The Internet of Toys: Opportunities and Risks in Early Childhood Education: A Mixed Method Exploratory Study

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Abstract

The Internet of Toys (IoToys) is viewed as a subset of the Internet of Things (IoT) and is being marketed as smart toys connected to the Internet that is introduced to children as everday toys. Despite the prevalence of IoToys and its potential for use in education, there is a noticeable absence of studies that seek to understand female teachers' perceptions of integrating IoToys into early childhood education (ECE). The purpose of this exploratory mixed method study is to investigate ECE teachers' perceptions of using IoToys in teaching ECE students, through analyzing qualitative and quantitative data. In the qualitative phase of data collection, semi-structured interviews were used for (8) ECE female teachers to obtain their perceptions of using IoToys in ECE and to determine indicators for constructing the quantitative questionnaire. Quantitative data was collected through a questionnare of (100) ECE teachers; with the aim of supporting the qualitative results of the research. The results showed that qualitative and quantitative analyses were consistent in identifying the most important opportunities and risks of IoToys usage. The opportunities of IoToys use include active interaction and social communication, enhancing 21st century skills, personalized education, and IoToys as a flexible learning environment. The most burning risks identified were privacy and cybersecurity, addiction to and emotional attachment to IoToys, and failure of time management as well.

Keywords: *Internet of Toys, Internet of Things, Early Childhood, Mixed Methods, Exploratory Study.*

Introduction

The current era is witnessing unprecedented developments in toy industry. Toy manufacturers are increasingly integrating Artificial Intelligence (AI) functions into their products using mobile software and hardware (Hung, Tang & Kanev, 2017). The development of the toy industry and the possibility of connecting toys to the Internet and to other devices has led to the emergence of toys that can speak, communicate, and interact with the children who use them. Theses smart and Internet-connected toys are usually equipped with AI functions and features like sensing, facial recognition and sound detection. They also provide personalized and interactive playing and learning experiences (Berriman & Mascheroni, 2019; Chaudron, et al., 2019; Hung, et al., 2017). Smart and Internet-connected toys, which is also known as the Internet of Toys (IoToys), have transformed how children interact with toys, creating new forms of play that blur the boundaries between the physical and digital aspects of the toys (Berriman & Mascheroni, 2019). IoToys was shaped by the developments related to the Internet of Things (IoT) and wearable technologies that measure movement, and activity patterns (Holloway & Green, 2016).

Studies indicate that there is a dearth of research pertaining the use and role of IoToys in educational practices, despite the penetration of these toys into children's daily lives (Ihamäki & Heljakka, 2019; Holloway & Green, 2016; Ling, Yelland, Hatzigianni, & Dickson-Deane, 2021). Accordingly, this exploratory mixed study examines female teachers' perceptions of IoToys usage in ECE by analyzing qualitative and quantitative data. To address and achieve this goal, the following research questions were formulated:

What are the perceptions of ECE teachers towards the use of IoToys in teaching ECE students?

What are the axes or variables that were identified from the statements of the teachers participating in the interviews through which the quantitative scale is built?

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Do the quantitative data obtained from the scale in the second phase confirm the validity of the results of the qualitative interviews in the first phase?

Literature Review

The Internet of Toys

The development of the toys industry and the ability to connect them to the Internet and to other devices has led to the rise of a type of smart, interactive, and talking toys, in addition to programmable and controllable robots. These smart toys are connected to the Internet, and equipped with features and capabilities such as sensors, facial and speech recognition, and network connectivity (Holloway & Green, 2016; Ihamäki & Heljakka, 2018; Kewalramani, Palaiologou & Dardanou, 2020). Such toys are usually directed to children and can empower them with individualized and interactive playing and learning experiences (Mascheroni, & Holloway, 2017). These toys are designed to support children's playing and learning, their communication, and the development of their abilities and skills as well.

Holloway & Green (2016) defined IoToys as a type of smart toys connected to the Internet and other toys, which is usually equipped with sensors and can communicate with children individually. Berriman and Mascheroni (2019) indicated that IoToys has numerous characteristics and features, including the existence of sensors and their ability recognize sound and images, in addition to its connection to the Internet and providing personal and interactive playing opportunities and experiences. Furthermore, IoToys can be define as "a device consisting of a physical toy component that connects to one or more toy computing services to facilitate gameplay in the Cloud through networking and sensory technologies to enhance the functionality of a traditional toy" (Hung, et al., 2017, p.1). In general, the term IoToys may be used as a comprehensive and general term to refer to a wide range of hybrid and smart playing objects and devices that are wirelessly connected to other objects and devices (Ling, et al., 2021; Zaman, Mechelen & Bleumers, 2018).

Table (1). Shows A Set of Examples of the Iotoys That Can Be Used in ECE (Chaudron, Et Al., 2019; Ihamäki & Heljakka, 2018; Mcreynolds Et Al., 2017;).

Expressive image of the toy	Name of the toy	
	Wonder Workshop Dot and Dash Robot	1
	CogniToys Dino	2
	Ozobot 2.0 Bit	3
	Robotic Sphero Ball	4
	Beasts of Balance	5
	Fisher-Price Smart Toy Bear	6
	Barbie Girls MP3 Player	7
	Woobo Robot	8
	Furbies	9

	Tiggly World	10
	Oniri Islands	11
	EMO Robot toys	12
	Hello Barbie	13
	My Friend Cayla	14
	TROBO the story-telling Robot	15
	Jibo	16
	Hatchimal	17

IoToys provides a set of potential advantages, such as individualizing interactive media to match children's abilities, needs and characteristics, as this technology can analyze children's individual data and inputs and respond accordingly (Holloway & Green, 2016). IoToys also offer unique educational possibilities for learners, especially in informal educational settings, since learning through these toys usually take place at home. and in home environments; for example, using them at home for learning languages and acquiring skills such as communication skills. In this way, IoToys offers significant educational benefits and provides new possibilities for young learners.

IoToys offers unique opportunities for personalized playing and learning (Chaudron, et al., 2019; Mascheroni & Holloway, 2017). Similliraly, McReynolds et al. (2017) added that manufacturers of these toys emphasize in their marketing campaigns their educational and developmental benefits for children, in addition to their interactivity and dynamic content to attract the attention of parents and children as well. Besides, IoToys provide learners with flexible learning environments that blur the boundaries between formal and informal learning environments. IoToys enable students to acquire a range of future skills including programming and 3D design. IoToys usually use advanced sensor-based technologies to collect information from children and cloud-based platforms to process this information through real-time interactions. This means that IoToys offers new opportunities for using personalized content in playing and learning, providing rich, interactive and innovative learning experiences for ECE students (Ihamäki & Heljakka, 2018). One of the distinguished features of IoToys is their complexity. That is, they are built on complex software and hardware, without which their interactivity and multidimensional nature would not exist. It is this complex system of interaction that is available in tactile devices which separates IoToys from traditional analog learning resources, and mostly from the screen-based media that have dominated children's playing and technology for decades. This complexity requires adults to assist children with devices and for children to support each other (Arnott, Palaiogou & Gary, 2019).

