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EXPLORING THE WORLD OF ROBOT-ASSISTED DIGITAL STORYTELLING: TRENDS, MODELS, AND EDUCATIONAL IMPLICATIONS

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ABSTRACT

Aim/Purpose	This paper explores the trends in robot storytelling, its conceptual models, and educational implications.
Background	Digital storytelling is the use of digital media elements such as text, images, audio, and video to create and tell a story. A form of digital storytelling using a social robot to do the story presentation is called robot-assisted digital storytelling or simply robot storytelling. A robot storytelling conceptual model is a visual representation of the process of creating and presenting robot stories. The model displays the main elements and their relationship, providing guidelines for creating and sharing the robot story.
Methodology	This paper uses the scoping review method that follows the PRISMA Extension for Scoping Review (PRISMA-ScR) and the methodological framework developed by Arksey and O'Malley to review 30 publications selected from the period 01/01/2003 to 06/02/2024. The study first retrieved 235 publications from Scopus, Web of Science, and Lens databases based on specified inclusion and exclusion criteria. The retrieved articles were screened, and 30 were selected for the review. The charting of the selected articles was carried out using content analysis on the following characteristics: author(s)/year, title of study, purpose of study, conceptual model/theoretical/methodological framework used, population, intervention/study activity, usage of intervention and finding/outcome.

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Contribution	The paper contributes to knowledge by revealing the trend in robot storytelling, its impacts on education, and the limitation or gap in robot storytelling conceptual models.
Findings	The paper found that robot storytelling is mainly used as a tool to impart knowledge to pupils and students in educational institutions. In addition, robot storytelling has a positive impact on teaching and learning at all levels of the educational ladder. Also, the number of published research studies on robot-assisted storytelling conceptual models is woefully inadequate.
Recommendations for Practitioners	This paper recommends that practitioners, especially the instructional delivery fraternity who use other digital storytelling presentation methods, such as computer and online storytelling, must resort to robot storytelling. This is because robot storytelling has proved to improve learning outcomes compared to other digital storytelling methods.
Recommendations for Researchers	This paper recommends that researchers in the field of robot storytelling endeavor to propose and publish more conceptual models for practitioners who want to develop robot storytelling. In addition to the conceptual models, detailed methodological frameworks can be developed for the models to make it easier for practitioners to develop robot storytelling.
Impact on Society	Robot storytelling is more attractive and sustains audience attention, therefore improving learning outcomes. This paper reveals to teaching professionals the current growing method of imparting knowledge to learners that uses robot storytelling. This paper also motivates managers of educational institutions to plan toward the use of social robots in instructional delivery.
Future Research	The paper proposes the development of a robot storytelling conceptual model that provides complete guidance from requirement analysis, story preparation, programming, testing, and presentation to evaluation to help practitioners. In addition, a detailed methodological framework based on the model should be developed to make it easier for users of the model.
Keywords	robot-assisted storytelling, robot-based storytelling, robot storytelling, robot storytelling conceptual model, scoping review

INTRODUCTION

Digital storytelling (DST) is the use of digital tools and media, including audio, video, art, graphics, photographs, and words, to communicate a story (Sage et al., 2018). Digital storytelling evolved from traditional storytelling by using digital multimedia elements that were created from the use of digital computers. Using digital media for storytelling has made the art of storytelling interesting and attractive to storytellers. Because of the attractive nature of digital storytelling, it is being used as a tool to disseminate information to different categories of audiences.

According to Robin (2016), digital storytelling has gained popularity and is being practiced in places such as libraries, schools, museums, community centers, and medical and nursing schools. In teaching and learning, teachers use multimedia elements such as text, images, sound, and videos to prepare lessons in the form of digital storytelling (Robin, 2016). This method makes lessons more practical and easier to learn. Digital storytelling is also used by businesses to advertise products to potential customers, especially millennials, through the Internet (Fernandes, 2019). Digital stories are now powerful tools to raise awareness on such issues as social justice, social change, homelessness, agedness, mental health, and abuse, besides personal experiences (Hewson et al., 2015).

There are several platforms for presenting digital storytelling, including web-based, social media, computer-based, and robot-assisted platforms (Miller, 2019). The web-based platform is a story-creation site that allows users to visit the site to read, listen, or create stories. An example of a web-based platform for digital storytelling is the Storybird site, founded by Mark Ury in 2010 (Kazazoglu & Bilir, 2021). These web-based platforms may also host prerecorded storytelling using other media, such as robot and computer-based storytelling. The social media platform for digital storytelling is a social media site that allows users to create and present stories to viewers. Computer-based platforms for digital storytelling are computer applications such as PowerPoint and Plotagon studio to create and present stories to viewers. Robot-assisted platforms for digital storytelling use social robots to present stories to listeners. Social robots are autonomous agents that think and behave like humans and can freely interact with humans (Lee, 2020). Some social robots, like the Pepper robot (Pandey & Gelin, 2018), have screens that can display videos and images to audiences. Social robots use different gestures and gazing while presenting stories to audiences. These capabilities of social robots attract audiences' attention and sustain their interest during the storytelling. Social robots are mostly humanoid robots and animaloid robots. Humanoid robots are built to have human-like shapes, and animaloid robots have animal-like shapes.

According to Conti et al. (2020), a humanoid robot was used to tell a tale to kindergarten children and compared it to the same tale told by a human. The results show that kindergarten children can memorize more details of the tale narrated by the robot with expressive social behavior. Iio et al. (2019) used a social robot to teach the English language to nine Japanese adults. In this robot-assisted storytelling language learning, the researchers conducted a pre-test for the participants before going through the robot-assisted language learning activities. After the participants had gone through the activities, they were also given a post-test. The results of the two tests indicated that robot-assisted storytelling language learning has improved the speaking abilities of the participants. Liang and Hwang (2023) employed robot storytelling in teaching English as a foreign language to 11th-grade students and compared it with using conventional animation digital storytelling to teach another group of students. The results of the study showed students who were taught using the robot storytelling approach had improvement in their English speaking ability, storytelling ability, narrative engagement, and communication tendency compared to the students who were taught using the conventional animation digital storytelling approach. According to the paper, robot storytelling has the advantage of two-way communication compared to one-way communication offered by conventional animation digital storytelling, which is suitable for knowledge acquisition (Liang & Hwang, 2023). Tengler et al. (2021) carried out a study to investigate how robots enhance computational thinking skills by designing and building an interactive story using the robot Ozobot, and the results show that combining educational robots and storytelling is a promising approach to promote computational thinking.

As a result of the significant uses of digital storytelling in society, researchers have designed digital storytelling conceptual models for digital story developers. The digital storytelling conceptual model is a visual representation of the process of creating and sharing digital stories. The model is either in the form of a diagram containing texts or a list of words. The list of words or texts on the diagram is referred to as the elements of the model. Kogila et al. (2020) discussed the key elements of digital storytelling conceptual models from various experts and their limitations. For example, the digital storytelling conceptual model proposed by Porter has the following elements: living in your story, unfolding lessons learning, developing creative tension, economizing the story told, showing, not telling, and developing craftsmanship (Kogila et al., 2020). In that paper, all the models discussed lack the elements of hardware and software tools that are necessary for robot-assisted storytelling. Papadopoulos et al. (2020) carried out a systematic review of socially assistive robots employed in pre-tertiary classroom teaching of mathematics and science. According to the results of that study, the dominant theoretical/conceptual framework employed in these socially assistive study designs and learning is social interactionism and constructivism, where collaborative, active, and personalized learning is often quoted, in some cases referring to the Vygotskian framework (Papadopoulos et al.,

2020). According to this study, 38% of the selected articles for the review did not even state explicitly the theoretical/conceptual framework employed in their studies (Papadopoulos et al., 2020). The theoretical/conceptual framework discovered by that review is an indication that there is no robot storytelling theoretical/conceptual framework tailored for socially assistive robot storytelling.

