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Education, Development and Intervention

Toward Participatory and Integrated Solutions

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Preface

Education has become a critical tool for individual and societal development in an era of rapid technological advancement and a growing global population. As we strive to prepare future generations for the challenges and opportunities ahead, it is imperative to reimagine the role of education and embrace innovative approaches that foster participatory and integrated solutions.

New-generation schools represent a paradigm shift in education, moving away from traditional models emphasizing rote memorization and standardized testing toward holistic learning environments that nurture creativity, critical thinking, and problem-solving skills. These schools strongly emphasize student engagement, active learning methodologies, and collaboration among students, teachers, and the wider community.

At the heart of new-generation schools is participatory learning, where students are not merely passive recipients of knowledge but active participants in their learning process. This approach empowers students to take ownership of their education, fostering a sense of agency and responsibility for their intellectual growth.

Integrated solutions are another hallmark of new-generation schools. These schools break down the silos between traditional academic subjects, integrating learning across disciplines and real-world contexts. This holistic approach allows students to develop a deeper understanding of the interconnectedness of knowledge and apply their learning to solve real-world problems.

The transition toward new-generation schools requires a multifaceted approach that involves collaboration among educators, policymakers, and communities. Teacher training equips educators with the skills and knowledge to facilitate participatory and integrated learning. Policymakers must also create supportive environments that encourage innovation and experimentation in education.

Moreover, community engagement is essential for ensuring that new-generation schools are responsive to the needs and aspirations of their communities. By involving parents, local businesses, and community organizations in developing and implementing new educational models, we can foster a sense of ownership and shared responsibility for the success of our future generations.

In conclusion, education, development, and intervention are inextricably linked in creating new-generation schools that equip students with the skills and mindset to thrive in an ever-changing world. By embracing participatory and integrated approaches, we can empower learners to become active agents of change, shaping a more just, equitable, and sustainable future for all.

Education, Development, and Intervention: Toward Participatory and Integrated Solutions represents a groundbreaking exploration into the transformative intersection of education, development, and intervention. This thematic journey underscores the imperative for a shift from traditional educational paradigms toward a participatory model. By involving students, educators, parents, and the broader community in decision-making processes, this approach seeks to create a more inclusive and responsive educational system.

Integrating modern technologies and pedagogical innovations, the book discusses how these interventions can enhance the educational experience. The participatory and integrated solutions presented in the text are crucial components for adapting to the demands of the 21st century. This likely involves academic knowledge and cultivating critical thinking skills, creativity, and emotional intelligence.

Moreover, the book may delve into the practical implementation of these solutions, offering insights into successful case studies and strategies. It likely addresses the role of teachers as facilitators in this participatory model and explores ways to empower students to take an active role in their education. Ultimately, "Education, Development, and Intervention" serves as a roadmap for educators, policymakers, and stakeholders interested in fostering dynamic, adaptable, and forward-thinking new-generation schools that contribute to individual growth and societal progress.

In Chap. 1, entitled "Storybooks as a Scaffolding Tool in Teacher–Child Interaction: The Mediating Role of Vocabulary and Receptive Language in the Investigation of the Relationship Between Teacher Attitude and Children's Language Skills," authors Özgün Uyanık Aktulun, Ali İbrahim Can Gözüm, Ümit Ünsal Kaya, Stamatios Papadakis, and Michail Kalogiannakis present a scholarly inquiry into the pivotal role of storybooks and shared reading activities in the linguistic and communicative development of preschool children. Grounded in Vygotsky's sociocultural theory, which conceptualizes language as a context-specific cognitive tool, the study examines the impact of preschool teachers' attitudes toward storybooks on Turkish-speaking children's vocabulary and receptive language skills. The research, encompassing 360 children aged 60–72 months and 72 teachers from Afyonkarahisar and Kars in Turkey, employs the Preschool Teachers' Attitudes Towards Storybooks (SPTATS) scale and the Kaufman Survey of Early Academic and Language Skills (K-SEALS). Utilizing Structural Equation Modeling (SEM), the findings reveal a significant correlation between teachers' attitudes toward storybooks and children's vocabulary and receptive language proficiency. Notably, vocabulary emerges as a partial mediator in the relationship between storybook usage and receptive language skills, emphasizing its critical role in shaping language abilities within educational contexts.

In Chap. 2, titled "An International Community of Practice Through ScratchJr: The Coding as Another Language Curriculum Around the World," authors Francisca

Carocca P., Jessica Blake-West, and Marina U. Bers present a comprehensive exploration of the Coding as Another Language—ScratchJr (CAL-ScratchJr) International Community of Practice. This community, established through the CAL-ScratchJr Special Interest Group (SIG) within the Scratch Education Collaborative, spans 21 teams distributed across 12 countries globally. The collaborative effort emerged from the shared interest of ScratchJr organizations, providing a platform for engagement with the DevTech Research Group, the Scratch Foundation, and fellow practitioners in their inaugural year. Within this framework, the organizations delved into the Coding as Another Language pedagogy and the Positive Technological Development (PTD) theoretical framework, meticulously adapting and implementing these concepts within their diverse local contexts. The chapter details the practical application of PTD principles as organizations actively embraced the identified behaviors within the framework, ultimately transforming from a specialized interest group into a cohesive international community of practice. Noteworthy findings include shared motivations among community members for participating in the initiative and uniformly positive perspectives on its impact on their respective organizations and local communities.