Neverthless, there are some issues and problems that might be related to the use of IoToys such as privacy and security issues. Some studies suggest that IoToys increases the risks associated with children's privacy and security. Several advanced sensors and sensors embedded on IoToys, including location and motion sensors, touch sensors, cameras, and microphones, increase the security and privacy risks of data hacking (Chaudron, et al., 2019). The security problem associated with IoToys is that, unlike smartphones and other devices, IoToys devices are constantly on and connected to the network and disappear into the background until they are needed and used by the child. This constant connection to the network establishes a threat to privacy and introduces new capabilities and possibilities for these toys that have never been seen before in the toys field. While they may be similar in nature to other devices connected to the Internet, IoToys

represent a greater problem and risk because their user is usually a child, and children may be more exposed to dangers and threats on the Internet (McReynolds et al., 2017). Therefore, children's data privacy should be considered an integral part of the system design for IoToys. The challenge lies in the idea that IoToys can collect a large amount of voluntary and involuntary data that lacks privacy considerations.

Theoretical Framework

The implementation of IoToys is supported by several theories that explain ECE students' use of IoToys, including the Attachment Theory, which describes the nature of relationships between people and their need to develop emotional and social relationships. This attachment may be a secure attachment through which individuals can interact with others, or an insecure attachment through which individuals are characterized by anxiety, fear, and isolation when interacting with others (Bowlby, 1969). IoToys is one of the technologies that enhances children attachment to the toys; as the nature of these toys contributes to children's attachment to all components and elements of IoToys, whether the digital or physical of the toys, which can explain children's attachment to IoToys. Such an attachment may turn into an emotional attachment (Berriman & Mascheroni, 2019). One of the theories that explains the use of IoToys by ECE students is the Uses and Gratifications Theory. The basic premise of this theory is that individual seeks out media that fulfill their needs and desires and leeds to ultimate gratifications. Children's tendency to satisfy their needs related to playing or learning via the Internet of Toys greatly pushes them towards a deeper connection to these toys, which makes the child connected to the toy and attached to it.

The Self-Determination Theory also explains the use of IoToys by ECE students, as this theory suggests that humans have three basic psychological needs, namely autonomy, competence, and relatedness (Gagné & Deci, 2005). Acheiving such needs are facilitated by IoToys as it urges childrens' autonomy by giving them control over the toy. It also encourages competence by giving children a sense of mastery and efficacy in using IoToys. It supports relatedness by enablling children to build social and emotional relationships with the toy, and the child's sense of belonging to the group of toy users (Ryan & Deci, 2000). The Flow Theory is also one of the theories that explain children's use of the IoToys and their attachment to it. Given that, this theory cogitates flow as a psychological state describing the optimal feeling of people who are cognitively efficient, motivated, and happy and as it integrates motivation, personality, and subjective experience, IoToys, through its digital and physical tools, create a state of ecstasy and joy that motivates children towards connection and attachment to them.

Methodology

Approach

This research adapted the blended approach (mixed method), which is based on integrating qualitative and quantitative methods in theory and practice (Johnson & Onwuegbuzie, 2004), with the aim of revealing the perceptions of ECE teachers regarding the use of IoToys in teaching ECE students, through analyzing qualitative and quantitative data. The main reason for choosing the mixed research methods is that they enhance the strength of the research by integrating the quantitative and qualitative approaches together in the same study (Fetters & Molina-Azorin, 2017). They provide varied opinions on the research issue, which gives more valid, accurate, comprehensive and clear results (Teddlie & Tashakkori, 2011). The mixed-research method contributes to building a bridge between the qualitative and quantitative research methodologies to benefit from the strength of each, which is reflected in a deeper understanding of the phenomenon and a better interpretation of the outcomes (Creswell & Poth, 2018).

Design

Because of the novelty of IoToys (Peter et al., 2019), the lack of studies related to it and its use in ECE practices (Kewalramani et al., 2020), and the need to understand ECE teachers' perceptions of this promising technology in the educational field; the exploratory sequential design is consistent with current research trends that require identifying themes or variables by first collecting qualitative data and exploring the perceptions and opinions of the study participants. This stage is given priority and an important

dimension in identifying topics, themes, or variables. After the qualitative data is analyzed, the information obtained from that data is employed in the next stage of data collection, which is collecting quantitative data, through a quantitative measurement tool that suits the population of the study. This stage is given the minor element of research Creswell & Poth, 2018). Figure 1 illustrates the stages of this design.
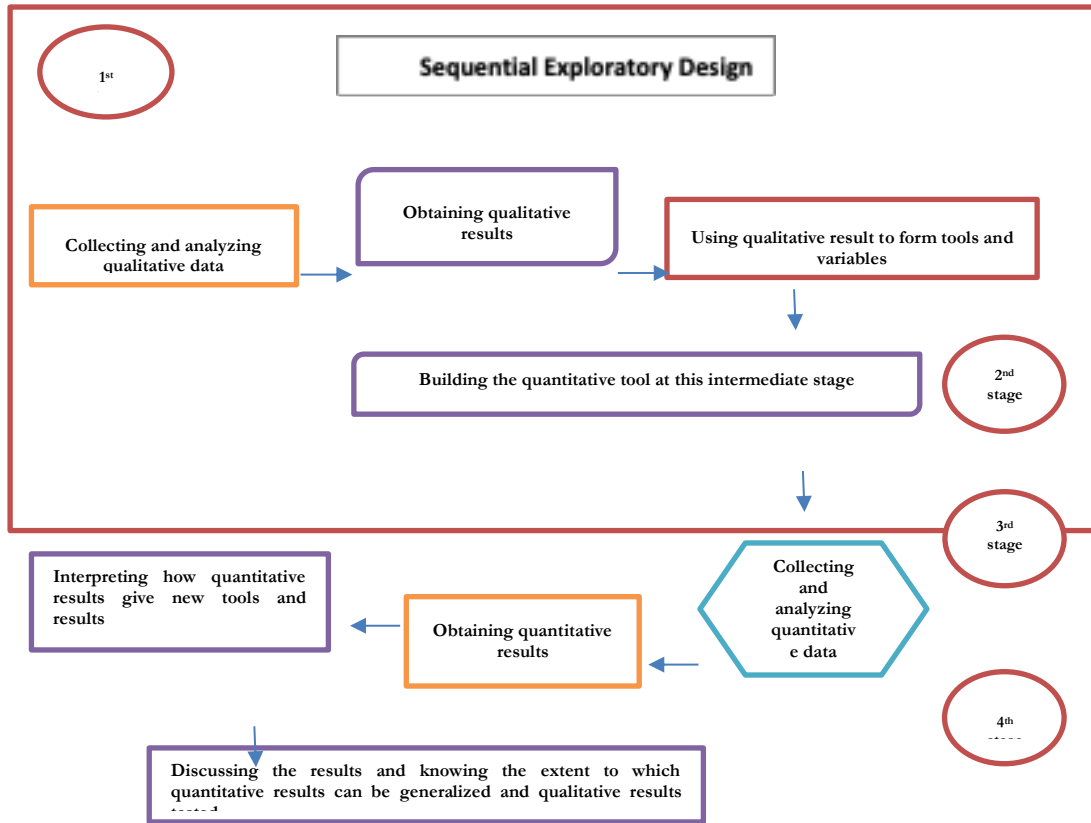