These two revelations from Kogila et al. (2020) and Papadopoulos et al. (2020) motivated this study to search for existing conceptual models proposed to develop robot-assisted digital storytelling. Hence, the scoping review aims to explore the trend of robot storytelling and its conceptual models. The results of the review will reveal the current trends in robot storytelling together with its conceptual models, methodological frameworks, and impacts on education.

METHODS AND MATERIALS

This study employed a scoping review to explore the trend in robot-assisted storytelling, its impact on education, and conceptual models. The scoping review follows the PRISMA Extension for Scoping Review (PRISMA-ScR) (Tricco et al., 2016) and the methodological framework developed by Arksey and O'Malley (2005). A scoping review can examine the extent, range, and nature of research activity. A scoping review can also identify research gaps in existing literature (Arksey & O'Malley, 2005). There are five steps in the Arksey and O'Malley framework used in the retrieval and analysis of the records. These steps are (1) identifying the research question, (2) identifying the relevant studies, (3) selecting the study, (4) charting the data, and (5) collating, summarizing, and reporting the results. The following are the activities carried out in the scoping review process.

IDENTIFICATION OF THE RESEARCH QUESTIONS

This study aims to explore robot-assisted digital storytelling, focusing on trends, conceptual models, and educational implications of the findings. Based on this purpose, data items that will be charted include author names, year of publication, the title of the study, the purpose of study, the conceptual model used, the theoretical or methodological framework used, population, activities or interventions carried out, usage of interventions, and findings or outcomes of the studies. However, discussions will focus on the conceptual model used, the methodological framework used, the population, the type of interventions, the usage of intervention, and the outcome or findings of the study. Hence, the following research questions were chosen to guide the study.

RQ1: What is the research trend in robot-assisted digital storytelling?

RQ2: What conceptual models are used in creating robot-assisted digital storytelling?

RQ3: What is the educational impact of robot-assisted digital storytelling?

IDENTIFICATION OF ELECTRONIC DATABASES AND RELEVANT STUDIES

Records to be retrieved were searched from three electronic databases: Scopus, Web of Science, and Lens. The search period was from 10 July 2023 to 6 February 2024. The records searched include primary research that follows the search keywords and is published in English or translated into English. The search keywords were done on title fields in all three databases, and the keywords for all three databases are Title (robot storytelling), Title (robot "digital storytelling"), Title ("robot-assisted storytelling"), or Title ("robot storytelling model"). After the first search on 10 July 2023, alerts were created in the three databases to capture any relevant articles for this study. The following is a sample search query entered in the Scopus database: (TITLE (robot AND storytelling) OR TITLE (robot "digital storytelling") OR TITLE ("robot-assisted storytelling") OR TITLE ("Robot storytelling model")). The study literature or records were selected based on the inclusion and exclusion criteria in Table 1. The selected period in Table 1 refers to the period in which the retrieved records were published. This implies that all records published before and after this period were not considered in this study.

Table 1. Inclusion and exclusion criteria

No.	Criteria
	Inclusion criteria
1	Literature published in the English language
2	Selected period 01/01/2003 – 06/02/2024
3	Primary research focused on robot storytelling and its models
4	Qualitative studies
5	Articles and conference papers
	Exclusion criteria
1	Literature that focused on other robot studies without storytelling
2	Literature published in non-English languages
3	Books and book chapters
4	Quantitative studies

Screening and selection of publications

The number of records obtained from the Lens database was 142, while the records obtained from the Scopus database were 72. Also, 21 records were obtained from the Web of Science Database. All the records were retrieved from 10 July 2023 to 6 February 2024. A total of 235 records were retrieved. The records from the three databases in the BibTeX format were imported into Mendeley Reference Manager (Elston, 2019) to combine into one library. The combined library was exported into Endnote (Gotschall, 2021). Endnote was used to remove duplicate copies of the entire records leaving 76 records. The next step was screening. The titles and abstracts of the remaining records were read individually to screen for the final records. The following criteria were used to screen the records: (1) records that created robot storytelling and administered it to selected participants, (2) records that created a robot storytelling platform, and (3) records that created a robot storytelling model, used the model to prepare robot platform, and used the robot platform to present the story. After the screening, a total of 30 records were obtained for the study. Figure 1 shows a customized PRISMA flow diagram based on PRISMA2020 designed by Haddaway et al. (2022) for the entire screening and selection process.

Data charting

Charting is a technique to synthesize and interpret qualitative data. This technique is termed data extraction in a systematic literature review (Arksey & O'Malley, 2005). Arksey and O'Malley's (2005) framework does not specify a standard method for the charting process to enable practitioners to use it (Westphaln et al., 2021). This means researchers who want to use the framework will have to employ their charting method. Because of that, this study adopts content analysis to extract information relating to the selected data items for this review. Content analysis is a rule-guided technique used to analyze the information contents of textual data (Forman & Damschroder, 2007). The data items of the selected articles captured in the charting process include authors names, year of publication, the title of the study, the purpose of the study, a conceptual model used for the study, theoretical/methodological framework used for the study, study population, storytelling activity/intervention, usage of intervention, and finding or outcome. Each of the final selected articles was read carefully, and information relating to the data items was extracted. Serial numbers have been assigned to the records, and these numbers will be used in the next section for collation and summary reporting. The information extracted from the selected articles is shown in the Appendix.

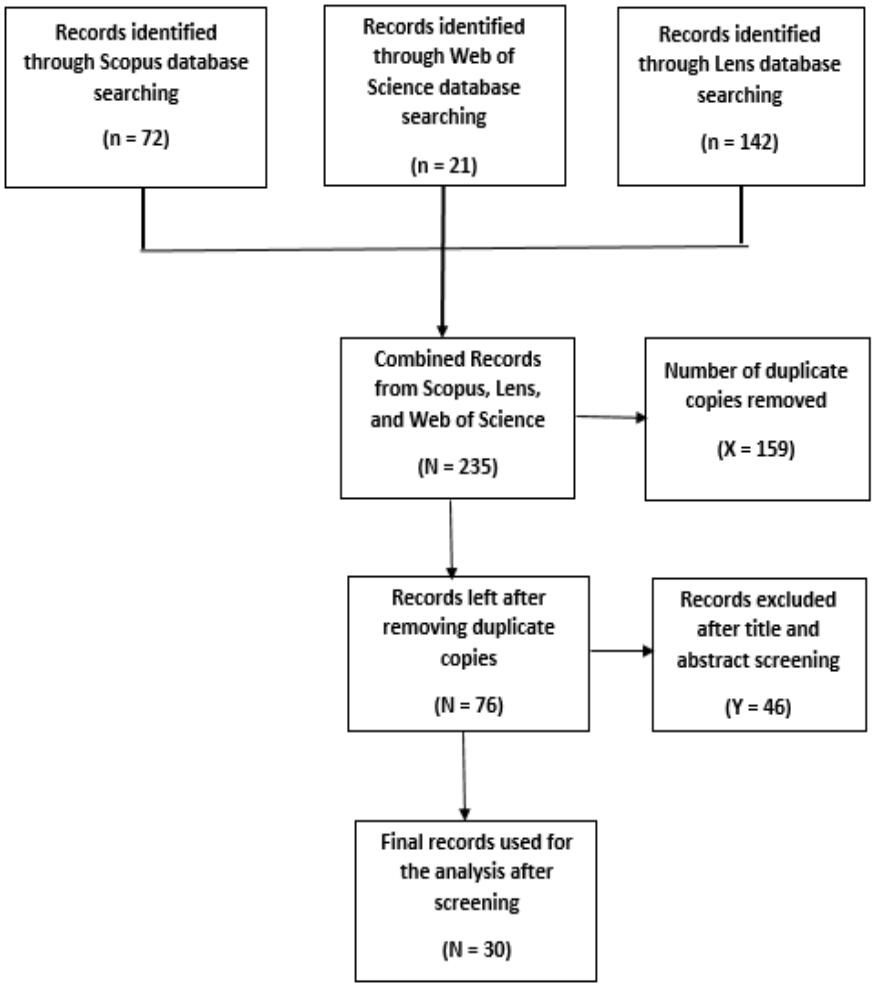

Figure 1. PRISMA flow diagram

RESULTS

COLLATING, SUMMARIZING, AND REPORTING THE RESULTS

This section reports the collation and summary of the data charting carried out in the previous section. The collation and summary are done using tables and charts to display the information. The characteristics used in the collation and summary include population, conceptual model, methodological framework, intervention, usage of intervention, and findings/outcomes. To make the collation simple, the serial numbers of the records were used instead of the titles.

