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Cultivating Digital Citizens: Positive Technological Development and Children

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Abstract

This review article aims to introduce the Positive Technological Development (PTD) framework in the context of existing literature. The paper provides a theoretical explanation of how the PTD approach can be used in the teaching-learning process. The dimensions and components of the PTD framework are outlined. The paper discusses the multifaceted relationship between technological developments and educational environments and offers suggestions on how technology can be used most effectively to make individual and societal contributions. The PTD framework is presented as a rational approach to using technology to support positive development in children, promoting creativity, critical thinking and social engagement while reducing negative impacts. The study emphasizes the importance of integrating technology into educational settings to support positive development and improve learning outcomes and advocates for the thoughtful and developmentally appropriate design of digital experiences for children.

Keywords: Early childhood education, pozitive technological development, children.

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Introduction

Technology and digital media are revolutionizing our society today, becoming a big part of our entertainment, social life and now our classrooms. Both the US Department of Education (2017) and NAEYC (2012) have recognized that Educational technology is a rapidly growing field and can offer educators innovative ways to teach material and complement a child's learning using different skills. In 2017, the National Educational Technology Plan specifically stated that "technology can play a powerful role in transforming learning" (US Department of Education Office of Educational Technology). NAEYC has also reported that technology and digital media should be incorporated into the early learning curriculum because it is important to spark curiosity at this age and technology provides a creative outlet for children to explore different concepts (NAEYC, 2012). Educators should be aware that these tools can be effective in early childhood and early primary education and should be integrated into classrooms.

Technological development is associated with positive impacts on various aspects of society and the economy. Studies have shown that technological development positively affects production and economic growth (AL-Refai et al., 2016). Moreover, while technological innovation contributes significantly to regional economic development (Xiao et al., 2022), technology has positive impacts on employment policies and entrepreneurship, highlighting the broader positive effects of technological advances (Al-Saleh and Allen, 2019; Canbay, 2020).

Technology, which has an impact on every aspect of life, has also found an echo in the field of education. The relationship between technological development and educational environments is complex and multifaceted. Research shows that children are increasingly exposed to sophisticated technological environments, including video games, virtual spaces and social media (Freier & Kahn, 2023). This exposure affects children's learning experiences, social interactions and personal development (Demetriou & Nikiforidou, 2019). While there are generally positive views about the benefits of technology on children's intellectual, social and emotional development (Jabbar et al., 2019), there are also serious concerns about the potential risks associated with technology (Jabbar et al., 2019; Oktafia, 2020). Although the assumption that technology helps individuals improve their quality of life has been confirmed by many studies, the impact of new technologies and media on well-being and positive functioning is still somewhat controversial (Riva et al., 2012). For this reason, the design of technological environments for children today needs to take into account various aspects of child development, including embodied and social experiences (Freier, 2023). In this context, it has become a necessity to design educational environments to respond to the problems arising from new technologies (Costabile & Spears, 2012).

Using computers in the context of computer literacy involves a set of instrumental as well as epistemic competencies and confidence (Resnick, 1996). Stating that information technology is constantly changing over time, Resnick (1996) emphasized that there is no value in learning to use these tools, but rather technological competence is important. Similarly, Bers (2006) states that in a digital age where technology plays a role in many aspects of a child's life, it is necessary to have the competence and confidence to use computers, but using a computer is not an end in itself. It is equally important to develop character traits that will serve children to use technology safely to communicate and connect with others, and to provide opportunities for children to use computer skills and new ways of thinking to create a better world. Thus, he emphasizes that the goal is to promote positive development through the use of technology (Bers, 2006). Studies on the impact of technology on children's development have highlighted both positive and negative effects and emphasized the importance of guidance and appropriate approaches to technology use (Gottschalk, 2019; Lau et al., 2011; Ricci et al., 2022). Ravikumar (2022) stated that educators have some negative perceptions about the use of technology and digital media in their classrooms. However, he emphasizes that there are some ways in which we can address technology in a way that provides an alternative perspective, such as PTD. Therefore, as Bers et al. (2012) state, the Positive Technological Development (PTD) Framework functions as a theoretical framework that aims to provide positive behaviors that children can develop when they interact with digital learning technologies.

