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PAPER

Using Interactive Multimedia to Stimulate Early Childhood Students' Speaking Skills: A Systematic Review

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ABSTRACT

Interactive multimedia is currently a significant topic in terms of learning speaking skills. This study aims to describe the use of interactive multimedia in stimulating early childhood speaking skills based on a literature review that has been conducted. The study method used in this literature study is the PRISMA (preferred reporting items for systematic reviews and meta-analyses) method. Data was obtained from the Scopus and Google Scholar databases using scientific articles from reputable international journals with the Scopus Q1–Q4 index. Article searches using the title and keywords "Interactive Multimedia," "Multimedia," "Interactive Multimedia in Early Childhood," or "Speaking Skills" are limited to the last ten years, starting from 2013–2023. The findings showed that the articles in the source database were 10.982 articles, and the final selected papers left 40 articles for review. The results of the study found that: a) the use of interactive multimedia in early childhood learning is dominated by Android-based interactive multimedia (50%), video (30%), and animation (20%); b) the use of interactive multimedia in stimulating early childhood speaking skills is dominated by android media (45%), video (40%), and animation (15%); c) the challenges faced when using interactive multimedia in early childhood learning are limited infrastructure and resources, and not all schools have adequate facilities for the use of technology-based learning media and a lack of teacher creativity. The contribution of this research can provide insight into the use of interactive multimedia to stimulate early childhood speaking skills effectively and efficiently. Thus, the use of interactive multimedia can be a research target in selecting interactive multimedia that is appropriate and effective for stimulating students' speaking skills at all levels of education and on different research topics.

KEYWORDS

interactive, multimedia, speaking skills, early childhood

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1 INTRODUCTION

Multimedia utilizes technology to combine several media types, including text (alphabetical or numeric), symbols, graphics, audio, video, and animation, to enhance comprehension [1]. Using static and dynamic graphics as visualization technology enhances spoken instruction to improve performance and expression [2], [3]. Multimedia technology is the gear and software used to develop and execute multimedia applications [4]. Digital and print communication of ideas and information is made possible by multimedia technology's features, including integration, diversity, and interaction [5]. In this context, "digital and photo features" relate to multimedia-based tools or programs that provide data to users so they can better understand concepts [1].

Information and communication technologies (ICTs) are revolutionizing many facets of human business, particularly education [7]. ICT uses technology and software to gather digitally, process, store, present, and distribute information [8]. One crucial area of information and communication technology is multimedia, which deals with the digital representation and presentation of data utilizing text, audio, and video [1]. Several technologies are combined to provide the optimum information format, package, and size [2].

Attaining the best imitation of the teacher is required when using multimedia programs for educational reasons or in the classroom since they must have a high enough level of design and sophistication to incorporate various parts of cognitive processes. Today's market offers a variety of multimedia application types [10]. This program has been utilized for pedagogical objectives in numerous fields, including physiology, physics, social sciences, mathematics, and physical education studies [3–7].

However, the primary issue is still present. The challenge lies in using applications to provide experience learning while disseminating knowledge to help pupils grasp subjects [8]. For practical instruction delivery, various apps must be developed; nevertheless, each has its target age, focus regions, quirks, benefits, and drawbacks [9]. Therefore, a great deal of research must be done on the taxonomy and synthesis of parts for producing multimedia applications, as these will impact the delivery of instruction and learning as well as other applications. Although some multimedia has been tried and implemented successfully, others have only had mediocre performance. Success stories differ based on the target age, region, and deployment objectives. This gap in the literature shows that the use of interactive multimedia that focuses on stimulating early childhood speaking skills is not adequate.

Based on the gap in the literature above, one of the skills that must be developed in early childhood is speaking. Speaking skills in early childhood are based on children's confidence to speak correctly, honestly, reasonably, and responsibly. Therefore, it is necessary to develop speaking skills in early childhood. The development of speaking skills in children is also influenced by listening skills, considering that children acquire vocabulary from their parents and the surrounding environment. According to [10], through speaking, children are free to express their thoughts and emotions under certain conditions. In speaking, the focus is not only on the words used but also on the way of speaking, intonation, facial expressions, attitudes, and gestures. Children need to be taught to speak continuously to help them develop speaking skills to communicate optimally [8].

Early childhood is an individual who has characteristics in every aspect of development, especially in the ability to speak [12]. The importance of speech aspects in

early childhood development means stimulation is needed to stimulate children's speech development. Schools have an essential and fundamental role in children's speech development [13]. According to [14], individuals can express their ideas and thoughts freely through speaking. Speaking skills are productive skills in oral mode. The use of the body is a tool so that the listener can understand the message's meaning [15]. Early childhood requires a variety of stimuli that can improve their speaking ability so that, with the proper stimulation, the child's speech development can be achieved optimally. Children express their feelings by speaking to communicate with others to convey their intentions, desires, emotions, thoughts, and knowledge verbally.