In Chap. 3, titled "Enhancing Picture Book Reading Experiences: Empowering Children Through Participatory Technology Solutions in Early Years," authors Adriana G. Bus, Kees Broekhof, Christiaan Coenraads, Charles L. Mifsud, Burcu Sari Uğurlu, Bora Uğurlu, and Karin Vaessen present an insightful exploration of the Erasmus Plus project, SAYL (Stimulating Adventures for Young Learners). The project's central objective is to establish a digital library of picture books, empowering young children to engage in independent book-reading experiences. The authors focus on the strategic use of technology to address cognitive processing challenges inherent in interpreting stories presented through a combination of words and images. Drawing from principles embedded in multimedia learning theory, the chapter addresses the delicate balance required in guiding cognitive processing during digital book reading, mindful of the limited memory capacity allocated to processing visual and verbal information. The discussion delves into the challenges of minimizing cognitive load and swiftly identifying essential details for comprehension amid potential distractions. Additionally, the chapter explores the application of multimedia learning theory in incentivizing young children's integration of selected information, utilizing enhancements such as highlighted details, animations, and musical elements. The theoretical insights are substantiated with illustrative examples from one of the books digitized within the SAYL project.

Chapter 4, titled "Interventions, and Programs to Support Girls Studying Information Technology in Senior Secondary School," authored by Therese Keane, Andreea Molnar, and Rosemary Stockdale, addresses the persistent underrepresentation of women in the Information Technology (IT) field despite increasing initiatives aimed at promoting IT among secondary school students. The study investigates the impact of targeted interventions and events on female students' decisions to pursue an IT degree. Employing a questionnaire instrument, the research gathered quantitative and qualitative data from 119 first-year female IT students in Australia, with 84 participants included in the analysis from a sample of approximately 300 students. The

findings indicate that women perceive interventions, particularly those promoting coding, as motivational. Notably, a significant proportion of surveyed women who pursued IT degrees had studied the subject in secondary school, emphasizing the importance of early exposure to IT in the curriculum for diversity in the field. The chapter also underscores the influential roles of parents, friends, and teachers in shaping women's choices, as well as factors such as the pervasive presence of technology in daily life, awareness of job opportunities, and the financial security associated with IT careers. The complexity of these influencing factors suggests that addressing the low representation of women in IT requires a multifaceted approach, dispelling the notion of a singular solution or "silver bullet."

In Chap. 5, authored by Mustafa Saritepeci, Hasan Celal Balıkçı, and Uğur Ferhat Ermiş, the focus is on the perspectives of innovative teachers with extensive experience in technology integration, examining how these educators incorporate technology into their instructional methods and the consequential impact on student competency development. The study involves 18 teachers from diverse disciplines who participated in one-to-one interviews responding to inquiries structured under four headings aligning with the study's objectives. The analysis of these insights revealed four overarching themes. The findings underscore the emphasis placed by teachers on student-centered learning approaches and the evolving role of teachers in the process. Furthermore, the integration of technology is recognized for its substantial contributions to supporting learning, enhancing educational outcomes, and fostering digital literacy skills. Despite these benefits, the study identifies primary obstacles such as access limitations and challenges, including insufficient technical support and teacher training, which hinder effective technology integration. The prevailing perception advocates for technology use with a clear educational purpose, emphasizing the need for teaching practices where technology is a facilitator. However, the chapter advocates for a more comprehensive understanding of the transformative potential of technology integration, emphasizing the importance of adopting advanced perspectives that encompass a systematic view of educational technologies, integration with instructional methods, and active student engagement.

Chapter 6, authored by Andrej Šorgo and Vida Lang, critically examines the potential of smart mobile devices, including smartphones and tablets, in the long-term promotion of transdisciplinary, interdisciplinary, and transversal scientific competencies within STEM education. The chapter delves into the integration of content across diverse subjects and explores the role of smart mobile devices in facilitating collaboration between educators and students. The methodology employed encompasses reference analysis complemented by the authors' expertise in computer and smartphone-based laboratories. The study's outcomes underscore the capability of smartphones to enhance a spectrum of competencies, encompassing activities such as collecting, analyzing, and organizing information, communicating ideas, planning and organizing tasks, collaborative teamwork, application of mathematical concepts, problem-solving, and the adept utilization of technology. This investigation contributes to the evolving discourse on the multifaceted potentials of smart mobile devices in advancing scientific competencies, emphasizing the dynamic intersection of technology and education in STEM disciplines.