The PTD framework provides a rationale for using technology to support children's positive development (Bers, 2010). This approach emphasizes aligning technology-mediated behaviors with children's presence in appropriate developmental contexts (Vaala, 2012) and carefully considering the use of technology to avoid its potential negative effects (Sigdel, 2017), while promoting creativity, critical thinking, and connection among children (Dhanain & Kumar, 2023). Offering a systems approach to understanding the overall impact of technology on development, the PTD model (Chau & Bers, 2006) aims to guide the creation of developmentally appropriate digital experiences.

Purpose and Importance of the Study

The integration of technology into education is important to promote positive development and improve learning outcomes. The Positive Technological Development framework emphasizes the value of developing character traits and civic engagement in educational settings through the use of technology (Bers, 2010). Innovative educational technologies contribute to increasing intellectual potential and social development in children (Holbozarova Nasiba Holbozar kizi, 2024; Kambarova, 2021), create new learning environments that support constructivist experiences (Fallas, 2011) and promise a more rapid, comprehensive and internalized form of knowledge acquisition (Granados Maguiño et al., 2020). While information and communication technologies (ICTs) offer numerous advantages, their effective implementation requires teachers' understanding and optimal use of these tools to improve the quality of education (Luz Marina Gómez Gallardo & Julio César Macedo Buleje, 2014). In this context, it is important to present and disseminate this approach in the literature in order to improve the quality of educational environments, facilitate teaching processes, and present technology with a set of internalized skills for social development.

Theoretical Basis

As a theoretical approach, PTG emerged from the integration of constructivist theories about learning with technology (Bers, 2018). The term positive in both Positive Youth Development (PYD) and PTG refers to the goal of engaging a young person in a good, healthy, and productive developmental trajectory (i.e., self and directed development) (Bers, Strawhacker, & Vizner, 2018). Although PTG is a theory that explains positive behavior, it does not adopt an interventionist perspective or a design approach. PTG incorporates the design of educational processes and focuses on technologies as tools to promote change. Whereas PGG describes a naturally occurring phenomenon (i.e. positive development), PTG provides methods and tools to design experiences where positive development is more likely. The PTG framework asks “how can the learning experience and learning space be designed to support cognitive, personal, social and moral development? How can these designed experiences promote developmental milestones for healthy and productive psychosocial growth at every stage of growth?” (Bers, Strawhacker, & Vizner, 2018). Therefore (Bers, 2018), PTG refers to how to create environments that support positive behaviors using technology as the main goal of positive technological development.

From a theoretical perspective, PTG integrates ideas from the fields of computer-mediated communication, computer-supported collaborative learning, and constructivist learning with technology with research in applied developmental science and positive youth development. In short, PTG focuses on two interrelated core issues:

(1) The design and evaluation of technology-based psychoeducational programs and experiences that aim to assist in the positive use of technology,

(2) Using technology to learn new things, express oneself in creative ways, communicate, take care of oneself and others, and contribute to society while developing one's own sense of identity based on personal and moral values (Bers, 2010).

In this context, positive technological development is outlined by two main pillars. The first is the Constructivist Approach and the second is Positive Youth Development (PYD). These approaches are detailed below.

Constructivism

The understanding of learning based on children's experiences was based on the views of Pestalozzi, Montessori, Dewey and Piaget and developed as constructionism with Freire and Papert. Piaget's theory of cognitive development created a framework for understanding children's ways of thinking and learning at different developmental stages (Ackermann, 2001). Piaget's definition that children do not receive knowledge passively but rather play an active role in constructing knowledge (Piaget, 1964) has fundamentally affected education and the view of education. Dewey's concept of "learning by doing", which was strengthened by his view that "school should be life itself", has influenced educational approaches, models and programs. Vygotsky, one of the important theorists of the constructivist approach, emphasized that children construct knowledge through their experiences with adults and peers and cultural tools that provide them with scaffolding (Vygotsky, 1980).