Speaking is a form of oral communication that conveys meaning smoothly, uses sentences clearly, and uses words [16]. Speaking in early childhood helps children interact with their peer group to exchange stories and experiences and interact with adults to convey messages [17]. Speaking is one of the skills children need to express their opinions, thoughts, and feelings verbally [18]. Speaking skills in children are closely related to the development of listening skills. Children's listening skills are also needed to understand language messages conveyed by adults. A child with hearing ability will have a good vocabulary.

Therefore, preschool teachers must provide quality teaching by highlighting the big ideas children need to have and the ability to develop developmentally appropriate play-based pedagogy [19]. One of the efforts is to increase the need for proper stimulation with media and methods relevant to children's age and age characteristics. Teachers must provide applicative media that facilitate concrete demonstrations of the material presented [20]. The applied media packages the delivery of media in a fun and exciting way for children so that the media can trigger students' interests, thoughts, and feelings in the learning process [9].

Using media in the learning process will help the child provide meaningful experiences and make the child understand abstract things more concretely [22]. Research results by [23] show that learning media affects students' speaking skills. Media that can be used to develop speaking and listening skills in early childhood are interactive multimedia in the form of animation, video, and Android media. Animated films process still images into motion films and are very liked by children [24]. Animated films can be the center of children's attention because they make it easier for children to enjoy and understand a story [25]. Another opinion states that animated films are one of the media that combine audio and visuals with stories using animated or cartoon steps [26]. Playful film media affects children's speaking skills [27]. Lively film media affects the listening skills of children aged 56 years [10].

The use of video media (audio-visual) makes children more interested in teaching and learning activities to increase learning motivation; learning materials are accessible to deliver and improve children's interaction in activities; children not only listen to the teacher's story but also observe, demonstrate, and others [29] [30]. Displaying sound and images simultaneously is a function of audio-visual media, so children's memory is more vital in capturing the material delivered. Video media can make it easier for students to express or convey the messages they receive so that others understand [31]. Some studies that have been conducted previously state that Android-based interactive media is very effective in developing and teaching students [32]. Android-based interactive media can improve thinking skills and the ability to remember the material learned [33]. Interactive multimedia is very worthy of development and learning because it has the characteristics of being able to

visualize the concepts learned, which are composed of several types of media, meet differences in learning speed, and are packaged in the form of Android-based applications so that they are proven effective in improving the achievement of cognitive learning outcomes [34]. Based on some of these studies, Android-based interactive media is feasible to develop and teach students because it can improve their thinking and memory skills.

This research examines the types of interactive multimedia used in early childhood learning in the form of videos, animations, and Android. The importance of using interactive multimedia in the form of videos, animations, and Android can stimulate young children's speaking skills at the early stages of their development. These skills will be measured through pronunciation, vocabulary development, sentences, fluency, and expression. Limited stimulants for children from parents and developments in technology in children's environments make interactive multimedia an option to support children's development, especially in practicing speaking skills. This research also provides information about the importance of giving stimulants to children in the early stages of growth and development by giving children the opportunity to talk through conversation activities using interactive multimedia in the form of videos, animations, and Android. Therefore, to identify the current use of types of interactive multimedia, the frequency of use of interactive multimedia, and assess the challenges faced in its use in early childhood learning, this paoer is different from the results of previous studies because it focuses on scientific studies that investigate various interactive multimedia in early childhood learning to stimulate children's speaking skills. For this purpose, this research problem is formulated as follows: (1) How do practitioners use interactive multimedia in early childhood learning? (2) What is the frequency of using interactive multimedia in stimulating early childhood speaking skills? (3) What challenges are faced when using interactive multimedia in early childhood learning?

The findings of this research aim to help practitioners choose interactive multimedia and types of interactive multimedia that are effective in stimulating early childhood speaking skills in the classroom as well as the challenges faced during the use of interactive multimedia in early childhood learning. The results of this literature review can be used as a reference for further research regarding the appropriate use of interactive multimedia in stimulating early childhood speaking skills in the classroom, and the challenges faced during the use of interactive multimedia are also identified based on the obstacles faced so far.

2 LITERATURE REVIEW

2.1 The importance of interactive multimedia in early childhood learning

Interactive multimedia delivers information to people through technology, such as computers or other electronic devices [35]. Text, sound, animation, and video [36]. Interactive multimedia can develop early childhood speaking skills using simple sentences with excellent and correct language [37]. Interactive multimedia can be designed to involve more children in the learning process [38]. This will also increase the success rate of achieving learning objectives [39]. To improve speaking skills, children need adults to provide various stimuli at home, at school, and in the surrounding environment. Parents are responsible for the most critical role in a child's life. Parents play an essential role in a child's language development at every

stage [40]. If parents are limited in stimulating language development, technology can help promote innovative and varied learning media. With the development of technology, teachers and parents can use learning media that are more flexible and can be adapted to existing needs [11].

