value for both the saturated and estimated model is .106, which is slightly higher than the ideal threshold (below .08). Nevertheless, this value falls within an acceptable range for many structural model applications, indicating that the model demonstrates a reasonably good fit despite some minor deviations from a perfect model.

d_ULS (Squared Euclidean Distance) measures the squared Euclidean distance between the observed covariance matrix and the one predicted by the model. Lower d_ULS values indicate a better fit. The

d_ULS value for both the saturated and estimated models is 4.560. This value suggests an adequate fit between the estimated model and the observed data.

d_G (Geodesic Distance) measures the geodesic distance used to evaluate differences between the observed and predicted models. Lower d_G values indicate a better model. The d_G value is 1.569 for both models, indicating that the estimated model fits the observed data reasonably well, with values within acceptable limits for most analyses.

Chi-square (χ^2) is a statistic that measures the degree to which the estimated model aligns with the observed data. Lower Chi-square values indicate better model fit. The Chi-square value for both models is 769.254. It indicates some imperfections in model fit, which is standard in SEM analyses with large sample sizes. Typically, larger sample sizes result in higher Chi-square values, even for reasonably well-fitting models.

NFI (Normed Fit Index) measures how much the estimated model improves upon a simpler baseline model. Higher NFI values indicate better model fit. The NFI value is .575 for both models, suggesting that the estimated model has a lower fit than a simpler model. It indicates areas within the model that require improvement to enhance overall fit.

P-Values

The p-value results in Figure 3 can be interpreted to understand the various relationships between the variables in the model used to examine the factors influencing students' utilization of Artificial Intelligence (AI). Each p-value indicates whether the relationship between two variables in the model is significant or not, with the commonly used significance level being .05. Below is the interpretation of the obtained p-value results.

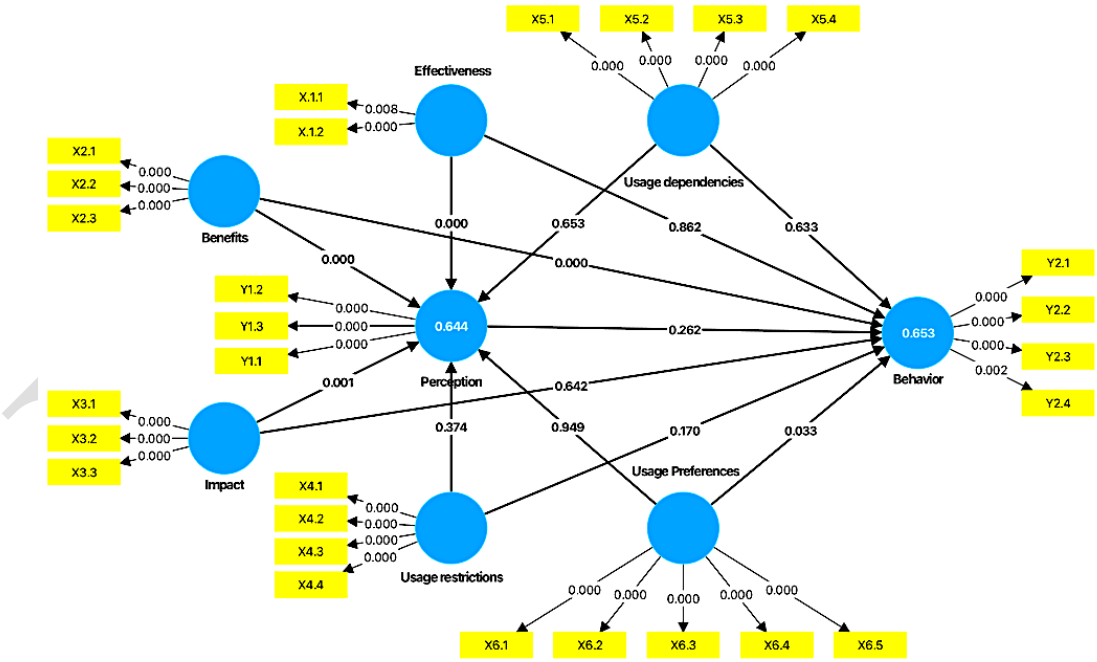

Figure 3. p-values.