Figure 1. Stages of the Sequential Exploratory Design (Salehi & Golafshani, 2010)

To answer the first research question, the phenomenological approach was used in the qualitative method to provide basic data on the context of understanding ECE teachers' perceptions of the use of IoToys in teaching ECE students and identifying potential topics or variables that contribute to developing the axes and elements of the scale or survey, by estimating the multiple perspectives of the participants and achieving a deeper understanding of the phenomenon being studied (Creswell & Poth, 2018). Regarding answering the second research question, the survey approach was used in the quantitative method to generalize and confirm the qualitative results obtained based on a limited number of ECE teachers from the first stage on a larger sample whose numerical data was collected in the second stage (Fetters & Molina-Azorin, 2017). Then, the process of linking these two stages was carried out in the step of interpreting the results. Table 2 shows the stages of research design and the transition between qualitative and quantitative approaches.

Table 2. Stages of Design Included in the Research

S	Stages	Procedures	Results
1	Collecting Qualitative Data	- Building the qualitative research tool represented by the semi-structured interview. Determining the characteristics of the participants.	- Preparing the interview questions - Choosing the participants - The interviews content consisting of several sentences and statements

		- Implementing the semi-structured interviews with the participants.	
(1	Analyzing Qualitative Data	- Thematic analysis	- coding, topics, azes, variables
(2	Collecting Quantitative data	-Building the research tool - Implementing the experiment - Implementing research tool	- Obtainig the research tool - The IoToys - Quantitative data
(3	Analyzing Quantitative Data	- Frequencies, arithmetic means, and standard deviation.	- Figures measuring the opinions and perceptions of ECE teachers regarding the use of the IoToys in teaching ECE students
5	Merging Qualitative and Quantitative Interpretations	-Discussing and interpreting results	- Conclusion, recommendations, suggestions

Participants

The participants in this study represent the teachers of (39) ECE's schools in Jeddah Governorate. These are all the schools of ECE in the general directorate of education in Jeddah, in the year (2023/2024). The number of participants in the qualitative phase of the study was (8) female teachers, while the number of the participants in the quantitative phase was (100) female teachers, who were selected after collecting and analyzing the qualitative data.

Ethical Procedures

After obtaining approvals from the official authorities to which the participants in the research belong, a meeting was held with the participants to explain to them the importance of this research, its objectives, procedures and their roles. Their approvals were obtained to implement the research, and they were informed about their freedom to participate or withdraw at any time, and to choose the appropriate time to conduct the interview according to their free time. The participants were also informed about the confidentiality of all data and information. The symbol (T) was given to the teachers participating in the qualitative part of the study, where the first participant was symbolized by (T1) and the last female teacher was symbolized by (T8).

Tools

Qualitative Data Collection Tool (Semi-structured Interviews)

The semi-structured interviews seemed a logical first step to collect qualitative data and provide in-depth and detailed information about and understanding the phenomenon being studied (Johnson & Onwuegbuzie, 2004). This meant to explore participants' perceptions, ideas, and experiences in employing IoToys in ECE (Lin & Chang, 2020).

This, in fact, obtains the answer to the first research question related to monitoring the perceptions of ECE teachers regarding the opportunities and risks of using IoToys in teaching ECE students. By accessing these perceptions, it is possible to identify the variables and topics that contribute to building the quantitative tool, thus answering the second research question related to the axes and variables which are identified from the statements of the teachers participating in the interviews and through which the quantitative scale is built. Open-ended questions were used in the interviews conducted to provide an opportunity to provide a deep understanding and broad details of the experience of employing IoToys in teaching ECE students, by encouraging an open conversation with them (Salehi & Golafshani, 2010). The questions focused on the

following areas: How do you describe your experience in employing IoToys in teaching ECE students? What makes employing the IoToys useful in teaching ECE's students? Talk about the things you like about the Iotoys? What features have you noticed in employing the technology in teaching ECE students? Would you like to share your experience of using IoToys in teaching ECE students with your colleagues in your school or other schools? What makes using the IoToys a special experience for you in teaching ECE students? How do you feel when you use IoToys in teaching ECE's students? Have you faced any challenges/problems/obstacles in using IoToys in teaching ECE students?

The researcher did not just ask questions, but also urged and motivated the participants to speak freely and in more detail by giving examples related to the questions and re-posing the questions in different ways that contribute to continuing the conversation (Creswell & Poth, 2018).

Quantitative Data Collection Tool (Quantitative Scale)

The quantitative data collection tool aims to collect quantitative data through which the phenomenon can be generalized numerically (Fetters & Molina-Azorin, 2017), in contrast to the qualitative data collection tool, which seeks to provide a deeper understanding of the phenomenon (Teddlie & Tashakkori, 2011). Therefore, a quantitative scale was prepared to support the qualitative data obtained through semi-structured interviews with participating teachers as well as to assess their perceptions and experiences of employing the IoToys in teaching ECE students.

In addition, Google Forms tool was used to collect the responses of the participating teachers. The scale was organized into seven categories, each category containing a set of elements as follows: active interaction and social communication (3 elements), enhancing 21st century skills (3 elements), personalizing and individualizing learning (3 elements), flexible learning environment for children (3 elements), privacy and cybersecurity (4 elements), game addiction and emotional attachment to the game (3 elements), and time management failure (3 elements). The scale now includes (20) elements based on the five-point Likert scale, where participating teachers were asked to evaluate each element according to the values (strongly agree: 5 points, agree: 4 points, not sure: 3 points, disagree: 2 points, strongly disagree: 1 point). By using this tool, it is possible to answer the second research question, which states: What are the axes or variables that were identified from the statements of participating teachers in the interviews, through which the quantitative scale is built?

Procedures

Qualitative Procedure

As an initial step to begin the research implementation procedures, four faculty members specialized in educational technology and ECE were consulted to obtain their opinions on the research tool and its suitability for application. After considering their modifications and suggestions, which the researcher carefully followed, the tool was tested on a sample of the community consisting of 4 female ECE teachers, with the aim of testing the tool and evaluating its validity and applicability. Based on their comments, the questions were reviewed and rephrased. Once the applicability was confirmed, a meeting was held with the participating female teachers to clarify the importance of the research, its objectives and procedures. All female teachers expressed their desire to participate, and eight female ECE teachers working in several schools in Jeddah Governorate were selected to conduct interviews with them in coordination with the ECE department in the General Directorate of Education in Jeddah.

