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Introduction

This Fall issue provides readers with a variety of topics that include literacy, supporting refugee students with learning loss, creativity in the classroom, and technology concentrated on Artificial Intelligence and social and emotional engagement through video games. Moreover, this issue introduces a new section titled "Education: Words and Meaning" to help readers learn the meaning of education terms. The International Journal of the Whole Child continues to be committed to promoting holistic learning and the development of the whole child.

Article #1:
Promoting Tangible, Cultural, and Cognitive Access to STEAM Identity Through Literacy-Based-Picture Book Biographies
Joan Boulware, Eula Monroe

The authors of this article discuss how picture book biographies can be used as a tool to support both STEAM identity and literacy. The use of picture book biographies allows for support to be addressed through tangible access, cultural access, and cognitive access. Information on appropriate book selection is provided. Additionally, the authors present sample picture book biographies as well as accompanying STEAM goals and literacy tasks.

Article #2
The Impact of Mitigating Refugee Students' Mathematics Learning Loss on Their Resilience Levels
Seyat Polat

Through a pretest-posttest quasi-experimental study, the author hoped to decrease math learning loss by increasing resilience through a mathematics education program. The author outlines the role of resilience both in the face of challenges and academics. The findings measure resilience on the Connor-Davidson Resilience Scale (CD-RISC-25). Findings suggest that reducing math learning loss increases students' resilience. The author provides additional activities that support the building of resilience. Future research can expand on the various forms of resilience that support refugees as well as examining resilience through a variety of lenses.

ETC.
Creativity Crisis: Awakening the Creative Classroom Environment
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This author discussed the impact regimented curriculum has on creativity in the classroom and how implementing active engagement, instructional flexibility, and differentiated goals during the learning process can reignite creativity in the classroom. The author proposes eight attributes to help teachers implement a creative environment.

Tech Talk

Entering A New Frontier: AI in Education *Nancy Caukin, Lori Vinson, Leslie Trail, Constance Wright*

The authors of this article discuss how Artificial Intelligence (AI) can be used as a digital assistant that improves teaching and learning. AI can improve teaching and learning by creating greater opportunities for differentiated and personalized learning that meets both students' needs and interests. Additionally, the authors address the use of AI in assessment and tutoring, as well as a teacher's assistant addressing administrative tasks. Conversely, risks for the use of AI in this context include both inherent bias and security issues.

STEAM

The Science of Sand and Water

Cris Lozon, Jennifer Hardison

The authors of this article share their experiences with the use of sand and water in a play-based early childhood school. Through the exploration, practice, and repetition associated with sand and water play children are unknowingly forming the foundation of scientific principles and enhancing their literacy. The learning experienced through sand and water play fosters scientific inquiry and investigative play that aligns with the Next Generation Science Standards.

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Susan Elswick, Elena Delavega

The authors of this article explore the effects of virtual reality and game-based interventions via Minecraft™ on social emotional learning for children with high functioning Autism. Additionally, they provide theoretical grounding for this work, addressing how technology can be used alongside therapy, and what progress looks like through this lens. Finally, the authors discuss the opportunities for further research to shed more light on how these interventions compare to face-to-face interventions, the use of technology and predictive analytics, and supportive technology without a live data collector.

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The data provided by the author in "Education by the Numbers" discuss the correlation between education attainment and employment.

Education: Words and Meanings

Larry Burris

This first publication for the column, Education: Words and Meanings, describe the use and misuse of common research terms and words. These words are often used incorrectly and interchangeably, leading to confusion and misunderstanding, when accuracy and clarity are needed.

Pictures for Reflection

A Playground Mystery: What Happened

Kathy Burriss, Larry Burriss

The authors discuss how a simple metal frame can be used in a multitude of ways to inspire imagination and play.

Page Turners: Books for Children

Carla K. Meyer, Michelle J. Sobolak, Patricia Crawford, Maria Genest, Katrina Bartow Jacobs

In this article, different children's books are listed with descriptive summaries on each one. The books include: *Blast Off! How Mary Sherman Morgan Fueled America into Space; Little Houses; Memory Jars; Once Upon a Book; Salat in Secret; The Year We Learned to Fly; Across the Tracks: Remembering Greenwood, Black Wall Street, and the Tulsa Race Massacre; Luminous: Living Things that Light Up the Night; and My Brother is Away*.

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Promoting Tangible, Cultural, and Cognitive Access to STEAM Identity Through Literacy-Based-Picture Book Biographies

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Dr. Eula Ewing Monroe is Professor Emerita of Mathematics Education at Western Kentucky University and Brigham Young University. Among the topics she studies are literacy-STEAM relationships (including the role of picture book biographies), vocabulary in mathematics, and the development of basic facts among young children. She is interested in the translation of research in these areas into classroom practice.

Abstract

Learning and innovation skills such as creativity, critical thinking and problem solving, communication, and collaboration can be fostered through learning about STEAM role models. Using selected picture book biographies, teachers can help their elementary students visualize the experiences of these individuals as they developed and refined ideas or products that addressed needs. The nature of picture book biographies, the unique vocabulary of each STEAM content area, and the use of language arts strategies can promote access and equity as students examine issues and challenges faced by previous generations. They can question and begin to form their own STEAM identities as they consider the contributions they can make during their lifetime.

Keywords: STEAM education, equity and access, picture book biographies, literacy strategies, role models

Introduction

The concept of STEAM (science, technology, engineering, the arts, and mathematics), a recent and exciting innovation in curricular thinking (Piro, 2010; Sharapan, 2012), is fluid and evolving, and has a role in literacy instruction through the use of STEAM picture book biographies. Not unexpectedly, the roles and emphases the arts can and should have alongside or within the STEM subjects of science, technology, engineering, and mathematics remain a matter of considerable discussion and debate. Nevertheless, it is widely viewed that each of the arts—

visual and graphic arts, the language arts (subsumed within a broad definition of literacy, including disciplinary literacy), music, etc.—holds the potential to contribute to creative aspects of discovery and invention as students develop and hone foundational skills needed for innovative thinking and problem solving.

Learning and innovation skills such as creativity, critical thinking and problem solving, communication, and collaboration (Partnership for 21st Century Skills, 2009) can be developed through STEAM-based literacy using language arts curriculum tasks. These skills empower students, over time, to develop possibilities not yet envisioned for solving problems for themselves and for the larger world around them.

STEAM picture book biographies provide positive motivation for aspiring STEAM-interested elementary learners of varying age levels who see the people represented in the biographies as role models. Role models may also be others who have gone before them, recognized the challenges their generations have faced, made connections to available resources, solved problems, and created innovative designs that addressed issues pertinent to their lives. (Gladstone & Cimpian, 2021.)

The genre of the picture book biography, consisting of limited text and mostly pictures, has its roots in previous decades. Particularly in STEAM subjects, it is growing in appeal and is becoming a favorite among elementary children (MSRI, 2003). Alongside the increasing presence of STEAM education in schools, the availability of recently produced picture book biographies of STEAM role models from many eras of history makes their use a natural choice in instruction. These biographies can provide contexts for developing STEAM concepts and literacy tools while helping students develop their own potential identities as they explore the lives of individuals in STEAM-related careers (Gladstone & Cimpian, 2021; Young et al., 2021). Picture book biographies often pique students' interest while addressing issues of access to learning about careers that initially may seem distant from their everyday lives and their own aspirations.

Picture book biographies may be shared in a variety of contexts for multiple purposes and are not necessarily age- or level-dependent for learners. However, this article is addressed to elementary teachers, a teacher group broadly prepared with a cross-section of skills for working with young students to equip them for future, yet-unknown challenges, and to teacher educators who collaborate with elementary teachers. Picture book biographies can provide an especially meaningful context in which teachers can mobilize their own STEAM knowledge base and their diverse experiences in planning and implementing lessons to foster literacy within and across the STEAM disciplines.

Picture Book Biographies Access Points

The lives of a wide range of individuals, so interestingly shared in well-written picture book biographies, can encourage learners to envision themselves in STEAM-related careers by supporting three kinds of access: *tangible* access, *cultural* access, and *cognitive* access (Saldutti, 2019). Knowledge of these access points enables teachers to design and implement equitable

solutions to a range of literacy needs in their classrooms, including awareness of the kinds of literacy tools needed in different STEAM disciplines.

Tangible Access

Tangible access to learning opportunities such as doing experiments, constructing models and drawings, and involvement in other carefully designed STEAM tasks can activate connections that emphasize how human endeavors have met needs and affected people groups. Such authentic content-related experiences are foundational to developing STEAM skills and practices (Saldutti, 2019). At the same time, a well-written picture book biography read aloud by the teacher, or in the hands of a reader, can provide an authentic, near-tangible experience as the learner identifies with the primary character, and in doing so, with that character's career choice.

Cultural Access

One's sense of self, or identity—situated, at least in part, within perceived bounds and expectations of culture—has been found to be integral in decisions regarding participation in STEAM, thus deeply affecting career goal choices (e.g., National Council of Teachers of Mathematics [NCTM], 2020). Teachers influence their students in developing and expanding their identities, including their identities as learners and doers of STEAM, by planning and enacting lessons situated within their students' background and knowledge base. At the same time, teachers can choose picture book biographies that feature individuals from a wide variety of backgrounds and interests in the STEAM professions. In that way, students can explore literacy experiences that offer the promise of empowering them to think of themselves as active contributors to the betterment of society, either through STEAM-related fields or other careers. The genre of picture book biography offers a repertoire of choices for examining a wide range of human endeavors, and thus the likelihood that students can discover exciting options they may not otherwise have considered.

Cognitive Access

As important as both tangible and cultural access are to learning STEAM content and practices, students must also develop skills and strategies essential for them to gain cognitive access to development in the STEAM disciplines. Often foundational understandings in one discipline support cognitive access to another. For example, content in the traditional STEM subjects typically builds on or utilizes mathematical understanding; and the arts bring with them, perhaps not so obviously, the need for mathematical understanding as well as opportunities for its development. However, nowhere across STEAM instruction do we find this interplay among disciplines more obvious than in the need for the language arts: "speaking/listening, reading/writing, and viewing/representing" (Malloy et al., 2019, p. 7), which are essential to accessing, developing, and expressing STEAM ideas. Often in ways specific to the discipline, the language arts not only support the development of content and literacy, but, while doing so, support their own development as well (Houseal et al., 2016).

Well-written picture book biographies often provide rich contexts for developing a range of literacy strategies that support comprehension of STEAM concepts. These strategies may be

specific to the discipline, but often more general strategies are needed within the context and content of the STEAM ideas addressed in picture book biographies. Such strategies may involve sequencing ideas, identifying details, making inferences from print-based evidence, and engaging in reasoning scenarios that provide opportunities for learners to recognize and interpret patterns prevalent in the content under study (Buehl, 2017).

Teachers will also need to address other aspects of literacy while using picture book biographies. The vocabulary specific to the context and content of a selection, as in other targeted text materials (Flanigan et al., 2012; May et al., 2019), has a major influence on cognitive access to concepts. Learners can be given opportunities to participate in meaningful collaboration with peers that involves verbal interactions and writing activities in which students record their ideas and configure them as needed to communicate an emerging idea or invention they may desire to introduce into the culture. Elementary teachers can actively engage their students in literacy tasks that may require them to build charts or graphs and generalize ideas that enable them to develop vocabulary and meanings specific to the discipline, promoting comprehension of online or print materials (Monroe et al., 2018).

Selecting Picture Book Biographies for STEAM Instruction

STEAM picture book biographies are typically about individuals who thought beyond the boundaries of the traditional notions of their generation. Their paths varied, but STEAM biographical characters are among those who were able to impact their present circumstances and contribute to a STEAM profession, and, in many cases, to the culture as a whole. These biographies provide current readers opportunities to examine identities of people who contributed to an idea, invention, or innovation.

Teachers can work with their students to analyze selected picture book biographies for qualities of creativity and problem solving that enabled the STEAM role models to develop their interests as well as their identities. Among the growing number of titles available for examination, the special achievements of the biographical characters featured may help children recognize that, contrary to some perspectives, STEAM is done by and with real people who do interesting and exciting things with their lives (Columba et al., 2005).

The following subheadings pose several important considerations when selecting picture book biographies for STEAM instruction. Overall, the discussion extends the work of May et al. (2019), who identified several common characteristics of well-written picture books when considering their use in music instruction, and Young et al. (2021), who described the use of picture book biographies in mathematics instruction. It also is situated in the authors' previous work with STEAM instruction using picture book biographies (e.g., Boulware & Monroe, 2021, 2023).

Length/Scheduling Considerations

The picture book biography is usually 32-40 pages in length and can fit readily into a classroom schedule. This format encourages their use as read-alouds in connection with the STEAM concepts being taught. However, teachers may choose to use picture book biographies as a part of their

overall literacy instruction. A specific selection may fit equally well in either place, according to the teacher's instructional goals.

Format

Picture book biographies are typically written in a story format, which is often more accessible and engaging, especially for younger learners, than are many other text materials. Teachers can use these stories to appeal to the STEAM interests of their students, connect them with the biographical characters featured, and enhance their access to the STEAM topic under study.

Context

Picture book biographies are often situated within places, people groups, or time periods different from those of many students within a specific classroom, yet the characters and the context may be accessible, and can be culturally enlarging, to a wide range of students at various age levels. Teacher use of a specific book will vary according to age and knowledge base of the students as well as goals for instruction, including the specific STEAM ideas under study.

Art and Graphics

In well-designed picture books, the art and the words interactively communicate the content. Other graphics, when included, serve as teaching tools to develop the content of the discipline and allow for meaningful discussion.

Range of Choices

Across STEAM content, a wide range of picture book biographies is emerging for classroom use. When teachers select and use books that honor diversity and address the biographical characters' interests and individual differences or unique needs equitably, student access to the STEAM disciplines is likely to increase.

Back Matter

A section usually known as back matter is included in many picture book biographies. This section often provides additional content-related information as well as other information that expands understanding of the book character's life, including contributions to STEAM.

Access/Equity

As teachers address the considerations discussed under the previous subheadings in making book selections, they all coalesce when anticipating the kinds of access the specific book selection may support with the students in their classrooms. Tangible, cultural, and cognitive access to STEAM can be supported through giving students opportunities to learn about individuals who have made notable achievements in STEAM-related careers. Selected picture book biographies of such individuals, past and present, who exemplify qualities of creativity in problem solving can be shared by teachers in their classrooms. Literacy experiences with STEAM biographies

can both inspire and empower students to develop their own visions of how to make the world a better place, either through a STEAM-related field or through other worthwhile choices.

Sample Picture Book Biographies, With Accompanying Goals and Literacy Tasks

The considerations noted in the previous section guided the selection of the five picture book biographies used as samples. Teachers can access picture book biographies, either through a hard copy or, in many cases, as an online posting of a read-aloud of the selection. Although hard copies provide for more flexible use, online postings often provide engaging renditions of the stories and may include supplemental materials that can be used to deepen students' understanding of the STEAM field under study.

Each book selected provides teachers rich contexts through which they can engage their students in numerous age-appropriate tasks to help them access STEAM content. The context of the book characters' lives impacted their opportunities, experiences, and often their dreams and visions for themselves. Real-world situations described in the texts often point to issues of equity and factors that affected tangible, cultural, and cognitive access for that individual. Sample tasks allow students to participate in critical thinking, problem solving, and reasoning while engaging in meaningful communication and collaboration with peers. The tasks provided are designed to spark the thinking of teachers regarding the ways they themselves might use picture book biographies in supporting literacy needs of their students for engaging productively in learning STEAM content and processes in their classrooms.

Bardoe, C. (2018) *Nothing stopped Sophie: The story of unshakable mathematician Sophie Germain.* Illustrated by B. McClintock. New York: Little, Brown and Company.

Book summary:

Sophie Germain had an indomitable spirit and an approach to life that embodied perseverance in the face of many odds. Even when Sophie was a little girl, her parents did not want her to do mathematics—females in her culture were allowed to play the piano and other pursuits, but it was "unseemly" for them to do mathematics. Both the author and illustrator delightfully present Sophie, who persevered in solving problems that led to advances in engineering and in pure mathematics. Her foundational work with modeling the mathematics of vibrations allowed for the later design and construction of structures such as the Eiffel Tower, modern skyscrapers, and long-span bridges.

STEAM goal:

To support the development of students' perseverance in problem solving, a primary goal of school mathematics (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010), is applicable also in other STEAM disciplines.

Literacy task:

Present the book to students as a read-aloud experience. Later, read the book again orally, asking students to think about Sophie's perseverance. The title, *Nothing Stopped Sophie*, will lend itself well to helping students understand this trait. After discussion, ask each student to write two or three words or short phrases that describe or provide examples of Sophie's perseverance. Using your favorite Word Art or Word Cloud program (see, for example, https://wordart.com/), enter the students' responses, including all repetitions.

Display the word cloud and clarify that the size of the words and phrases is related to their frequency. Ask students to think about important ways Sophie demonstrated perseverance in mathematics. Is there anything they can learn from Sophie about why it is important to persevere in mathematics and in other STEAM-related fields? As a class or as individuals, guide the students to decide on a way they can focus on developing and extending their perseverance in STEAM content and help them develop individual or group plans for doing so.

Biebow, N. (2019). *The crayon man: The true story of the invention of Crayola Crayons.* Illustrated by S. Salerno. HMH Book for Young Readers.

Book summary:

The year 1903 must have been exciting for Edwin Binney, who spent his days running a company that sold carbon black pigment for everything black—from shoe polish to rubber car tires. In that year, he developed the original Crayola spectrum of eight coloring crayons!

Although he earned his living in black, he loved color, and he had an inventive mind. His wife, a former schoolteacher, told him of the inadequate quality of crayons at that time (besides being unpleasant and lumpy, some were poisonous) and challenged him to invent better, cheaper ones. After many tries and with much experimentation and the help of many people, Binney developed the crayon that still rules the market today.

STEAM goal:

To focus students on the processes an inventor might use in creating or improving a product.

Literacy task:

In pairs or small groups, students are to create a storyboard based on the book. The storyboard is to document in words and pictures the process Mr. Binney engaged in to invent Crayola Crayons. Students are to create and label the storyboard sections and put them together sequentially.

Make sure students note Mrs. Binney's part in helping her husband define and introduce the word *Crayola* into the culture. They also should consider the marketing and distribution of Crayola Crayons that involved his friend Harold at the World's Fair in 1904.

Diehn, A. (2019). *Computer decoder: Dorothy Vaughan, computer scientist.* Illustrated by K. Mazeika. Nomad Press.

Book summary:

Dorothy Vaughan, born in 1910, was gifted even as a child at solving problems. After graduating from college, she became a mathematics teacher. One day she saw an ad on a bulletin board for a position as a human computer at the Langley Memorial Aeronautical Laboratory (the predecessor to NASA). Although she was hired for the position, she experienced discrimination as a female in the workplace. As an African American, she also dealt with segregation issues. Despite the challenges, her gifts as a mathematician were recognized and she was promoted to a supervisory position, where she led a team of people in acquiring the knowledge needed to develop programming skills. She is remembered as an author of computer codes that are foundational to the technological society that exists today.

STEAM goal:

To help students begin to envision themselves in STEAM occupations and to understand the kinds of preparation needed for them.

Literacy task:

Dorothy Vaughan's life changed when she responded to a bulletin board ad for a mathematics position. Students can learn about STEAM jobs available today by creating written advertisements for job openings.

Working in pairs, students are to prepare interview questions for someone who works in a STEAM occupation in which they are interested. Then they are to conduct the interview, taking notes and/or recording as they interview. They are to use the information they gathered to construct a realistic advertisement of a hypothetical job opening in that occupation. Make sure students document in their ad the preparation and skills needed to perform the job effectively.

Griffith, E. (2021). *Secrets of the sea: The story of Jeanne Power, revolutionary marine scientist.* Illustrated by J. Stone. Clarion Books.

Book summary:

Jeanne Power, born in 1794, was a 19th-century problem solver. She is remembered as the designer of aquariums so she could study marine animals in their natural habitats. As a young woman, she moved to Paris to learn the trade of drawing patterns and making clothes. Her work as a seamstress became sought after to the extent that she was commissioned to draw a pattern for the wedding gown of an Italian princess. After marrying in 1818, she and her husband moved to Sicily, where she observed, drew, and studied both land and sea animals. The skills she had acquired as a dressmaker helped her draw images designed to scale for fish tanks made of transparent glass that sea creatures could inhabit. The scientific community credits her today for inventing the aquarium and for solving the mystery of how the paper nautilus creates its own shell.

STEAM goal:

To promote student awareness of the pervasiveness and roles of patterns in everyday life.

Literacy task:

Jeanne Powers was an expert at creating patterns and then producing a product from the written pattern she created. There are many kinds of patterns, and they appear everywhere! Some are repeating patterns; others grow or shrink, with regularity in the way they change.

Assign students to pairs or small groups. Ask each group to create a pattern, either a repeated pattern or a growing or shrinking pattern (They might use music, movement, numbers, shapes, claps, objects, seasons, time intervals, etc.). Then they are to devise a way to represent their pattern on paper and label whether it is a repeating, growing, or shrinking pattern and/or "perform" their pattern for peers and ask them to label it.

Now, back to Jeanne's dressmaking patterns: In what ways could the patterns Jeanne created for dressmaking be repeated? How might she have adapted them to become growing or shrinking patterns? Children who have learned about equal ratios might design a pattern for their own glass fish tank, referring to the drawings in the book. In planning for its completed size, they will need to consider the space needed for the aquatic life it will be designed to hold.

Parsons, K. (2021). *Saving the day: Garrett Morgan's life-changing invention of the traffic signal*. Illustrated by R. Christie. Little, Brown and Company.

Book summary:

Garrett Morgan, a Black inventor, was born in 1877 as the seventh of eleven children. His parents recognized early in his life that he had a gift for thinking in innovative ways. Although his parents were not wealthy, they sent their son from rural Kentucky to the city (Cincinnati, Ohio) where he could study with a tutor and work toward his dream to become an inventor. Garrett studied during the day and after hours experimented with the tools he had available to create products and fix objects. He is credited for inventing the zig-zag attachment for sewing machines and a mask that provided protection for soldiers and firefighters. However, he is best known for the idea and invention of a three-way traffic signal.

As a Black American, he promoted equal rights for all. He gave much of his wealth from his inventions to traditionally Black colleges and universities.

STEAM goal:

To engage students in reading and interpreting graphic representations of technical information.

Literacy task:

Garrett Morgan looked around himself and viewed things that could be made better in the culture and environment in which he lived. One was the traffic signal. Before his development of a three-way traffic signal, patented in 1923, traffic signals were only two-way: "stop" and "go." Referring to Morgan's accident as related in the book and incorporating children's knowledge of safety at traffic signals, discuss why a three-way signal was a major improvement. Then project the drawings from Morgan's patent application, included in the book as the last page of back matter (n. p.). They are technical in nature, but with careful examination, students can make some important observations.

After reviewing what they observe from the drawings, have them use a Venn diagram to compare Morgan's three-way signal of about one hundred years ago with current three-way signals. The following questions may prompt children's thinking.

> What materials were used to build the signals then? Now?
> What were the power sources then? Now?
> What would happen if that source of power became unavailable?
> Do the signals accomplish the same—or different—purposes?
> What were traffic signals called then, and what are they usually called now?