Types of population identified in the review

The population of the final selected records was grouped into four, namely (1) children from kindergarten, primary, and middle schools, and those that have been hospitalized, (2) students from senior high schools, (3) undergraduate and graduate students, and (4) adults. However, two records were indicated as other (not specified). The reason is that though one of them (article number 10) involved human participants, it did not disclose their identities, while article number 14 did not involve any human participants apart from the researchers who carried out the study. Refer to Table 2 for the types, article numbers, and total number of records for each type of population.

Table 2. Population types

Characteristics	Article number	Total number of articles
Children (primary school, middle school, hospitalized)	1, 4, 5, 6, 7, 8, 9, 11, 13, 16, 18, 19, 24, 25	14
Students (senior high schools)	2, 21, 23, 28	4
Graduate and undergraduate (college/universities)	12, 15, 20, 27, 29, 30	6
Adults	3, 17, 22, 26	4
Other (not specified)	10, 14	2

Of the thirty selected articles, fourteen used children participants and this number of articles constitutes 47% of the final selected articles that were charted (Figure 2). Articles that used undergraduates and graduates as the population are six, representing 20% of the final selected articles. Articles that used students from senior high schools as their population are 4, representing 13% of the selected articles. The same number of 4 articles, representing 13% used adult as their population. The remaining two articles on the row headed "other (not specified)" represent 7% of the final selected articles. From the types of population discovered in this review, the implication is that robot storytelling studies involve participants that cut across all levels of education from kindergarten to graduate schools as well as the adult population.

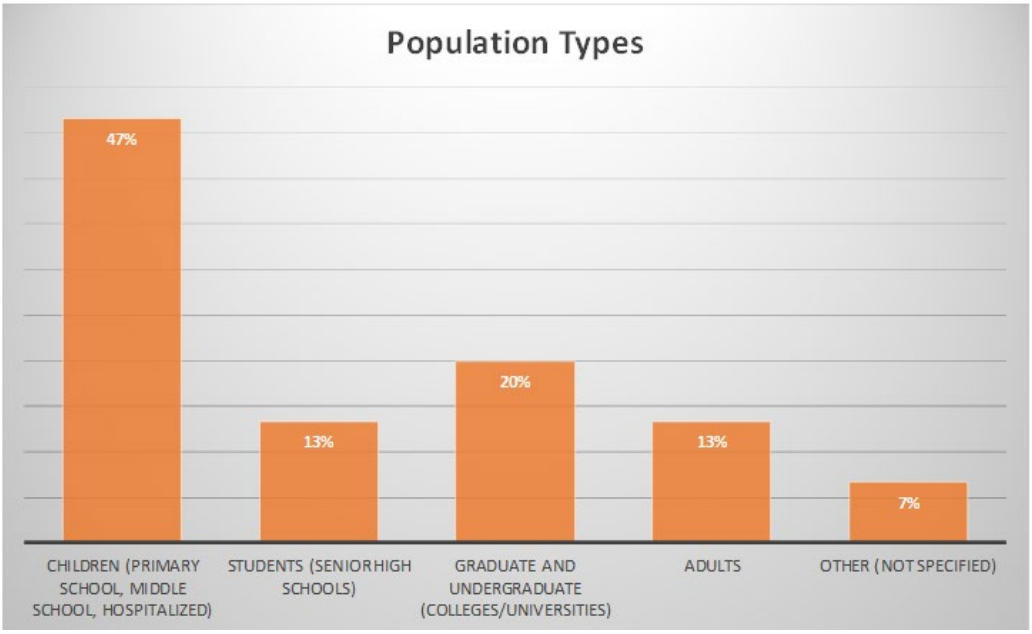

Figure 2. Percentages of population types

Conceptual model/theoretical/methodological framework

A conceptual model is a high-level description of how a system is organized and operates (Johnson & Henderson, 2002). A digital storytelling conceptual model is a visual representation of the process of creating and sharing digital stories. It is usually a simplified representation of the digital storytelling process in the form of diagrams or words but does not provide detailed guidance to developers. The information contained in the model is referred to as elements of the model. An example of a digital storytelling conceptual model is Lambert's storytelling model, which has the following seven elements: a point of view, a dramatic question, emotional content, the gift of your voice, the power of the soundtrack, economy, and pacing (Kogila et al., 2020).

A theoretical framework comprises the theories expressed by experts in the field into which research is planned and which are drawn upon to provide a theoretical coat-hanger for data analysis and interpretation of results (Kivunja, 2018). A theoretical framework can also be described as a structure that summarizes concepts and theories, which are developed from previously tested and published knowledge that are synthesized to help one have a theoretical background or basis for the data analysis and interpretation of the meaning contained in the research data (Kivunja, 2018).

A methodological framework is a structured guide to complete a process or procedure. It can also be described as a tool to guide a developer through a sequence of steps to complete a procedure (McMeekin et al., 2020). Table 3 shows the article numbers and the total number of articles that used conceptual models, theoretical frameworks, or methodological frameworks for their studies as well as those that did not apply any of these guidelines for their studies.

Table 3. Articles that used conceptual model/theoretical/methodological framework

Characteristics	Article number	Total number of articles
Conceptual model	3, 4, 8, 12, 13, 23,	6
Theoretical framework	1, 2, 5, 6	4
Methodological framework	10, 14, 22, 24, 27, 28	6
None/Not specified	7, 9, 11, 15, 16, 17, 18, 19, 20, 21, 25, 26, 29, 30	14

Of the 30 articles that were analyzed, six of them used conceptual models in their studies, constituting 20% of the selected articles, while another six used methodological frameworks for their studies, representing 20% (see Figure 3). Four articles used theoretical frameworks in their studies, representing 13% of the selected articles. Fourteen out of the thirty selected articles did not apply any of the models or frameworks for their studies. This group of articles constitutes 47% of the selected articles and forms the largest number of articles. This implies most robot storytelling studies do not apply any form of framework or model for their studies.

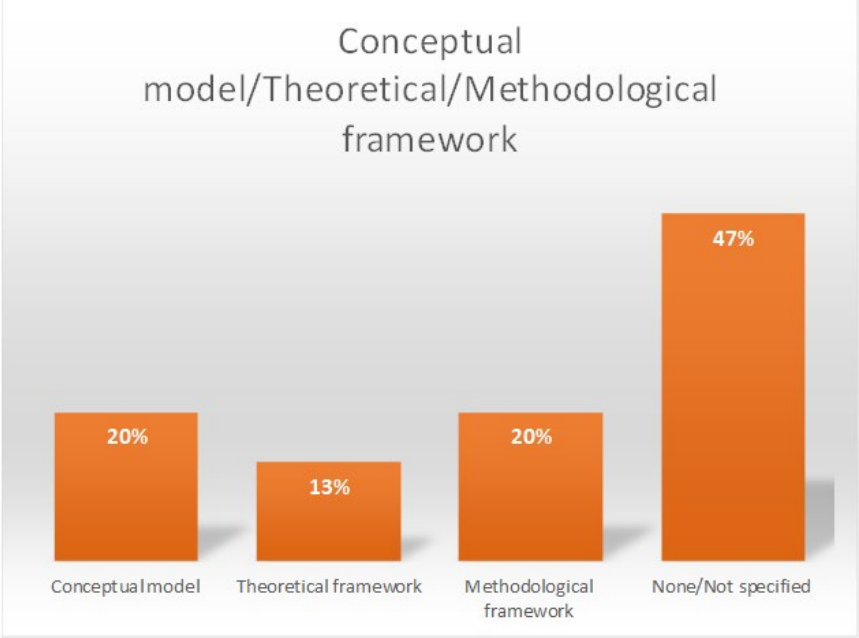

Figure 3. Percentages of articles that used conceptual model, theoretical framework, or methodological framework