The interviews with participating teachers were conducted via Zoom platform after setting an interview schedule that included one interview per day over eight days, with interview time ranging from 30-45 minutes. The questions which were asked were formulated, and the participants' speech was fully recorded in audio, and notes were taken. Thematic analysis was then conducted by reading and reviewing the data derived from the participants' statements, creating codes, searching for patterns, building categories, and identifying themes within the qualitative data (Creswell & Poth, 2018) using Maxqda software.

Quantitative Procedure

The quantitative procedures of the research began after the completion of the qualitative procedures of the research and the identification of the axes and variables through which the quantitative scale is built. The scale was created according to the categories and elements reached from the qualitative analysis. Before starting to apply the scale, it was presented to a group of arbitrators specialized in educational technology and ECE to verify the validity and reliability of the scale, the appropriateness of the elements, the accuracy of their formulation, and the clarity of their phrases, as well as the relationship of the elements to the categories of the scale.

The arbitrators' agreement rates on each item of the scale were calculated using Lawshe's equation to calculate the Content Validity Ratio (CVR). The results showed that the arbitrators' agreement rates ranged between (90-100%), with an overall agreement rate of (96.2%). After this step, the scale was tested on a sample of (10) female teachers from outside the research sample, to discover the extent to which it can be applied to students. The experiment showed the availability of phrases that required rephrasing and some spelling and typing errors. All comments were dealt with, and the required modifications were made. To ensure the stability of the scale, Cronbach's alpha method was used, where it reached (Cronbach's $\alpha = 0.88$), which shows strong reliability in internal consistency. The stability of the scale was also confirmed using the re-application method, where the re-application stability coefficient for the card reached (0.82*), which is a statistically significant stability coefficient at a significance level of (0.05). This is followed by applying the scale to the research sample, which is (100) female ECE teachers.

Results and Their Discussion

Qualitative Results Related to The First Research Question and Their Analysis

What are the perceptions of the ECE teachers towards the use of IoToys in teaching ECE students? In order to answer this question, thematic analysis of the data extracted from semi-structured interviews with teachers was used based on a set of steps that began with reviewing, identifying and immersing the data that was collected, then reviewing the quotes for the participants' phrases, after that forming and writing the initial codes, next reviewing the codes and searching for recurring words and patterns, collecting similar codes and classifying them into categories, naming potential titles, identifying the main topics, and writing the final report (Creswell & Poth, 2018). These steps resulted in the creation of (130) codes that were classified into categories and organized into sub-headings that led to reaching two axes. The first axis was related to opportunities to use online games and included four topics that included: active interaction and social communication, enhancing the 21st century skills, personalizing and individualizing learning, and a flexible learning environment for children. The second axis was related to the risks of online games and included three sub-topics that included: privacy and cybersecurity, game addiction and emotional attachment to them, and failure of time management. Figure (2) shows the axes and sub-topics that were reached.
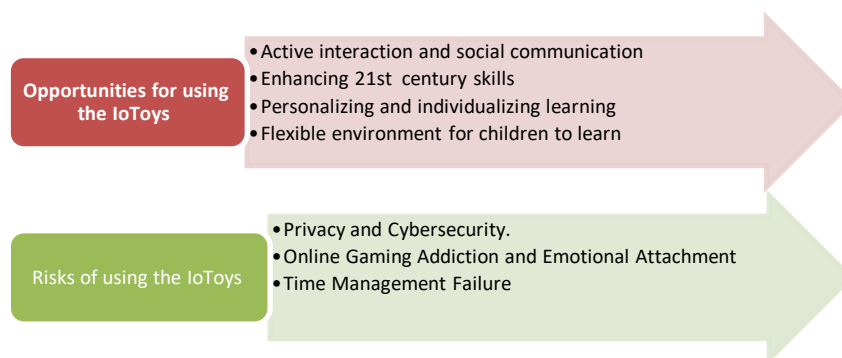

Figure 2. Results of the Thematic Analysis of Semi-Structured Interviews

These Topics will be Presented as Follows

Opportunities for Using the IoToys

Active Interaction and Social Communication

Several teachers indicated that the use of IoToys in teaching ECE's students contributed to increasing their interaction and activity. For example, one teacher stated that her students' use of IoToys increased their activity, interaction, positive participation and engagement in the learning process, as she said:

> *"As an ECE teacher, I noticed that my students' use of IoToys had a clear role in increasing their activity, interaction, and learning through the game while they were enjoying, happy and engaged in the game, and it also contributed to motivating them and engaging them with attention and focus" (T1).*

Similarly, another teacher explained that IoToys had a clear role in increasing interaction between students, saying:

> *"One of the many important points that made this technology attractive and distinctive for students is the increase in interaction among students... where students interact with each other with enthusiasm and happiness... you see them explaining and clarifying to each other the idea and topic of the lesson and the way the toy works, operates and is used" (T7).*

Some participants reported that the use of the IoToys had a clear impact on students' interaction and in sharing their experiences and skills, as one of them indicated:

> *"For me, the IoToys greatly enhanced children's interaction and their exchange of experiences and skills among themselves, and some of them were even able to teach their colleagues and transfer their experience and knowledge in using the game linked to the network and explain how to explain and teach it to their colleagues, as well as to their parents and older brothers and sisters" (T6).*

Another participant, in turn, hinted at another dimension, which is the role of IoToys in enhancing students' social skills, cooperation, and teamwork, saying:

> *"I found that the IoToys enhances children's social skills because it requires cooperation between children, teamwork, and interaction with others… and on top of that, their interaction with the toy itself… and perhaps the closest example of this is their use of the toy CogniToys Dino's – it is a toy that the child communicates with and responds to him/ her and responds to him/ her in a language that is appropriate for him/ her as a child" (T3).*

Another participant confirms the same idea by saying:

> *"The IoToys is useful in developing social and emotional aspects… The idea of its role in supporting the social aspect and communication between students is clear and expected… But the emotional aspect also had a role in enhancing it… And I will tell you how… In games related to the Internet, the child usually becomes attached to the game, which could be a doll, a teddy bear, a monkey, or any ordinary toy… and becomes very attached to it" (T5).*

Therefore, one of the main advantages of employing IoToys is that it can enhance students' interaction and social communication. Such as result is supported by the study by Berriman & Mascheroni (2019) and Danby, fleer, Davidson & Hatzigianni (2019), which showed the role of IoToys in enhancing activity rates among users. Thus, by employing IoToys, the learner becomes in a state of continuous activity and self-construction of knowledge, which is consistent with the philosophy of constructivist theory (Tsivitanidou & Ioannou, 2021). The results are aslo consistent with the studies that indicated that social interaction and communication skills are one of the skills that should be developed in children in ECE (Ngoc, 2021), and they are also consistent with the findings of the study by Mariati et al., (2022), which showed that this skill

is an essential skill since it affects the child's future life, especially with regard to his/ her social ability and his/ her ability to express his/ her ideas, opinions, and positions.