Based on Figure 3, the relationship between the perceived benefits of AI usage and students' behavior in using AI for task completion shows highly significant results, with a p-value of .000. It indicates that the perceived benefits strongly influence behavior. Statistically, this relationship is highly significant, supporting the hypothesis that the greater the perceived benefits, the higher the tendency to use AI for academic tasks. Similarly, the relationship between benefits and students' perceptions of AI also shows highly significant results, with a p-value of .000. It indicates that the perceived benefits influence

behavior and enhance students' perceptions of AI's potential and utility in completing tasks. Benefits are critical in shaping students' views and attitudes toward AI technology.

The relationship between the effectiveness of AI usage and students' behavior shows a p-value of .862, which exceeds the .05 significance threshold. This means that the relationship between effectiveness and behavior is not significant. This result indicates that although students find AI effective in assisting task completion, its influence on behavioral change is not strong enough to drive greater adoption in academic tasks. In contrast, the relationship between effectiveness and students' perceptions shows a highly significant p-value of .000. This suggests that effectiveness does not directly impact behavior. It significantly affects how students perceive AI technology. Students who perceive AI as more practical tend to have more positive perceptions of it, which may increase their likelihood of using it.

The relationship between the impact of AI usage and students' behavior shows a p-value of .642, more significant than .05, indicating that this relationship is insignificant. Although students recognize the impact of AI usage, the results indicate that this impact is not strong enough to alter their behavior in using AI for academic tasks. However, the relationship between impact and perception is significant, with a p-value of .001. This indicates that although the impact does not directly influence behavior, it significantly affects how students perceive AI technology. The findings suggest that students who experience positive impacts from AI are more likely to have favorable perceptions of the technology.

The relationship between students' perceptions of AI and their behavior shows a p-value of .262, which is greater than .05, indicating that the influence of perception on students' behavior is insignificant. Although positive perceptions of AI tend to foster positive attitudes, this relationship is not strong enough to directly influence behavior in the context of academic tasks.

The relationship between AI usage preferences and student behavior shows a significant p-value of .033. This result indicates that students' preferences for using AI significantly influence their behavior in integrating AI into the learning process. Students who favor using AI to support learning tend to be more active in utilizing it for academic tasks. In contrast, the relationship between AI usage preferences and students' perceptions has a p-value of .949, which exceeds .05, indicating that preferences do not significantly influence students' perceptions of AI. It suggests that even if students prefer AI, it cannot alter their perceptions of the technology.

The relationship between dependency on AI and student behavior shows a p-value of .633, more significant than .05, indicating that dependency on AI usage does not significantly influence student behavior. This means that although students may rely on AI, this dependency is not strong enough to change their behavior when using the technology. Similarly, the relationship between dependency on AI and students' perceptions shows a p-value of .653, exceeding .05, indicating that dependency on AI does not significantly influence students' perceptions of the technology.

The relationship between AI usage restrictions and student behavior shows a p-value of .170, more significant than .05. It indicates that while there are restrictions on AI usage, their influence on student behavior is not significant. It suggests that students can still find ways to utilize AI technology in their learning process, even with restrictions. Meanwhile, the relationship between AI usage restrictions and students' perceptions shows a p-value of .374, which is also greater than .05, indicating that such restrictions do not significantly impact students' perceptions of AI technology.

Prediction-Oriented Segmen (POS)

The Prediction-Oriented Segmentation (POS) analysis results, as presented in Table 3, provide further insights into how the relationships between variables in the model function across two distinct segments. Table 3 highlights the original path coefficients and how each path coefficient varies between Segment 1 and Segment 2. These differences illustrate whether the relationships between variables differ across segments and indicate how specific factors influence behavior or perception within different groups.

Table 3. Prediction-oriented segmentation.