Seymour Papert led children to learn by design through his work with Piaget and the LOGO program he developed to support children's mathematical skills (Ackermann, 2001). Papert took constructivism one step further by using the concept of constructivism as "constructing knowledge structures" (Bers, et al., 2012). While Piaget's theory emphasized that knowledge is constructed in our minds, Papert's theory drew particular attention to the ways in which such internal structures are supported by structures in the world, such as using computers. Papert also noted that people are more likely to build internal knowledge and develop technological fluency in a playful way by creating an external object to think about (Bers, Doyle-Lynch, & Chau, 2012).

According to Papert (1991), the key to learning is to express one's feelings and thoughts and share them with others. The expression of ideas takes place when they are transformed into concrete and shareable products (Ackermann, 2001; Papert, 1991). Contrary to Piaget, Papert (1994) sees knowledge not only as a commodity to be transferred, coded, stored and reapplied, but also as a personal experience to be constructed and emphasized that a good way to support knowledge construction in one's mind is to build things in one's mind (Bers et al. 2012).

Seymour Papert's (1980) constructivist approach built on Piaget's constructivism and emphasized the importance of creating concrete products in the learning process (Ackermann, 2001; Harel & Papert, 1991). Papert's view of constructivism focuses on "learning to learn" and the role of tools, media and context in knowledge construction (Ackermann, 2001; Papert, 1993). This approach advocates for student-centered, project-based learning environments where children interact with technology to create meaningful products (Rob & Rob, 2018; Stager, 2005). Although constructivism and constructionism share some similar features, they differ in their emphasis on designing things that are meaningful for children, addressing their real-life problems, and using technology (Alanazi, 2016; Rob & Rob, 2018). Both theories have influenced instructional design and problem-based learning approaches (Savery & Duffy, 1995).

Key components of the theory include the use of technology as a learning material, especially computers and programming languages such as LOGO, to structure knowledge (Folk, 1981; Stager, 2007). Papert advocated "microworlds", which represent specially designed environments that facilitate natural learning of complex topics (Folk, 1981). The theory promotes personalization, computational thinking, and democratization of access to creative tools (Wellner & Levin, 2023). Constructionism focuses on the art of learning, the importance of making things and interacting with artifacts to enhance self-directed learning (Ackermann, 2001). Its practical applications include LEGO-based activities and computer programming to enhance problem-solving skills and metacognitive development (Beisser & Gillespie, 2003).

The constructivist approach encourages children to create meaningful products using technology. This approach emphasizes the development of basic competencies that enable children to become productive individuals, rather than merely consumers of technology. However, according to the constructivist approach, children's use of technology and production through technology alone is not considered sufficient. Children's ability to create meaningful products and share them constitutes the strengths of this approach. Therefore, the constructivist approach focuses on children's collaborative production through technology and the development of positive behaviors by sharing their products with society. The Positive Technological Development PTD approach has also formed the basis for

many technology-supported education programs and applications based on the constructivist approach, as it supports children in developing positive behaviors while producing through technology. This approach has been used in many applications to create a framework for supporting the negative effects of technology in technology-supported educational activities for children in a positive direction. In particular, Bers (2012, 2020), who introduced this approach, used the PTG framework in his applications with children to develop their coding and computational thinking skills while also supporting the development of their positive behaviors.

Positive Youth Development (PYD)

PYG is an approach to adolescent development based on the strengths of individuals, which emerged as an alternative to the disability-oriented models prevalent in the 1990s (Burkhard et al., 2020; Peterson, 2004). PYD views young people as resources to be developed rather than problems to be managed and emphasizes highlighting their unique talents, strengths, and potential (Benson et al., 2007; Romer & Hansen, 2021). The approach is based on developmental systems theory and focuses on aligning youth resilience with developmental assets (Lerner et al., 2005). Key elements of FGD include promoting the six Cs (competence, confidence, connection, character, civic engagement, and caring), supporting youth voice and agency, and developing supportive contexts such as families, schools, and communities (Schusler et al., 2018; Zarrett and Lerner, 2008). FGD research has transformed understandings of child nature, child-society interactions, and moral development (Damon, 2004). This approach promotes a variety of educational and out-of-school programs that aim to help young people develop and reach their full potential (Romer & Hansen, 2021).