Summary

Elementary teachers can create many opportunities to inspire and help their students envision themselves as capable of STEAM learning and as agents for positive change through STEAM fields. Teachers manage learning environments and instruction that employ the language arts: "speaking/listening, reading/writing and viewing/representing" (Malloy et al., 2019, p. 7) to promote tangible, cultural, and cognitive access to the development of student identities as STEAM learners. Introducing students to picture book biographies that present a diversity of STEAM contributions by highlighting the accomplishments and struggles of the characters is a promising practice.

The characters (and potential role models) responded to the contexts and challenges of their time periods and circumstances by producing innovative ideas or products to address needs. They engaged in problem solving to find solutions and to produce change. The contribution each STEAM biographical character made enriched the lives of not only their generation but generations to come. The STEAM characters presented in picture book biographies serve not as examples to be copied, but as inspirations for students of today in developing their own identities as meaningful contributors to society, whether in the STEAM fields or in another field of their choice (Gladstone & Cimpian, 2021).

References

Boulware, B. J., & Monroe, E. E. (2021, October 15). *The many colors of STEAM: The Crayola Man and other picture book biographies* [Conference presentation]. Organization of Teacher Educators in Literacy of the International Literacy Association. Online.

Boulware, B. J., & Monroe, E. E. (2023, October 13). Developing STEAM identity through picture book biographies using language arts strategies [Conference presentation]. Organization of Teacher Educators in Literacy of the International Literacy Association. Online.

Buehl, D. (2017). Teaching comprehension of complex disciplinary texts. In D. Buehl, *Developing readers in the academic disciplines (2nd ed.)* (pp. 29-73). Stenhouse Publishers.

Columba, L., Kim, C., & Moe, A. (2005). *The power of picture books in teaching math, science, and social studies. PreK – 8*. Holcomb Hathaway.

Flanigan, K., Templeton, S., & Hayes, L. (2012). What's in a word? Using content vocabulary to generate growth in general academic vocabulary knowledge. *Journal of Adolescent and Adult Literacy, 56*(2), 132– 140. https://doi.org/10.1002/JAAL.00114

Gladstone, J. R., & Cimpian, A. (2021). Which role models are effective for which students? A systematic review and four recommendations for maximizing the effectiveness of role models in STEM. *International Journal of STEM Education, 8*(1), 59. https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-021-00315-x

Houseal, A., Gillis, V., Helmsing, M., & Hutchison, L. (2016). Disciplinary literacy through the lens of the Next Generation Science Standards. *Journal of Adolescent and Adult Literacy, 59*(4), 377– 384. https://doi.org/10.1002/jaal.497

Malloy, J. A., Marinak, B. A., & Gambrell, L. B. (2019). Evidence-based best practices for developing literate communities. In L. M. Morrow & L. B. Gambrell (Eds.) *Best practices in literacy instruction* (6th ed. pp. 3-25). Guilford Press.

May, B., Milner, A., & Young, T. (2019). Biography breaks in the music classroom. *General Music Today, 32*(2), 37-43. https://journals.sagepub.com/doi/full/10.1177/1048371318814910

Monroe, E., Young, T, Fuentes, D., & Dial, A. (Eds). (2018). *Deeping students' understanding of mathematics through children's literature.* National Council of Teachers of Mathematics.

MSRI/Simons Laufer Mathematical Sciences Institute (SLMath). (2023). *Mathical Book Prize.* https://www.mathicalbooks.org/

National Council of Teachers of Mathematics. (2020). *Catalyzing change in early childhood and elementary mathematics: Initiating critical conversations*. NCTM.

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common core state standards for mathematics.* http://www.corestandards.org/Math/

Partnership for 21st Century Skills. (2009). *P21 framework definition*. https://files.eric.ed.gov/fulltext/ED519462.pdf

Piro, J. (2010). Going from STEM to STEAM: The arts have a role in America's future, too. *Education Week, 29*(24), 28-29. http://www.ischoolcampus.com/wp-content/uploads/2010/03/Going-From-STEM-to-STEAM.pdf

Saldutti, C. (2019). Equity and representation in STEM: Giving students functional access to 21st-century STEM literacies. *Literacy Today*, *36*(6), 8-9. http://viewer.zmags.com/services/DownloadPDF?publicationID=017d30e7&selectedPages=all&pubVersion=77&print=true

Sharapan, H. (2012). From STEM to STEAM: How early childhood educators can apply Fred Rogers' approach, *Young Children, 67*(1), 25-33. https://www.proquest.com/openview/faea64e6647f6d1d292b909f63fba7e2/1?cbl=27755&pqorigsite=gscholar&parentSessionId=A8b5Sa53PuVjpVcIiEzg%2F9k95Q3oZQTCrlKKl1vp%2FoU%3D

WordArt. (2009-2023). https://wordart.com/

Young, T. A., Monroe, E. E., & Roth McDuffie, A. (2021). Picture book biographies read-alouds and Standards for Mathematical Practice. *The Reading Teacher, 75*(2), 135-146. https://doi.org/10.1002/trtr.2019

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The Impact of Mitigating Refugee Students' Mathematics Learning Loss on Their Resilience Levels

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Abstract

Refugee children face many difficulties on their migration routes. These challenges continue even after arriving in the destination country. It is important for the world's growing child migrant population to successfully adapt to the host country. Otherwise, there is a risk for future generations facing psychological, social, and academic challenges. Education and training play an important role in the adaptation process of children and youth. The focus of this study was to overcome the math learning losses of refugee students by changing the approach to mathematics in order to increase their resilience. For this purpose, a one-group pretest-posttest quasi-experimental design was used. Among the refugee students now living in Germany and Greece, two were Syrian and 40 were Turkish. Within the framework of the project, a two-month problem-based mathematics education program was carried out for the students. The Connor-Davidson Resilience Scale (CD-RISC-25) (2003) was administered to the refugee students at the beginning and end of the program. In addition, the students' views on the mathematics education program were taken. According to the students' views, the program was efficient, and the learning losses were mitigated. It was also found that the mitigation of math learning losses increased the resilience of refugee students significantly ($p<.01$).

Keywords: refugee children, resilience, mathematics, learning loss

Introduction and Background

In today's world, individuals are forced to migrate and relocate due to political (Polat & Kröner, 2022), war (Reed, 2018), and economic reasons (Geist & McManus, 2012), as well as natural disasters (Drabo & Mbaye, 2015).

Migrating children and young people face difficulties such as being deprived of the right to education or by experiencing educational losses. Along with the challenges of migration, the students in this study group were also affected by lockdown (Covid-19).

Because of the lockdown, when schools switched to e-learning (Betthäuser et al., 2023), refugee students, especially those who had just arrived in the destination country, either could not go to school or had to study online in a language they did not know. Thus, their education had been severely disrupted. This process caused students to experience various difficulties in learning language and basic sciences, socialization, and cultural adaptation.

In addition to these difficulties experienced by refugee students, a mathematics course is particularly difficult and is often considered as a field that cannot be easily achieved by many people (Morkoyunlu & Saltık Ayhanöz, 2021). This understanding increases the burden of refugee students even more. Research describes learning deficits are larger in math; this is particularly true for children from low socio-economic backgrounds (Betthäuser et al., 2023). Therefore, it is possible to state that migration, Covid-19, and the difficulty of mathematics in general may reduce students' resilience.

In this context, the current study, which is a product of the European Union Erasmus+ project, explores the effect of eliminating mathematics learning losses of refugee students through a different mathematics approach called Problem-Based Learning (PBL) (Albanese & Dast, 2013; Allen et al., 2011; Wood, 2003) and then, examines its effects on the refugee children's resilience levels.

Review of the Research

People have to or want to change their places for different reasons. This mobile transition from one place to another can be called migration (Dustmann & Glitz 2011). While migration is by its very nature a corrosive process, it can be said that being forced to migrate is more difficult. Being forced to migrate brings with it serious problems. These problems are divided into pre-migration-migration route and post-migration challenges (Pieloch et al., 2016).

For instance, wars (Reed, 2018) and natural disasters (Gasparrelli, 2017) are referred to as pre-migration challenges, while cultural adaptation (Bhugra & Becker, 2005) and language learning (Föbker & Imani, 2017) are characterized as post-migration challenges. However, especially for people who have to migrate illegally, the migration route is also seen as an important challenge (Demir & Aliyev, 2019).

Naturally, children are among the people who migrate or are forced to migrate. According to UNICEF (2023), 36 million children migrated to different countries in 2020. Migrant children are affected by the challenges described above. In addition, due to their location in different environments (e.g., refugee camps), refugee children also face challenges including a limitation to educational access, experience with trauma, indication needs remain unmet, and evidence of their poor socio-emotional skills (Wang et al., 2019).

These problems make the situation even more complicated, especially for school-age children. This is because children are unable to attend school regularly for a certain period of time due to the location of their accommodation. Students who attend school face learning losses in basic subjects such as mathematics due to their poor command of the host country's language.

Under normal circumstances, learning mathematics is not easy and requires struggle. Struggle is a natural part of the learning process, as it involves a student's intellectual effort to grasp

challenging mathematical concepts in line with their capabilities (Permatasari, 2016). In other words, struggle is at the center of mathematics learning (Kooken et al., 2016). In addition to the difficulty of learning mathematics, refugee students also struggle to mitigate the learning losses they have experienced due to the migration process. Learning mathematics, a subject in which prerequisite learning is important, and the process of mitigating learning losses related to this subject can be quite challenging for refugee students. This academic difficulty, in addition to psychological and social difficulties, negatively affects the resilience levels of refugee students, and therefore, these students need additional support, such as learning loss mitigation, therapy sessions, music, and sports activities.

Role of Resilience

Resilience is a term that is attracting more and more attention in the academic world. When the definition of resilience in the context of social sciences is examined, it is seen that researchers handle this concept in two different ways. The first describes resilience in the face of challenges (Denov et al., 2019; Kumi-Yeboah, 2016; Sleijpen et al., 2015); the second definition refers to academic resilience (Cinkara, 2017; Nouwen & Clycq, 2021; Sosa & Gomez, 2012). Resilience in the face of challenges is the ability of individuals to survive and overcome difficulties despite negative and stressful life experiences (Motti-Stefanidi, 2015; Sleijpen et al., 2015). In addition, when faced with challenging or threatening conditions, it is the ability of people to cope with these challenges by considering the possibilities and to adapt positively (Demir & Aliyev, 2019; Denov et al., 2019).

Academic resilience, on the other hand, involves increasing the likelihood of success in education despite the adversities caused by environmental conditions and experiences (Agasisti & Longobardi, 2017; Nouwen & Clycq, 2021). In addition, academic resilience includes elements such as establishing friendships, acquiring academic skills, and increasing school-age children’s academic performance (Gardner & Stephens-Pisecco, 2019; Sosa & Gomez, 2012). Considering the above explanations, it is critical for refugee students to cope with both life and academic challenges. Therefore, the resilience of refugee students is critical to both their academic success and their integration into society.

How do individuals develop resilience and overcome negative situations? Overcoming challenges is not the same for every individual. While some people overcome this situation by developing strategies, others require external support. Researchers concluded parental attitudes (Motti-Stefanidi, 2015; Onat, 2010) and sense of belonging (Scarf et al., 2016) have a positive effect on children's resilience.

For refugee students, learning mathematics or mitigating math deficits can play a mediating role in helping them to integrate with their peers and communicate with their teachers. This may contribute to increasing students' resilience levels.

Targeting mathematics learning losses refers to the positive characteristics that enable students to compensate for their deficiencies in mathematics and to learn and use mathematics at school and in other areas of life (Lee & Johnston-Wilder, 2017). It also increases learners' self-confidence as knowing mathematics has a value in the world (Johnston-Wilder & Lee, 2010). This situation contributes to students’ ongoing socialization and increasing friendships.

This current study examines the possible impact of mitigating math learning losses through a different mathematics teaching approach (PBL) and how this approach may impact refugee students' resilience levels (Albanese & Dast, 2013; Allen et al., 2011; Wood, 2003). It is believed that addressing refugee students' mathematics learning deficits can have a positive impact on their self-confidence, friendship relationships, and resilience in dealing with challenges and adversity.

Refugee students often face challenging living conditions and language barriers and require additional support to learn and succeed in mathematics. When the studies in the field are examined, it is observed that there are publications on increasing students' mathematical resilience (Hernandez-Martinez & Williams, 2013; Ishak et al., 2020; Kooken, 2016). The common feature of these described studies is that learning losses in mathematics reduces students' resilience and possible solutions to this situation are sought. Studies discussing the resilience of refugee students (Gruttner, 2019; Khawaja et al., 2017; Stermac et al., 2013; Wong & Yohani, 2016) describe this existing situation. In contrast, this study describes the existing problem and produces solutions to this problem with experimental methods. Therefore, it is believed this study is significant and contributes to the field.

Purpose and Research Questions

This study aims to investigate the impact of mitigating the mathematics learning loss of refugee students on their resilience through problem-based learning.

Within the scope of this purpose, the following research questions were prepared.

1. Does mitigating math learning losses of refugee students through Problem-Based Learning impact their resilience levels?
2. What are the opinions of refugee students about mitigating math learning losses through Problem-Based Learning?

Method

Research Design

In this study, a one-group pretest-posttest quasi-experimental design was used to determine the change in the resilience levels of refugee students who participated in the mathematics instruction program called Problem-Based Learning (PBL). In order to support the quantitative findings of the study, the participants' opinions about the mathematics education program (PBL) were also obtained.

A one-group pretest-posttest design is a type of quasi-experimental design in which the outcomes of the study are measured at least twice. The participant group is selected non-randomly, making it a quasi-experimental design (Johnson, 1986).

Participants

The participants of this study were refugee students who could not attend school regularly due to the difficulties of the migration process and who had math learning deficits. A total of 42 refugee

students, 21 from Germany and 21 from Greece, who originated from Turkey and Syria, participated in the study. Demographic information of the participants is presented in Table 1.

Table-1. Demographic characteristics of the participants

Variables		n	%
Gender	Female	29	69
	Male	13	31
Country	Germany	21	50
	Greece	21	50
Grade	6th	9	21.4
	7th	8	19
	8th	5	11.9
	9th	20	47.6
The parent with whom s/he lives	Mother	3	7.1
	Father	1	2.4
	Both	38	90.05

According to the table, 69% of the students were female, 47.6% were in the ninth grade and 90.05% lived with both their parents. The opinions of four volunteer students who participated in the mathematics program about the program were obtained.

Research Process

This research is a product of a large-scale European Union Erasmus+ project that aims to increase the resilience of refugee students by targeting their mathematics learning deficits. This project, which was planned as an 18-month period between 2021-2023, was realized in two phases: the preparation phase and the implementation phase.

Project activities started with seminars on measurement and evaluation of the mathematics field and usage of problem-based learning in the math field. Seven mathematics teachers participated in learning seminars conducted by Augsburg University in Bayern, Germany. Trained teachers determined the learning losses of students and trained the students in accordance.

The project process is shown in detail in Figure 1

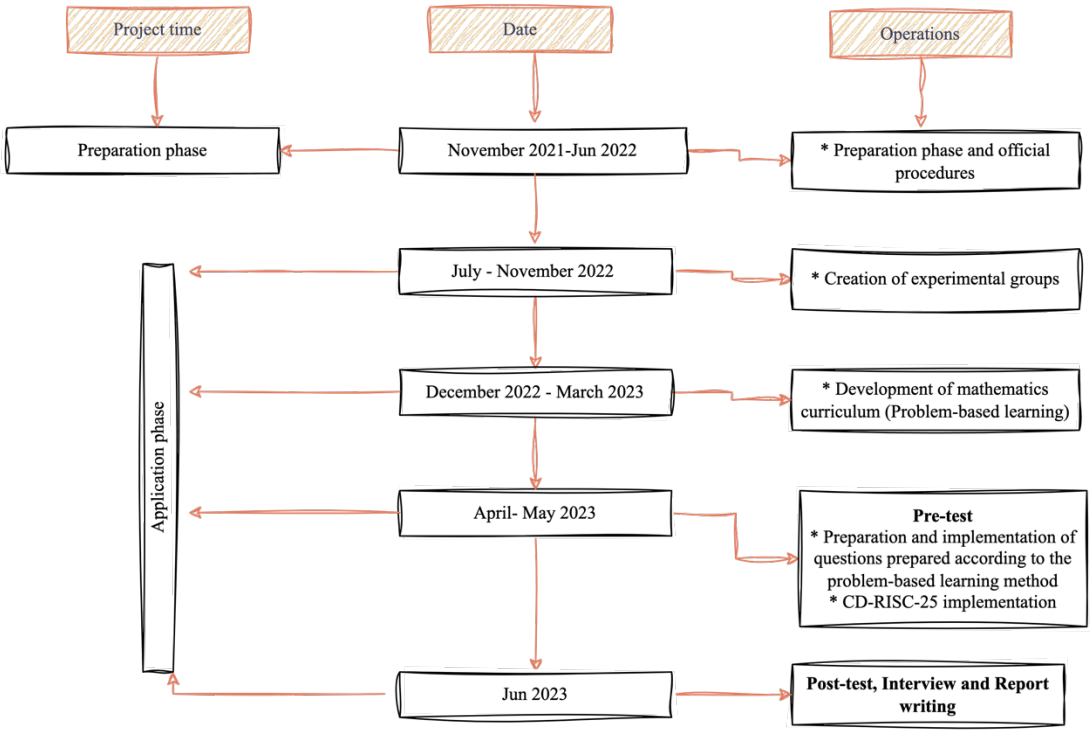

Figure-1: Project Process

The research process was prepared and supervised by the project committee. The project committee consisted of two academicians, a mathematics teacher and a psychological counselor. In this research, which is a part of the above-mentioned project "Mitigating Math-Related Learning Losses of Newly Arrived Refugee Children Through Innovative Teaching Method", a two-month mathematics education program called Problem-Based Learning was implemented. Before the implementation, a preliminary interview was conducted with the instructors and students by the project committee. As a result of the interviews, it was determined that almost all of the students who would participate in the program knew Turkish (n=38 Turkish, 2 Kurdish, and n=2 Arabic). The fact that all the students spoke Turkish was an advantage both in terms of time and cost. There was no need to prepare educational programs and applied data tools in different languages.

Mathematics Education Program

The project committee and math teachers (n=3) prepared a math exam with only numbers for each grade level (6-7-8-9) in order to identify students' math learning losses.

Before the test was administered, the students were provided with the necessary information about the test. The exam was administered in April 2023, and the mathematics program was rechecked based on the exam results. The basic approach in the mathematics education program

(PBL) is that the program should be in a language that students understand, should not include heavy topics, and should not involve reward or punishment actions as consequences.

The following points were taken into consideration in the preparation of the mathematics teaching program:

1. The program was developed based on a problem-based learning approach (PBL). One of the main arguments for choosing problem-based learning is that this learning method puts the student at the center of the learning process. Another argument is that this method aims to teach basic technical knowledge in real-life situations. In this way, it is intended to help students develop their ability to understand and solve real-world problems as well as to teach mathematics.
2. In the pre-test exam, it was determined that the students had significant deficiencies, especially in basic mathematics. For this reason, the program does not include heavy mathematics topics (e.g., functions, polynomials, complex numbers) in the program.
3. The topics included in the program are limited to basic mathematics (e.g., division, problem-solving, exponential-root numbers) to address all grade levels (6-7-8-9). This is due to the fact that most participants have not been attending school regularly for about a year. For example, the mathematics knowledge of a 9th grader is at the level of an 8th grader or a student in the middle of the 7th grade. Therefore, the first aim was to explain and reinforce basic mathematics topics.

Considering the demographic characteristics of the students and the interviews with the instructors, the mathematics education program (PBL) was implemented in German for the students in Germany and in Turkish for the students in Greece. Since two Syrian and two Kurdish students from Germany who wanted to participate in the program could speak Turkish, the Connor-Davidson Resilience Scale (CD-RISC-25) (2003) was administered to the students in Turkish, the language that all students understood, along with the mathematics exam. The implementation took place in April and May 2023. At the end of the program, as a result of consultations with the project committee, only the CD-RISC-25 scale was administered to the students as a post-test for the purpose of this study. In addition, the opinions of the volunteer students about the program were also taken.

Data Collection Tools

The Connor-Davidson Resilience Scale (CD-RISC-25)

The Connor-Davidson Resilience Scale was developed by Connor and Davidson to determine the resilience levels of individuals (Connor & Davidson, 2003). In the international literature, this scale was used for adolescents, and effective results were obtained (Bulut-Demir, 2018; Dominguez-Cancino et al., 2022). Since the scale also describes this age group, its use was approved by the project committee. The Turkish validity and reliability of the scale was conducted by Karaırmak (2010). The measurement tool is a five-point Likert scale consisting of 25 questions. The scale consists of three sub-dimensions: perseverance and personal competence (items 1, 5, 10, 11, 12, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25), tolerance to negative events (items 4, 6, 7, 8, 13, 14) and spiritual disposition (items 2, 3, 9, 20). Scale items are evaluated on a scale of 0-4, ranging from never true (0 points) to almost always true (4 points). The highest score that

can be obtained from the scale is 100 and high scores indicate that individuals with high scores have high psychological resilience. Cronbach Alpha coefficient of the scale: .92, and in the present study, Cronbach's Alpha coefficient was calculated as: .88.

Interview Form

There is only one open-ended question in the interview form prepared for the research. The interview question was prepared in consultation with a psychological counselor who is an expert in the field. The psychological counselor is someone who interacts with adolescents and is an expert on migration traumas. In this way, it was aimed to make the interview more effective for the students. Two students and their parents gave their consent for the interview to be videotaped. The other two students preferred to give their views in writing.

Data Analysis

Before analyzing the data obtained from CD-RISC-25, it was examined whether the data showed a normal distribution. For this purpose, skewness and kurtosis coefficients of the whole scale and its sub-dimensions and Kolmogorov-Smirnov test were taken into consideration. In terms of normal distribution, when skewness and kurtosis values are in the range of (+, -1), they are considered perfect, and when they are (+, -2), they are considered acceptable (George & Mallery, 2003). As a result of the analysis, it was found that perseverance and personal competence (Skewness = .182, Kurtosis =-1.07), tolerance to negative events (Skewness = .028, Kurtosis = -.466), spiritual disposition (Skewness = .395, Kurtosis = -.690) and total score (Skewness = .186, Kurtosis = -.986) showed normal distribution. In addition, when the results of the Kolmogorov-Smirnov test were examined, it was observed that the scores were in accordance with normality in both the sub-dimensions and the total scale ($p>.05$).

Accordingly, the data show normal distribution in terms of the relevant variables. Based on these results, parametric tests (t test) were used to analyze the data. In addition to parametric tests, effect size analyses were also performed on the sub-dimensions of the scale and the total score. Descriptive analysis methods, one of the qualitative research data analysis methods, were used to analyze the data obtained in the interviews.

Findings

In this part of the study, the results of the pre-posttest using the Connor-Davidson Resilience Scale (CD-RISC-25) and the data obtained from the interviews are presented.

Mitigating Math Learning Losses and Resilience

A one-group pretest-posttest experimental study was conducted to determine the effect of mitigating math learning losses of refugee students on their resilience levels. The arithmetic means and standard deviation distributions of the students' resilience levels are shown in Table 2, and the t-test and effect size values are shown in Table 3.