Using various media features that facilitate information processing, multimedia, or digital learning materials helps students develop solid mental models. Text, image, video, and audio are all used in combination by digital learning systems to deliver knowledge. Content and, occasionally, learning activities make up information. Studies on the use of multimedia for education have revealed that students who utilize both words and images profit more than those who use words [42] [43]. As stated in [44], various pedagogical approaches were employed through the utilization of digital resources.

The study's authors demonstrated how they might introduce subjects to students, provide examples of them, encourage group discussion, provide a variety of text formats, and include students in interactive learning. Multimedia technology used in education may generally be classified based on whether it is utilized for teaching or learning. A selection of digital or multimedia learning resources can be found in [44]. Furthermore, according to [9], in numerous studies, multimedia technology is beneficial to education, and multimedia tools are widely used. Technology is typically used in multimedia, and because of its many advantages, multimedia applications are commonly used in education [45]. The following is a summary of some benefits of multimedia application tools for instruction and learning: the ability to translate abstract ideas into tangible substance, the ability to provide vast amounts of knowledge quickly and efficiently, the ability to pique students' interest in learning, and the ability to give teachers insight on their students' learning positions.

Creating mental representations from words and images in many contexts is known as multimedia tailored for learning. They support education by providing resources that may be utilized in virtual reality, computer games, simulations, classroom or laboratory instruction, e-learning, and presentations. This enables students to process knowledge in spoken and visual formats [46]. Understanding some theories, such as the cognitive theory of multimedia learning, which makes three assumptions about how people learn from instructional multimedia content, is necessary to comprehend multimedia intended for educational purposes. These presumptions include active processing, limited capacity, and dual-channel technology [46]. Dual-channel theory presumes that students have multiple pathways for separating aural and visual information. There is a limit to the amount of data that can be processed in each channel, according to the restricted capacity theory.

Instructors who understand these can impart a multitude of knowledge to their students. Nevertheless, students will be aware of their information-processing capabilities and constraints. The theory of active processing holds that people are active agents who can select, arrange, and integrate the different kinds of information they come into contact with. ICT changes every aspect of human existence; thus, when employed appropriately in the classroom, the attention moves from the instructor to the student [9] [47]. [47] emphasized that the shift from teaching to learning leads to student-centered learning, in which educators play the role of facilitators rather than stage managers, changing their role from imparting knowledge to facilitating, navigating knowledge, and co-learning. [48] found that utilizing multi-media technology ensures that classroom instruction is delivered in a way that is highly effective, fascinating, motivating, interactive, and of the highest caliber while satisfying the needs of a wide variety of learners.

2.2 Use of interactive multimedia in stimulating early childhood speaking skills

Early childhood speaking skills get less attention from teachers because they focus more on reading and writing [21] and [12]. As a result, the vocabulary is still limited, so early childhood is less able to express ideas when answering questions from teachers, and children sometimes feel they need help understanding what they are talking about [49] [13]. In addition, there is a need for technology mastery in classroom learning activities [50]. The learning process still uses conventional media [51] to present material, using chalkboards, books, or oral delivery [17]. The problem that is being faced by schools in Indonesia today is the need for more availability of learning software, especially in kindergarten institutions, in the form of interactive multimedia. Children can use interactive multimedia to develop their speaking skills [52]. With the development of technology, teachers can use learning media that are more flexible and can be adjusted to existing needs [14].

Since technology is constantly changing, researchers in education technology and information technology (IT) continually examine how multimedia technologies might be used to improve teaching and learning. A software tool has the potential to enhance education across multiple domains. In the majority of subject areas, giving students real-world experience is vital. It's necessary to strike a balance between the value of multimedia technologies and applications as teaching and learning aids in the classroom. Numerous studies examining multimedia technologies' effects on the educational system have proven this. The value of incorporating multimedia resources into math classes and discovering how much they improve students' learning [6]. Numerous studies demonstrate that using multimedia to teach improves students' learning [15], [16].

Multimedia and face-to-face communication are highly comparable. It is less restricted than text and ensures greater comprehension [54]. Multimedia technology allows for individual variances, makes it easier to coordinate many representations from different angles, and aids in the clarification of abstract content. Using appropriate fonts and design to connect students with their learning through a computer-based method can be valuable. However, using this technology in the classroom could improve a few things. These restrictions include difficult-to-use software or user interfaces, scarce resources, insufficient experience and training, time constraints, and expensive maintenance [17], [18].