Positive Technological Development

The main purpose of PTD is to examine in detail the tasks expected of a child growing up in this technological age in terms of all aspects of development and to lead the development of rich technology-based programs that are most appropriate for children and to provide a model for the optimal evaluation of these programs. In today's digital age, the starting point of the computer literacy movement is to support society to live a more meaningful life to make the world a better place and to guide children in the positive use of technology. At this point, the most common misconceptions are “teaching children to use technology to accomplish specific tasks”, “designing projects that only make sense to them” or “helping them to program”. However, the Positive Technological Development approach creates meaning beyond these commonly attributed tasks, focusing on the multidimensional evaluation of environments to create meaningful interactions for children and society (Bers, 2006; 2010).

A natural extension of the computer literacy and technological fluency movements that have influenced the world of educational technology, the Positive Technological Development framework (PTD) is differentiated by adding psychosocial, social and ethical elements to the cognitive components. In the modern age, technology occupies a large part of a child's life. For this reason, although having the competence and confidence to use a computer is considered an essential skill for children, it is not sufficient on its own. The ultimate goal of technology is not only to teach children how to use computer technologies, but also to use technology safely to communicate and connect with others. Developing character traits that enable children to use technological innovations for these purposes is one of the primary goals of PTD. In addition, providing opportunities for children to build a better, meaningful and livable world by demonstrating their computer skills is also a fundamental principle of the approach (Bers, 2010).

In its most general definition, Positive Technological Development (PTD) involves the purposeful design and development of technology to support individuals' psychological well-being, development and individual strengths (Mirković et al., 2018; Riva et al., 2012). The goal of PTD is to create technology that promotes positive outcomes and empowers human potential (Calvo & Peters, 2014). PTD frameworks are designed to promote healthy development in technology-rich learning environments (Strawhacker & Bers, 2018). Positive technology and computing approaches provide basic design principles and guidelines for developing interventions that support individual strengths and psychological development (Mirković et al., 2018). Furthermore, the design of early childhood

makerspaces is guided by the PTD framework to facilitate positive technological development in educational settings (Bers et al., 2018).

Positive Technological Development (PTD) is a framework that explores how technology can support youth development and well-being beyond computer literacy (Bers, 2010). Emphasizing the use of technology to promote positive experiences, personal growth, and social connectedness (Botella et al., 2012; Riva, 2012), PTD synthesizes cognitive, psychosocial, social, and ethical components to guide the design and evaluation of technology-rich programs for youth (Bers, 2010; Chau & Bers, 2006). This approach aligns with the principles of Positive Psychology, which focuses on enhancing emotional quality, engagement and commitment through technology (Riva et al., 2012). Positive technologies, including serious games, are categorized according to their impact on hedonic, eudaimonic or social well-being (Argenton et al., 2014; Distéfano et al., 2015). The PTD framework provides a comprehensive model for understanding the impact of technology on youth development and guides the design of educational programs that use technology to promote positive outcomes (McKnight, 2013). Research shows that the PTD framework is used and effective in technology-supported education practices (Bers, 2001; 2006; 2008; 2010);Bers, Doyle-Lynch, & Chau, 2012; Bers, González-González, Armas-Torres 2019; Bers, Strawhacker, & Vizner, 2018; Pugnali, Sullivan, & Bers, 2017; Strawhacker & Bers, 2018).

Positive Technological Development Framework

Based on constructivism and Positive Youth Development, Positive Technological Development offers a holistic model that addresses the key elements of technology use. While the PYD approach offers a perspective that explains positive behaviors, it lacks an interventionist attitude and a design approach. Positive Technological Development basically emphasizes the concept of designing. However, technology comes to the forefront as a tool to promote change. This is where Positive Technological Development differs most from Positive Youth Development. While Positive Youth Development addresses positive development, that is, phenomena that occur spontaneously, Positive Technological Development aims to increase the likelihood of positive development by utilizing tools and methods to design experiences (Bers et al., 2018).