Chapter 7, titled "A Critical Retelling of the Implementing of Telepresence Robots to Enhance Learners' Collaboration: Through a Posthumanist New Materialist and Intersectionalist Lens," authored by Janika Leoste, Pamela Burnard, Dan Harris, Sirje Virkus, Jessica Blakeborough, Kristof Fenyvesi, Zsolt Lavicza, and Kristel Marmor, addresses the imperative of nurturing computational thinking skills in primary-aged learners as computer science gains recognition as a mandatory component of global curricula. Against a burgeoning interest in educational applications of augmented reality, the chapter investigates the efficacy of ByteEd's Play Code Learn series, specifically the Dinosaur Steps kit, in New Zealand classrooms. The series adopts an innovative, unplugged-to-digital pedagogy alongside augmented reality technologies. The study reveals that the unplugged approach proves advantageous, marking a substantial improvement in learners' retention and comprehension of computer science concepts, skills, and literacy. Furthermore, the incorporation of a play-based methodology is identified as a catalyst for heightened motivation in the learning process. This research contributes to the ongoing discourse on effective strategies for instilling computational thinking in young learners, emphasizing the success of interactive play and augmented reality technologies as influential tools in primary education.

Chapter 8, entitled "The Impact of Artificial Intelligence on Learners and Teachers: A Mathematics Education Perspective," authored by Xinyue Li, Tabitha Gould, and Rachad Zaki, addresses the critical intersection of artificial intelligence (AI) and education, particularly within the realm of mathematics education. Acknowledging the persistent challenge of the education sector trailing behind technological advancements, the chapter underscores the prevalence of learners and teachers venturing into emerging technologies without clear guidance on their optimal application in educational contexts. Focusing on the transformative potential of AI, the authors advocate for a novel e-learning model designed to harness the efficiency of AI in education. The chapter provides a comprehensive overview of critical AI-powered features, emphasizing their educational and pedagogical value, explicitly focusing on natural language processing, personalized learning, and generalization. Within the context of mathematics education, the authors propose pedagogical strategies for the effective adoption of AI tools that foster creativity and critical thinking in teaching and learning. Additionally, the chapter addresses pertinent issues and challenges associated with AI-powered tools, including considerations of academic integrity, digital inclusion, limited mathematical capabilities, and public attitudes. This contribution aims to inform educators and stakeholders on navigating the evolving landscape of AI in education while promoting thoughtful integration for enhanced learning outcomes.

In Chap. 9, authored by Christiane Gresse von Wangenheim, Nathalia da Cruz Alves, Marcelo Fernando Rauber, Ramon Mayor Martins, and Jean C. R. Hauck, the focus is on a pedagogical approach to teaching computing through hands-on activities, specifically the development of mobile applications infused with artificial intelligence. This method offers a comprehensive learning experience, enabling students to grasp algorithms, programming, user interface design, and artificial intelligence concepts and cultivate creativity. Embracing a computational action approach,

students are encouraged to envision their applications through design thinking practices. The chapter introduces a systematically developed course, following an instructional design process, and evaluates its application in an extracurricular setting with 40 underprivileged Brazilian public middle and high school students aged 14 to 22 years. Based on 11 completed projects, the results suggest that the educational strategy positively impacts student learning, learning experience, and motivation. Adopting an interest-driven creator theory is noted for keeping students engaged in creating original AI-powered applications. However, average performance results in algorithm learning, programming, and user interface design indicate the necessity for additional time and emphasis on these content areas to further enhance creativity in these domains. This chapter contributes valuable insights into effectively integrating hands-on AI application development for a diverse student population.

Chapter 10 titled "Optimizing Learning Outcomes of Educational Applications Enhanced with Multimedia and Interactive Features: A Review," authored by Cintia Bali and Andras Norbert Zsido, addresses the significance of educational applications incorporating multimedia elements and interactive features for enhancing learning. While such applications hold considerable potential by leveraging multimedia learning principles, their efficacy can be influenced by individual differences in neurodiverse children. Challenges arise due to variations in core cognitive functions, impacting the ability of children to process and integrate multiple multimedia elements and interactive features simultaneously. The authors emphasize the importance of considering working memory capacity and attentional mechanisms in designing educational applications. The literature review suggests that a strategic approach involving a small number of simple and relevant multimedia elements and interactive features designed with precise timing can alleviate cognitive load and reduce the need for task switching. Moreover, incorporating existing pedagogical techniques, such as immediate feedback, is recommended to enhance the effectiveness of interactive features. Through careful design considerations, the authors propose that the impact of individual differences can be mitigated, enabling a broader audience of children, including those with neurodiverse characteristics, to access the educational benefits of such applications.

In Chap. 11, authored by Dr. Nina Skorsetz, the focus is on scientific thinking and subject-specific learning within the context of the German subject Sachunterricht, which introduces children to the natural and social sciences through an interdisciplinary approach. The chapter delves into subject-specific learning by explicitly examining the concept of "scientific thinking" through a topic-centered approach. Using qualitative empirical research, classroom interaction is analyzed to illuminate how students actively engage in subject-specific and creative thinking as they negotiate their understanding of scientific concepts. This unintended process underscores the potential of cross-domain world exploration as a didactic goal in Sachunterricht. The study emphasizes the significance of fostering creative and critical thinking within subject-specific learning and calls for further exploration. As education continues to evolve, the chapter advocates embracing innovative teaching practices and prioritizing world exploration as transformative approaches to advance subject-specific learning.