	Original path coefficients	Segment1	Segment2
Benefits -> Behavior	.406	.510	.338
Benefits -> Perception	.403	.449	.493
Effectiveness -> Behavior	.018	.214	-.633
Effectiveness -> Perception	.303	.127	.522
Impact -> Behavior	.049	-.042	.341
Impact -> Perception	.327	.460	.138
Perception -> Behavior	.124	-.148	.779
Usage Preferences -> Behavior	.305	.297	.614
Usage Preferences -> Perception	-.007	-.042	-.136
Usage dependencies -> Behavior	.046	.120	.009
Usage dependencies -> Perception	-.050	.178	-.403
Usage restrictions -> Behavior	.115	.201	-.274
Usage restrictions -> Perception	-.077	-.139	.213

Based on the analysis results in Table 3, the relationship between benefits and behavior shows a higher path coefficient in Segment 1 (.510) than in Segment 2 (.338). This indicates that in Segment 1, the perceived benefits have a more significant influence on students' behavior in using AI than in Segment 2. Conversely, the relationship between benefits and perception is slightly stronger in Segment 2 (.493) compared to Segment 1 (.449), although the difference is not substantial.

Segment 1 shows a moderate influence between effectiveness and behavior with a coefficient of .214, while Segment 2 demonstrates a more negative relationship (-.633). This indicates that in Segment 1, the effectiveness of AI usage slightly influences students' behavior. However, in Segment 2, effectiveness has a significantly negative impact on behavior, suggesting that students in this segment may feel that although AI is effective, they are either hesitant to trust it or reluctant to use it in academic tasks. On the other hand, the relationship between effectiveness and perception is more substantial in Segment 2 (.522) than in Segment 1 (.127), indicating that the effectiveness of AI contributes more to shaping a positive view of the technology in Segment 2.

The relationship between impact and behavior shows significant differences between the two segments. In Segment 1, the impact has a small negative effect on behavior (-.042), whereas in Segment 2, the impact exhibits a more significant positive relationship (.341). This suggests that students in Segment 2 experience more positive effects from AI usage, encouraging them to use it more frequently for academic tasks. Meanwhile, the impact on perception is more significant in Segment 1 (.460) than in Segment 2 (.138), indicating that AI usage strengthens positive perceptions of the technology more in Segment 1.

The relationship between perception and behavior shows a stark contrast between the segments. In Segment 1, this relationship is negative (-.148) and insignificant, indicating that although students may have positive perceptions of AI, this is not enough to drive them to use AI for task completion. Conversely, in Segment 2, the relationship between perception and behavior is highly positive (.779), showing that students in this segment with positive views of AI are more likely to use it for academic tasks.

The relationship between AI usage preferences and behavior indicates a more substantial influence in Segment 2 (.614) than Segment 1 (.297). This suggests that students who prefer using AI for learning are more active in leveraging it, especially in Segment 2. Conversely, the relationship between preferences and perception is minimal and insignificant in both segments, with coefficients of -.042 in Segment 1 and -.136 in Segment 2, indicating that personal preferences do not significantly impact perceptions of AI usage.

The influence of dependency on behavior is small and positive in Segment 1 (.120) but negligible in Segment 2 (.009), indicating that although students in Segment 1 are more dependent on AI, this dependency is not strong enough to drive more active behavior. For the influence of dependency on

perception, Segment 1 shows a positive effect (.178), while Segment 2 exhibits a negative effect (-.403), suggesting that students in Segment 2 who rely on AI tend to have negative views of the technology.

Segment 1 shows a positive effect (.201) of restrictions on behavior, meaning that students in this segment tend to use it more actively despite restrictions on AI usage. However, in Segment 2, restrictions have a negative impact on behavior (-.274), indicating that restrictions may hinder AI usage among students in this segment. For the relationship between restrictions and perception, Segment 2 shows a positive influence (.213), meaning that restrictions on AI usage can improve positive perceptions of the technology in this segment, although the relationship is insignificant in Segment 1 (-.139).

Principal Component Analysis (PCA)

The Principal Component Analysis (PCA) results presented in Table 4 provide insights into the distribution of variance within the data and how the variables in this study can be grouped into several principal components. PCA is a method used to reduce the dimensionality of complex data into a few principal components that explain the majority of the variance in the dataset.

Table 4. Principal component analysis.