Types of interventions/study activities

In this review, an intervention is an experiment or activity carried out during the study by researchers with participants. From Table 4, activities from the 30 selected articles have been grouped into five. These are (1) articles that prepared robot platforms for storytelling without delivering the stories, (2) articles that prepared robot platforms and used them for storytelling, (3) articles that created conceptual models and used the models to prepare robot platforms, and used the platforms for storytelling, (4) articles that created methodological frameworks and used the frameworks to prepare robot platforms, and used the platforms for storytelling, and (5) articles that created methodological frameworks and used the frameworks to prepare platforms without delivering stories. The term storytelling in this section refers to any form of presentation delivered using a social robot. It can be language teaching presentations or science education presentations.

Table 4. Types of interventions/study activities

Type of intervention	Article number	Total number of articles
Robot platform	5	1
Robot platform and storytelling	1, 2, 4, 6, 7, 9, 11, 15, 16, 17, 18, 19, 20, 21, 23, 25, 26, 29, 30	19
Model, platform, and storytelling	3, 8, 12, 13	4
Methodological framework, platform, and storytelling	10, 22, 24, 28	4
Methodological framework and platform	14, 27	2

From Table 4, one study out of the thirty selected articles prepared a robot storytelling platform without using it to deliver a story. This article constitutes only 3% of the selected articles (Figure 4).

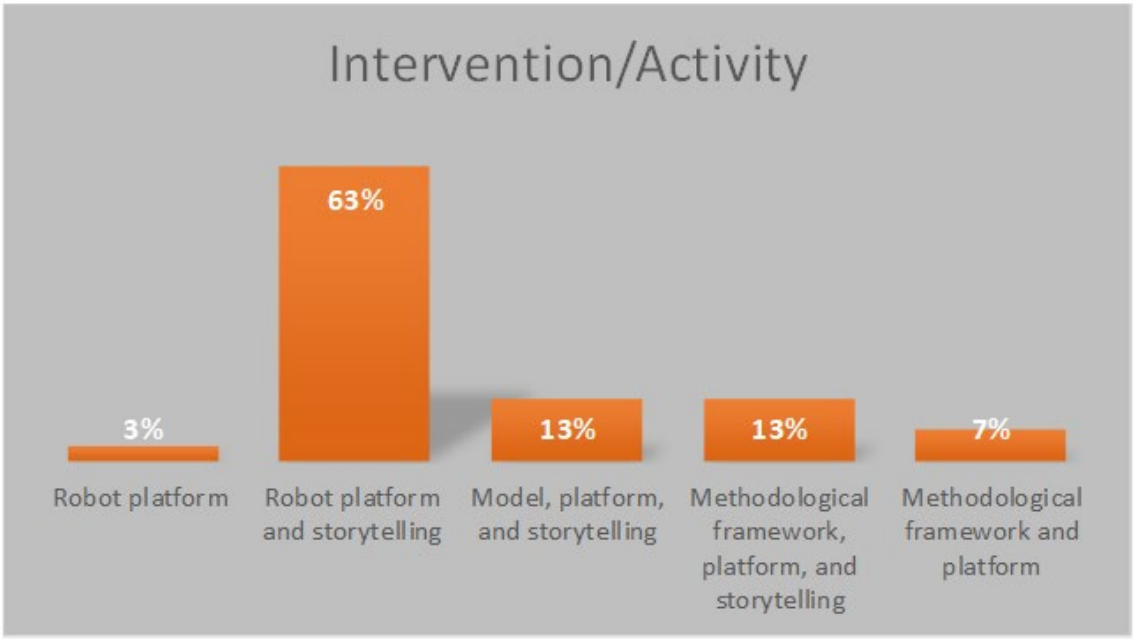

Figure 4. Percentages of types of interventions/activities carried out by the articles

Nineteen of the selected articles, constituting 63%, prepared robot storytelling platforms and used them to deliver stories. This category forms the largest number of articles on the final shortlists. Of the thirty selected articles, four articles proposed models and applied the models to prepare the robot

platform, and finally, they delivered the stories. This category forms 13% of the selected articles. Another four of the selected articles, representing 13%, proposed methodological frameworks and used them to prepare robot platforms and finally deliver the stories. Finally, two articles out of the thirty selected articles representing 7% proposed methodological frameworks and used them to prepare robot platforms but did not use the platforms to deliver stories. The implication of the types of intervention discovered is that only a few conceptual models of robot storytelling have been proposed by researchers in the field of robot storytelling.

Usage of studies' interventions

In this study, the use of intervention refers to the application of robot storytelling, platforms, or models created by the selected articles. Table 5 shows eleven different usages of the thirty selected articles for this scoping review.

Table 5. Usage of the studies' intervention

Usage	Article number	Number of articles
Teaching Assistant in preschool	1	1
Language teaching/learning/development in children	2, 4, 7, 19, 20, 24, 25	7
Lesson delivery in a Teaching hospital	3	1
Teaching programming in primary school	5	1
Developing social and emotional skills in children	6	1
Developing children's storytelling behavior	8	1
Telling stories to audiences	9, 10, 11, 12, 13, 15, 16, 17, 21, 23, 29, 30	12
Teaching science, technology, engineering, arts, and mathematics	14, 27, 28	3
Entertaining hospitalized children	18	1
Cognitive training for adults	22	1
Teaching cybersecurity	26	1

Out of the thirty articles, twelve of them used the intervention to tell stories to audiences, and this number constitutes 40% of the selected articles (see Figure 5). This usage is the most popular among all the usages discovered by this review. The next most popular usage of the interventions is language learning, teaching, or development among children. Seven out of the thirty selected articles used the interventions to teach or develop languages, and those articles constituted 23% of the selected articles. Three articles used their robot storytelling activity or intervention to teach science, technology, engineering, arts, or mathematics, and that constitutes 10% of the selected articles. The rest of the articles used their intervention for different purposes. Article number 1 used a robot as a teaching assistant to deliver lessons to preschool children, and article number 3 used robot storytelling to teach lesson plan design in a teaching hospital. Article number 5 used robot programming to teach programming in primary school, while article number 26 used robot storytelling to teach cybersecurity. Article number 6 used storytelling to develop social and emotional skills in children, while article number 8 used storytelling to develop children's storytelling behavior. Lastly, article number 18 used robot storytelling to entertain and reduce hospitalized children's anxiety about intravenous injections, while article number 22 used robot storytelling to provide cognitive training for adults. In summary, robot storytelling is used to impart knowledge and develop children's language, social and emotional skills, and storytelling behavior. A robot is also used as a teaching assistant in preschool, and robot storytelling is used to entertain children and provide cognitive training for adults.