Determining if a multimedia program succeeds in achieving its objectives and benefits the target audience is part of the evaluation process. Bring up the fact that the designers of multimedia tools have certain expectations about the purposes for which they are meant to be used. These purposes may be primarily instructional (with a focus on learning designs, processes, and results) or mostly functional (with an emphasis on the interface) [19]. It is essential to remember that while evaluating multimedia, various methodologies are used, and most of these assessments entail surveys, tests, and comparisons. The primary goal is to strike a balance between the assessment's validity and the evaluation procedure's effectiveness [20]. Sampling and questionnaires (or interviews) are the two primary components of survey research. It is more economical, time-efficient, and suitable for collecting data from a population that is too large to supervise than experimental research personally. Nevertheless, survey research can be impacted by non-response, social desirability, and remembering biases arising from questionnaire design and sample,

which hinder researchers from completely understanding the underlying causes of respondent behavior [21], [22].

In comparison studies, it is standard procedure to compare an experimental group's outcomes using the multimedia being evaluated with those of a control group. This approach has drawn criticism for several reasons, including the requirement for additional treatment definitions, the failure to include all treatment characteristics, and the inability to track treatment implementation [23]. Given the subjective nature of surveys and the limitations of comparison studies, eye tracking and other student behaviors, such as emotional responses, provide information that neither the student nor the researcher can consciously control. As such, they are used as an objective method of acquiring data. The multidisciplinary discipline of eye-tracking research monitors how the eyes move in response to visual cues [2]. Researchers can objectively and statistically assess how learners understand multimedia information, how they pay attention to the content while analyzing it, and the cognitive demands of the range using eye-tracking data [24]. Eye tracking is a fascinating technology because it offers kids a valuable source of information. This is because collecting data by conventional methods is more complex, mainly when dealing with the interests and preferences of children [25].

Previous efforts to examine how students behaved when interacting with online content included looking at student access computer logs and the frequency and duration of engagement [25]. Online classroom visual tracking is rapidly becoming more effective than manually analyzing student behavior [26]. They discovered various components of the optical monitoring behavior in online classrooms, including mapping, analysis and collection, presentation, analysis and selection, and facial expression analysis. Student behavior tracking is used in several studies to look at how students use multimedia learning resources. For instance, in [27], student behavior tracking, which is integrated into learning management systems (LMS), gave information on how much time students spend in front of computers reading the materials. They employed speaker verification, fingerprinting, and face monitoring to do this. [46] After conducting a thorough study of eye-tracking research on multimedia learning, we found that while the field expanded, most of these studies concentrated on the adverse effects of multimedia use in higher education.

Additionally, they found that while eye movements were associated with how students choose, arrange, and incorporate information from multimedia presentations, metacognition and emotions about eye movements were not frequently studied. [24] employed eye tracking to assess how elementary school students used multimedia. Several studies have examined learners' perceptions of the learning material and their cognitive processes during learning using verbal data and eye-tracking [28]. Although eye-tracking and other behavioral research offer opportunities for objective assessment, one drawback of eye-movement data is its interpretive complexity [29], and the widespread use of traditional methods for evaluation, such as administering questionnaires and conducting surveys, is not surprising.

3 METHOD

This study uses a search method to find papers that must be examined to address a particular research issue. It consists of a methodical examination of the article's content for synthesis and analysis. As presented in the work, the protocol for the

preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2015 is followed by the systematic review [31]. These recommendations make it easier to conduct meticulously thought-out and documented systematic reviews supporting review articles' integrity, accountability, consistency, and transparency [32]. Protocols for the study also included determining data sources, search terms, and inclusion standards. The essential aspects of the report are condensed into tables and elements that may be assessed and examined to help with synthesizing the particular piece. The steps of the article mapping process that have been completed are shown in the flow diagram below.