	Eigenvalue	Variance proportion	Variance cumulative
Component 1	8.823	.315	.315
Component 2	4.443	.159	.474
Component 3	1.958	.070	.544
Component 4	1.267	.045	.589
Component 5	1.163	.042	.631
Component 6	1.094	.039	.670
Component 7	.963	.034	.704
Component 8	.861	.031	.735
Component 9	.775	.028	.762
Component 10	.713	.025	.788
Component 11	.594	.021	.809
Component 12	.575	.021	.830
Component 13	.523	.019	.848
Component 14	.485	.017	.866
Component 15	.447	.016	.882
Component 16	.442	.016	.897
Component 17	.413	.015	.912
Component 18	.361	.013	.925
Component 19	.319	.011	.936
Component 20	.309	.011	.947
Component 21	.280	.010	.957
Component 22	.247	.009	.966
Component 23	.231	.008	.975
Component 24	.191	.007	.981
Component 25	.166	.006	.987
Component 26	.148	.005	.993
Component 27	.109	.004	.996
Component 28	.099	.004	1.000

Principal Components

The PCA results indicate that Component 1 has the highest eigenvalue of 8.823, explaining 31.5% of the total variance in the data. This suggests that Component 1 is highly significant in representing the overall data patterns and is the most dominant component in this analysis. This component likely represents the primary factors or variables with the most significant influence on the dataset. Component 2 has an eigenvalue of 4.443 and explains 15.9% of the total variance, making it the second most influential component in the data. The total contribution of the first two components is 47.4% of the total variance, indicating that these two components alone sufficiently explain nearly half of the information in the dataset. Components 3 and 4 have eigenvalues of 1.958 and 1.267, respectively, contributing 7.0% and 4.5% to the total variance. Although their contributions are smaller than the first

two components, they remain significant. The total contribution of the first four components reaches 58.9%, demonstrating that this combination of four principal components explains the majority of the patterns in the data.

Variance Distribution

Components 1 through 6 account for approximately 67.0% of the total variance, while the remaining components (7 through 28) contribute progressively smaller proportions. These smaller components have lower eigenvalues, such as Component 7 with an eigenvalue of .963 (3.4%) and Component 8 with an eigenvalue of .861 (3.1%). Subsequently, the contributions of individual components diminish incrementally, with the final component (Component 28) contributing only .004% of the total variance.

Implications of PCA Results

Several key conclusions can be drawn from the PCA results. Components 1 and 2 significantly contribute to the total variance, highlighting their importance in understanding the data structure. These components are typically used to reduce the dimensionality of high-dimensional data, facilitating more efficient analysis focusing on the most influential aspects. Meanwhile, the subsequent components, although contributing less, still carry additional helpful information for further analysis depending on the research context. However, given the decreasing contribution of each successive component, only a few principal components are usually considered for further analysis to reduce data complexity effectively.

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

One of the key factors influencing students' use of AI technology is the perceived benefits. Perceived benefits, such as ease of accessing information, time efficiency, and improved task quality, are significant motivators for students to utilize AI. Students who experience clear and immediate advantages from AI usage tend to develop positive perceptions of the technology and are more likely to actively use it in completing academic tasks. This aligns with technology adoption theories, which state that perceptions of benefits strongly influence individuals' attitudes and intentions to adopt new technologies (Al-Debei et al., 2015).

Although many students consider AI usage effective in assisting with academic tasks, its influence on behavior appears to be more limited. While the effectiveness of AI in completing academic tasks is acknowledged, it is not always sufficient to profoundly transform students' work habits. Other factors, such as established learning routines, personal preferences for traditional methods, or limitations in accessing technology, often significantly impact the decision to use AI.

Although AI positively impacts students' perceptions, such as facilitating faster task completion or easier access to answers, this is not strong enough to significantly change their behavior in using the technology more intensively. The positive impact of AI tends to serve as a supplementary benefit rather than a primary driver of significant changes in how students complete tasks or interact with technology in an academic context.

Students' personal preferences regarding the use of technology, including AI, play a significant role in determining how frequently they use it. Students more inclined toward using technology in learning are typically more active in integrating AI into academic activities. These preferences reflect individual tendencies toward new technology, influencing decisions to adopt tools like AI for completing tasks (Cao et al., 2021; Mahmud et al., 2023).