Chapter 12, co-authored by Erica Kleinknecht, Fran C. Blumberg, and Rachel M. Flynn, advocates for establishing artificial intelligence (AI) literacy skills as an educational priority for school-age children. Acknowledging the omnipresence of technological innovation in children's lives through smartphones, tablets, and computers, the authors highlight the need for inclusive K-12 AI literacy curricula to address the increasing use of AI-infused devices among children before entering formal schooling. The chapter argues for developing and implementing AI literacy programming, encompassing technical understanding, critical appraisal, and practical application of AI tools. Empirical evidence supports the assertion that well-designed, developmentally appropriate AI lessons can enhance critical cognitive skills, positively impacting educational outcomes. Emphasizing the call for "AI4All," the chapter delves into variations in AI and emerging AI literacy curricula, aligning them with reviewed research in development. Given the dynamic interplay between societal and personal forces shaping development, integrating AI literacy across the curriculum is essential to prepare children for a future that increasingly demands adept technological knowledge and skills.

Chapter 13, authored by Chrystalla Papademetri, focuses on advocating for an integrated approach to mathematical knowledge in early childhood education, contrasting it with a fragmented approach. The chapter contends that integration, often associated with blurring boundaries between disciplines, can be applied within a specific discipline, such as mathematics, by blurring other boundaries. The argument is explored through a story detailing a class of 25 preschool children (4–6-year-olds) engaged in a two-month intervention related to bowling. The intervention, based on Modeling-based Learning (MbL), gradually led the children to develop a conceptual understanding of the sequence of triangular numbers. The narrative emerged from a Design-based Research (DbR) initiative aimed at designing a mathematics curriculum for early childhood education in Cyprus. The chapter presents examples of fragmented practices based on data from educators participating in the DbR before program implementation. A comparison between these fragmented practices and the data from the "bowling story" underscores the distinction between a fragmented approach and meaningful, engaged, deep learning, as opposed to an integrated approach grounded in a sound constructivist, inquiry-based epistemological foundation.

In conclusion, the book *Education, Development, and Intervention: Toward Participatory and Integrated Solutions* emphasizes the crucial role of education in the rapidly evolving technological landscape and increasing global population. It advocates for a paradigm shift in education, moving away from traditional models to embrace new-generation schools. These schools prioritize holistic learning environments, creativity, critical thinking, and problem-solving skills. Participatory learning, where students actively engage in the learning process, is at the core of these schools, fostering a sense of agency and responsibility. The book underscores the importance of integrated solutions, breaking down academic subject silos and promoting real-world applications. It calls for a collaborative approach involving educators,

policymakers, and communities to facilitate this transformation. The chapters delve into specific case studies and innovative approaches, such as the use of technology, community engagement, and interventions to support girls in information technology. The overarching theme is to empower learners to become active agents of change, shaping a more just, equitable, and sustainable future.

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Contents

Chapter 1
Storybooks as a Scaffolding Tool in Teacher–Child Interaction: The Mediating Role of Vocabulary and Receptive Language in the Investigation of the Relationship Between Teacher Attitude and Children's Language Skills

Özgün Uyanık Aktulun ⓘ**, Ali İbrahim Can Gözüm** ⓘ**, Ümit Ünsal Kaya** ⓘ**,
Stamatios Papadakis** ⓘ**, and Michail Kalogiannakis** ⓘ

Abstract Storybooks and shared reading activities in classrooms are pivotal for children's linguistic and communicative development. Leveraging Vygotsky's socio-cultural theory, which posits language as a context-specific cognitive tool, this study explored the influence of preschool teachers' attitudes towards storybooks on Turkish-speaking children's vocabulary and receptive language skills. Our research encompassed 360 children (60–72 months) and 72 teachers from Afyonkarahisar and Kars in Turkey. Instruments employed included the Preschool Teachers' Attitudes Towards Storybooks (SPTATS) scale and the Kaufman Survey of Early Academic and Language Skills (K-SEALS). Using Structural Equation Modeling (SEM), results indicated a significant correlation between teachers' attitudes towards storybooks and children's vocabulary and receptive language proficiency. Notably, vocabulary

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emerged as a partial mediator in the link between storybook usage and receptive language skills, underscoring its critical role in shaping language abilities in educational contexts.

1 Introduction

Research into preschool teachers' attitudes towards storybooks influences children's language development and holds critical implications. Firstly, understanding this relationship can illuminate the teacher's vital role in language development, a cornerstone of academic and socio-emotional achievement [10, 87]. Such insights also guide the framing of teacher education programs, ensuring an enriching linguistic environment for children [51]. This research can further elucidate factors causing disparities in language development, directing specialized interventions for at-risk children.