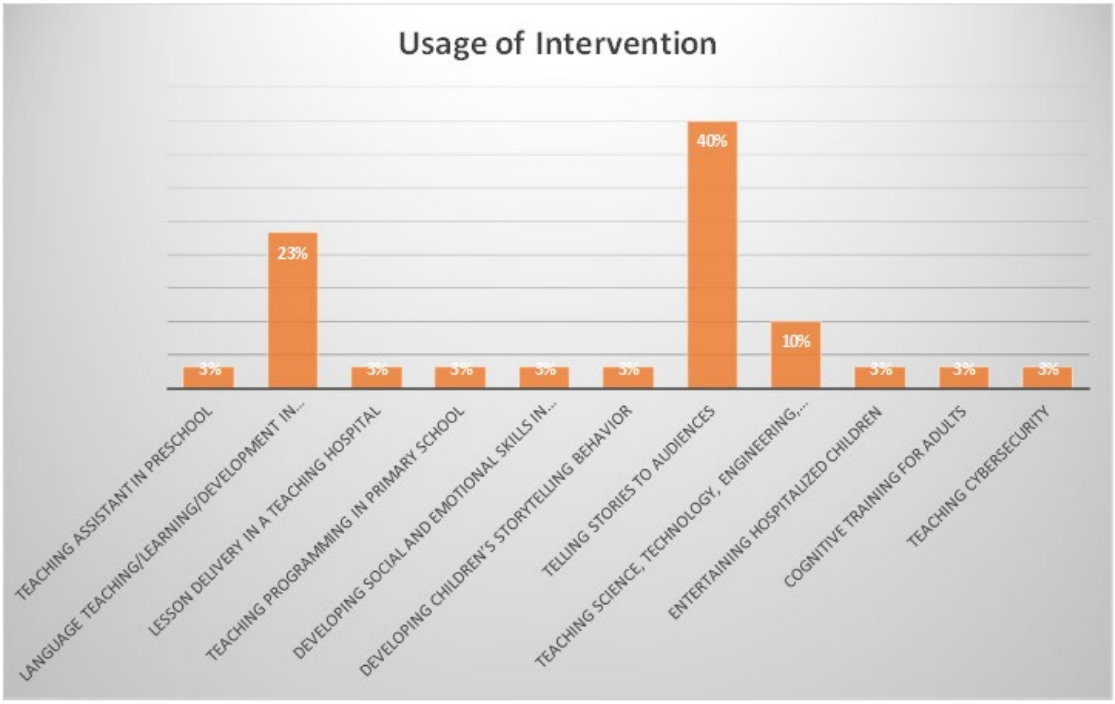

Figure 5. Percentage usage of intervention

Findings/outcomes of the interventions

Table 6 contains twenty different study outcomes and the corresponding articles that achieved those outcomes. For example, the outcome of article number 1 was that the intervention brought enjoyment to the audience. Article numbers 9, 12, and 19 found that robot storytelling with expressive behavior and gazing improves audiences' abilities to memorize the story. Articles numbers 2, 7, and 18 also found that robot storytelling increased the communication abilities of the audiences. Articles number 3 and 27 discovered that robot storytelling increased the learning achievements of audiences. Also, article number 3 again and article numbers 10 and 20 discovered that robot storytelling improves the learning attitude and satisfaction of the audiences. Other outcomes that were discovered by more than one article are storytelling increases audiences' attention and motivation and improves audience engagement and listening skills.

In addition, article numbers 21 and 23 discovered that audiences prefer human-robot collaboration in storytelling. Some of the remaining articles had outcomes that are similar to those that have been mentioned. For example, article number 4 discovered that audiences prefer storytelling using two robots compared to one, which is a form of collaborative storytelling described by article numbers 21 and 23, but the difference is that article number 4 used robot-robot collaboration as compared to article numbers 21 and 23 that used human-robot collaboration. Article number 5 discovered that robot storytelling increases the computational thinking of audiences, while article number 14, which prepared a robot platform with participants, also discovered that it improves the computational thinking of the participants. Article number 6 reinforced the outcome of articles numbers 9, 12, and 19 which discovered that robot storytelling improves audiences' ability to memorize stories delivered by robots. Finally, article number 29 found that audiences prefer a robot that tells stories with a cheerful personality and expressive body movement, emphasizing the outcomes of article number 15, which found that gestures and gazing are more persuasive. In summary, robot storytelling is a type of storytelling platform that most audiences prefer, and it improves learning outcomes when it is used for instructional delivery.

Table 6. Outcome of studies' interventions

Outcome	Article no.	No. of articles
Robot storytelling brought enjoyment to the audience	1	1
Robot storytelling with expressive behavior and gazing improves the audience's ability to memorize the story	9, 12, 19	3
Robot storytelling increases the communication ability of the audience	2, 7, 18	3
Robot storytelling increased the learning achievement of the audience	3, 27	2
Robot storytelling increases the learning attitude and satisfaction of the audience	3, 10, 20	3
Robot storytelling increases the computational thinking of the audience	5	1
Robot storytelling increases audience attention and motivation	8, 13, 28	3
Robot storytelling improves audience engagement and listening skills	24, 26	2
Audiences prefer robots with a cheerful personality and expressive body movement	29	1
Robot storytelling is acceptable to audiences	22	1
Robot storytelling with gestures and gazing is more persuasive	15	1
Audiences prefer robot storytelling compared to other storytelling platform	16	1
Audiences prefer two-robot storytelling compared to one	4	1
Robot storytelling audiences do not humanize robots; their gender matches with perceived robot gender	11	1
Colored lights in humanoid robots do not improve audiences' transportation into storytelling	17	1
Audiences prefer human-robot collaboration in storytelling compared to robot-only	21, 23	2
Audiences learn better with robots that adapt to their audiences	25	1
Individual interaction with a robot enhances the audience's ability to memorize compared to group interaction	6	1
Creating a robot storytelling platform improved the computational thinking and creative skills of the participant	14	1
A collaborative storytelling system is a more competent storyteller	30	1

DISCUSSION

THE TREND IN ROBOT-ASSISTED DIGITAL STORYTELLING

The results from Table 2 indicate that robot storytelling studies are conducted with participants or audiences who come from mostly educational institutions. The institutions range from Kindergarten through Senior High Schools to Graduate Schools. Apart from participants from educational institutions, adult populations are not excluded. However, most of the participants are children from kindergarten and primary schools. The results from Table 5 also indicate that robot storytelling is employed in instructional delivery in different subject areas, with most robot storytelling used for language learning and development. Robot storytelling is also used in science and technology education as well as training students in teaching hospitals. A robot is also used as a teaching assistant in preschools. Apart from instructional delivery, robot storytelling is used to entertain children and students as well as older adults. In summary, this scoping review shows that the current trend in robot-assisted digital storytelling is that it is being used in educational institutions at all levels to impart knowledge and also entertain audiences. In addition, robot storytelling is used to entertain hospitalized children and older adults.

Robot-Assisted Digital Storytelling Conceptual Models

Results from Table 4 show that four articles created conceptual models and applied their models to prepare robot platforms for storytelling. These studies are article numbers 3, 8, 12, and 13. The conceptual model proposed by article number 3 is the Brainstorming, Selection, Forming, and Evaluation (BSFE) model. This conceptual model was used to guide students to prepare a diabetes teaching lesson plan and used the plan to program a robot platform to deliver the lesson. However, this conceptual model lacks requirement analysis and testing as part of the proposed model. Requirement analysis and testing are very important stages in any programming module since they allow programmers to find the requirements of the module and detect any flaws in the module, respectively. Article number 8 proposed the backchannel opportunity prediction (BOP) model, which was used to program a robot to provide backchannel feedback to a child's story based on non-verbal prosodic cues. This conceptual model does not guide a robot storytelling developer to create a robot story but rather prepares a robot to respond to a human story. Article number 12 proposed a gaze model and implemented it on a robot to tell a story. This model enables the robot to keep eye contact with the audience of its story. This gaze model enabled the audience of the storytelling to pay attention to the robot. However, the model does not guide robot storytelling developers on how to create a robot story and prepare the platform for story presentation. Last but not least is article number 13, which proposed a model of story character based on ACT-R (Adaptive control of thought-rationale) cognitive model. This is a cognitive model that is implemented in a robot to enable it to respond to the audience's communication. The audience in this storytelling directs the story path of the robots. It is not a storytelling model that gives guidelines to robot storytelling developers to develop any storytelling system.