However, dependence on AI, while providing convenience, can negatively impact students' perceptions of their abilities. Students who rely heavily on AI for academic tasks often feel that their understanding or knowledge of the studied material diminishes. Excessive dependence can reduce critical thinking skills or problem-solving abilities, which are crucial in an educational context. This over-reliance also indicates a tendency to depend more on technology than to develop personal capabilities (Lall, 1992; Firdaus et al., 2025).

Restrictions on AI usage can influence students' perceptions, with some students feeling that these limitations reduce the benefits they can derive from the technology. However, such restrictions can also positively impact students' behavior. Restrictions on AI usage may encourage students to be more creative and prudent in utilizing the technology while preventing excessive dependency on AI. These limitations can also serve as a form of control, helping students stay focused on academic tasks without over-relying on AI tools.

This study also highlights the importance of validity and reliability in measuring the factors influencing students' use of AI. Each construct tested, such as effectiveness, benefits, impact, restrictions, dependency, preferences, and perceptions, plays a critical role in shaping students' views of this technology. High construct validity and reliability ensure that these factors are measured accurately, clearly showing how students utilize AI in education.

The findings of this study offer valuable insights into how students use AI technology to complete academic tasks. The perceived benefits of AI usage emerge as a key factor driving students to adopt this technology, while dependency on AI and its usage restrictions demonstrate more complex impacts on students' perceptions and behaviors. When designing policies or educational programs involving AI technology, these findings underscore the importance of considering various factors, such as personal preferences, access restrictions, and the effects on students' critical thinking skills.

This research demonstrates that while the benefits of AI usage are crucial in encouraging students to use this technology, other factors such as habits, dependency, and personal preferences also play significant roles in determining how AI is integrated into students' academic lives. Therefore, educators and policymakers need to consider these factors to support more effective use of technology in learning contexts.

The primary factor driving students' utilization of AI is the perceived benefits, which significantly influence their perceptions and behaviors when using this technology. Students' perceptions of AI usage's benefits, effectiveness, and impact are critical in determining how this technology is employed in academic contexts. However, excessive dependence on AI and usage restrictions can affect perceptions and limit the optimization of its utilization. Therefore, it is essential to maintain a balance in AI usage to ensure students retain independent learning skills while maximizing the benefits of the technology.

The effectiveness and benefits of AI significantly impact students' perceptions, which in turn influence their behavior in completing academic tasks. Conversely, other factors such as impact, preferences, dependency, and usage restrictions exhibit more complex relationships and are not always significant in shaping student behavior. By strengthening positive perceptions of the benefits and effectiveness of AI and managing dependency wisely, educators and technology developers can promote the productive adoption of AI in education. This provides opportunities to design curricula that strategically integrate AI to enhance learning quality and support student skills development to address future challenges.

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Ethics and Conflict of Interest

This research was conducted with the permission obtained from the Ethics Committee of PT. Komunitas Peneliti Alinea, dated 01.11. 2024. Furthermore, all publication ethics were adhered to at every stage of the research. The authors declare that they have no conflict of interest.

Author Contribution
All authors contributed equally to the research.

Data availability
The data that support the findings of this study are available on request from the corresponding author.

Corresponding Author
Correspondence to Thoriqi Firdaus, thoriqifirdaus.2023@student.uny.ac.id

REFERENCES

Al-Debei, M. M., Akroush, M. N., & Ashouri, M. I. (2015). Consumer attitudes towards online shopping: The effects of trust, perceived benefits, and perceived web quality. *Internet Research, 25*(5), 707-733. https://doi.org/10.1108/IntR-05-2014-0146

Alam, A., & Mohanty, A. (2023). Educational technology: Exploring the convergence of technology and pedagogy through mobility, interactivity, AI, and learning tools. *Cogent Engineering, 10*(2), 2283282. https://doi.org/10.1080/23311916.2023.2283282

Alsajri, A., Salman, H. A., & Steiti, A. (2024). Generative Models in Natural Language Processing: A Comparative Study of ChatGPT and Gemini. *Babylonian Journal of Artificial Intelligence, 2024*, 134-145. https://doi.org/10.58496/BJAI/2024/015

Arora, N., Manchanda, P., Aggarwal, A., & Maggo, V. (2024). Tapping generative AI capabilities: a study to examine continued intention to use ChatGPT in the travel planning. *Asia Pacific Journal of Tourism Research*, 1-20. https://doi.org/10.1080/10941665.2024.2405134