Past research underscores limited reading habits and parental book engagement in Turkey, suggesting sociocultural and socioeconomic determinants might underlie language proficiency disparities in Turkish children [2, 30, 50, 108]. The Turkish Ministry of National Education has responded by promoting the integration of storybooks in early childhood education, fostering collaborative language skill development involving teachers, children, and parents [57, 58, 74, 116].

Scholarly consensus, including views from [15, 54], and [114], stresses the profound impact of teachers' attitudes towards storybooks on children's linguistic development. Recognizing this link serves several objectives:

1. **Refining Preschool Education**: Unpacking the relationship offers a refined understanding, allowing for curriculum enhancements rooted in children's needs [55].
2. **Fostering Language Growth**: Recognizing influential factors during formative years can optimize early language development, a known predictor of academic success [44].
3. **Reducing Language Disparities**: Identifying determinants like teacher attitudes can help bridge language gaps in early education, especially among economically disadvantaged children [42].

This study seeks to bridge current literature gaps, investigating the nexus between teacher attitudes towards storybooks and children's linguistic development, informing future pedagogical strategies.

2 Literature Review

2.1 Theoretical Underpinnings

The interplay between storybooks and language development in preschool children is rooted in several educational theories. Bruner's Constructivist Learning Theory posits that children learn actively, and storybooks become a vehicle for this discovery process [12]. The attitudes and methods teachers employ can shape the efficacy of this learning tool.

Piaget emphasized that interactions and experiences enrich cognitive development, and storybooks can catalyse this exploration [49]. Teachers play a pivotal role in how effectively children engage with these materials through their attitudes and choices of storybooks.

Drawing from Bandura's social cognitive learning theory, teachers model reading behaviours for children, underscoring the importance of their attitudes and methodologies regarding storybook usage [4]. Their approach can either enhance or inhibit a child's language development.

Vygotsky introduced the concept of the Zone of Proximal Development (ZPD), emphasizing that guided learning, such as through storybooks, can optimize a child's development [118, 123]. Teachers' attitudes and how they scaffold children's interactions with books are central to this theory.

Lastly, Tomasello's Usage-based Theory asserts that social interactions are instrumental in language acquisition. Here, storybooks, facilitated by teachers, serve as conduits for such interactions, amplifying their importance in the language learning process [110].

These theories collectively highlight that storybooks are crucial for language development. The role of teachers, especially their attitudes towards storybooks, can significantly influence children's learning outcomes. Integrating these theoretical insights and parental involvement is essential to ensure the maximum benefit for the child's linguistic growth.

2.2 Storybooks as Scaffolding Tools in Teacher–Child Interaction

Storybooks play a pivotal role in nurturing the linguistic faculties of children, a notion well-acknowledged in studies by Girolametto et al. [34] and Kohm et al. [63]. Rich in cultural content, these books provide psychological and technical platforms essential for language acquisition. Their esteemed position as foundational tools, especially in vocabulary enhancement, has been underscored in research by Justice et al. [56] and Neuman and Kaefer [78]. Additionally, shared reading experiences, as emphasized by Walsh and Hodge [119], significantly boost children's vocabulary growth.

Teachers emerge as central figures in this linguistic journey. Their role in introducing children to storybooks and guiding them through their pages has been highlighted in studies by Gonzalez et al. [35] and Milburn et al. [73]. Their attitude and approach play a defining role, influencing book selection, knowledge dissemination, and the integration of these storybooks into diverse learning activities, as detailed by Gözüm et al. [37]. Positive interactions between teachers and storybooks foster increased participation from children and boost their overall motivation, as elucidated by Malloy et al. [68]. Such environments, crafted by teachers, become hotbeds for language development, an idea endorsed by multiple studies, including those by Barnes [5], Servizzi [94] and Rudasill Moritz et al. [89].

Shared book reading, a concept championed by Neumann [80], presents a vibrant medium for children to immerse themselves in language within their Zone of Proximal Development (ZPD). Here, teachers do multifaceted roles, guiding dialogues, enriching responses, and enhancing awareness about the written word. A fascinating dynamic shift is observed where children become narrators and adults become listeners, as Cárdenas et al. [18] explored.

The ripple effects of such reading engagements are manifold. Benefits range from enhanced vocabulary, as voiced by Gerde and Powell [32], to the fostering of early literacy skills, as posited by Blum et al. [8]. Additionally, the potency of storytelling in sharpening cognitive abilities, especially when viewed through Vygotsky's lens, has been celebrated by Bodrova and Leong [9], referencing the work of Zaporozhets (1978).

2.3 Language Skills

Through Vygotsky's sociocultural lens, teachers are central in shaping interactive storybook experiences, enhancing language development, and fostering children's linguistic and vocabulary skills. Piaget presents children as continuous learners, constantly modifying their cognitive structures. Their development is shaped by frequent interactions with words, complex grammar explorations, and a transition from understanding to expressing vocabulary, as supported by Harris et al. [41] and Konishi et al. [64].