The results from Table 3 show that six articles applied conceptual models to guide the studies. Four of the six are the ones that have been discussed above. The remaining two are article number 4 and article number 23. These articles applied the gaze model, which was discussed above. In summary, though this scoping review discovered four conceptual models created for robot storytelling, none provides a complete guide for robot storytelling that begins from requirement analysis to story preparation and creation through programming and testing to story presentation and evaluation.

Methodological Frameworks

Results from Table 3 show that six articles applied a methodological framework to guide their studies. Article number 10 used a methodology that was proposed by the researchers. Article number 14 also proposed a custom-made methodology for the study. The rest of the articles, which include article numbers 22, 24, 27, and 28, all proposed a custom-made methodology for their studies. None of the methodologies proposed was based on any digital storytelling model that was discovered by this review. Also, none of the six studies indicated that the proposed methodological framework is based on any conceptual model published by experts in the field of digital storytelling. Whether there is a standard methodological framework for developing robot storytelling or not, this study did not discover it. However, this study recommends that developers of robot storytelling conceptual models should propose a detailed methodological framework to help robot storytelling developers.

Educational Implications

The results from Table 6 show that the application of robot storytelling has a positive impact on teaching and learning in educational institutions. It was found that audiences prefer robot storytelling compared to other storytelling platforms, such as PowerPoint presentations. Some results revealed that using robot storytelling to deliver lessons improves learners' abilities to memorize the lesson contents. It was also discovered that using robot storytelling to teach and develop languages improves the communication abilities of learners. The types of study populations discovered in Table 2 also show that robot storytelling is popular in kindergarten and primary schools. The popularity of robot storytelling in the lower levels of education may be due to the robot's gestures, which create some form of fun for the children. This is evident in one of the outcomes in Table 6, which indicated

that gestures and gazing are more persuasive to the audiences. These and other outcomes mentioned in Table 6 imply that robot storytelling is an excellent instructional delivery tool that needs to be considered by policymakers and leaders of educational institutions.

In summary, this review provides the following information in response to the research questions.

(1) The current trend in robot-assisted digital storytelling is that it is being used as a tool in instructional delivery and also entertaining children and older adults.
(2) According to the discussion, there is no robot storytelling conceptual model that provides a complete guide to robot storytelling developers through the following stages: requirement analysis, story preparation, robot programming, testing, story presentation, and evaluation.
(3) The use of robot storytelling in educational institutions to deliver lessons improves teaching and learning outcomes. In other words, the application of robot storytelling in instructional delivery impacts positively on teaching and learning outcomes.

CONCLUSION, LIMITATIONS, AND RECOMMENDATIONS FOR FUTURE RESEARCH

This paper presented a scoping review of robot storytelling to identify its trends, conceptual models, and educational implications. The review follows the PRISMA Extension for Scoping Review (PRISMA-ScR) and the methodological framework developed by Arksey and O'Malley (2005). At the end of the selection process, 30 papers were selected for review. These 30 papers were charted using content analysis. The results obtained in the charting were grouped under five headings, namely study population, conceptual models/theoretical/methodological frameworks, types of intervention/study activity, usage of intervention, and findings/outcomes. It was found that study populations cut across all educational institutions, from kindergartens through senior high schools to universities. It was also found that robot storytelling has a positive impact on teaching and learning, and it is being used at all levels of the educational ladder, including health training institutions. In addition, robot storytelling is used to entertain children as well as older adults. The study identified some conceptual models for robot storytelling, but none of them provided a complete guide to robot storytelling developers, from requirement analysis and story preparation through robot programming and testing to presentation and evaluation. This implies that there is a gap in robot storytelling conceptual model research. Another implication of the findings is that robot storytelling has become a preferred tool to deliver lessons, especially at the lower levels of the educational ladder.

The study's main limitation is the scope of databases that were searched for relevant articles for the review. Only three of the dominant databases were searched for the articles. These databases are Web of Science, Scopus, and Lens.

The study recommends the need for more research in robot-assisted storytelling conceptual models to help practitioners build more robot storytelling. Educational institutions that have not adopted storytelling in instructional delivery are advised to incorporate it into their curriculum. Also, future robot storytelling conceptual models should come with a more detailed methodological framework to make the development of robot storytelling easy for practitioners.

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APPENDIX: CHARACTERISTICS OF SELECTED ARTICLES

S/n	Author (s) / (year)	Title of study	Purpose of study	Conceptual model/ theoretical/ methodological framework used	Population for the study	Robot storytelling activity or intervention	Usage of intervention	Finding/ Outcome
1	Fridin (2014)	Storytelling by a kindergarten social assistive robot: A tool for constructive learning in preschool education	To show how a KindSAR robot, acting as an embodied interactive storyteller, can assist the kindergarten educational staff by telling the children prerecorded stories.	Constructivism theory of learning (This is one of the three learning theories that provide information about the relationship among strategies, context, and learner characteristics for better integration (Khalil & Elkhider, 2016))	Kindergarten children between the ages of 3 years to 3 1/2 years.	Nao robot narrated an interactive story to kindergarten children	Teaching assistant to deliver lessons to kindergarten	The study found that the children enjoyed storytelling interacting with the robot and accepting its authority.
2	Liang and Hwang (2023)	A robot-based digital storytelling approach to enhancing EFL learners' multimodal storytelling ability and narrative engagement	The study proposes a robot-based digital storytelling (DST) approach to facilitate the interaction in the DST process and to enhance students' engagement.	Embodied learning theory (Embodied learning is grounded in the recognition that experience, perception, and knowledge are shaped through the activity of our body concerning the world and also shape the world.	Senior High School students between the ages of 16 and 17.	Students were guided to create a robot and a conventional PowerPoint-animated robot storytelling system. The two storytelling systems were evaluated using the experimental and the control groups.	Teaching Language in Senior High School	The results showed that the robot-DST approach could significantly reduce students' communication apprehension and enhance their English-speaking ability, narrative engagement, and communication tendency.
3	C. C. Chang et al. (2023)	Fostering professional trainers with robot-based	To create a robot-based digital storytelling (R-DST) approach	A brainstorming, selection, forming, and evaluation model	Adult professional trainers in a	Students used the model as a guide to preparing a diabetes teaching plan	The teaching of lesson plan design in a teaching hospital	The results showed that in comparison with the conventional

S/n	Author (s) / (year)	Title of study	Purpose of study	Conceptual model/ theoretical/ methodological framework used	Population for the study	Robot storytelling activity or intervention	Usage of intervention	Finding/ Outcome
		digital storytelling: A brainstorming, selection, forming and evaluation model for training guidance	based on the Brainstorming, Selection, Forming, and Evaluation (BSFE) model.		Teaching hospital	and programmed this on the Kebbi robot. They also used the same teaching plan to prepare digital storytelling using Power Director, a multimedia editing and presentation software. The two storytelling systems were evaluated using experimental and control groups.		digital storytelling (C-DST) learning approach, the robot digital storytelling (R-DST) learning approach enhances professional trainers' learning achievement, learning attitude, critical thinking awareness, and learning satisfaction.
4	Tamura et al. (2021)	Robots as an Interactive Social Medium in Storytelling to Multiple Children	This paper investigates the effects of group interaction in a storytelling situation for children using two robots: a reader robot and a listener robot as a side-participant.	Gaze model	Children between the ages of 3 and 5.	Two robots were prepared. One is a reader robot while the other is a listener robot in addition to the children. The listener robot and the children listened to the story from the reader robot and the children later listened to the reader robot alone without the listener robot.	Language development in children	Results showed that the children preferred storytelling with the two robots but their speech activities significantly decreased with two robots compared to just one.