Atchley, T. W., Wingenbach, G., & Akers, C. (2013). Comparison of course completion and student performance through online and traditional courses. *The International Review of Research in Open and Distributed Learning, 14*(4). https://doi.org/10.19173/irrodl.v14i4.1461

Baskara, F. R. (2025). ChatGPT and Google Gemini in EFL education: A qualitative exploration of pedagogical efficacy among Indonesian Sophomores. *Journal of Languages and Language Teaching, 13*(1), 436-447. https://doi.org/10.33394/jollt.v13i1.9926

Bayer, H., Araci, F. G. I., & Gürkan, G. (2024). ChatGPT-4o, ChatGPT-4 and Google Gemini are compared with students: A study in higher education. *International Journal of Technology in Education and Science, 8*(4), 627-644. https://doi.org/10.46328/ijtes.585

Calzada, K. P. D. (2024). Anti-dependency teaching strategy for innovation in the age of AI among technology-based students. *Environment and Social Psychology, 9*(8), 1-18. https://doi.org/10.59429/esp.v9i8.3026

Cao, G., Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2021). Understanding managers' attitudes and behavioral intentions towards using artificial intelligence for organizational decision-making. *Technovation, 106*, 102312. https://doi.org/10.1016/j.technovation.2021.102312

Carr, N. (2020). *The shallows: What the Internet is doing to our brains*. WW Norton & Company.

Choi, J., Park, J., & Suh, J. (2023). Evaluating the current state of ChatGPT and its disruptive potential: An empirical study of Korean users. *Asia Pacific Journal of Information Systems, 33*(4), 1058-1092. https://doi.org/10.14329/apjis.2023.33.4.1058

Davis, F. D. (1989). *Perceived usefulness, perceived ease of use and user acceptance of information technology*. MIS quarterly.

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International journal of information management, 57*, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Firdaus, T. (2022). Penerapan model direct instruction berbasis sets pada pembelajaran ipa untuk meningkatkan keterampilan berpikir kritis siswa. *Natural Science Education Research (NSER), 5*(1), 119-134. https://doi.org/10.21107/nser.v5i1.15759

Firdaus, T. (2023). Representative platform cyber metaverse terkoneksi BYOD sebagai upaya preventive urgensi digital pada sistem pendidikan Indonesia. *Jurnal Integrasi dan Harmoni Inovatif Ilmu-Ilmu Sosial, 3*(2), 123-131. https://doi.org/10.17977/um063v3i2p123-131

Firdaus, T., Sholeha, S. A., Jannah, M., & Setiawan, A. R. (2024). Comparison of ChatGPT and Gemini AI in answering higher-order thinking skill biology questions: Accuracy and evaluation. *International Journal of Science Education and Teaching, 3*(3), 126-138. https://doi.org/10.14456/ijset.2024.11

Firdaus, T., Nuryanti, E., Adawiyah, N. R., Sari, D. I., & Rahmah, F. (2025). Research trends in mental health and the effect on students' learning disorder. *Journal of Education and Learning Reviews, 2*(1), 1-20. https://doi.org/10.60027/jelr.2025.952

Gao, B. (2023). Understanding smart education continuance intention in a delayed benefit context: An integration of sensory stimuli, UTAUT, and flow theory. *Acta Psychologica, 234*, 103856. https://doi.org/10.1016/j.actpsy.2023.103856

Hochschild, A. R. (2018). *Strangers in their own land: Anger and mourning on the American right*. The New Press.

Hwang, G. J., Lai, C. L., & Wang, S. Y. (2015). Seamless flipped learning: a mobile technology-enhanced flipped classroom with effective learning strategies. *Journal of computers in education, 2*, 449-473. https://doi.org/10.1007/s40692-015-0043-0

Imran, M., Almusharraf, N. (2024). Google Gemini as a next generation AI educational tool: a review of emerging educational technology. *Smart Learn. Environ, 11*, 22 (2024). https://doi.org/10.1186/s40561-024-00310-z

Lai, C. L. (2021). Exploring university students' preferences for AI-assisted learning environment. *Educational Technology & Society, 24*(4), 1-15.