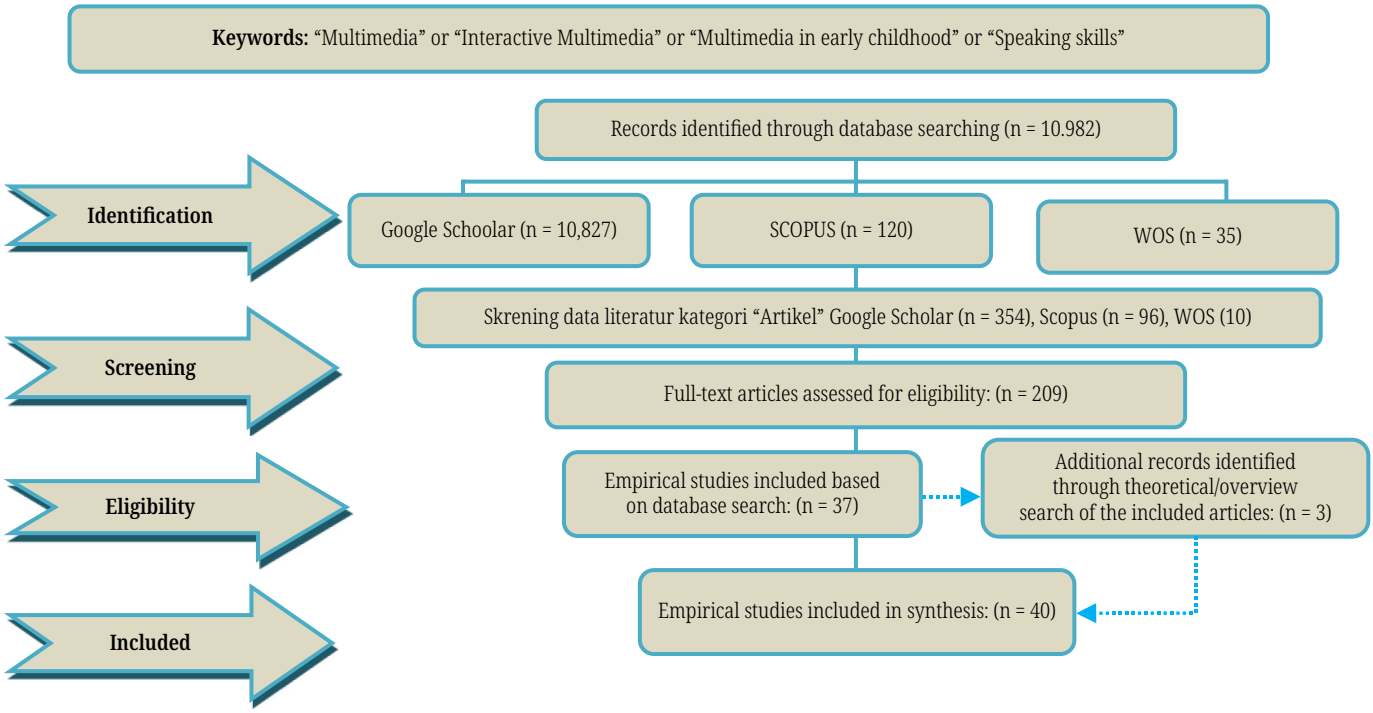

Fig. 1. Mapping of the selection of relevant articles for systematic review adoption from [30]

3.1 Data sources

The data sources used to search for research articles are the first step in a high-quality systematic review. This requires careful examination of previous research from various databases and scientific journals. The literature study took data from scientific articles in reputable international journals with the Scopus Q1–Q4 index an impact factor (IF) ranging from 0.030 to 3.092, which is the main indicator for selecting quality journal articles. The databases used are WOS, Scopus, and Google Scholar via the Publish or Perish application, limited to the last ten years, from 2013 to 2023.

3.2 Search keywords

The literature search strategy of [32] was utilized to ensure relevant papers were carefully picked for review purposes and that appropriate primary search phrases

were employed. Although the query output should always be possible to gather all related documents from a search on the main string, this is only sometimes the case, which is why a substring is included. Search terms for pertinent literature in academic databases and niche journals, such as "multimedia," "interactive multimedia," "multimedia in early childhood," or "speaking skills," are some of the keywords associated with the database used for this study.

The PRISMA flow chart in Figure 1 shows that the total number of articles obtained from database sources in the form of Google Scholar, Scopus, and WOS is 10,982 articles. The article is identified and screened again to find out the category of articles that are suitable for use. According to the results of the literature screening, 460 articles were obtained according to category.

3.3 Inclusion and exclusion criteria

Every article from the academic databases and libraries reviewed has an equal chance of being chosen for the intended use. Clear guidelines are developed and used to create the inclusion criteria for papers to prevent bias in the selection process. Figure 1 lists these requirements. As a result, a query utilizing an otherwise searched string returns 10,982 Internet articles in English about the topic of interest. Included are all the publications that were discovered throughout the search. There is no restriction on publication dates for the publications included in this analysis. Each researcher has finished screening 10,982 items (initial rater agreement of 80%).

Furthermore, an eligibility process is carried out to find out the categories of articles that can be accessed in full text. From the results of eligibility, 209 full-text articles were obtained. Articles that enter the eligibility stage are continued by determining inclusion and exclusion criteria included. Articles included in the exclusion criteria as many as 164 articles, and articles included in the inclusion criteria included as many as 37 articles. Further, we conducted backward and forward tracing on 164 published theoretical articles and summaries from previous reviews. In addition, we identified two other articles that fit the notability criteria. Thus, as many as 40 empirical articles were included in this systematic review.

3.4 Data collection and synthesis of results

For analysis, 40 articles were chosen based on the selection mechanism. Every component is examined, and data is extracted for tabulation. The type of multimedia utilized, the technology employed, the multimedia elements in the tool, and how the tool was used—for teaching, learning, or both—are among the details that are looked after. If the device is evaluated, the target group, methodology, outcomes, methodology constraints, and generalizability of the results are also provided. The insights from the reviewed publications are provided in the next section, along with selected findings organized into tables for simple synthesis and analysis. Two researchers coded the article separately, and the raters' agreement was 95% since the variables we evaluated could be inferred from the text objectively. The process of multimedia evaluation in early childhood learning is presented in Table 1.