Promoting the 21st Century Skills

The 21st century skills are essential skills because these skills equip students for functioning in constantly changing society as lifelong learners (Brand-Gruwel, Kester. Kicken & Kirschner, 2014). Many participants indicated that the use of IoToys contributed to the development of learners' 21st century skills, such as critical and creative thinking skills, problem-solving skills and digital skills. One of the participants indicated to this by saying:

> *"My students' use of IoToys improved their abilities to think critically and creatively and solve problems... One of the good and positive things I observed from my students' use of IoToys is that it pushes them towards innovation and creativity. Children now present ideas that are out-of-the-box" (T1).*

Another participant confirmed the same idea by saying:

> *"IoToys enhances learners' higher-order thinking skills. One of the good things I personally noticed and witnessed from my students' use of IoToys is that it pushes students towards innovation and creativity" (T3).*

Another participant added that the use of the IoToys played a role in enhancing cooperative learning, self-learning, and problem-solving skills.

> *"The students' use of IoToys helped them employ learner-centered strategies such as cooperative learning, self-learning, and problem-solving strategies... These technologies also play a role in enhancing thinking skills, such as critical thinking and problem-solving... The fact is that children's abilities to solve problems and find solutions to the problems they face while playing and working with the toys are clear" (T6).*

A participant indicated that using IoToys enhances students' digital skills, as she says:

> *"There is no doubt that kids' use of IoToys enhances their digital abilities... kids today, as it is being said, are digital natives and they constantly use iPads and smartphones to play. One of the positives associated with their use of IoToys is clearly enhancing their digital abilities.. the use of IoToys makes programming and 3D design accessible to kids from early ages" (T8).*

Theses findings are consistent with what Fleer (2018) and Mariati et al. (2022) indicated that when IoToys is introduced into children's learning environment, they can help developing 21st century skills such as higher-order thinking skills, creativity and problem-solving skills. Moreover, these findings also in agreement with those obtained by Kewalramani, et al., (2020) which found that the integration of IoToys in ECE developed children's cognitive capacities including creativity, inquiry and design thinking.

Education Personalization and Individualization

Studies emphasize the importance of individualizing education and considering individual differences among learners. Personalized learning allows learners to pursue indiviaual learning goals at their own pace (Chen & Wang, 2021).

Another very important theme that emerged from the qualitative analysis was the personalization and individualization of education. Teachers believed that IoToys is a platform for personal and self-directed playing, as each student plays and learns based on his or her ability, potential, experience, background, and personal progress. This is consistent with Ihamäki & Heljakka (2019) study which confirms that IoToys provides personalized and indiviualised content. Some teachers confirm this, as one teacher confirms by saying:

"Learning and playing through this technology take place through an interactive dialogue between the child and the toy and allows content to be provided to each student individually. IoToys is based on considering individual differences between students" (T4).

For her part, one of the participants adds that one of the basic features of IoToys is considering individual differences between children, because this technology works and responds according to the individual inputs provided by each learner. One teacher says this:

"Individualizing interactive media that analyze and respond and reactto each child's individual input and data is what I see as making significant educational benefits… it is the greatest added value of our use of IoToys" (T3).

Similliraly, a teacher added:

"Individualizing educational processes and practices is at the heart of the fundamental changes that educational technologies in general and IoToys in particular offer, especially when it comes to young children, IoToys uses software that take into account the individual needs and abilities of the child… and their progress…" (T1).

Another teacher aslo explained:

"It gives them [children] opportunities to take control of their learning and playing… and supports children's independence when using the IoToys" (T6).

The above findings are consistent with the findings of the study of (Holloway & Green, 2016), which showed that individualizing educational content, by analyzing and responding to children's individual inputs, is the main significant educational benefit of IoToys. The findings are also in line with Gordon's (2014) indicating that the educational technologies such as IoToys should consider students' differnces, abilities and needs and adapt to them by "giving students a choice in the pace, place, and method or strategy of learning" (Gordon, 2014, p. 3).

Flexible Environment for Children's Learning

Flexible learning environment is an environment that enables learners to make choices, selct learning materilas and personalize their learning trajectory. It enables learners to have choices in terms of what, where, when, why and how they learn (Brand-Gruwel, et al., 2014; Hill, 2006). Based on the analyses of the semi-structured interviews, flexible learning environment of IoToys in this study included subtopics such as ease of use, diversity in resources, activities and content, availability and accessibility, and the connection between different learning environments including physical and digital learning environments, formal, and informal learning environments. Some of the teachers stated:

"The nature of IoToys contribute to providing a flexible environment for children to learn and play, with no separation between formal and informal learning environments and digital learning environments… electronic… and physical learning environments" (T2).

This is in line with the results of the study (Marsh, 2017), which indicates that IoToys allows for blurring the boundaries and features between physical and digital learning environments, as they are provided with digital and non-digital learning and play elements in a synchronous and seamless manner. A teacher stated:

"Using IoToys provides a flexible learning environment for students that considers individual differences between them...and makes the learning environment friendly and attractive for learning because its basic idea is a toy" (T6).

On the other hand, some teachers indicated that the flexibility of the environment provided by IoToys is represented in the diversity of sources, activities and content provided. Some teachers pointed to this idea by saying:

"Using IoToys allows me greater opportunities for diversity in the activities and content provided to my students…. a wide range of options was provided to them " (T5).

Risks of Using IoToys

Privacy and Cybersecurity

Privacy and cybersecurity are important issues in all practices related to technology, the Internet, and other technical platforms. The level of importance increases especially when it comes to children in ECE. The data analysis revealed that the awareness of the participating teachers of the issue of privacy and cybersecurity in children's dealings with the IoT and IoToys. One of the teachers explained:

"The child owns the toy… I mean the physical toy, the bear or the doll, and controls it, but the truth is that he/ she does not control or know what is done to his/ her data and personal information… The truth is that there is a certain implicit understanding that individuals do not read privacy policies that are used to clarify the preservation and use of users' personal data" (T4).

Another teacher emphasizes the issue of privacy and cybersecurity, as she says:

"But we must be aware that there is a frightening and disturbing aspect to the issue of toys being connected to the Internet… Through the entered data and the data that the child or his/ her guardian enters to activate the toy connected to the network, the child identity can be identified and his/ her location is spotted" (T6).

Another teacher also emphasizes the issue of privacy and cybersecurity, saying:

"Children's security on the Internet is threatened and they are highly vulnerable to hacking, being fooled, exploited and deceived… Neither we [the teachers] nor the parents know what data is collected from the child, how it is saved, and for what purpose..." (T1).

Addiction and Emotional Attachment to the Toy

The problem of children's addiction to electronic games and toys is one of the problems that has received great attention in the past few years due to the high rate of addiction to electronic games among children (Najmi et al., 2023). Electronic addiction in general is the preoccupation with digital technologies toys connected to the Internet and using them for ling time (Wang et al., 2015, such as an addition leads to social isolation (Al-Hosani, 2011).