Table-2. Mean and standard deviation values of pre-post test scores obtained from CD-RISC-25 scale

	CD-RISC-25	Mean	N	Sd
Pre test	Perseverance and personal competence	44.76	42	9.66
	Tolerance for negative events	11.90	42	4.10
	Spiritual disposition	10.61	42	2.77
	Total	67.27	42	14.40
Post test	Perseverance and personal competence	56.68	42	13.99
	Tolerance for negative events	15.11	42	4.40
	Spiritual disposition	9.02	42	3.36
	Total	80.81	42	18.34

When Table 2 is analyzed, it is observed that the mean scores of the refugee students increased in perseverance and personal competence (Xpt = 44.76, Xpst = 56.68) and tolerance to negative events (Xpt = 11.90, Xpst = 15.11) sub-dimensions of the CD-RISC-25 scale, while the mean scores of the spiritual disposition sub-dimension (Xpt = 10.61, Xpst = 9.02) decreased. However, an increase was observed in the mean scores of the students in the whole scale (xpt = 67.27, Xpst = 80.81).

Table-3. Pre-posttest t-test and effect size results from the CD-RISC-25 scale

	CD-RISC-25	Mean	N	Sd	t	p	Effect Size Cohen's d
Pre-Post test	Perseverance and personal competence	11.92	42	12.32	-26.34	<.001	.96
	Tolerance for negative events	3.21	42	4.00	-5.19	<.001	.80
	Spiritual disposition	-1.59	42	3.32	3.11	ns	-.47
	Total	13.54	42	13.952	- 26.49	<.001	0.86

When the table is examined, the results show that mitigating math learning losses through problem-based learning increases the resilience of refugee students in the two sub-dimensions of the CD-RISC-25 scale and in the total score.

According to the data, the results obtained in the sub-dimensions of perseverance and personal competence, tolerance to negative events and total score have significant and high-level effect size. Perseverance and personal competence sub-dimension ($d = 0.96$, $p < .01$), tolerance to negative events sub-dimension ($d = 0.80$, $p < .01$), and total score ($d = 0.86$, $p < .01$) have significant, high and strong effect size. On the other hand, the results were not significant in the spiritual disposition sub-dimension.

Students' Views about the Implementation

Within the scope of the second question of the research, students were asked for their opinions about the program. Although the question was directed towards the students' opinions about the program, the students expressed a resilience process in which they had to deal with different problems in terms of language barrier and adaptation in the country they were already in. Therefore, in this part of the study, students' views on the mathematics education program were included along with other issues.

When the students' views on the mathematics education program were examined, three out of the four students who participated in this study expressed that they were very pleased that their views were taken into account. We can say that considering them as individuals and taking their opinions into account positively affected the resilience of refugee students. According to the descriptive analysis results, students' opinions were classified under three different headings: 'adaptation problem', 'language barrier', and 'satisfaction with the project.' In general, we can perceive mathematics as a boring, difficult, and complex subject under normal conditions. However, for refugee students, it becomes even more challenging, as they have to deal not only with the difficulties of mathematics but also with the problem of integration that comes with migration.

In the interviews conducted with the students, it was observed that students stated that cultural differences, dressing, and behavioral styles posed a problem in relation to the 'adaptation problem.' As a matter of fact, during the interviews we conducted on this subject, a student in the 6th grade expressed his views as follows. '*When I arrived, teachers' clothes were more formal in the country, but in Greece, teachers prefer more sporty and comfortable clothes. I can say that I had trouble getting used to this at first. Likewise, the way my classmates dressed was very different from mine. But I can easily say that both the teachers and my friends were very tolerant.'*

A seventh-grade female student in Germany expressed her feelings as follows. *'It was difficult, and it was immediately clear that I was different in the class. Neither the clothes I wore were similar to theirs nor the way I behaved.'*

Students who are trying to adapt to their new school in the host country initially have difficulties in understanding many of the lessons because they do not speak the language. Students stated that they were behind their peers and withdrawn because they did not speak the language. For example, a student from Greece commented: '*Since I came here at a young age, it didn't mean anything to me at first. Later, as I entered adolescence, I started to realize things a little more, and I realized how lonely I was; I could not communicate because I did not speak the language, and I became introverted*.'

Again, from Greece, she expressed her views as follows. '*Coming from my country to Greece turned my education life upside down. I couldn't do anything for the first two years because I didn't speak the language*.' In addition, a student from Germany who filled out an interview form about the language and the difficulty of the language expressed her views as follows:

‘*In Willkommensklasse, they taught us grammatical rules and hoch Deutsch. When I went to the regular class, I couldn't understand my friends at all because they spoke 'jugendsprache*. *So, it is not enough just to learn the language; you also need to know the daily language*. *Unfortunately, I had serious difficulties in this regard, and this lasted for a year and a half.’*

Again, in our interviews with the students, they stated that they were satisfied with this mathematics education program and that the distance between them and their peers was partially closed thanks to this program. A student from Greece expressed her views as follows: ‘*The course was good, I was very happy with the lecturers, it helped me a lot to close my gaps. Actually, it could have been a bit longer and more professional.*’

Another student, also from Greece, expressed her views as follows: ‘*The teachers' behavior towards us was good. It helped me in my math exams and in attending the class*.’

A female student participating in the program from Germany expressed her views on the project along with the learning losses caused by the Covid-19 period.

‘*Lockdown started six months after I arrived in Germany. I hadn't even learned German yet, and now I had to attend school online. The classes were very boring. I didn't know German, so I didn't understand math. Then, I would turn off the camera and not listen to the lesson. This mathematics program was very good for me. It partially compensated for my math deficiencies*.’

Another student from Germany expressed her views by comparing mathematics education in Turkey and Germany. *'Actually, when we compare the subjects, I think the math subjects in Germany are easier than the subjects in Turkey. However, since we lost a lot of time in the refugee camp, I couldn't attend a regular school for a long time. I didn't know the language very well anyway, so I fell behind a lot. But after I started this program, my math deficiencies started to decrease. My self-confidence came back. I wish it had been a little longer*.'

The views of a student from Greece were about the benefits of the mathematics education program. *'I learned a lot after attending this course. The teachers did not ask me about any problems with the exam. I learned a lot about operations here. I got a high score on the last exam, which made me very happy*.'

Students' opinions suggest that the mathematics education program should be longer and more professionally planned. In addition, while expressing their thoughts about the program, the students stated that they liked coming to the course, they were happy, and their self-confidence increased. Therefore, it is possible to state that the mathematics education program increased students' resilience.

Discussion and Conclusion

The focus of this study is to increase the resilience of refugee students from Turkey and Syria residing in Germany and Greece by mitigating their mathematics learning losses through using a different approach to mathematics, namely Problem-Based Learning. It also aims to reveal the students' views about the mathematics education program (PBL) implemented. In the study, rather than measuring the mathematics achievement of refugee students, the effect of the mathematics education (PBL) they received to mitigate their learning losses in mathematics on

their resilience levels was measured. Therefore, the study did not aim to measure students' math achievement. This can be seen as a deficiency for the current study.

It is in favor of both the students and the host country that refugee or asylum-seeking students attend school, and their education/training lives are not disrupted. Individuals are better integrated through education (Biasutti et al., 2020; Polat, 2022); the sense of achievement, learning, and recognition can contribute to increased resilience (Li, 2017).

New and challenging conditions await students who arrive in the destination country after a difficult migration path. These include adaptation problems, overcoming the language barrier, and adopting a new environment. In addition to these challenges, refugee students also face learning losses in basic subjects such as mathematics. In order to help students overcome this challenge and mitigate learning losses, school administrators often tend to start students in the lower grades. This means that students study with peers who are younger than them. This can be seen as a barrier for students to develop better friendships. Therefore, it can be said that refugee students need additional support to overcome learning losses and increase their resilience. In this study, the effect of refugee students' math learning deficits by engaging students in a Problem-Based Learning approach and exploring its impact on their resilience levels was examined.

When the pre-test and post-test arithmetic averages of the CD-RISC-25 scale of the students were examined, an increase was observed in the mean scores in the sub-dimensions of perseverance and personal competence, tolerance to negative events, and in the whole scale. However, a decrease was observed in the mean scores of the students in the spiritual disposition sub-dimension. Similarly, the results obtained in perseverance and personal competence, tolerance to negative events sub-dimension, and total score were found to be significant, and the effect size was found to be quite strong (Cohen et al., 2007). On the other hand, it was found that the results were not significant in the spiritual disposition sub-dimension. These results are in line with the purpose of the study because one of the main objectives of the study was to enable refugee students to overcome negative events and feel competent.

The feeling of learning mathematics through the Problem-Based Learning approach is effective against negative emotional states such as anxiety and helplessness in students and equips students to overcome negative situations (Lee & Johnston-Wilder, 2017). Learning mathematics encourages students to participate in school and classroom activities (Aktan, 2012). Students' participation in school and classroom activities increases their resilience (Catterall, 1998). When the students' views about the mathematics education program (PBL) were analyzed, it was found that the students expressed different difficulties as well as the problems they experienced in mathematics. These problems are the language barrier and adaptation challenges. The language barrier naturally makes it difficult to understand the mathematics course (Hernandez-Martinez & Williams, 2013). However, students expressed that they found the problem-based mathematics education program effective. According to the students' opinions, mitigating their math learning losses had a positive effect on their school exam results and closed the gap between them and their peers.

This result shows that mitigating math learning losses helps students to close the gap with their peers by improving their exam performance. Mitigating mathematics learning losses also helps

students to go to school happier and self-confident. Therefore, it is possible to state that the problem-based mathematics education program increased students' resilience.

Recommendations and Policy Implications

It is important to regard refugee students as a potential resource for their host countries. Investing in these children is also an investment in the future of the country. In the coming decades, these children will become indispensable forces in the economies of host societies and in dealing with a rapidly ageing population. The main aim of this study was to mitigate the mathematics learning losses that occur in refugee students during and after the migration process and to increase their resilience. For this purpose, a problem-based mathematics education program was developed and implemented in a small sample group. The results show that addressing math learning deficits increases students' resilience. It is, then, appropriate to take the following measures to increase the resilience of refugee students. These could include resilience-building activities such as mentoring programs, counseling services, sporting activities, and various social events.

Refugees have to cope with many difficulties until they reach their destination country; children are the most negatively affected individuals in this process. When they arrive in the destination country, children face different challenges, such as learning a new language and adapting to school. It is important not to leave children to themselves, but, rather, to support them with various activities. Therefore, it is considered that the activities mentioned above will help refugee children to cope with the challenges.

This research focuses on refugee students and math achievement and how the Problem-Based Learning approach in mathematics enhances refugee students’ levels of resilience. Future research may focus on social, emotional, and motivational resilience that may affect the lives of refugee students. In addition, the resilience of refugee students can be examined in a multidimensional way by focusing future research on the language problems they experience in schools, their experiences of being exposed to bullying or discrimination, and problems arising from their families.

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References

Albanese, M. A., & Dast, L. C. (2013). Problem-based learning. *Understanding medical education: Evidence, theory and practice*, 61-79.

Agasisti, T., & Longobardi, S. (2017). Equality of educational opportunities, schools' characteristics and resilient students: An empirical study of EU-15 countries using OECD-PISA 2009 data. *Social Indicators Research*, *134*, 917-953. https://link.springer.com/article/10.1007/s11205-016-1464-5

Aktan, S. (2012). *Öğrencilerin akademik başarısı, öz düzenleme becerisi, motivasyonu ve öğretmenlerinin öğretim stilleri arasındaki ilişki*. Unpublished doctoral dissertation, University of Balıkesir, Turkey.

Allen, D. E., Donham, R. S., & Bernhardt, S. A. (2011). Problem-based learning. *New directions for teaching and learning*, *2011*(128), 21-29. https://doi.org/10.1002/tl.465

Betthäuser, B.A., Bach-Mortensen, A.M., & Engzell, P. A. (2023). Systematic review and meta-analysis of the evidence on learning during the COVID-19 pandemic. *Nature Human Behaviour,* 7, 375–385. https://doi.org/10.1038/s41562-022-01506-4

Biasutti, M., Concina, E., & Frate, S. (2020). Working in the classroom with migrant and refugee students: The practices and needs of Italian primary and middle school teachers. *Pedagogy, Culture & Society*, *28*(1), 113-129. https://doi.org/10.1080/14681366.2019.1611626

Bhugra, D., & Becker, M. A. (2005). Migration, cultural bereavement, and cultural identity. *World Psychiatry*, *4*(1), 18. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1414713/

Bulut-Demir, M. H. (2018). *Investigation of structural changes in the brain of sexual trauma in female adolescents with sexual abuse*, Unpublished Master's thesis, University of Ege, Turkey.

Catterall, J. S. (1998). Risk and resilience in student transitions to high school. *American Journal of Education*, *106*(2), 302-333. https://www.journals.uchicago.edu/doi/abs/10.1086/444184

Cinkara, E. (2017). The role of L+ Turkish and English learning in resilience: A case of Syrian students at Gaziantep University. *Journal of Language and Linguistic Studies*, *13* (2), 190–203. https://dergipark.org.tr/en/pub/jlls/issue/36120/405605

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education*. Routledge. https://doi.org/10.4324/9780203029053

Connor, K. M., & Davidson, J. R. (2003). Development of a new resilience scale: The Connor-Davidson resilience scale (CD-RISC). *Depression and Anxiety, 18*(2), 76-82. https://doi.org/10.1002/da.10113

Denov, M., Fennig, M., Rabiau, M. A., & Shevell, M. C. (2019). Intergenerational resilience in families affected by war, displacement, and migration: "It runs in the family". *Journal of Family Social Work*, *22*(1), 17–45. https://doi.org/10.1080/10522158.2019.1546810

Demir, Ö. O., & Aliyev, R. (2019). Resilience among Syrian university students in Turkey. *Turkish Journal of Education*, 8(1), 33 51. https://dx.doi.org/10.19128/turje.454138

Dominguez-Cancino, K. A., Calderon-Maldonado, F. L., Choque-Medrano, E., Bravo-Tare, C. E., & Palmieri, P. A. (2022). Psychometric properties of the Connor-Davidson Resilience Scale for South America (CD-RISC-25SA) in Peruvian Adolescents. *Children*, *9*(11), 1689. https://doi.org/10.3390/children9111689

Drabo, A., & Mbaye, L. M. (2015). Natural disasters, migration and education: an empirical analysis in developing countries. *Environment and Development Economics*, *20*(6), 767-796. https://doi.org/10.1017/S1355770X14000606

Dustmann, C., & Glitz, A. (2011). Migration and education. In *Handbook of the Economics of Education* (Vol. 4, pp. 327-439). Elsevier.

Föbker, S., & Imani, D. (2017). The role of language skills in the settling-in process–Experiences of highly skilled migrants' accompanying partners in Germany and the UK. *Journal of Ethnic and Migration Studies*, *43*(16), 2720-2737.

Gardner, R., & Stephens-Pisecco, T. L. (2019). Empowering educators to foster student resilience. The Clearing House: A *Journal of Educational Strategies, Issues and Ideas*, *92*(4–5), 125–134. https://doi.org/10.1080/00098655.2019.1621258

Gasparrelli, S. M. (2017). Natural disasters and resilience training. *AJN the American Journal of Nursing*, 117(9), 13. https://doi.org/10.1097/01.NAJ.0000524527.72921.7f

Geist, C., & McManus, P. A. (2012). Different reasons, different results: Implications of migration by gender and family status. *Demography*, *49*(1), 197-217. https://doi.org/10.1007/s13524-011-0074-8

George, D. & Mallery, P. (2011). *SPSS for windows step by step a simple guide and reference* (Fourth edition 11.0 update). https://docs.google.com/file/d/0B7Ci0vaQcLjSNjNjOTY4OWMtMmM4MS00OWFjLWI5NzgtOTE2Y2FjMGJiMGMx/edit

Gruttner, M. (2019). Belonging as a resource of resilience: Psychological wellbeing of international and refugee students in study preparation at German higher education institutions. *Student Success*, *10*(3), 36-44. https://search.informit.org/doi/10.3316/informit.592099946298273

Hernandez-Martinez, P., & Williams, J. (2013). Against the odds: Resilience in mathematics students in transition. *British Educational Research Journal*, *39*(1), 45-59.

Ishak, N. H. F. B., Yusoff, N. F. B. M., & Madihie, A. (2020). Resilience in mathematics, academic resilience, or mathematical resilience?: An overview. *Universal Journal of Educational Research*, *8*(5), 34-39. 10.13189/ujer.2020.081905

Johnson, C. W. (1986). A more rigorous quasi-experimental alternative to the one-group pretest-posttest design. *Educational and Psychological Measurement*, *46*(3), 585-591. https://eric.ed.gov/?id=EJ342059

Johnston-Wilder, S., & Lee, C. (2010). Mathematical Resilience. *Mathematics Teaching*, *218*, 38-41. https://eric.ed.gov/?id=EJ889870

Karaırmak, Ö. (2010). Establishing the psychometric qualities of the Connor–Davidson Resilience Scale (CD-RISC) using exploratory and confirmatory factor analysis in a trauma survivor sample. *Psychiatry Research*, *179*(3), 350-356.

Khawaja, N. G., Ibrahim, O., & Schweitzer, R. D. (2017). Mental wellbeing of students from refugee and migrant backgrounds: The mediating role of resilience. *School Mental Health*, *9*, 284-293. https://link.springer.com/article/10.1007/s12310-017-9215-6

Kooken, J., Welsh, M. E., McCoach, D. B., Johnston-Wilder, S., & Lee, C. (2016). Development and validation of the mathematical resilience scale. *Measurement and Evaluation in Counseling and Development*, *49*(3), 217-242. https://doi.org/10.1177/0748175615596782

Kumi-Yeboah, A. (2016). Educational resilience and academic achievement of immigrant students from Ghana in an urban school environment. *Urban Education*, *55*(5), 753–782. https://doi.org/10.1177/0042085916660347

Lee, C., & Johnston-Wilder, S. (2017). The construct of mathematical resilience. In *Understanding Emotions in Mathematical Thinking and Learning* (pp. 269-291). Academic Press. https://doi.org/10.1016/B978-0-12-802218-4.00010-8

Li, H. (2017). The 'secrets' of Chinese students' academic success: academic resilience among students from highly competitive academic environments. *Educational Psychology*, *37*(8), 1001-1014. https://doi.org/10.1080/01443410.2017.1322179

Morkoyunlu, Z., & Saltık Ayhanöz, G. (2021). The opinions of elementary mathematics teacher candidates on the concept of mathematical resilience. *Amasya Education Journal*, *10*(2), 37-60. https://eudl.eu/pdf/10.4108/eai.3-6-2021.2310762

Motti-Stefanidi, F. (2015). Risks and resilience in immigrant youth adaptation: Who succeeds in the Greek school context and why? *European Journal of Developmental Psychology*, *12*(3), 261–274. https://doi.org/10.1080/17405629.2015.1020787

Nouwen, W., & Clycq, N. (2021). Assessing the added value of the self-system model of motivational development in explaining school engagement among students at risk of early leaving from education and training. *European Journal of Psychology of Education*, *36*(2), 243–261. https://doi.org/10.1007/s10212-020-00476-3

Onat, G. (2010). *Demokratik ve otoriter olarak algılanan ana-baba tutumlarının lise birinci sınıf öğrencilerinin Resiliencedüzeyine etkilerinin araştırılması*, Unpublished Master's thesis, University of Maltepe Turkey.

UNICEF, (2023). Migration, https://data.unicef.org/topic/child-migration-and-displacement/migration/

Permatasari, D. (2016, May). The role of productive struggle to enhance learning mathematics with understanding. In *Proceedings of 3rd International Conference on Research, Implementation and Education of Mathematics and Science* (pp. 95-100).

Pieloch, K. A., McCullough, M. B., & Marks, A. K. (2016). Resilience of children with refugee statuses: A research review. *Canadian Psychology/psychologie Canadienne*, *57*(4), 330. http://dx.doi.org/10.1037/cap0000073

Polat, S. (2022). The eEducation process of children with imprisoned parents after the July 15, 2016 coup attempt in Turkey. *Journal of Comparative & International Higher Education*, *14*(5), 213–238. https://doi.org/10.32674/jcihe.v14i5.3896

Polat, S., & Kröner, S. (2022). The resilience of school-age immigrant children: A scoping review. *Journal of Human Behavior in the Social Environment*, *33*(3), 329-347, https://doi.org/10.1080/10911359.2022.2061664

Reed, H. (2018). Forced migration and undocumented migration and development. *CUNY Institute for Demographic Research.* *https://www.un.org/en/development/desa/population/events/pdf/expert/28/EGM_Holly_Reed.pdf.*

Scarf, D., Moradi, S., McGaw, K., Hewitt, J., Hayhurst, J. G., Boyes, M., Ruffman, T., & Hunter, J. A. (2016). Somewhere I belong: Long-term increases in adolescents' resilience are predicted by perceived belonging to the in-group. *British Journal of Social Psychology*, *55*(3), 588-599. https://doi.org/10.1111/bjso.12151

Sleijpen, M., Boeije, H. R., Kleber, R. J., & Mooren, T. (2015). Between power and powerlessness: A meta-ethnography of sources of resilience in young refugees. *Ethnicity & Health*, *21*(2), 158–180. https://doi.org/10.1080/13557858.2015.1044946

Sosa, T., & Gomez, K. (2012). Connecting teacher efficacy beliefs in promoting resilience to support of Latino students. *Urban Education*, *47*(5), 876–909. https://doi.org/10.1177/0042085912446033

Stermac, L., Clarke, A. K., & Brown, L. (2013). Pathways to resilience: The role of education in war-zone immigrant and refugee student success. *Handbook of Resilience in Children of War*, 211-220. https://doi.org/10.1007/978-1-4614-6375-7_15

Wang, X. C., Strekalova-Hughes, E., & Cho, H. (2019). Going beyond a single story: Experiences and education of refugee children at home, in school, and in the community. *Journal of Research in Childhood Education*, *33*(1), 1-5. https://doi.org/10.1080/02568543.2018.1531670

Wong, A. H., & Yohani, S. (2016). An exploratory study of resilience in postsecondary refugee students living in Canada. *Canadian Journal of Counselling and Psychotherapy*, *50*(3s). https://cjc-rcc.ucalgary.ca/article/view/61073

Wood, D. F. (2003). Problem based learning. *Bmj*, *326*(7384), 328-330. https://doi.org/10.1136/bmj.326.7384.328

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ETC.
Creativity Crisis: Awakening the Creative Classroom Environment

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Dr. Natalie Tye, Associate Professor of Early Childhood Education and Program Coordinator for Early Childhood and Elementary Education, has taught in the early childhood setting for 10 years and in higher education for the past 20 years. Within her role as preschool teacher and director, Dr. Tye taught with best practices by developing learning experiences with her students and identifying eight key attributes to effective teaching. She has taught courses in Early Childhood Education within higher education for the past 20 years, working closely with districts and preservice teachers, coaching with creativity in mind. Through her work, she has supported teacher candidate learning through teaching foundational knowledge and incorporating meaningful field work, connecting learning standards to activities, environment planning, and curriculum development. Her passion is teaching to support students' thinking and learning in a meaningful context and developing a desire for incorporating best practices in education.