Table 1. Interactive multimedia evaluation in early childhood learning

No.	Interactive Multimedia Evaluated	Technology Used	Studied Multimedia Components
1.	Animation	The use of animated media can be made using the Macromedia Flash or Adobe Flash programs.	• Able to show objects with ideas (e.g. the effect of gravity on an object). • Able to explain difficult and abstract concepts so that they are easier to understand through animation visualization. • Able to explain procedural steps more clearly and in detail. • Able to attract attention through alternating motion and aligned voice, when integrated with audio elements.
2.	Android	The use of Android-based media can be opened and saved via smartphones and laptops with the Android operating system.	Android media has components: • *Open source,* can build Android-based applications. • *Multitasking,* mobile phones that use Android OS can run several applications simultaneously. • *Widget,* on the main screen of Android, some widgets make it easy for users to access applications Android. • *Google Play,* users can have applications either free or paid.
3.	Video	The use of video media can be through various models, for example using video in the form of digital video, video *streaming,* or video *conferencing*.	• Able to explain the original *(real)* state of a process, phenomenon or event. • As part integrated with other multimedia components, such as text, and images, and can enrich the presentation or explanation of material. • Users can replay certain parts to see a more focused picture. • Suitable for teaching material in the realm of behavior and attitude. • The combination of audio and video can more effectively and faster convey messages than text media. • Able to demonstrate a procedural step.

4 RESULT AND DISCUSSIONS

4.1 The use of interactive multimedia in early childhood learning

The use of interactive multimedia can create engaging and fun learning for early childhood. This is because interactive multimedia is a type of learning medium that includes writing, images, sound, video, and animation that can make it easier for users to use. Some interactive multimedia that is often used in early childhood learning is in the form of videos, animations, and Android. The following is presented as a graph of the percentage of interactive multimedia use in early childhood learning.

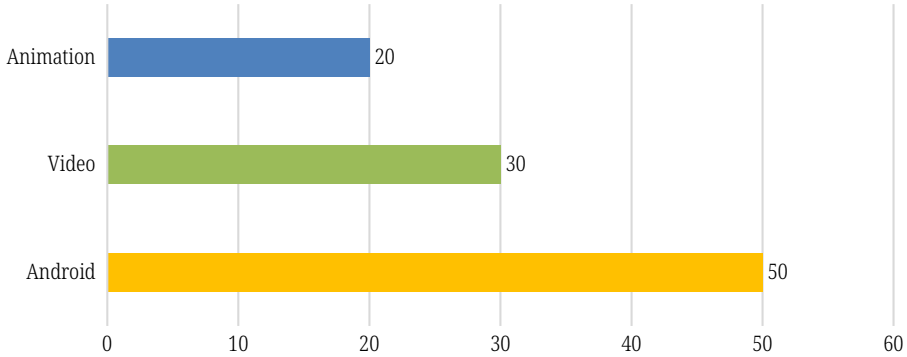

Fig. 2. Percentage of interactive multimedia in early childhood learning

a) **Video-based interactive multimedia:** Video-based interactive multimedia is a group of audio-visual media as a means of communication that can produce

sounds and images that can be heard and seen with the eye and combined with interactive multimedia, which becomes a learning tool or means that contains material, methods, limitations, and ways of evaluating that are designed systematically and interestingly to achieve competencies or sub-competencies of the expected goals and can increase motivation and the effectiveness of learning outcomes for its users through laptops in a fun way [31–32]. Video, when used as playback equipment for a program (recording), consists of at least one video tape recorder (video cassette record) and one or more monitors [8]. Video media can be classified as audio visual aids (AVA) media or media that can be seen or heard [33]. Audio-motion visual media (motion audiovisual media) has sound; there is movement, and the object's shape can be seen; this media is the most complete [34]. Information presented through this medium is in the form of a living document, can be seen on the monitor screen, or when projected onto a big screen through a projector, can be heard, and movement can be seen (video or animation) [35]. A video comment is a medium or intermediary of an activity delivered to clarify the presentation of messages and information [36]. Based on this video comment, students are asked to comment after seeing or listening to the video presented, which was used in this study as an improvement in speaking skills [37]. Television broadcasts, videos, or similar recordings are the most widely known uses of video comments [38]. Television broadcasts can also be recorded later in class, for example, because the necessary broadcasts do not match the time with learning hours at school [33]. The selected television broadcasts can be news broadcasts, soap operas, flora and fauna shows, and others with educational or other essential elements [39].