Positive Technological Development, which advocates the necessity of designing, implementing, and evaluating educational programs based on current technologies to increase learning experiences in children, sought answers to the following questions based on the Positive Youth Development approach (Bers, 2012):

- How can the learning experience and learning space be designed for children from a social, individual, moral and cognitive perspective?

- Given children's developmental milestones, how can all these designed experiences support healthy and productive psychosocial progress in children at each growth stage?

The six developmental assets (competence, connectedness, character, confidence, trust, interest and contribution to civil society) in the Positive Youth Development approach set the stage for the overall framework of Positive Technological Development. The key distinction here, however, is that Positive Technological Development focuses on the expression of positive behaviors, especially by leveraging and actively using technology. These positive behaviors consist of the six Cs: content creation, creativity, choice of conduct, communication, collaboration, and community building. These behavior descriptions are also the positive behaviors that technology supports (Bers, 2007). However, the PTD framework provides a method to support these positive behaviors through the use of new technologies in different contexts (Bers, González-González, & Armas-Torres, 2019). Table 1 shows the relationships between the 6 Cs of Positive Youth Development (PYD) and the behaviors identified by Positive Technological Development (PTD).

Table 1.
Relationships between PYD and PTD Concepts

PYD ***Individual*** **6 C's of *Assets***	**PTD** ***Technology-Mediated Behaviors (6C)***	**Definition of PTD Structure**
Competence	Content Creation	Creation of personally meaningful projects; young people as producers, not consumers; participatory online culture for young people to develop competences.
Confidence	Creativity	Supporting creative expression skills, sharing and reflection skills in order to promote self-efficacy in children.
Character	Choicesof Conduct	Children have limited play spaces and freedom to make their own choices, gain experience by taking some risks, experience the consequences of their choices and reflect on the process. These experiences include social norms and moral-ethical issues.
Connection	Contact	It represents connections between children and adults. These connections take shape in synchronous and asynchronous forms, through multimedia tools (text, audio, voice, audio, video, etc.). It is also based on the development of language and literacy skills.
Caring	Cooperation	It encourages children to interact with and respond to each other through defined shared tasks. These experiences, which emerge through social and technical support from both peers and adults, enable children to use technology to help others.
Contribution to Civil Society	Community Creation	It covers processes such as developing a sense of social responsibility, making visible the mechanisms of contribution to the public good, emphasizing the necessity of sharing responsibility, and children's participation in democratic processes.

According to the PTD framework, these elements are complex, interrelated and complementary in a dynamism that goes far beyond the conjugate definitions of PYD and PTD. A PTD model is presented, synthesizing six entities derived from PYD and six behaviors encompassing PTD. According to the PTD approach, our actions in daily life change who we are and who we are shapes our daily behavior choices. For this reason, there is a bidirectional relationship between the developmental assets identified within the scope of PDG and the technology-supported behaviors offered by the PTD framework (Bers et al., 2018).

The PTD theoretical model, which provides a framework to help understand how technology can be designed and used to promote positive behaviors and how these behaviors, in turn, can produce developmental assets, includes three components: individual outcomes, technology-mediated behaviors and practices. Figure 1 below shows how the Cs are interconnected and provides examples of how they can be implemented in a classroom setting (Bers, González-González, & Armas-Torres, 2019).

The first of the 6Cs in PTD is children's achievements/values/assets [competence, confidence, character, caring, connection, contribution and the other 6Cs are the skills that children need to develop [communication, collaboration, community building, content creation, creativity, choices of conduct]. According to Bers (2006; 2010; 2012) these outcomes are (see Figure 1):

Connection: Connection represents the capacity to build and maintain positive bonds and relationships through technology. Connection also encourages and supports collaboration between children in learning environments.