Abstract

This narrative acknowledges a creativity crisis enabled by a regulated curriculum and then provides a clear path for teachers to incorporate creativity into the classroom environment to nurture creative thinkers. In order to frame a creative mindset, it is critical to implement active engagement, instructional flexibility and differentiated goals during all aspects of the learning process for both children and teachers. Eight attributes have been compiled to provide teachers with a scaffold to implement a creative classroom environment with innovative opportunities, critical thinking experiences, and problem-solving instruction.

Introduction

We are in a creativity crisis. Creativity is declining and schools are not providing adequate support for teachers to increase children's critical thinking and the ability to problem solve (Cho et al., 2017; Powers, 2015). Teachers are not the only ones to see this issue; researchers across the nation confirm the reality that creativity is not an included focus in the classroom (Berliner, 2009). In fact, if teachers are not able to incorporate the four C's (creativity, critical thinking, collaboration, and communication), children are less likely to engage in the creative process as they grow older (Alabbasi et al., 2022). Knowing the crisis exists is only the beginning. Teachers need support in knowing where to begin. Building creativity into the classroom can be a daunting task without direction.

Teachers' Role in Constructing the Creative Classroom Environment

It is important that educators understand, and have confidence in, how they construct the creative classroom environment and their role in nurturing children's learning. Effective educators understand teaching is more than instruction and learning is more than curriculum (Berliner, 2009). The classroom teacher becomes the decisive element in a child's day and ultimately determines not only what a child learns, but, as well, frames how each child views future learning. It only takes one negative situation, one negative teacher, or one negative event where a child is not provided with an opportunity to express, represent, and/or resolve the event that may change his or her perception toward learning. Ginott (1972) connects classroom management with children's feelings and describes how vital the role of the teacher is in creating the social/emotional classroom environment. This proactive environment further supports children's abilities to think critically and provide equitable education for all children (Berliner, 2009). Additionally, Ginott (1972) describes why it is essential teachers' interactions should be grounded in acceptance rather than the rejection of feelings, emotions, or interpretations of learning. This positive relationship suggests creativity flourishes when children initiate opportunities to interact with the environment and become valued in their individual learning; thus, teachers listen to their children (Cho et al, 2017).

So, how do classroom teachers engage children in meaningful learning while continuing to support emotional growth as well as maintain instruction?

The Importance of the Creative Classroom Learning Environment

Creating a classroom environment that stimulates children as well as the teacher through ongoing, investigative learning requires a combination of strategies and supports to enhance learning (Azzam, 2009; Pianta, La Paro, & Hamre, 2008). Providing opportunities for children to think in new and autonomous ways, teachers not only increase children's creativity, but also their engagement, persistence, and critical thinking skills (Azzam, 2009; Berliner, 2009; Burgess, 2012; Pianta et al., 2008).

Sir Ken Robinson (TED, 2007) describes in a Ted Talk how creativity is as vital in education as other subject areas and emphasizes the use of creativity with the same importance as content learning (Azzam, 2009). To achieve creativity in the classroom, the teacher is willing to support children in unorthodox ways; reimagining teaching (Robinson & Robinson, 2022).

Davis (2018) cautions how schools are on the verge of experiencing a gap in creativity in the classroom. Currently, children do not achieve the outer limits of thinking; instead of constructing understanding, children are taught to merely receive information (Berliner, 2009; Cho et al., 2017; Powers, 2015). It appears children experience far more creative activity outside their school than in the classroom. An IBM global CEO study (2010) sought to determine the role of creativity in future success (Powers, 2015). Data reveals that more than any other attribute (rigor, management, discipline, integrity, or vision), successful navigation of the increasingly complex world we live in requires the ability to be creative (Azzam, 2009; IBM, 2010). Therefore, creativity is needed in the classroom now more than ever (Cho et al., 2017).

Planning for Creativity in the Classroom

There are eight different strategies common in classrooms where children are naturally creative and included in learning goals. By incorporating these eight attributes to enhance creativity, teachers discover ways for the classroom to transition to the next level of encouraging and supporting creativity. These attributes invite the teacher to 1) share power with children, 2) encourage risk-taking in the classroom, 3) provide active learning, 4) engage in meaningful conversations with thought provoking questions, 5) create positive energy, 6) provide open-ended opportunities and materials, 7) increase value in learning and 8) include children in assessment (See Image 1).

Image 1: Eight attributes to enhance creativity in the classroom.

The teacher's role in creative expression is more than simply being present in the learning experience. These attributes become essential for a teacher to enhance creativity throughout the classroom.

1) *Sharing power* with children is not typical in classrooms; however, it is through this act that a classroom transforms from a place of knowledge receiving to knowledge seeking. The teacher shares power by sharing learning, materials, and classroom space with children. It is not sufficient to merely provide a safe space for children; rather, collaborating in rule creation and discussing classroom materials and their use with children become integral toward nurturing creativity (Willis, 1997). It is through the sharing of power that children feel most comfortable and in control of their learning.

2) *Encouraging risk-taking* is another attribute observed in more creative spaces. Those

teachers who provide a safe space for children to take reasonable risks in their learning find them more eager to try something new (Bianco, 2018). These same children are more confident in sharing in class discussion, working with peers, and risking being wrong (Pianta et al., 2008). Teachers who strive for risk-taking frame learning as a part of the community structure where-in children discuss with peers before sharing, practice opportunities to reflect on their answer, and revise according to additional insight. Other strategies to support children include providing opportunities for contacting a friend across the room to elaborate on their spoken response, allowing children to pass when unsure or not yet prepared to share, or relying on a group huddle before discussing with the full class. Teachers need to understand how to nurture children's creative processes by encouraging risk-taking.

3) *Active learning* applies to the teacher who understands and values that creativity is embedded in the learning process and provides children with active experiences in the classroom. In these creative classrooms, teachers interact and communicate with children on their level (Pianta et al., 2008). Teachers provide opportunities for children's active engagement by including them in the planning process and inviting children to share where they want the learning to go. Including children in planning for learning requires a teacher's confidence. Planning sessions can include strategic discussions where children share what they want to learn more about, how they want to learn, or even sharing questions they still have about something already learned. This can be through individual or larger group questioning.

4) *Questioning strategies* support children's ability to think for themselves and build on their prior knowledge. Incorporating open-ended questions, higher order thinking questions, and back-and-forth exchanges encourage children to consider answers to "I wonder" statements and support understanding of central concepts in learning (Pianta et al., 2008). Teachers who plan to include open-ended questions throughout learning investigations find children seek a deeper level of understanding. By asking how and why questions, children engage with the subject rather than being a receiver of information. This makes learning relevant and new for children and teachers in the classroom. Investigative language encourages children to take ownership for their own learning (Robinson & Robinson, 2022). Effective and engaging questions excite children in learning new information and help to make valuable connections to making them life-long learners.

5) *Positive energy* begins with the teacher. How the teacher responds to children is reflected in the classroom. When the teacher is eager to encourage children through positive statements and reflective discussions, children are more eager to do well. Teachers in creative classrooms embrace the ability to encourage judiciously by focusing on the learning process rather than the product of a child's work. When teachers focus on positive interactions, they support and encourage children through words, actions and working through problems together. In creative classrooms, teachers celebrate successes and empower children by learning through their mistakes (Young, 2014). These teachers do not praise; rather, they encourage children to continue to think for themselves (Pianta et al., 2008). Positive energy increases children's self-confidence to open their minds to

imagination and wonder in their world (Robinson & Robinson, 2022). It is in these classrooms that children become self-motivated to learn.

6) *Open-ended materials* support ongoing learning in the creative classroom. Teachers who plan with creativity in mind choose open-ended materials and effective teaching strategies to engage children in more meaningful learning. Creativity does not have to be expensive through purchased materials or purchased lesson plans. Teachers who truly understand creativity know that children need hands-on learning, open-ended materials with more than one way to use them, and the time to experience learning through trial and error.

7) *Placing value on the learning process* enhances creativity and work output in the classroom. Children who see value in their learning are more eager to share their thinking and overall creativity with their teacher. Teachers can change the culture of learning by placing value on children's work through transcription. Transcription allows teachers to capture children's thinking in the moment and is a powerful tool in the classroom (Katz & Chard, 1996). When the teacher takes the time to capture the child's words, the child notices. Some opportunities to capture children's thinking occur during journal work, reflections on learning, and through planning for play (See Image 2). When incorporating play plans in work with children, they can think about their plan and reflect on their choices during a particular learning experience. By transcribing children's work, teachers model language and literacy, as well as capture children's ideas (See Image 3). In Image 3, the child provided more details as the teacher labeled his work. When transcribing children's words, teachers place value on their thinking, analyzing, and reflecting. Children recognize this and are encouraged to be even more reflective in their learning. Always ask children for permission prior to transcribing on their work. There are appropriate times to transcribe for learning and there are times when children are creating and choose for adults to not write directly on their work. It is important to understand the difference and ask children when in doubt. This contributes to the respectful relationship between teacher and child and supports the value teachers place on child work.

 "This is my ladybug with lots of legs." Ethan, age four	 "I wanted to show how the ant made a tunnel under the rock." Matthew, age five

Image 2: Placing value on learning using transcription during journal work and center time activities.

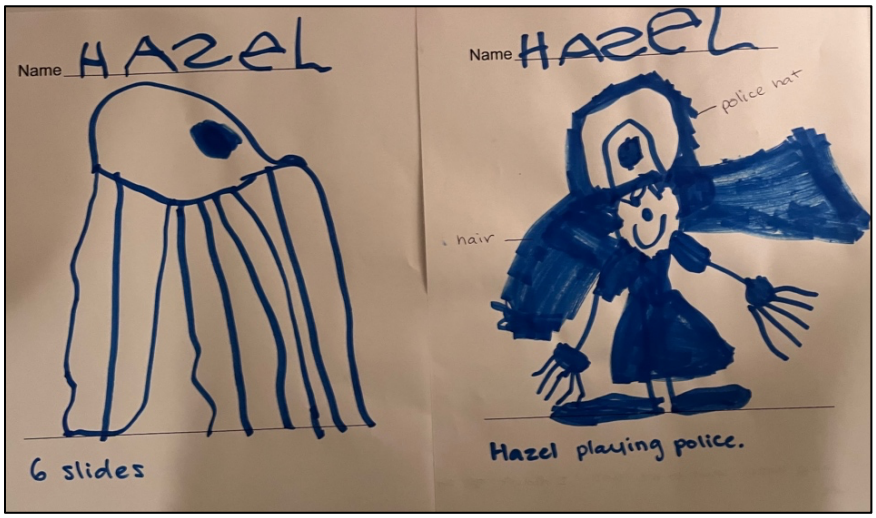

Image 3: Using play plans to model language and literacy

The teacher can also share an investigative role with children in their learning. In this strategy, children and teachers learn new information together, side by side in their investigation (See Image 4).

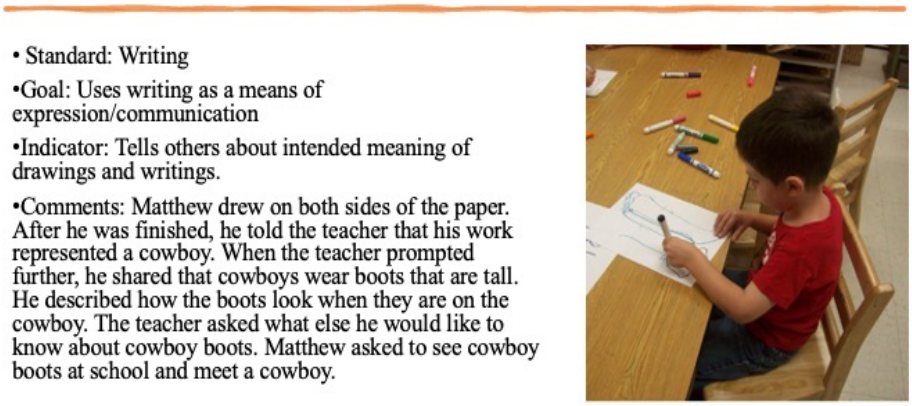

Image 4: Documentation of individual discussion leading to planning for future learning

Children learn how to investigate through the teacher's modeling of asking questions, researching, and reflecting. It is through these shared experiences that children learn how to find answers to their questions as well as how to process information gathering. Teaching children how to find the answers to their questions empowers them for a creative future. Examples including KWL charts, topic webs, and a parking lot (to park questions during investigation) guide children to learn how to ask questions and seek out their own answers. Teachers provide children opportunities for exploration through gathering of information, documenting questions children have, and researching topics together.

8) *Assessment of learning* is not just for teachers. Teachers can create a collaborative relationship with children through reflecting on learning together. Teachers who already include their children in the planning process may find it natural to also include children in the assessment process. In fact, in many elementary and middle school classrooms, children plan for parent-teacher meetings using child-led conferencing (Cromwell, 2015). Allowing young children to take an active role in their assessment prepares them for a world where they can set goals and feel positive about their accomplishments without relying on external gratitude. Teachers who include children in assessment share what they observe and ask what they notice. These teachers provide photos to the child and allow them to respond with their perceptions of what is occurring.

   Image 5 is an example of including children in assessing their own learning. The photo was taken by the classroom teacher. Later, the teacher showed the photo to the child and asked him to share what he was doing. The child shared, "I wanted to know how long the black piece of plastic is. I wanted to measure it using a tape measure to find it out. It was 6". The teacher captured the child's words to include in his portfolio. By including children in the assessment process, they take ownership of their learning and experience meaningful evaluation of learning in age-appropriate ways.

Image 5: Children involved in the assessment process

Summary and Conclusion

When the teacher constructs a classroom environment where learning happens naturally and is celebrated, child outcomes exceed expectations. Children feel free to investigate and learn in the classroom, seeing value in their ideas and creative thinking (Cho et al., 2017). The pairing of educators willing to embed content with authentic learning experiences becomes important. The risk for teachers includes carving time to be creative and taking a stand for critical thinking practices in line with an ever-changing world (Berliner, 2009). Additionally, children's discussion stimulates growth in creative processing for their own learning and that of their teacher.

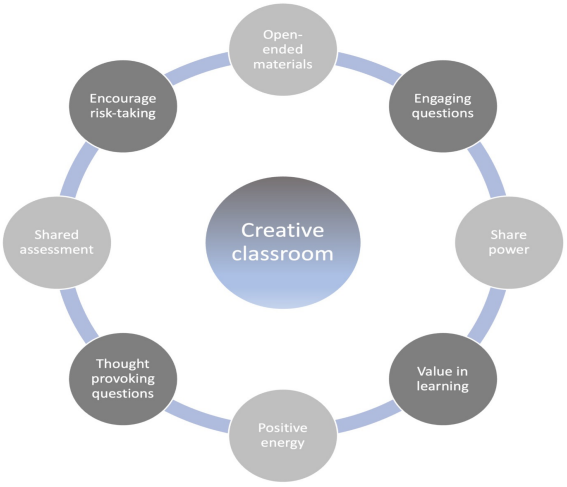

Image 6: Attributes for a creative classroom

Incorporating the eight attributes supports a higher order thinking classroom through creativity in teaching and in learning. Just as Image 6 portrays, there is no starting point or specific order for implementing these strategies; the classroom teacher may incorporate attributes where most comfortable and increase creativity as the school year progresses (Azzam, 2009). *Taking an initial first step* is a positive beginning to increasing creativity in the classroom. This model of teaching and learning benefits teachers, children, and our future (Azzam, 2009; Berliner, 2009; Cho et al., 2017). It is the combination of instruction, guided practice and reflection that provides teachers the confidence and ability to be successful in implementing a creative classroom environment where children are prepared for an ever-changing world in need of creative leaders!

References

Alabbasi, A., Paek, S., Kim, D. & Cramond, B. (2022). What do educators need to know about the Torrance Tests of creative thinking: A comprehensive review. *Frontiers in Psychology, 13*(1-14). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9644186/

Azzam, A. (2009). Why creativity now? A conversation with Sir Ken Robinson. *Educational Leadership, 67*(1), 22-26.

Berliner, D. (2009). MCLB (Much curriculum left behind): A US calamity in the making. *The Educational Forum, 73*, 284-296.

Bianco, A. (2018). Why taking risks in the classroom pays off for students and teachers. *Flipped Classroom*. https://www.edsurge.com/news/2018-02-14-why-taking-risks-in-the-classroom-pays-off-for-students-and-teachers

Burgess, D. (2012). *Teach like a pirate*. Dave Burgess Consulting, Inc.

Cho, H., Pemberton, C., & Ray, B. (2017). An exploration of the existence, value, and importance of creativity education. *Current Issues in Education, 20*(1).
https://infohub.nyced.org/docs/default-source/default-document-library/class-103.pdf

Cromwell, S. (2015). Student led conferences: A growing trend. *Education World*. https://infohub.nyced.org/docs/default-source/default-document-library/class-103.pdf

Davis, L. (2018). Creative teaching and teaching creativity: How to foster creativity in the classroom. *Psych Learning Curve: Where psychology and education connect.* American Psychological Association.

Ginott, D. H. G. (1972). *Teacher and child: A book for parents and teachers*. The Macmillan Company.

IBM Global CEO Study (2010). *Creativity Selected as Most Crucial Factor for Future Success*. https://newsroom.ibm.com/

Katz, L. & Chard, S. (1996). *The contribution of documentation to the quality of early childhood education*. ERIC Clearinghouse on Elementary and Early Childhood Education.

Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2008). *Classroom Assessment Scoring System™: Manual K-3.* Paul H. Brookes Publishing Co. https://infohub.nyced.org/docs/default-source/default-document-library/class-103.pdf

Powers, J. (2015). The creativity crisis and what you can do about it. *Psychology Today*. https://www.psychologytoday.com/us/blog/beyond-abstinence/201508/the-creativity-crisis-and-what-you-can-do-about-it

Robinson, K., & Robinson, K. (2022). *Imagine if …: Creating a future for us all*. Penguin Books.

TED. (2007). *Tedtalks: Sir Ken Robinson--Do schools kill creativity?* https://www.youtube.com/watch?v=iG9CE55wbtY

Willis, S. (1997). Sharing control in the classroom. *Education Update, 39*(6).

Young, J. (2014). *Encouragement in the classroom: How do I help students stay positive and focused?* ASCD.

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Tech Talk
Entering a New Frontier: AI in Education

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Abstract

Artificial Intelligence (AI) has become a normal part of life in many areas, including education. This article seeks to explain some background in AI, discuss how it can be used to improve teaching and learning, and how it can be used as a digital assistant. Particularly we explore how AI can be used to personalize and differentiate instructional plans, create and score assessments, provide feedback, incorporate intelligent tutoring systems, expedite administrative tasks, and

some uses of generative AI, as well discuss some of the risks and concerns associated with using artificial intelligence in education.

Introduction

Artificial Intelligence (AI) has become deeply embedded in our daily lives. Alexa and Siri (digital assistants), facial detection and recognition (e.g., on smartphones), email spam filtering, maps, and navigation (i.e. Google Maps and Waze), spelling auto-correct sentence restructuring (e.g., Grammarly), smart recommendation systems (e.g., on social media), chatbots (e.g., when ordering something online or seeking assistance), language learning apps (e.g., Duolingo), and e-payments and fraud detection are some common ways our society is engaging with AI daily (Holmes, Bialik, & Fadel, 2019; Reeves, 2023).

Ruiz and Fusco (2023) in the "Glossary of Artificial Terms for Educators" provide this definition of artificial intelligence, "AI is a branch of computer science. AI systems use hardware, algorithms, and data to create 'intelligence' to do things like make decisions, discover patterns, and perform some sort of action" (para. 1). In this setting, algorithms are considered the "brains" of AI as they provide the rules for the actions to be taken, or in the case of machine learning, discover the rules.

A popular and easily accessible form of AI, generative AI, uses large language models (LLMs), software or systems that have studied content on the web and are designed to learn patterns and make predictions based on that content, and natural language processing (NLP), the ability to understand text and spoken word, as part of artificial intelligence, to transform ideas into reality (Manzer, 2023; Mollick & Mollick, 2023). Many industries rely on these models in their use of AI. The agriculture industry uses AI to improve crop yields and track resource consumption. The construction sector uses it to predict budget and time requirements for projects. The healthcare industry capitalizes on AI to reduce human error, diagnose disease, and for drug development (Holmes, et al., 2019; Mendes, 2023). These technological advances in AI have become commonplace in the workforce as they have been developed to expedite decision-making, provide faster service, improve outcomes, and make life easier, and maybe even safer.

In addition to these fields, Artificial Intelligence is used in the field of education. Its uses have been researched in education for more than 80 years (Frontier, 2023) with the first AI, Logic Theorist, in 1956 at Dartmouth College. The precursor to AI began with B.F. Skinner's and Sidney Pressey's teaching machine (non-adaptive) and then Gordon Pask's Self-Adaptive Keyboard Instructor (SAKI) in the 1950s. Next, Computer-Aided Instruction (CAI) like PLATO (Programmed Logic for Automatic Teaching Operations) was developed in the 1960s, and then Jamie Carbonell's SCHOLAR (first intelligent tutoring system) (Arnold, 2000; Holmes, et al., 2019; Waters, 2015). Artificial Intelligence in Education (AIED) has exploded as evidenced by a myriad of applications, articles, and blog posts, as well as presentations at the 24th annual international conference on AIED in Tokyo, Japan on July 3-7, 2023 (AIED, 2023) and articles published in the *Journal of Artificial Intelligence in Education* (AIED Proceedings, 2023).

While AIED has been researched and utilized in education for many years, it has quietly entered the classroom and has only recently been recognized as a useful tool that is accessible to

educators and students. Now practitioners are recognizing that the integration of artificial intelligence into education can be a transformative force, revolutionizing the way educators teach and students learn.

Using AI to Improve Teaching and Learning

AI is demonstrating notable benefits for teachers' instructional practices. Educators can leverage AI for effective planning, execution, and evaluation of their teaching methods. AI aids in identifying students' needs, allowing teachers to tailor learning content and activities accordingly. During activities such as collaborative tasks, AI facilitates real-time monitoring and prompt feedback for teachers. Additionally, AI can be used to support educators' learning, keeping them up to date in their disciplines (Celik, et.al. 2022; Chen, 2023). There are also several ways AI may positively support and improve student learning when used to personalize and differentiate instruction.

AI for Personalized Learning and Differentiated Instruction

A significant challenge teachers face is accommodating the diverse needs, abilities, and interests of their students. Therefore, a significant advantage of AI in education is its ability to tailor learning experiences to individual student's needs because it can predict how people will learn (Meehir, 2023). Adaptive learning platforms utilize AI algorithms to assess students' strengths, weaknesses, and learning preferences, allowing them to progress through content at their own pace and truly personalize content, not heretofore possible (Frontier, 2023). It can also generate personalized learning materials such as worksheets, reading lists, and interactive exercises that align with each student's learning preference. For example, AI can help a teacher explain a complex concept by breaking down the concept, altering the lexile level of text, and suggesting different approaches. An example is iReady, an online math curriculum that differentiates and supports learners based on their current knowledge and skills (iReady, 2023). An example of altering lexile levels is the use of NewsELA. This online reading platform is customizable to meet the needs of individual students (NewsELA, 2023).