Bruner [14] emphasizes the role of preschool educators in creating a rich narrative environment. More than just storybooks, this setting should include discussions about stories, personal experience linkages, and probing questions. Carefully chosen storybooks, resonating with cultural and developmental contexts, become powerful tools for learning and cognitive enhancement.

The relationship between language, cognition, and understanding has been a focal point for scholars like [7] and [85]. Vygotsky [118] posits that words shape and give form to thoughts. Echoing Tomasello's [110] perspective, the collaboration between teachers and children centred around storybooks leads to richer discussions, vocabulary enhancement, and cognitive development. The intertwining of language

and cognition, especially in sociocultural settings, reaffirms teachers' vital role in enriching children's linguistic abilities and expanding their vocabulary.

3   Models and Hypotheses

Teachers' attitudes towards reading influence their reading habits and comprehension [3] and mould preschool children's perceptions and inclinations towards storybooks and education [97, 102]. In pedagogical research, [96] pointed to the advantages of teachers giving precise word explanations during story reading, improving children's receptive language. In tandem, [63] and Dickinson and Porche [26] emphasized the benefits of shared book reading and teacher–child interactions. Notably, [10] recognized the positive influence of teacher attitudes on children's language acquisition. This led to the first hypothesis: H_1: *Preschool teachers' attitude towards storybooks directly enhances children's receptive language skills.*

Illustrated storybooks in preschool predominantly bolster vocabulary [47, 86]. When teachers employ strategies that clarify storybook content and establish cause-effect linkages, it fosters deeper understanding in children [21, 24]. This brings forth the second hypothesis: H_2: *Preschool teachers' storybook usage directly boosts children's vocabulary.*

With vocabulary being fundamental to language acquisition [66], studies like [69] and [99] spotlight vocabulary as a significant forecaster of linguistic growth. This forms the basis for the third hypothesis: H_3: *A child's vocabulary positively influences their receptive language skills.*

As championed by teachers, interactive reading correlates with children's receptive and expressive language development [32, 125]. This understanding propels a subsidiary hypothesis: H_{3a}: *Vocabulary is an intermediary between teachers' storybook attitudes and children's receptive language skills.*

Receptive language typically precedes expressive language, with children first understanding and then articulating their thoughts [22, 33]. From this perspective, two hypotheses emerge H_4: *Vocabulary positively impacts expressive language skills.* H_5: *Receptive language skills augment expressive language capabilities.*

Drawing a logical extension, receptive language can be viewed as a bridge between vocabulary and expressive language skills, forming the final hypothesis: H_{5a}: *Receptive language mediates between vocabulary and expressive language abilities.*

This study hypothesizes that teacher attitudes towards storybooks influence children's vocabulary and receptive language. The study's framework evaluates children's vocabulary and receptive language as pivotal variables, employing path analysis to decipher the relationships, all elaborated upon in the research findings and visualized in Fig. 1.

Fig. 1 Theoretical representation of the proposed model
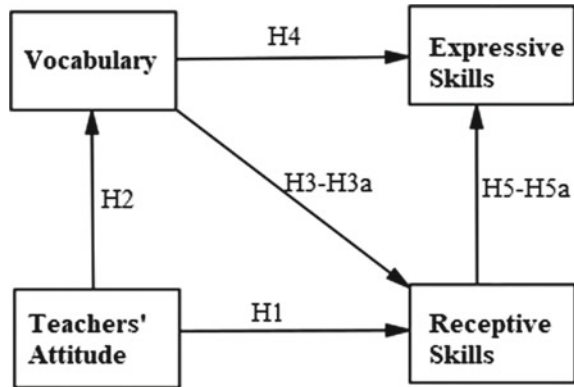
4   Method

4.1   Participants and Procedure

The study encompassed 360 preschool children aged between 60 and 72 months and 72 teachers from Turkey's Afyonkarahisar and Kars provincial centres. They were selected using a convenience sampling technique. Of the teachers, 66.7% resided in Afyonkarahisar, and 33.3% lived in Kars. Among them, 62.5% were female, and 37.5% were male. Regarding their educational background, 69.4% held a Bachelor's degree, and 30.6% had a Master's degree.

Regarding the child participants, 66.7% lived in Afyonkarahisar and 33.3% in Kars. 55.5% were girls, and 44.5% were boys, with an average age of 68 months. All children were monolingual. Ethical guidelines were strictly followed, such as informed consent, confidentiality, and data usage. The study was greenlit by the Afyon Kocatepe University's Social and Human Sciences Ethics Committee.

On investigating the number of storybooks owned by these children, half had between 5 and 10 books, 30% had 11 to 15, and the remaining 20% owned between 16 and 30 storybooks. Though convenience sampling presents generalization challenges, detailed participant information was provided to aid potential extrapolation. Initially, 84 teachers were approached, with the criteria being their active use of storybooks in language activities. Seventy-two participated; the rest were excluded due to illness or other engagements.