The implication of using video in early childhood learning is that it can describe the message conveyed to be easier to understand so that it can develop students' thoughts and opinions, especially by stimulating students' speaking skills. Some research results show that the use of video media (audio-visual) makes children more interested in teaching and learning activities to increase learning motivation; learning materials are accessible to deliver and improve children's interaction in activities; children not only listen to the teacher's story but also observe, demonstrate, and others [29], [30]. Displaying sound and images simultaneously is a function of audio-visual media, so children's memory is more vital in capturing the material delivered. Video media can make it easier for students to express or convey the messages they have received so that others understand them [40].

b) **Android-based interactive multimedia:** Android is a Linux-based mobile smartphone operating system that includes operating systems, middleware, and applications [41]. Android is a comprehensive open-source platform designed for mobile devices [42]. Android is a prevalent operating system because of its complete nature [43]. Android is provided openly (open source), and the heart of the Android Free Platform makes it easier for users [44]. Android can be an alternative learning supplement because learning occurs anytime and anywhere [45]. The choice of Android as the basis for making learning media smartphone applications is because the deployment and installation of applications on the smartphone do not have to go through the official application store owned by Android; the deployment can be done offline [46]. Using Android applications is an alternative to increasing students' understanding of the material taught [47].

Using Android applications is an alternative to increasing students' understanding of the material taught [60]. The learning materials displayed are exciting and interactive, making the learning process more active and fun [48]. Android-based

interactive multimedia with engaging presentations can increase student motivation [61]. This is supported by the opinion [41] that if learning media attracts students' attention more, it will foster learning motivation and improve student learning outcomes. The benefits of learning media are that learning materials will be easily understood by students and will allow them to master and achieve learning goals [49]. The use of Android can be an opportunity to support activities in the world of education, one of which is the development of Android-based learning media, which is expected to provide convenience for learning [63]. According to [50], using Android-based learning media helps improve students' academic performance through learning outcomes and motivation. Implementing learning using Android can positively impact students based on cognitive, metacognitive, affective, and sociocultural aspects [51].

The implication of Android media in early childhood learning is that children can learn through smartphones more easily because of educational games and the recognition of numbers, letters, and daily words that contain audio or sound. There is a large selection of complete learning materials to improve cognitive abilities while improving speaking skills in early childhood. Some studies that have been conducted previously state that Android-based interactive media is very effective in developing and teaching students [32]. Android-based interactive media can improve thinking skills and the ability to remember the material learned [33]. Interactive multimedia is very worthy of development and learning because it has the characteristics of being able to visualize the concepts learned, which are composed of several types of media, meet differences in learning speed, and are packaged in the form of Android-based applications so that they are proven effective in improving the achievement of cognitive learning outcomes [34]. Based on some of these studies, Android-based interactive media is feasible to develop and teach students because it can improve their thinking and memorization skills.

c) **Animation-based interactive multimedia:** Animation is a display arranged by combining text, graphics, and sound in movement activities [52]. Animation can provide a clear picture of a material, so the use of animation in learning can increase student interest, motivation, and understanding of learning [53]. Animation media becomes interesting when it can positively contribute to learning outcomes [54]. Every subject that is usually considered difficult to understand becomes very interesting because it can explain a concept or process that is difficult to explain with other media; animation media also has an aesthetic appeal so that an attractive and eye-catching appearance will motivate users to engage in the learning process [55].

In interactive media animation, also called film media, live images are images in frames projected through the screen so that the image looks alive [56]. Animation is a verbal symbol, visual symbol, and motion symbol combined into one equipped with audio, which at any time can be played back so that it impresses life and stores learning messages; animation has functions such as generating learning motivation, providing stimulation, and activating student responses [57]. The characteristic of this animation medium is a display that displays animated characters or objects that have a lively impression in a conversation, dialogue, or oral speech [58]. Through animation media, students can memorize and remember what has been learned by looking at the display of moving images [59]. This makes students more motivated to learn, affecting their interest in learning [60]. Therefore, learning with animated media can increase curiosity and interest in learning because learning can be done in a fun and exciting way [61].

Animated interactive media is a multimedia-based learning system because this medium can present information that can be seen, heard, and done at once [59]. People can remember 20% of what is seen and 30% of what is heard [62]. But people can retain 50% of what is seen and heard and 80% of what is seen, heard, and done at once [63]. So, with animated interactive media, students can remember 80% of the material because they can get information or learning materials from these media by seeing and hearing them all at once [64]. In this medium, there is animation, a form of moving visual that can be used to convey messages to make them more exciting and easier to understand; with that, the media is very effective in becoming a complete medium in the teaching and learning process [63]. Animated interactive media can attract interest in learning; high and low interest in learning will impact student behavior and quality [56]. Because interest in education is an increased tendency towards something or interest in something that someone wants to achieve to obtain behavioral changes over a long period of relatively settled practice or experience [65].