A participant explained this by saying:

" IoToys is useful in developing social and emotional aspects ... The idea of its role in supporting the social aspect and communication between students is clear and expected ... But the emotional aspect also had a role in strengthening it .. And I will tell you how ... toys related to the Internet, kids are usually attached to the toy, which could be a doll, a bear, or any ordinary toy .. and he/ she becomes strongly attached to it" (T4).

Another participant explains the same thing by saying:

"In the technology of the IoToys, the same thing may happen as in traditional games such as dolls, puppets and teddy bears that children play with and become very emotionally attached to... This is something that is related to a high degree of attachment that may reach the level of addiction to the Internet or smart games connected to the Internet" (T5).

Failure of Time Management

Time management failure is one of the problems that a significant number of people suffer from. In this context, Murali & George (2007) and Mustafa, Rose & Ishak (2020) indicate that the weakness of time management processes among adolescents is represented by the replacement of virtual relationships with social relationships between family members, based on the fact that the presence of exciting elements through digital sources is lacking for the adolescent within his/ her social and real environment, escaping from the problems of real reality to virtual reality, the influence of peer groups, and being affected by conflicting cultures in the digital resources community.

Children's failure of time management is depicted by the child failing to manage and organize his/her time to accomplish other tasks and assignments. The teachers expressed this through the following comments:

> *"Children spend a lot of time using and playing with the Internet connected toys and they suffer to organize their lives because of their connection to the toys, which makes them not good at organizing their learning times.. Saddly kids' time is spent unwisely ...playing games, they fail in their studies because of their lack of organization of their time" (T3).*

Another teacher explained this by saying:

> *"I always see that some of the neglected children who neglect their duties and homework are more attached to online games and I communicated with many parents about this issue and urged them to help organize their children's time" (T2).*

Quantitative Results Related to the Second Research Question and their Analysis

What are the axes or variables that were identified from the statements of the participants in the interviews through which the quantitative scale is built? To answer this question, the results obtained from the qualitative phase of the research and related to the topics were used to build the quantitative scale for the second quantitative phase. The scale was applied to the research sample of (100) ECE's female teachers based on Google Forms. After that, the scale was collected, the data was processed, and the results were extracted and will be presented as follows:

Opportunities to the use of IoToys

Active Interaction and Social Communication

Through the teachers' responses, it was possible to analyze the averages and relative weights of the teachers' opinions regarding the opportunities to use the IoToys to support active interaction and social communication, as shown in the following Table (3):

Table 3. Frequencies And Relative Weights of Teachers' Opinions Regarding Active Interaction and Social Communication Through the Iotoys.

s	Items	Frequences					Relative weight	Order
		Strongly agree	Agree	Not	Disagre	Strongly disagree		
1	IoToys contributed to children's positive activity and interaction.	69	12	9	7	3	87.4%	1
2	IoToys enabled children to communicate actively with their peers and toys through constructive and positive conversations.	55	22	16	6	1	84.80%	2
3	IoToys had a clear role in developing children's abilities and skills in communication and building effective and positive relationships.	51	18	13	7	51	78.2%	3
	Average relative weights	**83.47%**						

As shown in Table (3), it is obvious that the total average of the axis shows the teachers' agreement on the role of IoToys in improving active interaction and social communication by (83.47%), where the ability of IoToys to improve positive interaction and activity came in first place from the teachers' point of view. This was followed by (84.40%) by the ability of Internet games to enable children to communicate effectively with their peers in positive interactive dialogues. The ability of Internet games came in third place by (78.2%) to develop children's abilities and skills to communicate and build effective positive relationships. This is consistent with studies that have shown the importance of social communication skills and the need to enhance them in children (Mariati et al., 2022; Ngoc, 2021). The current result is also consistent with the literature that has shown the role of IoToys in developing the ability to communicate and interact positively, especially with children in the early stages of life (Mascheroni & Holloway, 2019). There is no doubt that this result imposes a context related to the necessity of moving towards using IoToys institutionally in developing specific skills related to communication and active interaction.

Enhancing the 21st Century Skills

Through the teachers' responses, it was possible to analyze the averages and relative weights of their opinions regarding the opportunities to use IoToys in enhancing the 21st Century skills, as shown in the following Table (4):

Table 4. Frequencies and Relative Weights of Teachers' Opinions Regarding the Role of the Iotoys in Enhancing the 21st Century Skills.

s	Items	Frequences					Relative weight	Order
		Strongly agree	Agree	Not	Disagre	Strongly disagree		
1	Enhancing collaborative skills by IoToy.	65	19	4	8	4	86.6%	1
2	IoToys enhances thinking skills such as critical thinking, creativity, innovation and imagination.	4	12	11	22	51	85.2%	2
3	IoToys enhances several digital skills that children need.	53	29	8	3	7	85.13%	3
	Average relative weights	**85.13%**						

Table (4) focused on identifying the indicators of IoToys in improving the 21st century skills, and the teachers agreed on the ability of IoToys with a relative average weight (85.13%) to develop the 21st century skills. This summation was done through several items, the first of which was the item related to the ability of the IoToys to develop collaboration skills with a percentage of (86.6%). In second place came the item related to the ability of the IoToys to enhance thinking skills and the ability to imagine with a percentage of (85.2%). In third place came the ability of IoToys to improve children's technical skills with a percentage of (83.6%). The current result is consistent with what was shown by the study of Fleer (2018); Ihamäki & Heljakka (2019) and Mariati et al. (2022) which confirms that introducing IoToys into ECE environment helps developing higher-order thinking skills, creativity, imagination and problem-solving skills.

Personalization and Individualization of Education

Through the teachers' responses, it was possible to analyze the arithmetic means and relative weights of the teachers' opinions regarding the opportunities to use IoToys in relation to personalizing and individualizing education, as shown in the following Table (5):

Table 5. Frequencies And Relative Weights of The Teachers' Opinions Regarding the Role of Iotoys in Personalizing and Individualizing Education

s	Items	Frequences					Relative weight	Order
		Strongly agree	Agree	Not	Disagre	Strongly disagree		
1	IoToys contributes to providing rich educational content.	62	20	7	5	6	85.40	1
2	The IoToys deals with children personally and individually.	49	27	12	10	2	82.20	2
3	The IoToys provides children with content suitable for their cognitive style.	2	9	13	32	44	38.60	3
	Average relative weights	**68.73%**						

Table (5) shows the teachers' opinions regarding the ability of IoToys to personalize and individualize education. This axis received a relative average weight of (68.73%), which can be said to be a lower percentage than the average, due specifically to the teachers' objection to the fact that IoToys can provide children with content that suits their learning method and cognitive style, as the teachers' opinion on this statement was at an average of (38.60%), which is an average that expresses the teachers' legitimate concern regarding personalization according to the learning method or cognitive style. On the contrary, the teachers' opinion was positive and strong regarding other aspects of personalization, such as the ability of IoToys to provide rich educational content at a rate of (85.40%), and the ability of IoToys to deal with children personally at a rate of (82.20%). Accordingly, the current result is generally consistent with the study (Chaudron, et al., 2019; Ihamäki & Heljakka, 2019), which showed that IoToys provides opportunities to provide personalized and customized content for children.