S/n	Author (s) / (year)	Title of study	Purpose of study	Conceptual model/ theoretical/ methodological framework used	Population for the study	Robot storytelling activity or intervention	Usage of intervention	Finding/ Outcome
5	Tengler et al. (2021)	Enhancing Computational Thinking Skills Using Robots and Digital Storytelling	This study aimed to investigate how the use of robots enhances computational thinking skills by designing and building an interactive story using the robot Ozobot.	Computational thinking framework for formulating problems, logically organizing and analyzing data, representing data through abstractions, automating solutions through algorithmic thinking, identifying, analyzing, and implementing possible solutions, and generalizing solutions)	Primary school children between the ages of 8 and 9.	Students created their own stories and implemented them on Ozobots.	Teaching programming in primary school	Results show that combining educational robots and storytelling is a promising approach to promoting computational thinking.
6	Leite et al. (2015)	Emotional Storytelling in the Classroom: Individual versus Group Interaction between Children and Robots	To explore a new direction for socially assistive robotics, where multiple robot characters interact with children in an interactive storytelling scenario	RULER framework (framework rooted in emotional intelligence theory designed to promote and teach emotional intelligence skills)	School pupils between the ages of 6 and 8.	A storytelling robotic system was created to tell a story. Selected students interacted with the robot in groups of three and individually.	Social and emotional learning in elementary school	Results showed that although participants who interacted alone with the robot remembered the story better than participants in the group condition, no significant differences were found in children's emotional interpretation of the stories.

S/n	Author (s) / (year)	Title of study	Purpose of study	Conceptual model/ theoretical/ methodological framework used	Population for the study	Robot storytelling activity or intervention	Usage of intervention	Finding/ Outcome
7	Westlund and Breazeal (2015)	The Interplay of Robot Language Level with Children's Language Learning during Storytelling	To examine the potential of a sociable robotic learning/teaching companion to support children's early language development	No model, theoretical, or methodological framework was stated	Children between the ages of 4 – 6.	Robot told stories to two groups of children. One of the robot's stories was easy to understand by the children while the other story was a little difficult compared to the children's level.	Language development in preschool children	Children who listened to the robot story that matched their learning ability learned more words than those who listened to stories that did not match their learning ability.
8	Park et al. (2017)	Telling Stories to Robots: The Effect of Backchanneling on a Child's Storytelling	To develop a backchannel prediction model based on observed non-verbal behaviors of children, and investigate the effects of an attentive listening robot on a child's storytelling.	Backchaneling models such as the wordy model, long pause model, and pitch model were used to create the proposed backchanneling opportunity prediction model which was implemented using robot storytelling.	Children between the ages of 4 and 6 years.	One of the two robots was programmed to gaze at the speaker randomly and did not adapt its expressiveness to the speaker's energy level. The other robot was programmed with twenty combinations of facial and body expressions that represent the backchanneling opportunity prediction model's responses.	Development of storytelling behavior in children	Results show that the backchannel opportunity prediction (BOP) model produces contingent backchannel responses that convey an increased perception of an attentive listener, and children prefer telling stories to the BOP model robot.

S/n	Author (s) / (year)	Title of study	Purpose of study	Conceptual model/ theoretical/ methodological framework used	Population for the study	Robot storytelling activity or intervention	Usage of intervention	Finding/ Outcome
9	Conti et al. (2017)	A Comparison of Kindergarten Storytelling by Human and Humanoid Robots with Different Social Behavior	To present a study on the influence of different social behaviors on preschool children's perception of stories narrated either by a humanoid robot or by a human teacher	No conceptual model, theoretical, or methodological framework was stated	Elementary school children between the ages of 5 – 6 years.	A robot teacher and a human teacher narrated stories to school children. The teacher narration was done in two conditions: static and expressive.	Telling stories to preschool children	Results show that preschool children can memorize more details of a story if it is narrated with expressive social behavior. In comparison, the humanoid robot performed as well as the human story narrator.
10	Wang et al. (2022)	Personalized Storytelling with Social Robot Haru	This study proposed an empathic and adaptive framework for robot storytelling that facilitates the social robot Haru to imitate human storytellers.	The study proposed a custom-made methodological framework for creating a storytelling robot.	Subjects identity and affiliate were not disclosed	A social robot Haru imitated a human storyteller to tell a story to selected students and another social robot Haru told the same story to the students without imitating a human storyteller.	Telling stories to audiences	The results show that participants had positive attitudes toward storytelling by the affective robot compared to the neutral one.
11	Robben et al. (2023)	The Effect of Gender on Perceived Anthropomorphism and Inten-	The purpose of this study is to examine how gender congruity affects the way children perceive	No conceptual model, theoretical, or methodological framework was stated	Children between the ages of 6 – 12 years.	Two robots were programmed to tell stories to children. One of the robots introduced itself as a male and the other as a female.	Telling stories to children	The results indicated that children did not humanize the robot to a higher degree if the robot's gender matched

S/n	Author (s) / (year)	Title of study	Purpose of study	Conceptual model/ theoretical/ methodological framework used	Population for the study	Robot storytelling activity or intervention	Usage of intervention	Finding/ Outcome
		tional Acceptance of a Storytelling Robot	social storytelling robots.					the children's gender.
12	Mutlu et al. (2006)	A Storytelling Robot: Modeling and Evaluation of Human-like Gaze Behavior	To explore how human gaze can be modeled and implemented on a humanoid robot to create a natural, human-like behavior for storytelling	An empirical model of gaze behavior	Graduate and undergraduate students between the ages of 19 – 33.	The proposed gaze model was implemented on a robot to tell a story to children.	Telling stories to graduate and undergraduate students	It was found that the model made participants perform significantly better in recalling the robot's story when the robot looked at them more.
13	Bono et al. (2020)	An ACT-R Based Humanoid Social Robot to Manage Storytelling Activities	To model a story character by using the ACT-R cognitive architecture and create a storytelling system accessible through NAO and Pepper robots	ACT-R (Adaptive control of thought-rationale) cognitive model.	Children.	ACT-R model was used to create a story character and implemented on Nao and Pepper robots to tell stories to children	Telling stories to children	The results show that the robots capture the attention and the curiosity of the audiences towards both the plot and the fate of the characters.
14	Hu (2022)	The Development of a Robot-based Storytelling Platform for Designing STEAM Learning Systems	The study aims to develop a Robot-based Storytelling Platform (RSP) to help creators design their robot-based storytelling systems	The study proposed a custom-made methodological framework for creating a storytelling robot.	Participants to evaluate the storytelling system were not captured in the paper.	This study proposed a robot-based storytelling platform for designing Science, technology, engineering, arts, and mathematics	Robot platform for science, technology, engineering, arts, and mathematics education	According to the paper, the proposed robot storytelling system can support creators to intuitively and effectively develop their creative robot-based

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			for particular applications.			(STEAM) learning systems.		learning systems for STEAM learning.
15	Ham et al. (2015)	Combining Robotic Persuasive Strategies: The Persuasive Power of a Storytelling Robot that Uses Gazing and Gestures	To investigate whether a robot that uses two persuasive strategies is more convincing than a robot that uses only one.	No conceptual model, theoretical, or methodological framework was stated	University students between the ages of 13 and 32 years.	Nao robot was programmed to tell a story to selected students using different gazing behaviors and gestures.	Telling stories to university students	Results show that a robot's persuasiveness is increased when gazing is used alone or in addition to gestures but gestures alone do not increase robot persuasiveness.
16	Chen Hsieh and Lee (2023)	Digital storytelling outcomes, emotions, grit, and perceptions among English-as-a-foreign- language (EFL) middle school learners: robot-assisted versus PowerPoint-assisted presentations	To examine the relationship among digital storytelling outcomes, emotions, and grit in different presentation modes (Robot vs. PowerPoint).	No conceptual model, theoretical, or methodological framework was stated	Pupils in Middle School.	Two groups of students constituting control and experimental groups were guided to create digital storytelling using PowerPoint and a robot respectively. The two groups presented their stories.	Telling stories to middle school pupils	Robot-assisted instruction is an appropriate instructional technology choice for EFL learning compared to PowerPoint presentations.