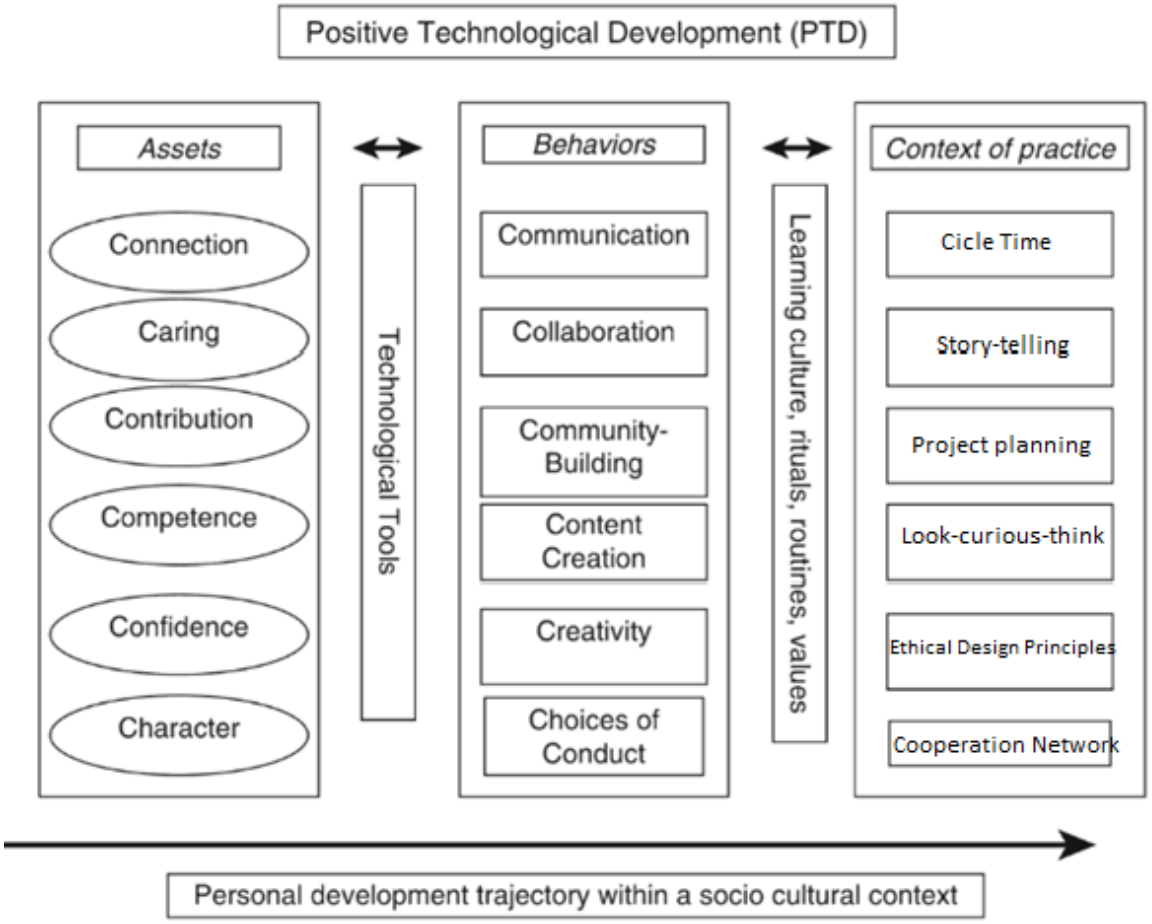

Figure 1. PTD Framework (Bers, 2010)

Caring: It means using technology with care and willingness to be responsive to the needs of others in the community. The basic idea of this approach is that people can communicate well through technology. For example, social media is one of the most important incentives for new ways of communicating.

Contribution: It is an orientation towards contributing to society by using technologies and developing new inventions to solve social problems. It prioritizes the contribution of technology to society building.

Competence: The creation of individually meaningful projects; children move from being mere consumers to producers.

Confidence: The development of self-efficacy through experiences that support children to express themselves in creative ways, share their ideas in a variety of ways and reason with the support of technology.