The child participants were chosen from classrooms where teachers actively used storybooks for language activities. Five children from each class with perfect attendance were selected after an 8-week observation to minimise disruptions. During these eight weeks, teachers utilized 24 storybooks, three per week, in their language sessions. The books were illustrated, colourful, and written in Turkish. After activities, the books were placed back in designated book centres. Parents were informed about the study in school meetings, and those who agreed to have their children participate provided written consent. Two essential scales, the Scale of Preschool

Teachers' Attitude Towards Storybooks and the Kaufman Survey of Early Academic and Language Skills, were administered to the children over two weeks.

4.2 Data Collection Tools

Personal Information Form: Crafted by the research team, it captured data on the child's birth date, gender, and number of storybooks they owned.

Scale of Preschool Teachers' Attitude towards Storybooks (SPTATS): Devised by Gözüm et al. [37], it underwent a rigorous validity test through Explanatory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The tool's reliability, as measured by Cronbach's Alpha, stood at 0.890 for this study, suggesting a high consistency level.

Kaufman Survey of Early Academic and Language Skills (K-SEALS): Originally framed by Kaufman and Kaufman [60], the tool was adapted for Turkish children by Uyanık and Kandır [112]. The current study found its internal consistency coefficient to be 0.890, confirming its reliability.

4.3 Data Analysis

4.3.1 Examining Assumptions

Prior to data analysis, assumptions were reviewed. There were all the correct data entries. Normality was assessed using z-scores, kurtosis, and skewness values for variables including teachers' attitudes towards storybooks, vocabulary, receptive language, and expressive language skills. All z-scores were between -3 and $+3$, confirming normal distribution. Similarly, kurtosis and skewness values were within the -1 to $+1$ range, upholding the normality assumption.

Linear relationships between variables were verified via scatter plots, which exhibited linear scatter. Further, correlation matrix tests revealed statistically significant values, and both the Variance Inflation Factor (VIF) and Tolerance (T) values confirmed no multicollinearity [72, 76, 104]. Hence, the dataset satisfied normality, linearity, and multicollinearity assumptions, bolstering the data analysis's validity.

4.3.2 Model Fit Assumptions

The established ranges for good model-data fit for these indices, as outlined in the literature, are as follows: ($\chi 2$/df) ≤ 3, RMSEA ≤ 0.05, NFI ≥ 0.95, CFI ≥ 0.95, GFI ≥ 0.95, AGFI ≥ 0.95, and IFI ≥ 0.95 [46, 48, 53, 62, 95, 104].

4.3.3 Analysis Method

This study used Structural Equation Modeling (SEM) to model relationships between key variables, following the standard SEM stages [1, 62, 93]. Within the theoretical model, two variables served as mediators. The vocabulary variable was added to the basic model, impacting teachers' attitudes towards storybooks and receptive language skills. Another mediating role was played by receptive language skills in the model, affecting vocabulary knowledge and expressive language skills.

Bootstrap analysis was deemed more reliable than traditional mediation tests [6, 38, 43]. This entailed generating 5000 resamples, establishing a 95% confidence interval. Mediation was assessed based on changes in correlation coefficients and model significance [6, 38, 43].

5 Findings

Before giving the findings of the research hypotheses, the values of the path analysis of the model were given for the relationships between variables, model fit results, and findings regarding the hypotheses. The relationship between the model variables proposed in the study and the descriptive statistics values are given in Fig. 2.

According to Fig. 2, it can be seen that the relationships between the variables of attitude towards storybooks, words, vocabulary, receptive language, and expressive language were at ($p < 0.01$) level. When the kurtosis and skewness values, indicators for the normal distribution of the variables, were examined, all variables took values between -1 and $+1$ (Fig. 2).

Path analysis was applied to test the hypotheses between teachers' attitudes towards storybooks, vocabulary, receptive language, and expressive language skills, which were the study variables. Path analysis results are given in Fig. 4.

According to the results of the path analysis shown in Fig. 4, teachers' attitudes towards the storybooks variable ($\beta = 0.166$; C.R. $= 3.661$; $p < 0.001$) affected the

Constructs	1	2	3	4	M	SD	Skewness	Kurtosis
1. Teachers' attitudes	1				103.29	18.75	-.147	-.962
2. Vocabulary	.425**	1			25.28	3.33	-.900	.907
3. Receptive Language	.396**	.611**	1		23.44	3.66	.483	.974
4. Expressive Language	.322**	.723**	.692**	1	16.89	3.73	.136	.565

**. Correlation is significant at the 0.01 level (2-tailed).

Fig. 2 Correlations among constructs, means, standard deviations, skewness, kurtosis (N = 360). ** Correlation is significant at the 0.01 level (2-tailed)