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17	Steinhaeusser and Lugrin (2022)	Effects of Colored LEDs in Robotic Storytelling on Storytelling Experience and Robot Perception	To investigate the influence of colored eye LED usage on robotic storytelling experience and robot perception.	No conceptual model, theoretical, or methodological framework was stated	Adults	Nao robot was programmed to tell a story using colored lights to indicate anger, sadness, and joy.	Telling stories to adult	Results show that adding colored light to the storytelling did not improve the recipients' transportation into the story. The cognitive absorption was also inhibited by adding colored light to the storytelling.
18	C.-Y. Chang et al. (2023)	Effects of robot-assisted Digital Storytelling on hospitalized Children's Communication during the COVID-19 pandemic	This study proposed a robot-assisted digital storytelling approach to reduce hospitalized children's anxiety about intravenous injections and to improve their therapeutic communication and therapeutic engagement.	No conceptual model, theoretical, or methodological framework was stated	Hospitalized children.	Two groups of hospitalized children constituting experimental and control groups were told stories. The experimental group listened to a story from a robot while the control group listened to a video of digital storytelling on a tablet computer.	Using storytelling to reduce the anxiety of hospitalized children	The study results indicated that the proposed robot-assisted digital storytelling approach not only reduced the children's anxiety but also had positive effects on children's communication about intravenous injections, emotions during hospitalization, and therapeutic engagement

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19	Kory Westlund et al. (2017)	Flat vs. Expressive Storytelling: Young Children's Learning and Retention of a Social Robot's Narrative	To compare expressive or flat robot storytelling on children's learning and retention outcomes.	No conceptual model, theoretical, or methodological framework was stated	Elementary school children between the ages of 4 and 7 years.	Two groups of children were told a story by a robot that used expressive voice to tell the story to one group and the same story was told by the same robot using flat voice.	Language learning in preschool children	Results show that children in the Expressive condition were more concentrated and engaged as indexed by their facial expressions; they emulated the robot's story more in their story retells; and they told longer stories during their delayed retelling.
20	Shih et al. (2007)	Robot as a Storytelling Partner in the English Classroom - Preliminary Discussion	The purpose of the study is to create a robot storytelling application	No application of conceptual model, theoretical, or methodological framework was stated.	College students.	A robot storytelling application was created and it was used to tell a story to college students for evaluation.	Language learning	The result showed that audiences had high satisfaction with the robot storytelling application and effectively improved the teacher's organization and technique of difficulties in the storytelling lesson.
21	Wong et al. (2016)	Human-Robot Partnership: A Study	To explore a novel method of	No conceptual model, theoretical, or methodological	Secondary school stu-	Nao robot was programmed to tell a story to a group	Telling stories to students	Results show that most participants prefer Human-

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		on Collaborative Storytelling	comparing Human-Robot Collaboration (HRC) for storytelling and Robot-only (RO) for storytelling	framework was stated	dents between the ages of 14 and 15.	of students. The robot was also programmed to tell the same story with a human storyteller to another group of students.		Robot Collaboration (HRC) over robot-only (RO) performance and consider HRC effective.
22	Tokunaga et al. (2019)	Cognitive Training for Older Adults with a Dialogue-Based, Robot-Facilitated Storytelling System	To propose a dialogue-based, robot-facilitated system that aims to provide cognitive training for healthy older adults daily.	The study proposed a custom-made methodological framework for creating a storytelling robot.	Elderly people.	A robot storytelling system was programmed to interact with older adults.	Cognitive training for adults	Results confirmed that most participants could use the system with little difficulty and that the appearance of the robot was acceptable.
23	Wu et al. (2017)	Investigation of the Roles of Humans and Robots in Collaborative Storytelling	To investigate the effectiveness of human-robot collaboration (HRC) in storytelling compared to robot-only (RO) only storytelling.	The gaze model was applied.	Secondary school students between the ages of 14 and 15 years.	Two groups of pupils were selected to listen to a storytelling from a robot alone while the other group listened to a story from a robot with a human storyteller performing the scenes.	Telling stories to students	Results showed that human-robot collaboration is an effective storytelling method, and is preferred over robot-only performance.
24	Shen and Lin (2018)	Robot-assisted Reading: A Preliminary Study on the	To combine a robot with existing digital picture books of a library to complete a	The study proposed a custom-made methodological	Elementary school children.	Nao robot was programmed and narrated two stories to selected school pupils.	Language development in children	Results show that the robot drew the children's attention to the

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		Robotic Storytelling Service to Children in the Library	"robotic storytelling service for children.	framework for creating a storytelling robot.				story and increased their listening effects and this service has received a very enthusiastic response from the children's readers.
25	Kory and Breazeal (2014)	Storytelling with robots: Learning companions for preschool children's language development	To propose a robotic learning companion to supplement children's early language education by interacting with children as a peer, not as a tutor or teacher	No application of conceptual model, theoretical, or methodological framework was stated.	Children between the ages of 4 to 6 years.	Two robots were programmed to play storytelling games with children. One robot story was at a lower level while the other story was at the same level or higher.	Language learning in children	Results show that children learn more from a robot that adapts to maintain an equal or greater ability than the children and that they will copy its stories and narration style more than they would with a robot that does not adapt (a robot of lesser ability).
26	Chiou et al. (2021)	Teacher Views on Storytelling-based Cyber security Education with Social Robots	To present interactive cyber security stories for students in grades 3 -5 delivered	No application of conceptual model, theoretical, or methodological framework was stated.	Teachers.	A robot told a story on cybersecurity to five selected teachers.	Teaching cybersecurity	Findings indicated that teachers found the social robot engaging and expressed interest in using it in their classroom

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			through a commercial social robot					despite some concerns.
27	Hu et al. (2022)	The effects of constructing a robot-based storytelling system on college students' computational thinking skills and technology comprehension	To propose teaching and learning activities with the robot-based storytelling development environment for constructing robot-based storytelling systems in promoting students' technology comprehension (TC).	The study proposed a custom-made methodological framework for creating a storytelling robot.	College students.	Selected students were guided to create a robot storytelling system.	For teaching technology comprehension	The results revealed that the proposed methods improved the students' learning outcome toward TC in terms of ICT knowledge and skills, and the positive impact on their creativity toward the robot-based storytelling development environment.
28	Bravo et al. (2021)	Using Robots with Storytelling and Drama Activities in Science Education	To explore the potential and challenges of using storytelling and drama activities with robot actors in science teaching	The study proposed a custom-made methodological framework for creating a storytelling robot.	Students between the ages of 11 and 13 years.	Students were guided to create a robot storytelling system in science education and proposed a methodology for developing storytelling and drama with robots.	Teaching science	Results show that robot storytelling and drama facilitate the development of science concepts, create a rich context to foster skills in students, create a positive classroom environment, and improve the students' attention

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								and motivation. However, there is a need to design low-cost expressive actor robots that are easily customizable.
29	Velentza et al. (2021)	Which One? Choosing Favorite Robot After Different Styles of Storytelling and Robots' Conversation	To identify the optimal social service robots' modalities that enhance the human learning process and level of enjoyment.	No application of conceptual model, theoretical, or methodological framework was stated.	College students.	A robot storytelling system was created to tell stories with different modalities and selected students watched the storytelling video online.	Telling stories to students and preservice teachers	Results indicated that participants prefer to collaborate with robots with a cheerful personality and expressive body movement
30	Nichols et al. (2022)	I Can't Believe That Happened! Exploring Expressivity in Collaborative Storytelling with the Tabletop Robot Haru	To present a working fully automatic collaborative storytelling robot, that can collaborate with a person to create a unique, improvised story	No application of conceptual model, theoretical, or methodological framework was stated.	University students between the ages of 18 and 50.	A collaborative storytelling robot system was built.	Telling of stories	Results show that collaborative storytelling systems with emotive voices and performed reactions were perceived to be more competent storytellers.

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