Character: In personality development, the process of choosing one's own behavior and facing the consequences of this choice plays an important role in shaping character. The sense of character functions as a compass for individuals along with a sense of responsibility during the use of technology. In modern life, especially in the digital world, it is important to be able to make behavioral choices. This is directly related to character.

The other part of the Positive Technological Development framework contributes to six individual behaviors highlighted as “communication, collaboration, content creation, community building, creativity and behavioral choices”. This section consists of various technology-based activities and behaviors that reinforce and bring these behaviors to light (Bers, 2012). Behaviors highlighted as 6Cs in PTG:

Content creation: The aim is to enable children to program computers and gain experience in working with sound, graphics, text, video and animation (Bers, 2012). In this way, children have the chance to be involved in Maker activities, programming computers and interacting with different materials. There is a strong relationship between children's competence and their ability to create content. In order to develop a sense of technological competence and skills in children, it is important to support their content creation skills. This content creation requires mastery of various computer applications for problem solving and debugging projects. According to DiGiacomo and Gutiérrez (2016), peer-supported content creation and play activities have a positive impact on young people due to the potential for "feedback in practice" that contributes to transformative learning.

Creativity: This skill represents the ability to transcend traditional ideas, rules, patterns, relationships or interpretations by creating and imagining original new ideas, forms or methods, and to integrate new technologies in the process. Many of the constructivist tools that support creativity also support content creation. Being able to use technology in creative ways also fosters the strong relationship between an individual's creativity skills and a sense of confidence. Creativity in PTD aims to move children from being passive users of technology and technological tools to engaging them in productive processes.

Choices of Conduct: Children's responsible use of technology has a significant impact on the development of a sense of character. The most important point is that the child has the opportunity to make behavioral choices, to evaluate possible outcomes in the face of "what if" situations, to have the freedom to choose, and thus to build their own moral compass (Bers, MU, Strawhacker, & Vizner, 2018).

Communication: It is the process of transforming thoughts, opinions or information through interactions using technologies. When mechanisms are formed in a form that supports communication, it is possible to envision ways of using technology to connect with others. Today, new technologically rich developments that encourage new ways of communicating are widespread. New developments in the technologically rich world encourage new ways of communicating. Bers, MU , Strawhacker, A. and Vizner, M. (2018)

Cooperation:. It is the chance to voluntarily cooperate with others on a common project. There is a strong reciprocal relationship between children's cooperative behavior and interest in learning environments. In order to collaborate, children need to consider each other's ideas and needs. The more children are encouraged to create and maintain positive bonds and relationships, the more their ability to collaborate improves. Many technologies that support collaboration in learning environments also provide opportunities for people to relate and communicate with each other.

Community building: Community building is an active stance and attitude towards using technology to support and improve the quality of the communication processes of the group and its individuals. There is a strong correlation between active participation in community-building activities and an orientation towards contributing to society by inventing and using new digital tools to solve problems they may encounter in the social environment. Community includes not only the child's interactions with peers, teachers and other staff at school, but also with stakeholders such as family and other members of society.

According to Chau (2014), technology is not a phenomenon in itself, but a construct that has its own environmental and ecological structure and includes a socio-cultural context. The third important part of Bers' PBL framework is the context of the practice. Here, context is directly related to the social parameters and specific characteristics of the environment in which technological interventions are deployed. The context in which the implementation takes place also includes enriching elements such as teacher guidance or peer collaboration, which are complementary elements of technological intervention. These elements can be supportive, but they can also lead to some inhibiting effects on the basis of context. From this point of view, Bers' framework emphasizes the design features of technology to promote the development of skills required by the digital age in children, while placing a strong emphasis on the context of technology use.