Flexible Environment for Children's Learning

Through the teachers' responses, it was possible to analyze the averages and relative weights of the teachers' opinions regarding the opportunities to use IoToys in terms of customizing and individualizing education, as shown in the following Table (6):

Table 6. Frequencies And Relative Weights of The Teachers' Opinions Regarding the Role of Iotoys in Providing a Flexible Environment for Children's Learning.

s	Items	Frequences					Relative weight	Order
		Strongly agree	Agree	Not	Disagre	Strongly disagree		
1	Children find it easy to deal with IoToys and its uses.	56	17	16	7	4	82.80%	1
2	Some children might face difficulty accessing online games and running them.	7	12	17	25	39	83.60%	2
3	Children find multiple alternatives that suit their desires.	60	23	11	1	3	86%	3
	Average relative weights	**84.13%**						

Table (6) showed the teachers' point of view of the role of IoToys in providing a flexible environment for children, and the average opinion of the teachers on this was at a medium rate of (84.13%). This opinion was built based on the statement that determined the teachers' opinion on the ease of students' use of IoToys at a rate of (82.80%). Also, the statement through which the teachers saw that students find multiple alternatives of games that suit their desires and interests at a rate of (86%). The teachers rejected at a rate of (83.60%) the statement that indicated that there are difficulties that students may encounter related to the steps and capabilities of accessing the IoToys. The current result is consistent with the literature that showed that the most important feature of the IoToys technology is that it is a flexible, multi-capacity environment that can be relied upon to build children's social skills, emotional intelligence, a sense of accomplishment, cooperation, and aspects of thinking processes in science, technology, engineering, mathematics, and game design (Kewalramani, Palaiologou & Dardanou, 2023).

Risks of using IoToys

Privacy and cybersecurity

Through the teachers' responses, it was possible to analyze the averages and relative weights of the teachers' opinions regarding the risks of using IoToys in terms of privacy and cybersecurity, as shown in the following Table (7):

Table 7. Frequencies And Relative Weights of Teachers' Opinions Regarding the Role of Iotoys in Privacy and Cybersecurity.

s	Items	Frequences					Relative weight	Order
		Strongly agree	Agree	Not	Disagre	Strongly disagree		
1	In IoToys environment, children are exposed to online risks, and many children are not aware of the implications of dealing with an IoToys.	63	12	18	2	5	85.20%	1
2	One of the problems with dealing with IoToys is that the child's data is exposed to violation, hacking and misuse.	67	15	10	3	5	87.20%	2
3	One of the risks associated with IoToys is the ability of this technology to identify	1	1	17	36	45	85.20%	3

s	Items	Frequences					Relative weight	Order
		Strongly agree	Agree	Not	Disagre	Strongly disagree		
	the child and determine his/ her location and identity.							
4	The risks of IoToys in terms of privacy and cybersecurity seem to be greatly exaggerated.	16	12	17	25	30	51.8%	
	Average relative weights	**77.35%**						

(77.35%) of the teachers expressed their fear of IoToys in relation to privacy and cybersecurity issues. The teachers attributed this primarily to the fact that the child's data is vulnerable to violation, hacking, and misuse, (87.20%). An equal percentage of (85.20%) of teachers see IoToys as a threatening and privacy-invading environment, because children are not aware of the consequences of dealing with an Internet-related toys, on the one hand, and on the other hand, the ability of the IoToys to identify the child and determine his/ her location, which can be considered a major privacy violation. Although the teachers saw privacy and cybersecurity violations in relation to the IoToys their opinion was neutral, (51.8%), regarding the existence of a great exaggeration in the risks of the IoToys in terms of privacy and cybersecurity. This finding is consistent with the study (Allana & Chawla, 2021; Chaudron, et al., 2019; McReynolds et al., 2017) which showed that the privacy issues and cybersecurity of IoToys, are an undeniable reality, and the danger increases since the end user is a child who lacks many of the experiences that make him/ her resist such types of threats.

Game Addiction and Emotional Attachment to The Toy

Through the teachers' responses, it was possible to analyze the averages and relative weights of the teachers' opinions regarding the risks of using IoToys in relation to game addiction and emotional attachment to the game, as shown in the following Table (8).

s	Items	Frequences					Relative weight	Order
		Strongly agree	Agree	Not	Disagre	Strongly disagree		
1	Children's addiction to IoToys is a problemre lated to how to use it.	87	5	3	3	2	94.40%	1
2	Like any physical toy (doll, teddy bear, etc.), a child may become emotionally attached to IoToys and find it difficult to get rid of it easily.	85	7	2	3	3	93.60%	2
3	Some children find it difficult to disconnect from using IoToys and stop using it or stay away from it.	89	6	2	2	1	96%	3
	Average relative weights	**94.67%**						

None of the axes witnessed a consensus as the axis of the teachers' opinions regarding the fact that one of the significant risks of IoToys is that they often cause addiction and emotional attachment to the toys, which puts children in a state of electronic addiction, with an average consensus of (94.67%). This opinion was formed based on the teachers' view of (96%) that one of the risks associated with IoToys is that some children find it difficult to disconnect from using IoToys and stop using it. Likewise, (94.40%) teachers believe that children's addiction to IoToys is one of the biggest problems associated with its use. And

(93.60%) teachers believe that like any game, the child may become attached to it and have an emotional attachment to it that lasts for long periods. The current study is consistent with studies that have shown that the IoToys, among their risks, is the occurrence of electronic and emotional addiction (Najmi et al., 2023).

Failure of Time Management

Through the teachers' responses, it was possible to analyze the averages and relative weights of the teachers' opinions regarding the risks of using IoToys in relation to failure of time management, as shown in the following table (9): Table 9. Frequencies and relative weights of teachers' opinions regarding the role of IoToys in failure of time management.

s	Items	Frequences					Relative weight	Order
		Strongly agree	Agree	Not	Disagre	Strongly disagree		
1	IoToys affects children's ability to set priorities.	82	8	5	3	2	93.0%	1
2	One of IoToys problems is the inability of children to balance between learning time and playing time.	90	7	1	1	1	96.8%	2
3	One of the risks of IoToys is children's inability to organize their daily-life time in general.	85	5	5	3	2	93.6%	3
	Average relative weights	**94.47%**						

Table (9) also showed a high consensus among teachers regarding the role of IoToys in the failure of time management, as the teachers' opinion was generally with a relative average weight of (94.47%), which is a large percentage that confirms the teachers' consensus. The current result was linked to the teachers' view at a rate of (96.8%) that one of the problems of IoToys is the students' inability to balance learning times and playing times. At a rate of (93.6%), one of the risks of IoToys is the students' inability to organize their daily-life times in general. Likewise, at a rate of (93%), the IoToys affects students' ability to set priorities. Contrary to this result, the study (Malone, 2023) indicated that IoToys does not lead to failure in time management, but rather that the design of games, if built in a standard and organizational manner that is consistent with the context in which the games are used, may enhance the positive performance rate for success in time management.