AI can also help a teacher build a bridge "between a skill and the student's interest" by making recommendations for strategies that would be helpful for the student. (Nieves 2023). AI can also be used to improve student outcomes by designing learning activities and assessments; and creating music, images, text, videos, and other innovative content (Manzer, 2023; Mollick & Mollick, 2023). An example of an AIED tool for personalized learning is ChoiceText. This fun, free online math and reading program responds to students' backgrounds and interests and customizes reading passages and comprehension questions (Dahlberg, 2023).

AI for Assessment

Part of differentiating instruction is differentiating assessment. AI can be used to create differentiated assessments by providing lower lexile levels in reading passages, simplifying verb tenses, and providing a glossary of terms. Tiered instruction and assessment questions, assignments, and rubrics can all be created using AI (Nieves, 2023; Spencer, 2023). Additionally, AI-powered assessment tools can gauge a student's proficiency and adapt the

difficulty level of questions in real time. This ensures that students are consistently challenged without becoming overwhelmed or bored, fostering a balanced learning curve (Nieves, 2023).

After instruction, AI-driven automated scoring systems can assist with grading assessments, ultimately streamlining teachers' workload and enabling them to focus on crucial aspects like timely intervention and assessment. AI has been used for automated essay scoring (AES) and computer adaptive testing (CAT) since the 1960s and has improved the efficiency and validity of assessment systems that use large volumes of data. It can also be used to check for plagiarism (Celik, et.al. 2022; Gardner, O'Leary, & Yuan, 2021; Jimenez & Boser, 2021). By analyzing students' performance data, AI can provide teachers with actionable insights into each student's progress, which enables teachers to identify areas where students are excelling and where they might need additional support.

Intelligent Tutoring Systems

When students need additional support, intelligent tutoring systems (ITS), a form of AI, can enhance student learning by providing real-time instruction and feedback that is better than conventional computer-assisted instruction and comparable to an effective human tutor (Sedlimeier, 2001). These systems leverage natural language processing and machine learning to offer students immediate feedback on their assignments and help them navigate complex topics. A study by VanLehn et al. (2005) found that students using an ITS in algebra showed significant learning gains compared to those using traditional methods, highlighting the potential of AI in addressing individual learning gaps.

AI can also provide feedback in the form of "feedback loops" that can be useful to help the teacher improve their instruction and how they adapt instruction for each student. The significance of feedback loops extends to immediate scenarios, such as honing a skill, as well as to broader situations involving comprehensive efforts and reflections, such as the conclusion of a project or a term paper presentation. Teachers can benefit from feedback loops by understanding how they are responding to students. They see patterns that are effective and others that are not (U.S. Department of Education, 2023).

AI as a Teacher's Assistant

In addition to being an excellent tool for teachers to support student learning, artificial intelligence can provide great benefits to educators when acting as a teacher's assistant. AI can aid in administrative tasks such as creating emails, memos, and proposals; time management and smart scheduling; and setting and tracking goals (Mollick & Mollick, 2023; Rampton, 2023).

AI tools used to curate information and created content are called generative AI. Generative AI, like ChatGPT, has found its way into the classroom. There are several generative AI tools, for example Anthropic Claude, Autodesk's Generative Design (for engineers), Bing AI, ChatGPT, Dall-E2 (for creating images and art), GitHub CoPilot (an AI programer), Google Bard (a conversational AI tool), Notion, Scribe, Speechify (text to speech read out loud), and Wordtune (Gonzales, 2023; Manzer, 2023; Mollick & Mollick, 2023). These tools can be used to assist with scheduling, class planning, and managing administrative work, allowing teachers to focus

more on teaching. Chatbots and virtual assistants can handle routine inquiries and administrative tasks, such as setting up parent-teacher meetings or managing classroom resources, creating emails to specifics such as parents and back-to-school planning.

In addition to AI acting as a tutor for students, AI can be used as a virtual assistant that is a resource to tutor teachers. Teachers can use AI as a professional development tool by using it to increase content knowledge and pedagogical content knowledge; stay up-to-date on technology; and for assistance in college coursework and preparing for additional licensure exams.

Risks and Concerns of Using AI

While artificial intelligence may offer an array of benefits and opportunities for educators, it is not without its risks. For example, potentially reinforcing bias; creating "hallucinations" due to limited training data; and risky security issues.

One concern is inherent bias. Because the training data used for generative AI is based on English text from Western culture, and these systems are created by humans, unconscious bias can enter machine learning models and become automated and perpetuated (Coley, et al., 2023; Marr, 2022). In turn, AI can reinforce existing biases and inequalities by not being reflective of the diversity in classrooms. These can be manifested in image creation tools, inappropriate facial recognition, and biased assessment of student performance (Blask, 2023; Chen, 2023; Coley, et al., 2023; Hardman, 2023; Marr, 2022).

Another concern is incorrect information, also known as hallucinations. In AI, hallucinations are information that is partially or entirely fabricated. Generative AI is programmed to provide plausible responses, even if they are incorrect. A query that is presented to a generative AI tool could be responded to an intelligent-sounding falsehood. This means that generative AI can be convincing liars (Coley, et al., 2023; Chen, 2023; Thorbecke, 2023).

Finally, with the rise of AI comes privacy and security concerns, particularly the misuse of personal information. Of note is what constitutes personal information (Office of the Victorian Commissioner of Information, 2018). Because AI systems collect and access large amounts of different data, there is a risk of personal information sharing, profiling, or even surveillance. Tracking students' online activity and making predictions about future activity as well as inferring private information, can lead to security issues (Cullican, 2023). Educators should proceed with caution in entering any identifiable student information into AI systems (Coley, et al., 2023; Yuskovych-Zhukovsk et al, 2021).

In Conclusion

The integration of Artificial Intelligence (AI) into education marks a significant and transformative shift in the way learning is facilitated and nurtured. As AI continues to evolve, its potential to revolutionize education remains vast. By aligning long-standing pedagogical aspirations with AI's emerging capabilities, educators can harness the power of technology to create truly engaging and effective learning experiences. The journey ahead necessitates a vigilant awareness of AI's limitations, ensuring that its implementation remains grounded in the

principles of effective education. The collaboration between educators, students, and AI is poised to shape the future of learning, enabling a more inclusive, adaptable, and engaging educational landscape. It's important to note that while AI has the potential to assist teachers in many ways, it should be seen as a tool to augment human expertise rather than replace it. Rather than focusing on the fear of using artificial intelligence, it is important for educators to use it in ways that can benefit teachers and students.

References

AIED (2023). International Conference on Artificial Intelligence in Education. https://www.aied2023.org/index.html

AIED Proceedings (2023). Springer Link. https://link.springer.com/book/10.1007/978-3-031-36272-9

Arnold, D.N. (2000). Computer-aided instruction. *Microsoft® Encarta® Encyclopedia*. https://www-users.cse.umn.edu/~arnold//papers/cai.pdf

Blask, T. (2023). From virtual assistance to intelligent tutors: How AI is changing higher education. LinkedIn. https://www.linkedin.com/pulse/from-virtual-assistants-intelligent-tutors-how-ai-changing-blask/

Celik, I., Dindar, M., Muukkonen, H., & Järvelä, S. (2022). The promises and challenges of artificial intelligence for teachers: A systematic review of research. *TechTrends: Linking Research & Practice to Improve Learning*, *66*(4), 616–630.

Chen, C. (2023). AI will transform teaching and learning. Let's get it right. Stanford HAI. https://hai.stanford.edu/news/ai-will-transform-teaching-and-learning-lets-get-it-right

Coley, M., Snay, P., Bandy, J., Bradley, J., Molvig, O. (2023). Teaching in the Age of AI. Vanderbilt University Center for Teaching. https://cft.vanderbilt.edu/guides-sub-pages/teaching-in-the-age-of-ai/

Cullican, J. (2023). AI in education: Privacy concerns and data security: Navigating the complex landscape. LinkedIn. https://www.linkedin.com/pulse/ai-education-privacy-concerns-data-security-complex-jamie-culican/?trk=article-ssr-frontend-pulse_more-articles_related-content-card

Dahlberg, E. (2023). A new way to personalize learning, thanks to AI. EdSurge. https://www.edsurge.com/news/2023-08-14-a-new-way-to-personalize-learning-thanks-to-ai

Frontier, T. (2023). Taking a transformative approach to AI. *Educational Leadership, 8*(9). https://www.ascd.org/el/articles/taking-a-transformative-approach-to-ai

Gardner, J., O'Leary, M., Yuan, L. (2021). Artificial intelligence in educational assessment: 'Breakthrough? Or buncombe and ballyhoo?' *Journal for Computer Assisted Learning*, *37*(5), 1207-1216. https://onlinelibrary.wiley.com/doi/epdf/10.1111/jcal.12577

Gonzales, J., Wright, B., Darche, K., Diem, M., Hassell, L. (2023). *6 Ed Tech Tools to Try in 2023*. The Cult of Pedagogy. https://www.cultofpedagogy.com/6-ed-tech-tools-to-try-in-2023/

Hardman, P. (2023). The AI-education divide: How the rise of AI has reinforced inequity in education (and what we need to do to reverse it). Dr. Phil's Newsletter. https://drphilippahardman.substack.com/p/the-ai-education-divide

Holmes, W., Bialik, M., Fadel, C. (2019). Artificial intelligence in education: Promises and implications for teaching and learning. Center for Curriculum Redesign. https://curriculumredesign.org/wp-content/uploads/AIED-Book-Excerpt-CCR.pdf

iReady (2023). Personalized Math Instruction: Online mathematics instruction with proven results. https://www.curriculumassociates.com/programs/i-ready-learning/personalized-instruction/mathematics

Jimenez, L., Boser, U. (2021). Future of testing in education: Artificial intelligence. CAP. https://www.americanprogress.org/article/future-testing-education-artificial-intelligence/

Manzer, A. (2023). 10 best generative AI tools to supercharge your creativity. *Scribe*. https://scribehow.com/library/generative-ai-tools

Marr, B. (2022,). The problem with biased AIs (and how to make AI better). Forbes. https://www.forbes.com/sites/bernardmarr/2022/09/30/the-problem-with-biased-ais-and-how-to-make-ai-better/?sh=5d149c684770

Meehir, K. (2023). How AI is personalizing education for every student. Elearning Industry. https://elearningindustry.com/how-ai-is-personalizing-education-for-every-student

Mendes, A. (2023, September 7). Artificial intelligence in business: A guide for industries. ImaginaryCloud. https://www.imaginarycloud.com/blog/how-artificial-intelligence-is-transforming-every-industry-2/

Mollick, E., Mollick, L. (2023). Let ChatGPT be your teaching assistant: Strategies for thoughtfully using AI to lighten your workload. *Harvard Business Publishing Education.* https://hbsp.harvard.edu/inspiring-minds/let-chatgpt-be-your-teaching-assistant

NewsELA (2023). https://newsela.com/

Nieves, K. (2023). 5 ways to use AI to meet students' needs. Edutopia. https://www.edutopia.org/article/using-ai-tools-differentiated-instruction/

Office of the Victorian Information Commissioner. (2018). Artificial intelligence and privacy: Issues and challenges. https://ovic.vic.gov.au/privacy/resources-for-organisations/artificial-intelligence-and-privacy-issues-and-challenges/

Rampton, J. (2023). The future of AI in time management. *Calendar.* https://www.calendar.com/blog/the-future-of-ai-in-time-management/

Reeves, S. (2023). 8 helpful everyday examples of artificial intelligence. Iot for All. https://www.iotforall.com/8-helpful-everyday-examples-of-artificial-intelligence

Ruiz, P. & Fusco, J. (2023) Glossary of Artificial Intelligence terms for educators. Center for Integrative Research in Computing and Learning Sciences. https://circls.org/educatorcircls/ai-glossary

Sedlimeier, J. (2001). Intelligent tutoring systems. *International Encyclopedia of the Behavioral and Social Sciences*, 7674-7678.

Spencer, J. (2023). 5 ways artificial intelligence might transform assessment practices. John Spenser. https://spencerauthor.com/ai-assessment/

Thorbecke, C. (2023). AI tools make things up a lot, and that's a huge problem. CNN. https://www.cnn.com/2023/08/29/tech/ai-chatbot-hallucinations/index.html

U.S. Department of Education, Office of Educational Technology (2023). Artificial intelligence and future of teaching and learning: Insights and recommendations. https://www2.ed.gov/documents/ai-report/ai-report.pdf

VanLehn, K., Lynch, C., Schulze, K., Shapiro, J.A., Shelby, R., Taylor, L., Treacy, D., Weinstein, A., Wintersgill, M. (2005). The Andes physics tutoring system: Lessons learned. *International Journal of Artificial Intelligence in Education*, *15*(3): 147-204. https://oli.cmu.edu/wp-content/uploads/2012/05/VanLehn_2005_Andes_Physics_Tutoring_System.pdf

Waters, A. (2015). Gordon Pask's adaptive teaching machines. https://hackeducation.com/2015/03/28/pask#:~:text=The%20SAKI%20was%20designed%20to,common%20method%20for%20data%20entry.

Yuskovych-Zhukovska, V., Poplavska, T., Diachenko, O., Mishenina, T., Topolnyk, Y., & Gurevych, R. (2022). Application of artificial intelligence in education. problems and opportunities for Sustainable Development. *BRAIN. Broad Research in Artificial*

Intelligence and Neuroscience, *13*(1Sup1), 339–356.
https://lumenpublishing.com/journals/index.php/brain/article/view/4615

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STEAM
The Science of Sand and Water

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Abstract

Sand and water play provides learning opportunities for young children to experiment with big concepts and fosters scientific inquiry. In using sand and water as a resource for learning, teachers observe preschoolers change and develop in their understanding of physical properties of the materials and see the child's growing sophistication in understanding how the changes the children make affects the outcome of the play. In this article, teachers observe and scaffold children's learning in the sand and water area based on cross cutting concepts from the Next Generation Science Standards and engage children in conversations that incorporate all disciplines.

Keywords: play, STEM, inquiry, sand and water, cross cutting concepts, NGSS

In a corner of the Outdoor Classroom, a three-year old watches droplets he releases from a pipette into the water table, carefully observing concentric circles form with each drop as the pattern repeats over and over again. He says, "Teacher, do you see? Do you see the circles? It's always circles!"

In another area, a group of children dig deep holes and fill them again with buckets of water only to watch the water slowly disappear into the hole. They rush back and forth between faucet and hole only to watch the water disappear repeatedly.

> "Run, run, get more water, the water is going again!"
> "Hurry, the water is running out in the hole. It's almost gone!"

Children can spend hours playing with water. We see it when we give children baths or take them to the beach, and they can show disappointment when they must leave the bath or the beach. Play in the context of school is often limited to recess time or after children have finished an assigned task or activity. Play is a tool not often valued in the context of a school setting. At our school, play *is* the curriculum that enhances our work in literacy, mathematics, and the sciences. We define play as being intrinsically motivated, enjoyable, freely chosen, exploratory in nature, process over product oriented, and non-literal (Lozon & Brooks, 2019). When children play, the teacher follows the child's lead while observing the play in context of learning new concepts.

In many play-based early childhood schools, sand and water play is prevalent and essential. Sand and water play is fun and creates an environment where children engage in mathematical ideas and scientific concepts. It gives them opportunities to practice the behaviors of a scientist or an engineer (NSTA, 2014). At our early childhood school, a mixed-age group of children (3 - 5-year-olds) approach the sand and water play area as a full-body experience. Socks and shoes are immediately removed in preparation for the play, and in the end, their clothes are soaked and muddied.

> "I made a pool, look guys, I made a pool!"
> "It's not a pool. If it were a pool, we could all jump in."
> "I'm digging a path so the water will come all the way over here."
> "But wait, there's only one problem. The water will stop here, we will have to go all the way this way to make it keep going."

One can immediately notice the embedded literacy, while also noting the children's development of concepts as they relate to a real-world context. The child who commented, "It's not a pool," sees a pool as large enough for his body and his friends' bodies to fit. That child can be presented with a different context for pools that causes him to make an accommodation for an existing mental framework. For example, the teachers could then engage in a conversation about "pools of water" with the child if a cup of water or glass of milk is accidentally tipped over at lunch. Perhaps the teachers could make comments about pools of water forming after a rain so that the definition is no longer limited to the knowledge or existing framework of a physical swimming pool. These extensions are organic and stem from the natural play of a child through a context-rich exploration of the child's own choosing. In this example, the teachers used the child's definition and conceptual understanding of the word "pool" to broaden their understandings.

Play often fosters self-initiated scientific inquiry, which introduces children to big concepts through real hands-on learning (Stone, 2016). The child who dug a path to move the water and who commented, "I'm digging a path so the water will come all the way over here," is engaging

with concepts such as form and function, cause and effect, and systems and systems thinking. Yet, educators may miss seeing these concepts develop when children are engaged in play. When we listen to young children, we discover where they are in their learning and what they understand about the properties of sand and water. How does this play help in the understanding of science and math? What did the children gain by repeating their actions over and over? In our preschool, we wonder what the children are thinking; we wonder how we can extend their play; we wonder if pedagogy helps enhance children's learning. How does our knowledge of cross-cutting concepts, developmental continuums, and theory guide our next steps with each and every child we work with at school?

When young learners engage in sand and water play, they are exposed to many concepts and make discoveries for themselves. For example, cause and effect is a concept children observe when they generate changes as they move the sand for the water's path. They observe changes as they pour water and watch it get stuck, move back and/or sink into the sand or continue to move along a carved-out path. Depending on their observations, children can make decisions based on the pattern of the water flow or the movement of the sand. Children can also observe patterns in their sand designs. They might be able to observe that rivers flowing down a sand path continue to move down, but that rivers cannot flow uphill and will sink into the sand. Children can explore and gain exposure to the concept of systems through their play and can observe the behavior of the system. For example, pouring the water into a large hole (which has different paths for escape) shows how the pool of water can be broken up into smaller paths. The concepts of stability and change are ubiquitous as the children play in the sand.

In the multiage outdoor classroom of three- and four-year-olds, we watched as younger three-year-olds filled a hole with water and observed the water disappear. The repetition of filling the hole, watching the water slowly disappear, and then filling the hole again delighted young learners over and over again. The children were unaware of the scientific principles of displacement or absorption as they played, yet through the repetition of such play episodes, the foundation of the scientific principles that govern our world were beginning to form.

In the multi-age classroom, we also saw how our older students who had more experience with sand and water play influenced the youngest learners. Because the older children had spent last year digging and filling sand holes with water repeatedly, they had formed a deeper understanding of the properties of sand and water and were ready to notice new phenomena that affected the outcome of their plans. The four- and five-year-old children searched for ways to keep the water in the sand area to create a little river for their boat play. They had the physical understanding that the water would eventually disappear or move into the sand. Their thinking moved toward the question of how they would keep the water in place so they could use it in their play of floating boats and other loose parts down their river. This authentic inquiry process was initiated through play and owned by the children as they explored questions that arose out of their own curiosity. Also, while the younger three-year-olds used any vessel available to dig, scoop, and fill buckets, the older children knew from prior experience which buckets were the best for filling. They also knew which buckets were the best for carrying water and which shovels were most effective for digging holes and trenches. The older children did not learn this by playing with sand and water on occasion; rather, it was through the repetition of play episodes that deepened their knowledge and understanding and helped them refine their practices.

During the unprecedented COVID year, our outdoor classroom shifted from a large open area in which children freely explored any area for as long, or as short as they liked, to three separate designated play spaces the children visited on specific days at specific times. Initially, this shift was viewed as a constraint. However, when thinking about the importance of repetition for children's learning, it became a possibility; it was a possibility for practicing and repeating play experiences with a deeper focus than before. Not being able to come and go freely had, in a way, given the children time to be more focused in their play.

Through their continued play with sand and water, the children noticed other elements that caused change in their waterways and constructions. They explored, practiced, and repeated their actions to better understand this new information until these processes were internalized. The repetition brought about familiarity and confidence with the once-new phenomena, so children were once again ready to notice new and unexplored occurrences in their surroundings. Over time, the children's play extended beyond digging and filling holes to forming bridges; creating homes for themselves and each other, and animals; and digging a complex system of waterways. The children observed the flow of water through their hand-made waterways and noticed what caused the water flow to stop, such as a friend's foot accidentally stepping into the waterway, helping them become highly aware of their physicality and how their own bodies take up space. Like engineers, children had to explain solutions of an upward incline stopping the water flow or the problem of a foot blocking water from flowing to a different path.

Through the repetition of play episodes with sand and water, the children were building the foundation for later scientific learning. The Next Generation Science Standards' (2014) crosscutting concepts were evident in every aspect of their play. The lines and grooves the children made in the sand became patterns for future digging endeavors. When children mixed sand with water and compared the new consistency to dry sand, they learned the physical properties of sand, as well as cause and effect of water on sand. Children also experimented with cause and effect as they dug and filled holes, stepped into a deep pool with shoes still on, or diverted the water flow away from a friend's pool. Energy and matter were explored as children noticed the water's effect on the sand and adjusted the flow of water into their trenches, as well as the difference between the flow of dry sand compared with how it sticks together when wet. The concepts of scale, proportion, and quantity were investigated through the building of bridges and sandcastles as children experimented with the proper ratio of sand to water to construct their castle. They also learned how to dig a hole for a tunnel so it didn't collapse. Stability and change were experienced every time the children returned to the sandbox, only to find their previous structures and waterways altered or gone completely.

As the children continued to play within the system of sand and water, they became more focused and intentional in their play. While play is process over product oriented, when children are in flow (Csikszentmihaly,1990), they are deeply involved in their activity of creating pools and pathways in the sandbox. Children worked together to create the longest trench as well as the "biggest pool in the universe." Plans were made about where and how they were going to make their "pools" and "homes" for each other and the animals. Rocks were added to trenches to act as dams, and twigs were used to define spaces. The children discussed if and when the trenches should be joined, resulting in a complex system for the water's path to meet each other's needs. Observing and documenting children's play provided a point of reference to analyze what the

children were doing. How are the children using and interacting with the materials? What problems are the children encountering and trying to solve? What possibilities are they testing and what are their theories about what might happen next? By reflecting on children's play, we noticed that the children always dug their paths in the same direction, downhill from the waterspout, which is actually quite strategic. After months of repeated play episodes messing about with sand and water, we decided to offer the children a challenge. During our next visit to the sand and water area, we sat on the edge of the sandbox and wondered aloud whether it was possible to dig a path that went around the tree, which happened to be located slightly uphill from the waterspout. The children eagerly accepted the challenge, which brought new problems to solve, ideas to share, and theories to test.

In conclusion, children's play with sand and water is rich, filled with investigations and experimentation. Children think like scientists as they plan out their investigations and collaborate with their peers. They analyze the cause and effect of their structures, collect the data they have visualized, and construct and design solutions like an engineer. Teachers who see the opportunities for learning through water and sand play celebrate and honor young children's play!

References

Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. New York, NY: Harper & Row.