Fig. 3 Standardized estimate values of the model as a result of the path analysis
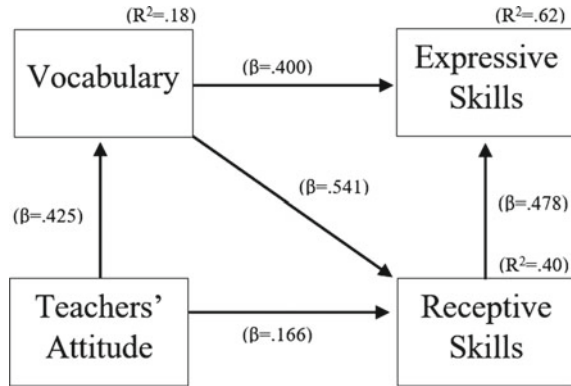
Predictive Variables	→	Outcome Variables	β	B	S.E.	C.R.	p	Hypotheses Result	
Attitude	→	Receptive Lang.	.166	.021	.006	3.661	<.001	H₁	Supported
Attitude	→	Vocabulary	.425	.049	.006	8.900	<.001	H₂	Supported
Vocabulary	→	Receptive Lang.	.541	.596	.050	11.941	<.001	H₃	Supported
Vocabulary	→	Expressive Lang.	.400	.537	.046	11.660	<.001	H₄	Supported
Receptive Lang.	→	Expressive Lang.	.478	.407	.042	9.748	<.001	H₅	Supported

B=Unstandardized Estimates β=Standardized Estimates.

Fig. 4 Results of path analysis. B = unstandardized estimates, β = standardized estimates

receptive language variable directly and positively. In this context, H₁ was accepted. Teachers' attitudes towards the storybook variable ($\beta = 0.425$; C.R. $= 0.8.900$; p < 0.001) affected the vocabulary variable directly and positively. Hence, the H₂ hypothesis was accepted. The vocabulary variable ($\beta = 0.541$; C.R. $= 11.941$; p < 0.001) affected the receptive language variable directly and positively. Therefore, H₃ was accepted. The vocabulary variable ($\beta = 0.400$; C.R. $= 11.660$; p < 0.001) also affected the expressive language variable directly and positively. In this context, H₄ was accepted. The receptive language variable, on the other hand, ($\beta = 0.478$; C.R. $= 9.748$; p < 0.001) affected the expressive language variable directly and positively. Thus, the H₅ hypothesis was accepted.

As seen in Fig. 3 regarding the variables in the model, vocabulary ($R^2 = 0.18$) explains 18% of the variance, receptive language skill ($R^2 = 0.40$) explains 40% of the variance, and expressive language skill ($R^2 = 0.62$) variable explained 62% of the variance.

In this study, two mediating variable analyses were examined. In this sense, H₃ₐ was first tested by examining the mediating role of the vocabulary variable among the teachers' attitudes towards storybooks, receptive language, and vocabulary variables.

Predictive Variable	Outcome Variable					Mediating Variable
	Receptive Language					Vocabulary
Attitude	β	B	95% CI		p	Hypotheses Result
			Lower	Upper		
Standardized Total Effect	.396	.051	.372	.476	.001	H₃ₐ-Accepted
Standardized Indirect Effect	.230	.029	.171	.272	.001	
Predictive Variable	Outcome Variable					Mediating Variable
	Expressive Language					Receptive Language
Vocabulary	β	B	95% CI		p	Hypotheses Result
			Lower	Upper		H₅ₐ- Accepted
Standardized Total Effect	.694	.780	.641	.746	.001	
Standardized Indirect Effect	.216	.243	.149	.280	.001	

B= Unstandardized Estimates β= Standardized Estimates CI=Confidence Interval.

Fig. 5 Mediating effect path analysis. *B*—unstandardized estimates, β—standardized estimates, CI—confidence ınterval

Next, the H_{5a} was tested by examining the role of the receptive language variable as a mediator among the vocabulary, expressive language, and receptive language variables.

According to Fig. 5, standardized total effect values showed that teachers' attitude towards storybooks was found to have a significant direct and positive effect on children's receptive language variable (β = 0.396; p < 0.05; 95% CI (0.372, 0.476)). When the result of the mediating effect model, in which vocabulary was added as a mediator variable, was examined, according to the results of the standardized indirect effect test, teachers' attitudes towards storybooks (β = 0.230; p < 0.05; 95% CI [0.171, 0.272]) significantly affected receptive language variable directly and positively.

In the simple effect model, in which receptive language skill was not added as a mediating variable, vocabulary affected the expressive language skill variable (β = 0.694; p < 0.05; 95% CI [0.641, 0.746]) directly and positively according to the standardized total effect results. When examining the results of the standardized indirect effect test according to the mediating effect model (see Fig. 5) in which receptive language skill was added as a mediating variable, vocabulary (β = 0.216; p < 0.05; 95% CI [0.149, 0.280]) affected expressive language skill variable directly and positively.

Figure 5 shows that when the vocabulary variable was added, the coefficient in the simple effect model of teachers' attitudes towards the storybook decreased, and the upper and lower limits of the confidence interval (CI) were not met. Hence, it was understood that in the practical model of teachers' attitudes towards the storybook on receptive language, vocabulary played the role of a significant mediating variable. Since the significant difference in the simple effect model did not disappear due to adding the vocabulary variable as a mediating variable, vocabulary took over a partial mediator role. H_{3a} was supported in this regard.