Mixed Results Related to the Third Research Question and Their Analysis:

Do the quantitative data derived from the scale in the second phase confirm the validity of the results of the qualitative interviews in the first phase? To answer the question, a comparison was made between the results of the qualitative and quantitative phases. This can be presented in two axes:

Connection of Qualitative and Quantitative Results Regarding Iotoys Opportunities

According to the previously presented quantitative and qualitative results, it can be noted that there is a match in the results obtained in both the qualitative and quantitative aspects regarding the opportunities for using the IoToys in education. The qualitative results identified active interaction and social communication as one of the most important opportunities for using IoToys, and this was supported in the quantitative aspect by (83.47%) and was consistent with previous literature that showed the impact of the IoToys on active interaction and social communication, such as the study (Mascheroni & Holloway, 2019), which showed the role of the IoToys in developing the ability to communicate and interact positively, especially with children at early ages. Regarding enhancing the 21st century skills, the qualitative analysis

outcomes supported the ability of the IoToys to improve these types of skills, and the quantitative analysis outcomes supported it by (85.13%), which was consistent with the literature that showed that there is a positive impact of IoToys on improving the 21st century skills (Ihamäki & Heljakka, 2019). With regard to personalizing and individualizing education, there was a general trend across the qualitative analysis processes towards the ability of IoToys to improve the processes of personalizing and individualizing education, which was also consistent with the quantitative analysis outcomes, except that teachers expressed concern that IoToys may sometimes not be compatible with students' cognitive styles, which made the average opinion of teachers in this axis by (68.73%), but the overall result of the axis was consistent with the study (Ihamäki & Heljakka, 2019), which showed that the IoToys technology provides supportive opportunities to provide personalized and customized content for children to use in games. Regarding the fact that one of the opportunities for using IoToys in ECE is to provide a flexible environment for children to learn, there was a great agreement between the outcomes of the qualitative and quantitative analyses, as the teachers in the qualitative analysis supported this, and (84.13%) the teachers in the quantitative analysis supported the ability of IoToys to provide flexible environments for children to learn, and this result was consistent with the study (Kewalramani et al., 2023) which showed that the most important feature of IoToys is that they are a flexible environment with multiple capabilities.

At the risk level, teachers in both the qualitative and quantitative analysis stages showed a great deal of agreement regarding the risks of IoToys in ECE. In the qualitative analysis, teachers expressed their concerns about privacy and cybersecurity as one of the most important problems of IoToys, and this result was supported by the quantitative analysis when (77.35%) agreed that one of the main risks of the IoToys is the lack of privacy and cybersecurity. This is consistent with the study (Allana & Chawla, 2021), which showed that privacy issues and the lack of cybersecurity threaten the status of IoToys, and this threat, according to the study, requires developing solutions that can confront the lack of privacy and children's exposure to cyber attacks. At the level of the danger of some games regarding the possibility of leading to addiction and emotional attachment, this was supported by qualitative analysis processes with teachers, and at a rate of (94.67%) there was a consensus among teachers regarding the quantitative analyses, and this result was agreed upon by the study (Najmi et al., 2023), which showed that IoToys among their risks is the occurrence of electronic and emotional addiction. Regarding the failure of time management as well, the qualitative analysis resulted in a certain trend among teachers that one of the most important risks of IoToys is the impact on children's abilities related to time management, and this was supported by teachers in the quantitative study at a rate of (94.47%), which reflected the great congruence between the results of quantitative and qualitative analysis, and regarding previous studies, the study (Malone, 2023) showed that IoToys, when designed in a standard design, may have a role in improving time management skills instead of being one of the reasons for the failure of time management.

Implications

Based on the results of the current research, the use of IoToys technology in ECE may provide multiple opportunities to improve the educational climate in ECE by relying on IoToys to increase positive and active interactions, as well as improving the 21st century skills, and providing flexible environments that allow children to learn freely and without restrictions in a context linked to the possibility of customizing and personalizing learning. Despite these opportunities provided by IoToys, a positive and tangible impact cannot be achieved in children's educational environments without well-thought-out plans that can neutralize the risks of IoToys related to privacy and cybersecurity issues, as well as the risks associated with the possibility of addiction to games and emotional attachment to them in a satisfying way, in addition to addressing designs that may lead to IoToys being one of the reasons for failure in time management. The implications of the current study are to create a clear path that all teachers can follow in trying to benefit from IoToys in maximizing its positive opportunities. Besides, among the implications of the current study is shedding light on the risks generated by IoToys, which can be considered as a window for researchers through which they can work to implement studies that neutralize the risks of the Internet.

Limitations

Despite the positive results reported by the teachers in the study, there are some limitations represented in the fact that the qualitative and quantitative analyses processes were limited to female teachers as they are the category through which teaching is carried out in the ECE. Consequently, male teachers were not involved in the qualitative and quantitative analyses processes. Although this is justified in the Saudi context, conducting further studies to study male teachers' opinions may be a future requirement to examine the opportunities and risks of using IoToys in the ECE. Among the limitations is the diversity of cultural backgrounds associated with IoToys among the teachers, which prompted the researcher to limit the study to only teachers in government schools in Jeddah's General Directorate of Education, so that there is a balanced cultural line in the environment in which the teachers work. This means that the study can be conducted again in the future with teachers in a different cultural context, such as in the context of private schools or foreign schools in Jeddah.

Conclusion

The current study aimed to use a mixed method approach to explore the opportunities and risks of using IoToys in ECE. The qualitative and quantitative phases of the study resulted in identifying the most important opportunities associated with the use of IoToys, which were: improving communication and active positive interaction, enhancing the 21st century skills, enhancing personalization and customization of education, and finally providing a flexible environment for children to learn. As for the most prominent risks, the study resulted in identifying risks associated with lack of privacy and cybersecurity issues, the possibility of IoToys causing electronic addiction for children, and finally considering IoToys as one of the causes of failure in time management by children. The qualitative and quantitative analyses processes were found to be consistent, which confirms the results of the study and enhances the reliance on its outputs in developing reality. The results of the current study can be built upon by those responsible for the educational process in exploiting the opportunities generated by IoToys in supporting children's education in the ECE, provided that the employment processes are thoughtful and used contextually across curricula in the presence of plans to neutralize the risks resulted from IoToys. Future research could focus on contextual experimental treatments of the effects of the IoToys on learning outcomes and could also focus on developing specific programs that can tackle and confront the risks generated by IoToys.

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