Lozon, C., & Brooks, J.G. (2019). The potential of purposeful play: Using the lens and language of crosscutting concepts to enhance the science and engineering practices of play. *International Journal of the Whole Child*, 4(2), 88-94. https://libjournals.mtsu.edu/index.php/ijwc/article/view/1602/1127

National Science Teaching Association. (2014). *Science and engineering practices*. NSTA. https://ngss.nsta.org/PracticesFull.aspx

Next Generation Science Standards (2014). *Cross cutting concepts.* NGSS. https://ngss.nsta.org/crosscuttingconceptsfull.aspx

Stone, B. (2016). Playing around in science: How self-directed inquiry benefits the whole child. *International Journal of the Whole Child*, 1(1), 1-10. https://libjournals.mtsu.edu/index.php/ijwc/article/view/599/544

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Play Therapy

Minecraft™: Just a Game or a Conduit to Enhance Social-Emotional Learning?

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Abstract

Minecraft™ is a popular game that immerses the player in a virtual world in which they can be creative and interact with others. Results of a 2017 survey of public educators utilizing Minecraft™ in the classroom, indicated that 90% of the teachers felt the game enhanced student problem-solving, creativity, critical thinking, and collaborative skills. One continued area of need in the practice of game-based interventions in context of clinical programming, is monitoring the effects of virtual reality and games on social-emotional and behavioral needs of participants. In January 2020, Minecraft™ launched a new Social-Emotional Learning (SEL) content packet to address this gap in services and research. The use of games and virtual reality (VR) in clinical practice are gaining popularity and are being used more readily to enhance

outcomes for identified clients. This article will discuss the design and development process of using the Minecraft™ SEL content packet in practice as a basis for group social skills training in latency age children with high functioning Autism. A review of current and best practices in virtual reality and game-based programming will be included.

Keywords: social skills, virtual reality, game-based interventions, groups, autism, and social-emotional learning

Introduction VR and Game Based Activities

The use of technology in the applied setting is not new to the field of medicine and social-behavioral sciences; however, the integration of technology into practice is growing rapidly and providing practitioners and clinicians much to think about as it relates to direct practice work. To date there is limited research addressing technology in social work practice, and the direct effects that the technology has on client outcomes. Therefore, further research is needed to fully understand the impact of technology as a tool in social work practice (Hill & Fergerson, 2010). As technology use increases in the population at large, the same technologies are gaining momentum within the field of behavioral sciences as a means of assessment, support, and intervention. Informatics in social work practice is an emerging field, and some technology-based supports are better than others (Ellison, et al., 2016). As practitioners we must take an active role in rigorously evaluating the technology for appropriate use within our practice and in developing these versatile technologies for use in practice. Historically, technology-based programs and supports are developed by computer science specialists who may have little understanding of human behavior and the behavioral and mental health needs of the consumers who are using these supporting technologies. The use of science convergence in technology development is an attempt to address this issue. Science convergence and convergence research is a means of solving complex problems, including social and emotional needs of individual consumers, while also focusing on the larger societal needs (NSF, 2020), particularly for the purposes of this article as it comes to the integration of social and behavioral sciences and technological applications (Aquirre et al, 2017). This type of collaboration and research will create changes that extend beyond the field and into the future of a technology-rich social service delivery system (Elswick, 2017). As these technological advances impact every aspect of modern life, social work and behavioral science practitioners will have to become more able to utilize and integrate them in their practices. Telehealth and other technologies were rapidly adopted due to the COVID-19 pandemic, but they were already on the cusp of broad adoption (Hirschi et al., 2022). Therapeutic interventions have benefited from the implementation of online counseling, self-help web-based interventions, social networks, telehealth/cyber therapy, and more recently the use of virtual reality and game-based interventions. For purposes of this article, Virtual Reality (VR) is defined as, “a computer-generated digital environment that can be experienced and interacted with as if that environment were real” (Jerald, 2015, p. 9). It is important to make clear that while there are many possible virtual reality games/ game-based treatments, the focus of this article is Minecraft™, a game that takes place in a virtual world, which is a subset of virtual reality.

Virtual reality and immersive gaming have been used successfully in a variety of interventions including pain reduction (Hoffman et al., 2000; Naylor et al., 2008), depression and anxiety

(Zeng et al, 2018), social connection and skill training (Botella et al., 2004), specific phobias (Gerardi et al., 2010), and post-traumatic stress disorder (PTSD) (Gerardi et al, 2010; McLean et al, 2010). Virtual reality immersive gaming has become a potential option for treatment intervention for clients both inside and outside of the behavioral health clinic space, merging other supportive computer science practices is imperative. For example, merging VR with the processes of Ecological Momentary Interventions (EMIs) and Ecological Momentary Assessments (EMAs) will assist the clinician in developing an effective and evidence-based intervention for use in practice. EMIs were defined as momentary health treatments provided via hand- held mobile technologies that deliver psychological interventions while people are engaged in their typical routines in their everyday life (Heron & Smyth, 2010). Further, Ecological Momentary Interventions (EMIs) are defined as treatments which are provided to patients between sessions during their everyday lives (i.e., in real time) and in natural settings (Shiffman, Stone, and Hufford, 2008). Clinicians have tried to extend some aspects of psychotherapy into patients' everyday lives to support their needs between the clinical sessions provided. In addition to continuity of service delivery beyond the clinical "four walls," clinicians have struggled with collecting ongoing data. Ecological Momentary Assessment (EMA) may be the answer to that issue. EMAs involve repeated sampling of subjects' current behaviors and experiences in real time, in subjects' natural environments. Ecological momentary assessment (EMA) aims to minimize recall bias, maximize ecological validity, and allow study of microprocesses that influence behavior in real-world contexts, with clear applications in behavioral health interventions. This article will focus on virtual reality and game-based interventions, specifically for use with high functioning autism as an adjunct to social skills interventions.

The article will show how the merging of VR and games and use of EMAs and EMIs can potentially enhance client outcomes. The suggested VR intervention will utilize grounding theories from multiple disciplines in conjunction with a well-known children's game. Explicitly, the authors hope to assist the reader in understanding the theoretical foundations, the importance of technology as an adjunct to therapy, the affordability of such an enterprise for a clinical practitioner, how to track progress of the client within the VR framework, and the development process for this type of technology. Specifically, Minecraft™ is useful because it provides milieu in which the children can practice and observe behaviors in interactions with others and with the environment (Ellison, 2016; Junco, 2014). The authors provide insight into the utilization of virtual-reality environments, specifically Minecraft™ in practice as a clinician in order to support social and emotional learning among youth experiencing deficits in this area.

Minecraft: Its Use in Practice with Autism

One of the defining characteristics of autism, as listed *as Category A* in the Diagnostic and Statistical Manual of Mental Disorders is lack of social skills (DSM-V; APA, 2013). The DSM-5 describes Category A (autistic social communication and social interaction) as "Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history" (DSM-V; APA, 2013). Examples in this category include but are not limited to deficits in social-emotional reciprocity, deficits in nonverbal communicative behaviors used for social interaction, and deficits in developing, maintaining, and understanding relationships.

Social skills are a combination of cognitive, behavior, and affective components that are necessary to occur together in order for social functioning to occur. Additionally, social skills can be defined as pivotal skills that when successfully acquired, can elicit positive clinical gains in other domains of functioning especially when developed in the natural environment (Koegel & Koegel, 2012). In order for social skills to be identified as effectively learned, they must be seen in multiple settings, with many different people, during different conditions, and with a high level of fluency. It is important that these skills are not just seen within the setting in which they were taught, such as the clinic setting, but in other areas of the client's life. In fact, many studies over the years have been conducted on the need to increase social skills in this population but to date the research remains limited in studies that measure the generalization of social skills outside of the group setting/classroom. Research focusing on generalization of social skills is a critical area, but current research is currently lacking (de Marchena, Eigsti, & Yerys, 2015; Watkins et al., 2015). This gap in the literature is surprising considering the notion of and importance of the generalization of skills and the focus on social skills as a core dimension of services delivered to individuals with Autism dating back to Stokes and Bear (1977). Generalization also ensures that outcomes of interventions should be applied and should be actively pursued or taught to the client (Stokes and Bear, 1977). While some existing social skills curriculum and clinicians do embed generalization plans into their programming, many of these attempts fall short of testing for generalization in the community and in real life opportunities that can elicit appropriate behaviors. Thus, skill generalization of newly learned social skills into the clients' lived environment is extremely difficult yet critical to the client's social success in the areas of friendships, later employment, and navigating future relationships. Because of the current lack of interventions supporting generalization and the increased need, there is an opportunity to develop a tool that can support skill generalization as it relates to social skills. Therefore, setting the stage for the expansion of the use of VR to a relatively new population (Autism) and a new skill domain (social skills) goes beyond traditional clinical approaches. This article and future research endeavors will expand to a new population and skill set and explore VR as a social skill learning tool. The development of the Minecraft™ social skills intervention is rooted in proven theories such as social learning theory (Bandura, 1971), activity theory in human computer interaction (Draper, 1993), and pivotal response training (Koegel & Koegel, 2012) as it ties universal design to human-computer interactions and ecological momentary assessments and interventions to promote generalization and maintenance of social skills in individuals with autism to set the stage for a myriad of future opportunities across many domains.

Grounding Theory for Developing Game based VR Interventions for Practice

When developing specific technology, such as virtual reality programming for a specific population, we must consider what theories are necessary to ground this work. Because this form of intervention includes social science and computer science, it is important to include grounding theories from both disciplines to ensure effective science convergence occurs. For the purposes of the technology development, both disciplines identified the more evident theories that would properly guide this new VR intervention tool. The following paragraphs will give a brief overview of each proposed theory so others seeking to do this work can develop understanding of discipline specific theory. The theories used in this work were Behavioral Learning Theory- in the form of pivotal response interventions, Social Learning Theory (SLT), and Activity Theory

in Human-Computer Interaction. The convergence of these fields and practices will ensure that effective outcomes within social behavioral sciences are produced.

Behavioral Learning Theory- Pivotal Response Interventions

Behavioral Learning Theory sets the groundwork for the virtual reality intervention developed by the researchers. When using behavioral learning, Pivotal Response Training is often used to assist and aid in the participant obtaining new skills in the "real world" environment. Hollet and Ehret (2015) have found that using Minecraft™ can recreate complex emotional situations found in the real world. Pivotal Response Training (PRT) is an intervention that is used in the client's natural environment to teach needed skills. This intervention model is developed from the principles of applied behavior analysis. Instead of teaching a client one skill at a time in the clinic environment, the clinician uses pivotal activities and areas of a child's development in the natural environment to teach skills. Pivotal Response Training and interventions use techniques such as motivation (Koegel & Koegel, 1990), cue prompting and responses (Schriebman et al, 1982), self-monitoring, and social interactions as a way to teach new skills necessary for social functioning. By targeting these specific foci, the intervention becomes more supportive of the client's everyday life, and skill generalization across environments occurs more readily. Often found in PRT is the notion that each individual participant should be motivated by the intervention, and that the intervention should include the following whenever possible: choice, task variation, interspersing maintenance tasks, rewarding attempts, and the use of direct and natural reinforcers (Dunlap & Koegel, 1980). The client plays an important role in the activities they participate in during the intervention, the reinforcement obtained for their activity, and their attempts are reinforced naturally within the intervention itself. Research shows that PRT can be used to teach skills, decrease disruptive or unwanted behaviors, and increase social, communication, and academic skills (Koegel & Koegel, 1990). Research also shows the positive impact that play environments have on teaching pivotal social skills. Play environments are often used to teach social skills, such as turn-taking, communication, and language. For purposes of this work and technology development, the only difference is the "play environment" is a virtual environment where all the same social interaction and opportunities exist. PRT is widely considered a child-directed intervention, in that the child makes choices during the play that are then directed in the group therapy environment. Minecraft™ places the child into a setting in which that the child can interact with the environment and other players, practicing actions (Junco, 2014).

Social Learning Theory

Adult caregivers play an important role as primary intervention agents who also monitor progress towards goals. The Minecraft™ virtual reality intervention relies heavily on behavioral theory and pivotal response training for guiding outcomes, but because social interaction is so vital to the identified virtual reality intervention, Social Learning Theory is also utilized as a core theory in the development of this virtual reality intervention.

Social Learning Theory is often seen in interventions that focus on behavioral outcomes and shifts in human behavior. Social Learning Theory (SLT) notes that learning is part of the human cognitive processes and occurs within social context of being around others. The theory indicates

that learning is influenced by three specific elements which are environment, behavior, and cognition (Bandura, 1971).

Within the context of SLT, the process by which an individual learns includes activities where the individual must role model exhibiting behavior, the individual must be capable of understanding and have internal cognition of the task being asked, and the individual must ultimately perform the activity. Throughout this learning process the individual's behavior is reinforced by positive or negative consequences provided by the environment.

Most frequently, social learning theory activities occur in the context of social skills group interventions for children and adolescents. This form of intervention is very popular in supporting the needs of children who are on the autism spectrum. The purpose of social skills groups is to practice learned social behaviors in a facilitated environment. The social skills group intervention incorporates imitation, observing, and modeling into the group activities which are parts of SLT. One of the core components of social skills group interventions is that participants engage in cooperative activities during the group which facilitates the growth of newly learned social behaviors by all members (Kasari, 2016). The research will explore how social skills groups hosted in clinics are extending into the client's community through the online environment of Minecraft™, and thus, broadening the opportunity for social learning to occur in between live face-to-face group interventions. Offering participants, the opportunity to practice and enhance their newly learned skills through virtual interactions guided by a clinician.

Activity Theory in Human- Computer Interaction (HCI)

It is important to consider the human focused theories of practice, and to evaluate and incorporate theories that look at the interactions between humans and the specific technology. Activity Theory in Human-Computer Interaction (HCI) is a general theoretical framework for the analysis of human and communal action within the world. Activity is defined as an interaction between the participant and the world. Participants have needs that are met through interactions with the world and there is a reciprocal effect that occurs between the person and the environment. Activity theory focuses on the notion that humans utilize activities to complete pre-determined goals, and that the activity is necessary for them to gain access to goal achievement (Moran, 2006). However, over time the theory developed into identifying tasks that lead to a goal and engaging the participant in activities that provide so much more than goal attainment. Understanding and designing technology in the context of purposeful, meaningful activities is now a central concern of HCI research and practice. Because humans are complex creatures, the process of activity theory understands that individuals have goals, motives, and actions, but they are different for each person, and the technology being used should be able to adapt to the individual participant in order to ensure successful outcomes (Kaptelinin & Nardi, 2006). By monitoring how individual participants in the Minecraft ™ intervention and world interact with each other and individually, and by ensuring the participant has some autonomous choice but guided by social interaction and natural reinforcers within the game, the activity theory in human interaction is evident.

The Theoretical Framework: Using Minecraft™

The combination of these theories was integral to determining the processes and steps to be used in the development of the Minecraft™ social emotional intervention. If this work were to only focus on the behavioral theory frames, the important interaction between human and computers would be left by the wayside. It is important that practitioners start to utilize interventions that focus on science convergence and the interdisciplinary collaborations to enhance activities and interventions for client use.

Process and Procedures Setting up Minecraft SEL Intervention

After the grounding theories for developing the tool were identified, the authors then spent time reviewing what specific games already exist that may be easily adapted to a VR platform and develop a social emotional intervention for use in practice. Minecraft™ was noted as a strong option for this work. Minecraft™ is a popular game that immerses the player in a virtual world in which they can be creative and interact with others. There are versions of the Minecraft™ game that can run on multiple platforms: personal computers, major game consoles, and many handheld devices. Depending on the platform and personal preference, play can be either solo or multiplayer. In multiplayer, the gamer is either playing local multiplayer (i.e. two people playing on the same game console) or playing online. The base software is extensible, allowing modding (incorporating software add-ons ("mods") that alter the game environment) for the player. Since the launch of this game in 2009, there have been reportedly more than 50 million copies sold worldwide (Ovide & Rusli, 2014). With its intense growth and use across the nation and worldwide, it started to gain much interest among the educational researchers. For this Minecraft™ social emotional intervention, the platform is on a single server manned by the therapist and only used for assigned clients of the social skills intervention.

Minecraft™ has gained popularity by teachers as a potential platform to enhance student engagement and motivation (Fan et al, 2022; Getting Smart, 2017; Hollett & Ehret, 2015; Junco, 2014). Results of a 2017 survey conducted by Microsoft Education and *Getting Smart Staff* of public educators utilizing Minecraft™ in the classroom, indicated that 90% of the teachers felt the game enhanced student problem-solving, creativity, critical thinking, and collaborative skills (Ellison et al., 2016; Getting Smart, 2017; Junco, 2014; Kersánszki et al., 2023; Other surveys conducted by Microsoft Education and Economist Intelligence Unit (EIU) in 2019, where more than 760 educators in 15 countries participated, indicated that 58 percent of educators mentioned immersive experiences that allow students to explore scenarios from the perspective of others, which showed strong promise for promoting social-emotional skills, particularly empathy were very valuable and needed. From the same survey 46 percent of educators surveyed favored tools that help collect and analyze data about students' emotional states.

Beyond the context of education, Microsoft Education decided to look at the need for current learners in the broader view as it relates to future employment and needed skills. In 2018, Microsoft Education brought together 70 thought leaders around the world, reviewed 150 pieces of existing research, and surveyed 2,000 teachers and 2,000 students across Canada, Singapore, the United Kingdom, and the United States to determine these needs. Results of this work identified 2 core themes as important skills to teach: social emotional skills and personalized

learning. The results noted that employers are placing a premium on social skills and emotional literacy with up to 40% of future jobs requiring explicit social emotional skills. With these recent surveys and research reviews, it is evident that one continued area of need in the practice of game-based interventions in context of clinical programming, is monitoring the effects of games on social-emotional and behavioral needs of participants. Teachers who frequently used Minecraft™ in the classroom were also looking for options to enhance the social-emotional learning of students. Minecraft has increasingly been used in education (Pusey & Pusey, 2015), and it is versatile enough to teach a variety of topics including renewable energy (Kersánszki et al., 2023), creativity (Fan et al., 2022), elementary education (Marín-Díaz et al., 2019), and math and science (Lane & Yi, 2017) or other common core standards (Magee, 2015). Minecraft is also useful in cooperative learning as it promotes collaboration in an environment that mimics the real world (Fan, et al., 2022).

In addition to the interest that educators have for the use of Minecraft™ as a tool for skill development, some researchers were also interested in the use of the game for specific populations such as children with Autism. In 2017, Zolyomi and Schmalz studied the effects of Minecraft™ on social skill development in the home and therapeutic environments for neurodiverse youth. The focus of this research was on the perceptions of therapists and parents on the use of Minecraft™ as a tool for teaching social skills to children with neurodiverse needs. Results of their study suggest that the intervention enriches the experiences and practices of social among neurodiverse children (Zolyomi & Schmalz, 2017) and this has applications in the real world.

The authors decided to focus on the existing three Minecraft™ SEL content packs within the VR space as a potential intervention for group social skills training in latency age children with high functioning Autism. These pre-developed social emotional Minecraft™ lesson plans and content packs were used to develop a virtual space that would allow and support this work within a secure server. This assisted the therapist and researcher to ensure only assigned students in the social skills group intervention were able to join the VR space during the slotted intervention time. Each of these lesson plans were also used to identify potential data collection parameters in order to monitor progress towards an increase in social emotional literacy and learning. Additional assessment processes and data collection practices for this intervention will be discussed later in this manuscript.

It is important to remember that in the field of behavioral sciences, technology is not the only piece to the therapeutic intervention. Technology is to be used as an adjunct to therapeutic services and not as a replacement. It has been noted that technology-based interventions can serve to be “clinician extenders” that support the client’s needs between therapy sessions and enhance the opportunity for the skills learned in the clinic environment to be used beyond the four walls of the clinician’s office (Bickel, Marsch, & Budney, 2013). Technology can assist in supporting prevention and promotion programming for clients, but it is not intended to be a stand-alone support for individuals seeking social-emotional and behavioral health (Webb, Joseph, Yardley, & Michie, 2010). It is important to note that this intervention, in order to be successful in teaching needed social-emotional skills, must include both the live interaction of a therapist and the use of the virtual reality world with opportunities for peer interaction.

Minecraft™ Social- Emotional Learning (SEL) Content Packets

To address the need in supports for socio-emotional development supports for autistic children and youth, in January 2020, Minecraft™ launched three Social- Emotional Learning (SEL) content packets to address this gap in services and research. These three SEL content packs currently available for free by Minecraft™ for use in community and educational practice, each of the SEL packs come with an overview and guided lesson plan for the group facilitator or teacher. The three SEL packs are entitled as follows: The Mindful Knight, Digital Citizenship, and Inspiration Island. The following paragraphs will briefly describe each of SEL packs and their purpose in developing social-emotional skills in children ages 8-15.

The Mindful Knight

The Mindful Knight, developed by Rebecca O'Connor, is an interactive world that introduces mindfulness, social awareness, and self-regulation through a series of exciting quests through a medieval world. This activity was produced by an interdisciplinary team of game designers, Microsoft Hackathon participants, and educators. The Mindful Knight introduces four mindfulness practices focused around self-awareness and management of emotions. A link to the lesson plan: https://education.minecraft.net/lessons/the-mindful-knight

Figure 1.

Figure 1. Mindful Knight Sample Screenshot

Digital Citizenship

The lesson called "Digital Citizenship" teaches participants how to become a responsible internet user. As they explore a Minecraft world, students will encounter areas that address issues like "griefing" (the purposeful interference with other people's play in multiplayer games), trolling, plagiarism, and respectful online conduct. The accompanying lesson plan includes a discussion guide and sample social contracts for your classroom: https://education.minecraft.net/lessons/digital-citizenship-2

Figure 2.

Figure 2. Digital Citizenship Sample Screenshot

Inspiration Island

Inspiration Island, developed by Minecraft Education, is a floating theme park designed to introduce students and educators to Creative Mode in Minecraft: Education Edition. The lesson plan covers self-awareness, communication, and self-expression. This world was created by the Minecraft game design team and is available on all versions of Minecraft. The accompanying lesson plan supports the clinician in implementing in practice: https://education.minecraft.net/lessons/inspiring-self-awareness

Figure 3.

Figure 3. Inspiration Island Sample Screenshot

Intervention and Research Protocol

The developers of the virtual Minecraft™ social emotional intervention decided to create a 14-week virtual social skills group intervention using the three identified SEL content packs. The intervention was administered by a licensed clinical social worker with extensive knowledge and training in working with neurodiverse populations. Participants included four children who were diagnosed with autism spectrum disorder (ASD) (Level 1), who ranged in age from 9-11. All

four participants were male, and for this pilot intervention the developers decided to not conduct a pilot with a mixed-sex sample. All four participants had participated in some type of therapeutic intervention in the past and were already habilitated to therapy interventions focusing on behavioral needs. The racial demographic makeup of these participants was as follows: one Asian American, two Caucasian, and one African American male.

The intervention is a 1-hour weekly group intervention that utilizes approximately 15 minutes for assessment purposes, and 45 minutes to conduct the intervention. The SEL content pacts are implemented per the instructions provided by Microsoft. Before each intervention week started, the group members complete a review of the scripted lesson plan, led by the trained therapist, for each of the SEL content packs. After direct instruction is provided on the content pack, each group participant is assessed to determine their comprehension of the content. Each of the three lessons or packets includes specific concepts that must be understood before engaging with the Minecraft™ activity. These concepts include social awareness, self-regulation, mindfulness, grieving, trolling, plagiarism, and respectful conduct, among others. The participants must meet a set 80% criterion for accuracy in understanding prerequisite concepts as described above before being placed in the virtual platform with peers.