Lall, S. (1992). Technological capabilities and industrialization. *World development, 20*(2), 165-186. https://doi.org/10.1016/0305-750X(92)90097-F

Luckin, R. (2018). *Machine learning and human intelligence. The future of education for the 21st century*. UCL institute of education press.

Mahmud, H., Islam, A. N., & Mitra, R. K. (2023). What drives managers towards algorithm aversion and how to overcome it? Mitigating the impact of innovation resistance through technology readiness. *Technological Forecasting and Social Change, 193*, 122641. https://doi.org/10.1016/j.techfore.2023.122641

Nikolic, S., Sandison, C., Haque, R., Daniel, S., Grundy, S., Belkina, M., ... & Neal, P. (2024). ChatGPT, Copilot, Gemini, SciSpace and Wolfram versus higher education assessments: an updated multi-institutional study of the academic integrity impacts of Generative Artificial Intelligence (GenAI) on assessment, teaching and learning in engineering. *Australasian journal of engineering education, 29*(2), 126-153. https://doi.org/10.1080/22054952.2024.2372154

Popenici, S. A., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and practice in technology enhanced learning, 12*(1), 12-22. https://doi.org/10.1186/s41039-017-0062-8

Rane, N. L., Choudhary, S. P., Tawde, A., & Rane, J. (2023). ChatGPT is not capable of serving as an author: Ethical concerns and challenges of large language models in education. *International Research Journal of Modernization in Engineering Technology and Science, 5*(10), 851-874. https://www.doi.org/10.56726/IRJMETS45212

Ritchie, J., Lewis, J., & Elam, R. G. (2013). *Selecting samples. Qualitative research practice: A guide for social science students and researchers*. Thousand Oaks, CA: Sage, 111.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly, 27*(3), 425-478. https://doi.org/10.2307/30036540

Vidgen, B., & Yasseri, T. (2016). P-values: misunderstood and misused. *Frontiers in Physics, 4*, 6. https://doi.org/10.3389/fphy.2016.00006

Wang, S., Wang, F., Zhu, Z., Wang, J., Tran, T., & Du, Z. (2024). Artificial intelligence in education: A systematic literature review. *Expert Systems with Applications, 252*, 124167. https://doi.org/10.1016/j.eswa.2024.124167

World Bank. (2024). *Who on Earth Is Using Generative AI?* https://hdl.handle.net/10986/42071

Zhai, C., Wibowo, S., & Li, L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: a systematic review. *Smart Learning Environments, 11*(1), 11-28. https://doi.org/10.1186/s40561-024-00316-7

About the authors:

Thoriqi Firdaus
He is a researcher at PT Komunitas Peneliti Alinea. He is currently pursuing a Master's degree in Science Education at Universitas Negeri Yogyakarta. His research interests focus on science learning development, educational innovation, and the integration of technology in the learning process. He

actively engages in collaborative research activities that support the improvement of science education quality in Indonesia.

Noura Aulya Damayanti
She is a research assistant and young researcher at PT Komunitas Peneliti Alinea. She is currently studying at the Department of Primary School Teacher Education, Universitas Trunojoyo Madura. Her academic interests include primary education, creative learning strategies, and the role of literacy in shaping elementary students' competencies.

Rika Nur Hamida
She is a research assistant and young researcher at PT Komunitas Peneliti Alinea. She is pursuing her undergraduate studies in Primary School Teacher Education at Universitas Trunojoyo Madura. Her research is mainly concerned with innovative learning, curriculum development for primary education, and the role of teachers in fostering 21st-century skills among students.

Roukhil Ummu Hani'
She is a research assistant and young researcher at PT Komunitas Peneliti Alinea. She is currently undertaking her undergraduate studies in Primary School Teacher Education at Universitas Trunojoyo Madura. Her fields of interest include elementary education, technology-based learning media development, and strategies to increase students' active participation in the classroom.

Najwa Salma Khoirun Nisa
She is a research assistant and young researcher at PT Komunitas Peneliti Alinea. She is currently pursuing her undergraduate degree in Primary School Teacher Education at Universitas Trunojoyo Madura. Her research interests lie in primary education, digital literacy, and the development of innovative learning methods to support students' needs in the modern era.