PTG is more than just a program or approach; it provides an important framework for planning technology-supported educational processes. It is seen as a framework that ensures technology-supported educational applications for children are developmentally appropriate and serve the purpose of helping children develop positive behaviors. Bers, Strawhacker and Vizner (2018) developed educational applications that build on the ideas of PTD's basic educational framework and interior design principles to develop the design principles of several successful makerspaces. Bers and Kazakoff (2013) examined technology within the PTG framework with a focus on its positive aspects and noted that this framework supports positive behaviors. In programs designed for children to support coding and computational thinking, it has been observed that, in addition to supporting these skills, the PTG framework is used to support positive behaviors (Bers, et all., 2023; Bers, et al., 2019; Elkin, et al., 2016; Metin, et al. 2024; Metin, 2022).

Conclusion

In the 21st century, with the acceleration of technological developments and their support for educational processes, there has been an increased emphasis on helping children develop positive behaviors. The skills highlighted by the PTG (Positive Technological Development) approach, such as creativity, collaboration, communication, content creation, behavior selection, and community building, are now considered essential competencies for all individuals in today's world. In Turkey, these skills are emphasized and supported, particularly in Early Childhood Education (ECE) and the Maarif Model. The concepts of content creation and community building, in particular, are among the fundamental pillars of new preschool education programs.

As a limitation, while the PTG framework primarily focuses on six skills, it can be supported by different skills to make technology-supported education processes more effective. At this point, teachers need to be supported and guided on how to reflect these skills in technology-supported education processes. In addition to the skills teachers are already familiar with, it is important to strengthen their abilities in areas such as behavior selection, community building, and content creation. In educational programs and applications developed in line with the PTG framework, the contributions of this approach must be clearly demonstrated.

Access to technology, teachers' proficiency with technology for teaching, and their capacity to adjust to many cultural contexts are all necessary for the successful application of the Positive Technological Development (PTG) strategy. Technology access issues, particularly in low-socioeconomic areas, can hinder children's development of PTG-based abilities including content production, community building, and creative expression. The depth and caliber of the learning experiences that PTG aims to provide can also be diminished by teachers' inexperience with digital tools. Furthermore, it's important to remember that cultural adaptation is necessary because different cultures may have different ideas about what collaboration, creativity, and content production entail and how important they are. Therefore, it is essential to support teachers through ongoing professional development programs, develop strategies to equalize access to technology, and take into account local values, language, and learning habits when implementing the PTG approach in various socio-cultural contexts.

In conclusion, the PTD framework offers a comprehensive approach to integrating technology into educational settings, aiming to support the holistic development of children. The framework emphasizes utilizing technology not only as a tool to develop cognitive skills, but also as a tool to promote emotional, social and ethical development. Promoting creativity, critical thinking and positive social interactions, PTD offers a balanced perspective on the role of technology in education, addressing both its potential benefits and inherent risks.

The theoretical insights presented in this study underscore the need for educators to take a proactive and thoughtful approach to designing and implementing technology-rich learning environments. Teachers play a crucial role in this process, as their attitudes and practices significantly influence the effectiveness of technology in supporting positive developmental outcomes. Furthermore, the PTD framework encourages the development of digital experiences that are aligned with children's developmental needs, ensuring that the use of technology is both meaningful and enriching. This

approach advocates a shift from viewing technology as merely an educational tool to recognizing it as a crucial element in shaping the future of learning and development.

Ultimately, the integration of the PTD framework into educational practices is intended to create environments that nurture and support children's ability to develop intellectually, emotionally and socially, and to use technology purposefully and productively, rather than as consumers of technology. As technology continues to evolve, it is imperative that educators, researchers and policy makers collaborate to refine and expand the PTD approach and ensure that the benefits of technological advances are fully utilized to promote the positive development of future generations.

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Ethics statement: In this study, we declare that the rules stated in the "Higher Education Institutions Scientific Research and Publication Ethics Directive" are complied with and that we do not take any of the actions based on "Actions Against Scientific Research and Publication Ethics". At the same time, we declare that there is no conflict of interest between the authors, which all authors contribute to the study, and that all the responsibility belongs to the article authors in case of all ethical violations.

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Data Availability Statement: Since this is a synthesis study, the data is from open source publications.

Conflict of Interest: There is no conflict of interest.

Generative Artificial Intelligence Statement: In this study, artificial intelligence (ChatGPT) was utilized for language editing and translation.

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