The therapist provided support to the participants in each session by guiding the activities in the virtual worlds, supporting, and reinforcing positive approximations to the terminal behaviors, and gathering data on each participant based on their individualized needs and treatment goals and objectives. The trained therapist observed the participants during the session and gathered the individualized data using identified data sheets through and an event recording/rate data collection process. Data were gathered for each session and analyzed using a visual analysis of data across sessions. The results of the intervention and outcomes will be shared in a future article.

The first week of the 14-week intervention starts with a parent orientation and student and parent screening session. The baseline screenings include the SSIS-RS from both parent and child self-report. The SSIS-RS is completed at the beginning of the intervention, and during the final week of the intervention to track progress.

The next week of the 14-week intervention is the introduction to The Mindful Knight content for 4-weeks of the intervention. This was the initial curriculum chosen for implementation because it focused on skills of self-regulation and social awareness. This first week of the intervention the individualized observation data collection for participants began. This observational data was gathered throughout the intervention across all 14 weeks. The next 4-weeks focused on the Digital Citizenship curriculum and the participants learned about appropriate social conduct within the virtual world. Observations and data collection continued. The final 4-weeks of the 14-week intervention utilized the Inspiration Island curriculum to develop the participants skills in cooperation, critical thinking, and social interaction. At the end of this full intervention phase, the participants and caregivers complete a social validity rating scale. The participants complete the Child Intervention Rating Profile (CIRP) and the parents complete the Intervention Rating Profile (IRP). These assessments are used to determine what parts of the intervention were perceived as positive, and to support the researchers in enhancing and modifying the intervention in the future for enhanced success. The final week of the 14-week intervention is used to review

progress, discuss growth and continued needs, to review maintenance programming for each member, gather final social validity data from the participants, and provide a closure ceremony.

The Instruments

The instruments chosen were selected because they have been found to be valid and reliable, are widely used by therapists, and have been found to be useful through extensive experience of the principal investigator.

The Social Skills Improvement Systems Rating Scale (SSIS-RS)

The Social Skills Improvement Systems Rating Scale (SSIS-RS) was developed by Gresham and Elliot in 1990. The scale is designed to be used as a multi-rater instrument (students, teachers, and parents) and it assesses social skills among children 3-18. There are 46 items subdivided into seven subscales: the 7-item prosocial subscale; the 30-item problem behavior subscale, and the 7-item academic competence subscale. The scale was normed based on a representative sample according to the U.S. Bureau of the Census. The SSIS-RS has high reliability *(*median Cronbach's alpha = 0.96 (teacher), 0.96 (parent), and 0.94 (student) and high test-retest reliability within a three-month period for all subscales (median correlation = 0.83 (teacher), 0.86 (parent), and 0.79 (student). Additionally, interrater reliability was calculated for parents (median reliability coefficient, 0.55) and teachers (median reliability coefficient, 0.62). The validity and reliability of this scale has been assessed by other researchers and has been used to assess other scales (Merrell et al., 2001; Reynolds & Kamphaus, 2004; Walker, 1995).

The Children's Intervention Rating Profile (CIRP)

The Children's Intervention Rating Profile (CIRP) (Turco & Elliot; 1986a) was adapted from an earlier version, the Child Intervention Rating Profile (CIRP) (Witt & Martens; 1983). The CIRP is a 7-item instrument on a 5-point Likert scale (Strongly Disagree, 1, to Strongly Agree, 5). Three of the items are reversed. Maximum score is 35. A higher score indicates higher positive perception and acceptability of intervention. The Children's Intervention Rating Profile (CIRP) has been found to have good validity and reliability (Turco & Elliot; 1986a; 1986b).

The Intervention Rating Profile (IRP)

The Intervention Rating Profile (IRP) (Witt & Martens, 1983; Martens et al., 1985) is an instrument designed to assess the caregiver's perception of the intervention as useful/not useful in developing social skills among the participant children. The IRP utilized is a modified 11-item instrument on a 5-point Likert scale (Strongly Disagree, 1, to Strongly Agree, 5). The maximum possible score is 55 with a higher score indicating higher positive perception of the proposed intervention. Tarnowski & Simonian (1992) assessed the 20-item instrument and found it to have high internal consistency (0.89).

Notes on Data Collection

This intervention provides the clinician with both direct and indirect data collection practices. Indirect data collection involves sourcing and accessing existing data that were not originally collected by the researcher or practitioner directly through observations. Indirect data can include assessments, questionnaires, and surveys that are completed by the direct research participant or third-party supporters. Indirect data is a form of subjective data and is typically gathered through participant self- reported data. There are two forms of indirect data that will be gathered in this intervention. The first is a social skills survey that is completed by both the client and the caregiver. The social skills assessment is a standardized assessment of social skills that is gathered at baseline and post intervention. Specifically, the Social Skills Improvement System (SSIS-RS; Elliott & Gresham, 2013) is used as the external pre-post method of growth analysis of this Minecraft™ virtual reality intervention. The Social Skills Improvement System (SSIS-RS) Rating Scales enables targeted assessment of individuals and small groups to help evaluate social skills, problem behaviors, and academic competence. It takes about 10-25 minutes to complete the assessment. The scoring uses a standard score and percentile ranking system, and evaluate across behavior levels on a below average, average, above average rating scale. The assessment is appropriate for age range of 3 years to 18 years of age, and there is a parent and student rating option. The reading level of the student is a 2nd grade level, and parents is a 5th grade level for the SSIS-RS. The SSIS-RS parent and child is administered prior to beginning the Minecraft™ virtual reality social skills intervention and can be obtained during a parent and participant meet and greet to obtain consent for the intervention. The pre and post assessment across participants and parents will allow us to review the positive impact and affect that the Minecraft™ virtual reality social skills intervention had on student social skills. This pre and post assessment will also provide an understanding of skills learned during the Minecraft™ Social Emotional Group intervention based on baseline scores obtained through the SSIS- RS.

The second indirect assessment that can be used for this work, is a social validity measure that aims at gathering participant and caregivers' perceptions of the Minecraft™ virtual reality intervention. The Intervention Rating Profile (IRP) will be used to gather parent perceptions, and the Child Intervention Rating Profile (CIRP) will be used to gather the client perceptions. The IRP and CIRP are administered during the final week of the intervention during the closure ceremony. Social validity measures may help us to identify common features of procedures that are likely to be adopted and persist in a specific environment overtime by being deemed acceptable by the participant. This information will be used to alter future iterations of the intervention to be more accepted by the participants and caregivers.

In addition to the indirect data measures that will be gathered, the intervention will utilize direct data collection. Direct data is obtained when the researcher observes the participant in their natural setting perform the identified behavior. Direct data collection can also include knowledge-based assessments where there is a set criterion for the participant to pass before moving to the next level of the intervention. The criterion-based assessments are administered in the first week of each of the SEL content pack curriculum being reviewed. Once the participant passes the content-based assessment with a score of 80% or higher, they are allowed into the secure server and intervention. The 80% mastery is required because Minecraft is used to teach skills that the client needs to be able to implement in "real world"/"natural setting" with direct observation by the clinician/researcher. As a result, if this 80% benchmark is not met, it is

difficult to take the next step. The next phase of direct assessment occurs once the participant is in the virtual world.

The direct data collection for the Minecraft™ virtual reality social skills world involves obtaining data on the following data points: the frequency of curriculum/ intervention use; frequency of pro social skills observed (using manners, asking for assistance, positive group collaboration, peer to peer interactions in the virtual world, positive words spoken, reinforcing peers, positive conflict resolution skills, etc.); the time spent in the virtual intervention; and successful completion of the virtual group mission. This direct data is obtained by hosting the Minecraft™ virtual intervention at identified times so that a therapist and data recorder can also be present to collect the data and support pro-social behaviors in the virtual setting. This data can easily be displayed in a visual graph showing a visual analysis of progress being made across participants. A sample data collection sheet for the therapist/ researcher collecting this data can be found below noted as Table 1.

Table 1

Client Name	Curriculum Use in Session	Pro social skills observed	Time spent in intervention	Behaviors Needing redirection	Mission Completed Successfully? Y/ N
John Doe	*Used 5 out of 6 times offered* *8/10/2020* *8/13/2020* *8/16/2020* *8/19/2020* *8/21/2020*	• *Asked for help 5 times* • *Said 5 nice things to peers* • *Showed 2 opportunities to collaborate with peers* • *Conflict resolution skills used 1 time this session*	*30 out of 30 minutes the client was engaged in appropriate activity*	• *Client trolled 4 times* • *Client yelled at a peer for not building the world "correctly" 5 times*	*Yes*

Table 1. Sample direct data collection sheet for the Minecraft™ Social Skills Virtual Reality Intervention

The following table (Table 2) provides an overview of the 14-week Minecraft™ Social Skills Virtual Reality Intervention from week to week as a template for replication in clinical practice.

Table 2

Week 1	Assessment- 30 minutes	Activity- 30 minutes
Parent and Client orientation	• Parents complete the baseline SSIS-RS	Parents

• Discuss the purpose of the intervention • Gather baseline data on SSIS-RS from the parents and the client • Identify what the parents want from the intervention and what the clients want from the intervention • A brief overview of the content found in the Minecraft™ Social Skills Virtual Reality Intervention	• Clients complete the baseline SSIS-RS	• Getting to know their child through question and answer sessions • Working with parents to answer questions and concerns about the intervention • Sharing with the parents the intervention schedule Clients • "Getting to know you" activities for the clients and ice breakers • Gathering information about their interests and likes • Gathering information through game play about their social skill needs through live and virtual game play • Discussing client expectations and roles as well as sharing the intervention schedule
Week 2	Assessment- 15 minutes	Activity-45 minutes
Mindful Knight Curriculum	• After direct instruction about the Mindful Knight Curriculum is completed, assess the client content knowledge about the topic (must pass with 80% or higher) • If a client does not meet criteria, identify areas of need and send homework packet to address the deficit area	• Mindful Knight Curriculum introduced • Identify key terms and skills needed as pre-requisites • Play a game to build knowledge and skills • Send home parent letter about skill development and tips
Week 3	Assessment- 15 minutes	Activity- 45 minutes
Mindful Knight Curriculum	• Re-assess those clients who did not pass with 80% accuracy or higher • Once in the virtual world collect direct data on each client regarding	• Review Mindful Knight Curriculum • Review key terms • Start the virtual intervention

	their specific observable behaviors (this is a baseline for the direct data)	• Direct data collection happens for the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving as a form of direct feedback • Send home parent letter about skill development and tips
Week 4	Assessment -15 minutes- duration of the intervention	Activity- 45 minutes
Mindful Knight Curriculum	• Re-assess those clients who did not pass with 80% accuracy or higher (everyone should meet criteria by this point) • Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session)	• Review Mindful Knight Curriculum • Review key terms • Start the virtual intervention • Direct data collection lasts the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving the intervention as a form of direct feedback • Send home a parent letter about skill development and tips
Week 5	Assessment- duration of the intervention	Activity-45 minutes
Mindful Knight Curriculum	• Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session)	• Review Mindful Knight Curriculum • Review key terms • Start the virtual intervention • Direct data collection lasts the duration of the intervention • The therapist is in the virtual platform to

		address needs, reinforce, and prompt • Data is shared with the clients individually before leaving the intervention as a form of direct feedback • Send home a parent letter about skill development and tips
Week 6	Assessment- 15 minutes	Activity- 45 minutes
Digital Citizenship	• After direct instruction about the Digital Citizenship is completed, assess the client content knowledge about the topic (must pass with 80% or higher) • If a client does not meet criteria, identify areas of need and send homework packet to address the deficit area	• Digital Citizenship Curriculum introduced • Identify key terms and skills needed as pre-requisites • Play a game to build knowledge and skills • Send home parent letter about skill development and tips
Week 7	Assessment-15 minutes	Activity-45 minutes
Digital Citizenship	• Re-assess those clients who did not pass with 80% accuracy or higher • Once in the virtual world collect direct data on each client regarding their specific observable behaviors (this is a baseline for the direct data)	• Review Digital Citizenship Curriculum • Review key terms • Start the virtual intervention • Direct data collection happens for the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving as a form of direct feedback • Send home parent letter about skill development and tips
Week 8	Assessment-15 minutes to duration of the intervention	Activity-45 minutes
Digital Citizenship	• Re-assess those clients who did not pass with 80% accuracy or higher	• Review Digital Citizenship Curriculum • Review key terms

	(everyone should meet criteria by this point) • Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session)	• Start the virtual intervention • Direct data collection lasts the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving the intervention as a form of direct feedback • Send home a parent letter about skill development and tips
Week 9	Assessment- duration of the intervention	Activity- 45 minutes
Digital Citizenship	• Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session)	• Review Digital Citizenship Curriculum • Review key terms • Start the virtual intervention • Direct data collection lasts the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving the intervention as a form of direct feedback • Send home a parent letter about skill development and tips
Week 10	Assessment- 15 minutes	Activity- 45 minutes
Inspiration Island	• After direct instruction about the Inspiration Island Curriculum is completed, assess the client content knowledge about the topic (must pass with 80% or higher) • If a client does not meet criteria, identify areas of	• Inspiration Island Curriculum introduced • Identify key terms and skills needed as pre-requisites • Play a game to build knowledge and skills

	need and send homework packet to address the deficit area	• Send home parent letter about skill development and tips
Week 11	Assessment-15 minutes	Activity- 45 minutes
Inspiration Island	• Re-assess those clients who did not pass with 80% accuracy or higher • Once in the virtual world collect direct data on each client regarding their specific observable behaviors (this is a baseline for the direct data)	• Review Inspiration Island Curriculum • Review key terms • Start the virtual intervention • Direct data collection happens for the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving as a form of direct feedback • Send home parent letter about skill development and tips
Week 12	Assessment-15 minutes to the duration of the intervention	Activity- 45 minutes
Inspiration Island	• Re-assess those clients who did not pass with 80% accuracy or higher (everyone should meet criteria by this point) • Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session)	• Review Inspiration Island Curriculum • Review key terms • Start the virtual intervention • Direct data collection lasts the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving the intervention as a form of direct feedback • Send home a parent letter about skill development and tips
Week 13	Assessment- duration of the intervention	Activity-45 minutes

Inspiration Island	• Once in the virtual world collect direct data on each client regarding their specific observable behaviors (you will begin comparing weekly data in this session)	• Review Inspiration Island Curriculum • Review key terms • Start the virtual intervention • Direct data collection lasts the duration of the intervention • The therapist is in the virtual platform to address needs, reinforce, and prompt • Data is shared with the clients individually before leaving the intervention as a form of direct feedback • Send home a parent letter about skill development and tips
Week 14	Assessment-30 minutes	Activities- 30 minutes
Closure ceremony	• Parents complete a post SSIS-RS for review • Parents complete an Intervention Rating Profile about the intervention (social validity) • Clients complete a post SSIS-RS for review • Clients complete a Child Intervention Rating Profile (social validity)	• Graduation and closure ceremony where clients receive awards and review progress • Parents attend as social supporters • Games/ celebration/show parents the completed world and discuss what they learned • Extension activities as well as maintenance activities provided to the parents and the clients

*** If students want to continue in the intervention beyond 14 weeks (and they have made sufficient progress) they should be trained as client "leaders" and assist in facilitating and running the intervention for the future cohorts.

Table 2. The 14-week Minecraft™ Social Skills Virtual Reality Intervention Schedule- Complete curriculum available

Future Outcomes

The researchers believe that a new generation of highly integrative, deeply personalized EMIs is possible if certain advances in technology can be incorporated into already existing behavioral interventions. This Minecraft™ virtual reality social skills intervention can be the first of many

interventions to address the needs of children with neurodiversity. Much work is needed to advance this research in the future such as evaluating comparison data of VR supported intervention and face-to-face interventions; identifying ways in which the technology can utilize predictive analytics to support the client within the intervention based on client responses; and more supportive technology to gather specific target data without the need for a live data collector within the intervention.

This proposed example of how a virtual reality intervention can be developed by incorporating Minecraft™ and social skills group interventions for children on the Autism Spectrum is just the tip of the iceberg. Because this work is so novel, and given the paucity of evidence for effectiveness, more research is necessary to evaluate the outcomes of EMI and virtual reality interventions in comparison to the typically used face-to-face behavioral interventions often used in social behavioral practices.

Currently the use of VR and EMI used in this social-emotional Minecraft™ intervention consists of passive detection derived from a live therapist in the Minecraft™ world with the participants. As work continues and VR practices in social behavioral sciences progress, EMIs of the future might require a “live” support watching and responding.

Additionally, predictive analytics and machine learning algorithms can be used to identify needs and personalize instruction so that interventions can be delivered in intelligent and responsive ways while still remaining evidence based. We propose future VR interventions and programming to be implemented and piloted with the identified population to determine the effectiveness in social skill-building and improvement in social functioning as well as skill generalization of clients identified with high functioning Autism. Future VR research should investigate the development of game-based apps characterized by dynamic feedback to the client which would enable them to be an active participant in managing their own care in addition to interacting with a therapeutic group leader.

References

American Psychiatric Association [APA]. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: Author.

Aquirre, R.T., McCoy, M.K., & Roan, M. (2017). Development guidelines from a study of suicide prevention mobile applications (apps). *Journal of Technology in Human Services, 31,* 269–293.

Bandura, A. (1971). *Social learning theory*. Englewood Cliffs, N.J.: Prentice Hall.

Bickel, W.K., Marsch, L.A., & Budney, A.J. (2013). Technology-delivered treatments for substance use disorders: Current status and future directions. In P. M. Miller (Ed.), *Interventions for Addiction: Comprehensive Addictive Behaviors and Disorders, Volume* 3 (pp. 275–285). Oxford, England: Elsevier Limited.

Botella, C., Quero, S., Baños, R. M., Perpiñá, C., García Palacios, A., & Riva, G. (2004). Virtual reality and psychotherapy. *Studies in health technology and informatics*, *99*, 37–54.

de Marchena, A.B., Eigsti, I.M., & Yerys, B.E. (2015). Brief report: Generalization weaknesses in verbally fluent children and adolescents with autism spectrum disorder. *Journal of Autism Developmental Disorders. 45*(10):3370-3376. Doi:10.1007/s10803-015-2478-6

Draper, S. (1993). Activity theory: The new direction for HCI? *International Journal of Man-Machine Studies 37*(6):812–821.

Dunlap, G. & Koegel, R.L. (1980). Motivating autistic children through stimulus variation. *Journal of Applied Behavior Analysis, 13*, 619–627. Doi:10.1901/jaba.1980.13-619. PMC 1308168. PMID 7204282.

Elliott, S.N. & Gresham, F.M. (2013). Social skills improvement system. In: Volkmar F.R. (eds) *Encyclopedia of Autism Spectrum Disorders.* New York, NY: Springer.

Ellison, T.L., Evans, N., & Pike, J. (2016). Minecraft, teachers, parents, and learning: What they need to know and understand. *School Community Journal, 26*(2), 25-43.

Elswick, S. (2017). Informatics in social work practice: Technology within the field. *New York, NY: Nova Science.*

Fan, Y., Lane, H. C., & Delialioğlu, Ö. (2022). Open-ended tasks promote creativity in Minecraft. *Educational Technology & Society, 25*(2), 105-116.

Gerardi, M., Cukor, J., Difede, J., Rizzo, A., & Rothbaum, B. O. (2010). Virtual reality exposure therapy for post-traumatic stress disorder and other anxiety disorders. *Current Psychiatry Reports, 12*, 298–305.

Getting Smart. (2017). How Minecraft supports social and emotional learning in K–12 Education. Posted on June 23, 2017. Retrieved on 7/8/2020: https://www.gettingsmart.com/2017/06/minecraft- social-emotional-learning-k-12-education/

Gresham, F.M., & Elliott, S.N. (1990). *Social skills rating system*. Minneapolis, MN: NCS Pearson.

Heron, K.E. & Smyth, J.M. (2010) Ecological momentary interventions: incorporating mobile technology into psychosocial and health behaviour treatments. *Behavioral Journal of Health Psychology, 15*(Pt 1), 1-39. doi: 10.1348/135910709X466063.

Hill, K., & Ferguson, S. (2014). Web 2.0 in social work macro practice: Ethical considerations and questions. *Journal of Social Work Values & Ethics, 11*(1), 2-11.

Hirschi, M, Hunter, A.L., Neely-Barnes, S.L., Malone, C.C., Meiman, J., & Delavega, E. (2022). COVID-19 and the rapid expansion of telehealth in social and behavioral health services. *Advances in Social Work 22*(1), 91-109.

Hoffman, H.G., Doctor, J.N., Patterson, D.R., Carrougher, G.J., & Furness, T.A. (2000). Virtual reality as an adjunctive pain control during burn wound care in adolescent patients. *Pain, 85*(1-2), 305-309.

Hollett, T., & Ehret, C. (2015). Bean's world: (Mine)crafting affective atmospheres for gameplay, learning, and care in a children's hospital. *New Media and Society, 17*, 1849 – 1866.

Jerald, J. (2015). *The VR book: Human-centered design for virtual reality*. ACM Books: Morgan & Claypool.

Junco, R. (2014, April 28). Beyond "screen time": What Minecraft teaches kids. *The Atlantic*. Retrieved from http://www.theatlantic.com/technology/archive/2014/04/beyond-screentime-what-a-good-game-like-minecraft-teaches-kids/361261/

Kaptelinin, V., & Nardi, B.A. (2006): *Acting with technology: Activity theory and interaction design.* Cambridge, MA: The MIT Press.

Kasari, C. (2016). Social development research in ID/DD (Ch. 5), Robert M. Hodapp, and Deborah J. Fidler (Eds.) *International Review of Research in Developmental Disabilities*, Vol. 50. Academic Press.

Kersánszki, T., Holik, I., & Márton, Z. (2023). Minecraft game as a new opportunity for teaching renewable energy topics. *International Journal of Engineering Pedagogy (iJEP), 13(5), 16–29.*Koegel, R.L., & Egel, A.L. (1979). Motivating autistic children. *Journal of Abnormal Psychology, 88*(4), 418–426.

Koegel, R.L., Koegel, L.K. (1990). Extended reductions in stereotypic behavior of students with autism through a self-management treatment package. *Journal of Applied Behavior Analysis 23 (1*), 119–127.

Koegel, R.L., Koegel, L.K. (2012). Treatment of pivotal areas (Pp. 13– 38) in R.L Koegel and L.K. Koegel *The PRT pocket guide: Pivotal Response treatment for autism spectrum disorders*. Baltimore, MD: Paul H. Brookes Publishing Co.

Lane, H. C., & Yi, S. (2017). Playing with virtual blocks: Minecraft as a learning environment for practice and research (pp. 145-156). In F. C. Blumberg, & P. J. Brooks (Eds.), *Cognitive Development in Digital Contexts*. Elsevier.

Magee, M. (2015, May 1). School district taps Minecraft game: World's most popular video game is a hit in schools. *The San Diego Union-Tribune*. Retrieved from http://www.sandiegouniontribune.com/news/education/sdut-Cajon-Valley-Schools-use-minecraft2015may01-story.html

Marín-Díaz, V., Morales-Díaz, M., & Reche-Urbano, E. (2019). Educational possibilities of video games in the primary education stage according to teachers in training. A case study. *Journal of New Approaches in Educational Research, 8*(1), 42-49.

Martens, B.K., Witt, J.C., Elliott, S.N., & Darveaux, D.X. (1985). Teacher judgments concerning the acceptability of school-based interventions. *Professional Psychology: Research and Practice, 16,* 191e198.

McLean, C. P., Steenkamp, M. M., Levy, H. C., & Litz, B. T. (2010). Posttraumatic stress disorder (pp. 45–68). In M. A. Cucciare & K. R. Weingardt (Eds.), *Using technology to support evidence-based behavioral health practices: A clinician's guide*. New York, NY: Routledge/Taylor & Francis Group.

Merrell, K.W., Streeter, A.L., Boelter, E.W., Caldarella, P., & Gentry, A. (2001). Validity of the home and community social behavior scales: Comparisons with five behavior-rating scales. *Psychology in the Schools, 38*(4), 313–325.

Moran, T. P. (2006): Activity: Analysis, design, and management. In: Bagnara, Sebastiano and Smith, Gillian Crampton (eds.) *Theories and practice in interaction design (human factors and ergonomics series*). Mahwah, NJ: Lawrence Erlbaum Associates.

National Science Foundation. (2020). Convergence Research at NSF. Retrieved from https://www.nsf.gov/od/oia/convergence/index.jsp

Naylor, M.R., Keefe, F.J., Brigidi, B., Naud, S., & Helzer, J.E. (2008). Therapeutic interactive voice response for chronic pain reduction and relapse prevention. *Pain*, *134*, 335–345.

Ovide, S., & Rusli, E.M. (2014, Sept. 15). Microsoft gets 'Minecraft'—not the founders. *Wall Street Journal*Retrieved from https://www.wsj.com/articles/microsoft-agrees-to-acquire-creator-of-minecraft-1410786190

Pusey, M., & Pusey, G. (2015). Using Minecraft in the science classroom. *International Journal of Innovation in Science and Mathematics Education, 23*(3), 22-34.

Reynolds, C.R., & Kamphaus, R.W. (2004). *Behavior assessment system for children* (2nd ed.). Circle Pines, MN: American Guidance Service.

Schreibman, L., Charlop, M.H., & Koegel, R.L. (1982). Teaching autistic children to use extra stimulus prompts. *Journal of Experimental Child Psychology, 33*, 475–491.

Shiffman, S., Stone, A.A., & Hufford, M.R. (2008). Ecological momentary assessment. *Annual Rev Clin Psychol, 4*,1-32.

Stokes, T.F., & Baer, D.M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10*(2), 349–367.

Tarnowski, K. J., & Simonian, S. J. (1992). Assessing treatment acceptance: the Abbreviated Acceptability Rating Profile. *Journal of Behavior Therapy and Experimental Psychiatry*, *23*(2), 101–106.

Turco, T.L., & Elliott, S.N. (1986a). Assessment of student acceptability ratings of teacher-initiated interventions for classroom misbehavior. *Journal of School Psychology, 24,* 277–283.

Turco, T.L., & Elliott, S.N. (1986b). Students' acceptability ratings of interventions for classroom misbehaviors: A study of well-behaving and misbehaving youth. *Journal of Psychoeducational Assessment, 4*, 281–289.

Walker, H.M. (1995). *The Walker-McConnell scale of social competence and school adjustment: Elementary version*. San Diego, CA: Singular Publishing Group.

Watkins, L., O'Reilly, M., Kuhn, M., Gevarter, C., Lancioni, G.E., Sigafoos, J., & Lang, R. (2015). A review of peer-mediated social interaction interventions for students with autism in inclusive settings. *Journal of Autism Dev Disorders 45,* 1070-1083.

Webb, T. L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of Medical Internet Research,* 12, e4.

Witt, J.C., & Martens, B. (1983). Assessing the acceptability of behavioral interventions used in classrooms. *Psychology in the Schools, 20*, 510–517

Zeng, N., Pope, Z., Lee, J. E., & Gao, Z. (2018). Virtual reality exercise for anxiety and depression: A preliminary review of current research in an emerging field. *Journal of Clinical Medicine, 7*(3), 42.

Zolyomi, A. & Schmalz, M. (2017). *Mining for social skills: Minecraft in home and therapy for neurodiverse youth.* Proceedings of the 50th Hawaii International Conference on System Sciences. Retrieved from http://hdl.handle.net/10125/41569.

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Education by the Numbers

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Evidence shows that the correlation between educational attainment and employment is strongly positive. Educational attainment at or above high school completion significantly improves one's employment opportunities (U.S. Bureau of Labor Statistics (2023). Data indicates that postsecondary students with an earned postsecondary degree median earnings are higher compared to non-degreed postsecondary students (NCES, 2022).

Putnam (1981) defined a postsecondary student as a person who has completed or terminated their secondary education and for whom instruction is provided in postsecondary education. Postsecondary institutions may be grouped as universities or colleges offering programs leading to the bachelor or higher degree and/or first professional degree. Postsecondary also includes 2-year community/junior colleges and others leading to diplomas or certification.

Table 1
Postsecondary undergraduate enrollment in a degree-granting institution

Characteristics	N
Total Number of Students	15.5 million
Enrolled in 4-year institutions	10.8 million (70%)
Enrolled Full time	7.9 million (73%)
Enrolled Part time	2.9 million (27%)

Enrolled in 2-year institutions	4.7 million (30%)
Enrolled Full time	1.6 million (35%)
Enrolled Part time	3.0 million (65%)

Table 2
The racial/ethnicity distribution of undergraduate enrollment in degree-granting postsecondary institutions

Characteristics	N
White	52%
Hispanic	22%
Black or African American	13%
Asian	7%
Two or more races	4%
Native American/Alaska Native	1%
Pacific Islander	1%

References

National Center for Education Statistics. (2022). Employment and Unemployment Rates by Educational Attainment. *Condition of Education*. U.S. Department of Education, Institute of Education Sciences. Retrieved on November 22, 2023 from *https://nces.ed.gov/programs/coe/indicator/cbc*.

Putnam, John, F. (1981). Postsecondary student terminology: A handbook of terms and definitions for describing students in postsecondary education. National Center for Education Statistics; Eric Number: ED215656, page 3.

U.S. Bureau of Labor Statistics (2023). Employment status of the civilian noninstitutional population 25 years and over by educational attainment, seasonally adjusted. Retrieved on November 22, 2023, from https://bls.gov/cps/demographics.htm#education

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Education: Words and Meanings

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This first publication for the column, Education: Words and Meanings, describes the use and misuse of common research terms and words. These words are often used incorrectly and interchangeably, leading to confusion and misunderstanding, when accuracy and clarity are needed.

Data

Researchers collect *data* (the plural form of the singular *datum*). This means, data reflect, represent or demonstrate; *datum*, admittedly rarely used, is the singular form: one datum, many data.

Analysis and Analyses

Analysis is singular; *analyses* is plural. The *analysis* used chi square. The *analyses* used t-tests and ANOVA.

Rationalistic and Narrative

Data may be *rationalistic* or *narrative*. Rationalistic data generally describe research using numbers to indicate participants' choices. This could, for example, be a Likert scale allowing participants to select a number from 1 through 5 to describe their choice on a scale. In order to analyze rationalistic data, researchers use quantitative methods. Quantitative analyses include t-tests, chi squares or an analysis of Variance (ANOVA). The data is rationalistic; the analysis is quantitative.

In contrast, *narrative* data generally refer to words, written or spoken. Researchers collect narrative data when they write observations in field notes, use participants' survey comments, examine existing text (often referred to as available data) such as diaries, newspapers, government documents or interview transcripts. After reading the narratives, researchers look for common themes and trends. The data are narrative; the analysis is qualitative.

Primary and **Secondary** Data

Primary refer to rationalistic or narrative data that you, as the researcher, collect. These original data are generated from surveys, interviews or observations (field notes). The researcher decides the type of data (rationalistic/narrative/mixed), identifies an instrument for collection (survey, interview, field observation), determines a method for analysis (quantitative/qualitative) and finally, interprets, summarizes and draws conclusions.

Secondary data refer to those articles, books and documents already published. Prior to conducting their own study, researchers examine the existing literature, referred to as a "Review of the Literature." Related questions may be, "What are other authors/researchers discussing in a particular area?" "What other studies support or diminish particular claims?" "What are areas of deficit?" "What other authors indicate prominence in this particular area of interest?"

Important note: If you are using content analysis on available sources (narratives, diaries, television programs, teacher comments), then those are primary sources, not secondary.

For example, suppose you have a number of 4th, 5th and 6th grade teachers' comments using words such as "good," "fine," etc. If you say, in your article, "Many teachers use comments such as 'good' and 'fine' on homework evaluations," then you are using those comments as secondary sources. If, however, you take comments such as "good" and "fine" and you run a chi square of words versus gender (male/female), or you run an ANOVA of words versus grade level, then you are doing content analysis, and the comments are primary sources.

In reviewing the existing literature, it is critical that credit is afforded by providing accurate references. Different journals require different styles to reference existing literature (APA, MLA, *Harvard Blue Book*, etc.). The Review of Literature is integral to the research process, but since it is not new/primary data, it is referred to as secondary.

Avoid Redundancy

Redundant writing is annoying, unnecessarily increases the length of your article, complicates what you are saying, and makes your article harder to read.

Here are some common redundancies:
* *Added bonus*. All bonuses are added.
* *2 a.m. in the morning*. 2 a.m. is in the morning. And don't be tempted to say "2 (or two) in the morning." By the way, the word for these kinds of self-referential phrases is "pleonasm."

* *30th year anniversary*. Another good reason for studying Latin. "Anniversary" comes from the Latin word "annum," which means "year." So 30th year anniversary is redundant. "30th anniversary" is the correct form.

* *ATM machine*. The M already stands for "Machine." You get money from an ATM, not from an ATM machine.

* *Completely destroyed*. If it is "destroyed" it is "complete." Be careful with these kinds of intensifiers.

* *Ultimate goal.* Again, knowledge of Latin comes into play. The word "ultimate" means "final" or "last." You can't have a goal in the middle of something; the "goal" is always "final."

* *The children worked with their own hands.* It is impossible for someone to work with someone else's hands. Similar to "I saw it with my own eyes," and "I walked on my own two feet."

* *Frozen ice*. Ice is already frozen water.

* *Suffocated to death*. If they suffocated, they died. They *suffocated*. Period.

* You cannot *center around* anything. The center is the exceedingly small single point in the middle, so you can only *center on*.

* You can only *hold* something tangible, so you cannot *hold* a meeting or *hold* a class or *hold* a funeral. But you can *hold* a book or *hold* a pencil; or *have* a meeting or *conduct* a class.

Causation / Correlation

Causation has a very specific meaning, and unless some very specific protocols are followed, is extremely difficult to prove causation (all of these intensifiers and redundancies are intentionally used to emphasize the point about causation).

Very briefly, in order to show causation, you must (yes, must. You absolutely must) start with at least two randomly assigned groups that you "measure" at Time 1. At Time 2 you apply the test variable (treatment), eliminating all extraneous variables, to Group 1. At Time 3 you again measure the two groups. If (and only if) there is a statistically significant difference between the two groups can you even begin to consider making a claim of causation.

Correlation, which is also important, means simply that there is some kind of relationship between two groups. And as we like to say, "Correlation is not causation."

In order to show correlation, you can simply show there is some kind of connection (usually time) between two groups.

Here is a simple but fun example of perfect correlation but zero causation: every year at your school, students show up in mid- to late-summer. And every year, without fail, 100% of the

time, the weather starts to change about two months later. Do you really think the students arriving at school caused the weather to change? Of course not! Yet although the correlation is a perfect 1.0 (it happens every year), the causation is a perfect 0.0 (no direct causation).

Parallel Construction

Parallel construction is such an easy way to improve your writing it has sometimes been called "instant style." Yet it is surprisingly easy to use.

Here's the idea: parallel construction uses the same grammatical structure across words, sentences or paragraphs.

Here's what not to do: The students like riding bicycles, going on hikes, and swimming." Notice how awkward that sounds. Now, let's make the elements parallel: "The students like to ride bikes, hike, and swim.

Here's a complex example from President John Kennedy's inaugural address in 1961. See if you can find the interlocking parallelisms, including examples of thesis and antithesis.

"We observe today not a victory of party but a celebration of freedom, symbolizing an end as well as a beginning, signifying renewal as well as change."

"Let every nation know, whether it wishes us well or ill, that we shall pay any price, bear any burden, meet any hardship, support any friend, oppose any foe, to assure the survival and the success of liberty."

"If a free society cannot help the many who are poor, it cannot save the few who are rich."

"And so, my fellow Americans, ask not what your country can do for you; ask what you can do for your country. My fellow citizens of the world, ask not what America will do for you, but what together we can do for the freedom of man."

Note, many of these lines sound better when read aloud (as intended), rather than read silently. Try it and notice the difference. Or better yet, find the original on the Internet.

Finally, return to the discussion above of primary and secondary sources. In this article, the Kennedy quotes are secondary sources (we simply use them as examples). However, you could do a content analysis by taking them apart grammatically and comparing them to other Kennedy speeches (or other inaugural speeches), in which case they are primary sources.

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Pictures for Reflection
A Playground Mystery: What Happened?

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Photograph by Larry L. Burris

Is this simple metal frame supposed to be a landscaping border? Is this simple metal frame left over from one of the playground buildings? Is this simple metal frame lacking other important features? Did the playground managers make a mistake?

This simple metal frame on the playground is not a mistake; it is quite intentional in its form and function. What does it do?

When children play, this frame becomes a boat, table, mountain, car, plane or spaceship. Using their unbounded imagination, children transform, in their minds-eye, the metal frame into whatever is required in their dramatic play scenario.

For example, one day I observed children, ages five through eight, transforming the frame into the counter at a fast-food restaurant. Initially, two girls, six and eight years old, started playing "McDonalds."® They took turns as server and customer, ordering, cooking, and after paying, collecting their burgers and French fries. Within five minutes, a few other children joined this thematic play scenario by simply getting into the ordering line. As still other children joined, the two original players became the servers and cashiers, using mulch for the food as well as mulch for the money.

Aside from the two original players, children appeared randomly from across the playground. No one gave directions, no one made rules, and no child appeared confused as to the expectations in the role play. At one point, there were more than 10 children standing in line, ordering food and exchanging mulch money for mulch burgers.

The metal frame invited children's imagination and creativity. For example, while going down a traditional slide, children invent new functions such as sliding down on backs or with partners. Additionally, children may roll stones or toys down the chute. Children create different ways to explore sliding. Similarly, when using a swing, children begin to twist or jump. In other words, once children discover the single function of the equipment, they innovate other alternatives to experience. This is where the metal frame provides children with safe, numerous and creative alternative play events.

Finally, after running, climbing, and tunneling across the playground, children come to the metal framework which then serves as a quiet place to rest, reflect and observe other players.

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Page Turners: Books for Children

Carla K. Meyer[a], Michelle J. Sobolak[b], Patricia Crawford[c], Maria Genest[d], Katrina Bartow Jacobs[e]

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Blast Off! How Mary Sherman Morgan Fueled America into Space
Written by **Suzanne Slade**
Illustrated by **Sally Wern Comport**
Calkins Creek, 2022
ISBN 9781684372416

Engaging and detailed illustrations highlight the life of Mary Sherman Morgan in this notable biography. Slade's text makes the complex idea of inventing rocket fuel accessible to young readers. The compelling story of this hard-working female scientist includes moments of failure and insecurity, while Morgan continues to try to support the United States Space program in its early days of innovation. With time, readers witness the results of her efforts and brilliance with the successful launch of the first satellite into space. This informational text will invite readers into the age of space exploration and the ways in which women such as Morgan defied the odds to be a successful scientist. Ages 7-10.

Little Houses
Written by **Kevin Henkes**
Illustrated by **Laura Dronzek**
Greenwillow, 2022
ISBN 9780062965721

There's much to savor when a young girl visits the beach with her grandparents. Surrounded by the sights and sounds of the ocean, the girl discovers a never-ending treasure trove of unique and beautiful seashells. When Grandma says that the shells were little houses where creatures have lived, the girl takes extra care to treasure and respect these homes. Her mind fills with many questions of the shell's former inhabitants, which leads to bigger questions about the natural world. This lovely intergenerational tale celebrates the power of wonder, the beauty of nature, and the joy of engaging with loved ones. The poetic text and beautiful acrylic illustrations make for a story well told by a beloved author-illustrator team. Ages 4-8.

Memory Jars
Written and Illustrated by **Vera Brosgol**
Roaring Book Press, 2021
ISBN 9781250314871

After picking the tastiest blueberries with her Gran, Freda is faced with the reality that the blueberries will not last forever. Drawing on how her Gran makes delicious blueberry jam from the extra blueberries and warmed by the memories of her grandfather who used to eat the jam daily, Freda sets out to save all her favorite things and people in jars. She realizes that while she can look at her growing number of jars, her favorite things and people are missing from her life when they are tucked away. Caldecott Honoree, Vera Brosgol, charms readers with her colorful illustrations that expertly use white space to highlight the characters and story while readers learn along with Freda that some memories are best saved in our hearts and minds. Ages 4-8.

Once Upon A Book
Written by **Grace Lin and Kate Messner**
Illustrated by **Grace Lin**
Little, Brown and Company, 2023
ISBN 9780316541077

Like many young children when feeling bored, Alice wishes she could be someplace, anyplace else. In this whimsical tale, books take her to faraway places where she can experience the amazing world around her. Through the pages of the book, she engages with animals from faraway places as they invite her into their worlds. After traveling as far as into the clouds and to outer space, Alice longs for the familiarity and warmth of home where she is welcomed back by her mother and the smell of home cooking. Not only will the reader be enchanted with the faraway places that Alice visits through reading, but the illustrations also hold surprises and treasures to discover. Ages 4-8.

Salat in Secret
Written by **Jamilah Thompkins-Bigelow**
Illustrated by **Hatem Aly**
Random House, 2023
ISBN 9781984848093

Muhammad has just turned seven and with his new salat rug, he is now old enough to pray five times a day, like his father. The intricate blue and gold rug, elegantly depicted in Aly's illustrations, is the focal point for Salat's story about how to proudly engage in one's religious traditions. Salat is trying to work up the courage to ask his kind teacher, Mrs. Baker, for a quiet place to pray during the school day. The reader witnesses his nervousness and bravery as he navigates through this experience and finds his voice. Thompkins-Bigelow's text and Aly's illustrations complement each other beautifully and young readers will not only get a glimpse into the facets of this important prayer ritual in the Islamic faith but also see that we all share moments of uncertainty and fear around sharing our stories with others. This text provides educators and parents with a powerful tool to launch those discussions around family traditions and feelings of belonging. Ages 4-8.

The Year We Learned to Fly
Written by **Jacqueline Woodson**
Illustrated by **Rafael López**
Nancy Paulsen Books, 2022
ISBN 9780399545535

In this vibrant text, a brother-sister duo wonder what to do when they find themselves in challenging times. Their grandmother reminds them that no matter what they encounter– boredom, bad weather, misunderstandings, or even maltreatment– someone else has experienced it before. She encourages them to lift their arms, close their eyes, take a deep breath. . . and believe. Soon the children use their minds and imaginations to take them beyond their circumstances to a better place. Their grandmother's life-sustaining advice has been passed down from those who have gone before. Woodson and López offer readers a beautiful, culturally-sustaining companion text to their previous book, *The Day You Begin.* An author's note further links the book to Virginia Hamilton's treasured *The People Could Fly: American Black Folktales.* Ages 4-10.

Across the Tracks: Remembering Greenwood, Black Wall Street, and the Tulsa Race Massacre
Written by **Alverne Ball**
Illustrated by **Stacey Robinson**
Harry N. Abrams, 2021
ISBN- 9781419755170

Across the Tracks: Remembering Greenwood, Black Wall Street, and The Tulsa Race Massacre, is a must have for any American history teacher who works with students in middle or high school. The beautifully illustrated nonfiction graphic novel examines the rise, fall, and rebirth of Greenwood, Oklahoma otherwise known as Black Wall Street. While the author and illustrator do not shy from the horrific destruction of property and loss of life caused by the Tulsa Race Massacre, the text includes the rebirth of Greenwood, an often overlooked aspect of the tragedy. The focus of hope and rebirth provides an entry point for teachers to promote an understanding of the tragedy that focuses on the resiliency of the American people, specifically members of the Black community. The text also includes supplemental materials including a preface, timeline, and an historical essay that can also scaffold students' understanding of a complex and sensitive topic. Ages 12 and up.

Luminous: Living Things that Light Up the Night
Written and Illustrated by: **Julia Kuo**
Greystone Books, 2022
ISBN: 978-1-77164-888-2

What brings us light in the dark of night? This beautifully illustrated non-fiction book offers children a glimpse into the magical world of bioluminescent creatures. Starting with fireflies and moving from the depths of the ocean to the dark quiet of caves, this text provides both a basic narrative in larger lettering, while also providing interesting facts about specific animals, interwoven with breathtaking images on black paper. This book stands alone as a wonderful text

to share with children who are interested in the natural world, but also would provide an excellent introductory text for older students who are starting a unit on bioluminescence or other natural traits and wonders. The illustrations also feature a mother and child exploring the world together, bringing out the awe and amazement at what the world can show us when it grows dark outside. Ages 3-8.

My Brother is Away
Written by: **Sara Greenwood**
Illustrated by: **Luisa Uribe**
Penguin Random House Books, 2022
ISBN: 978-0-593-12716-2

This book opens with a picture of a young child sitting on the steps of her house; the text reads "My brother doesn't live here. He's far away." From this simple beginning the author and illustrator offer a realistic, at times painful, look at the impact a loved one's imprisonment can have on a family. Through the eyes of a young girl, the book focuses on feelings of shame, anger, forgiveness and love. The book also touches on the diverse ways that families can be impacted, and how comfort can be found in realizing one isn't alone in this situation. The author shares that the book draws on her own childhood and her brother's time in prison, bringing a real sense of gentle understanding to the complex topic. This book would be a wonderful way to help children understand the normal range of feelings that can go along with these situations, as well as build empathy and understanding within school communities. Ages 5-10.

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Updates

Thank you for your continued support of the International Journal of the Whole Child and our commitment to holistic learning and to the development of the whole child. We are excited to announce a new IJWC column titled “Education: Words and Meanings”. This new column will provide readers with clarification associated with terms and words used in educational practice and writing. Frequently, words may be used interchangeably when, in fact, the meanings are dissimilar. In other instances, terms may not be as familiar with readers and require further description in order to enhance understanding. Finally, this new column supports readers with additional references to extend their knowledge regarding concepts, practices, and theories. Words and terms represent meaning. It is important we, as educators, use the educational language with accuracy, intentionality, and as well with an understanding of a term’s origin.

The submission deadline for the Spring 2024 issue is February 28th and the Fall 2024 submission deadline is September 30th. The Spring 2024 will be published in May 2024 and the Fall 2024 issue will be published in December 2024. Thank you again for your continued support. We look forward to seeing you in Spring 2024.