Animation can be categorized into three categories: 1) Stop-motion animation comes from two words: stop and motion. So, stop activity means stop and move. 2) Traditional animation is used for most animated films. It is traditionally named because this animation technique was used when animation was first developed. 3) 3-dimensional animation is a graphic presentation achieved through computers and digital generators. 3D animation itself is a model that has shape, volume, and space so that it can be seen from all directions [53], [64], [66]. From several theories about interactive media, it can be concluded that animated interactive media is one of the ICT-based products in the form of moving visuals such as films; animation can also be interpreted by animating images, so it is necessary to know with certainty every detail of the character in various expressions (normal, silent, angry, smile, laugh, annoyed, and others), used as a medium in learning that can facilitate and arouse students' learning interest [54], [57].

The implication of using animated media in early childhood learning is that problematic or abstract learning material can be delivered in a way that is easier for students to understand. Animation can also present information interactively, allowing students to participate actively in the learning process. The results showed that animation media can improve early childhood learning outcomes [56]. Students demonstrate a very enthusiastic interest and enthusiasm in learning, are happy when learning using animated learning media, and can follow learning well [67] [8] [64]. Playful learning media can help teachers present information and knowledge effectively over time and make students more interested in participating in fun learning [56] [55]. Animation media can help students understand the material presented and assist teachers in learning activities with the ease of delivery of learning communication, especially in training early childhood speaking skills [58] [68].

4.2 The use of interactive multimedia in stimulating early childhood speaking skills

Speaking is the process of conveying messages through spoken language. Speech uses articulated sounds or words to express and share thoughts, ideas, and feelings [69]. Language skills are related to speaking skills, and broadly, there are three types of speaking situations: interactive, semi-active, and non-interactive [70]. Interactive speaking situations, such as face-to-face conversations and talking on the phone,

allow switching between talking and listening and let us ask for clarifications, repetitions, or tips from the person, slowing down the tempo of speech from the interlocutor [71]. There are also semi-active speaking situations, for example, in public speeches in person [72]. In this situation, the audience cannot interrupt the conversation, but the speaker can see the listener's reaction from their facial expressions and body language [73]. Some speaking situations can be said to be non-interactive, for example, giving a speech over the radio or television [74]. Speaking skills are an activity carried out by issuing language sounds or voices to convey ideas, opinions, and thoughts to others so that the listener gets what is meant clearly and well-received [75]. Speaking describes getting messages through spoken language; speech is the ability to pronounce articulated sounds or words to express and convey thoughts, ideas, and feelings [38], [76].

Based on the results of an analysis of 40 articles, it was found that using technological media in early childhood learning is an effective strategy to improve the speaking skills of early childhood students in mastering second and third languages. Media that have been used on a variety of materials to enhance speaking skills at the early childhood level are Android, animation, and video. The most widely used media types in early childhood learning are Android, animation, and video. The following percentages of interactive multimedia used in stimulating early childhood learning speaking skills are presented in Figure 3.

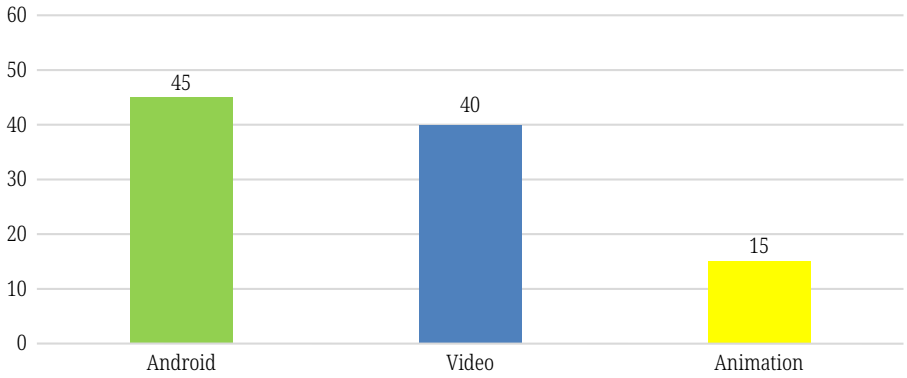

Fig. 3. Percentage of interactive multimedia in early childhood learning

Figure 3 shows that Android-based interactive multimedia is more dominant in early childhood learning than video and animation. This is in line with [77], which states that Android is very effective in improving language skills, as shown by children being able to interact with their peers using the new language they acquire; children's communication with teachers and parents is also increasingly directed and understandable. The use of android can train listening skills and foster children's interest in telling stories, especially now that this is the era of using android media that is in great demand by children, making it easier to teach and motivate children to learn to speak [78]. Android is a medium for delivering information to children to improve their speech or language skills [79]. As stated by [80], learning media can be used to distribute news or messages. Multimedia creates a better and unique language teaching context [81]. Technology-based media significantly affect teachers' knowledge, pedagogy, and language proficiency [13]. In addition, the use of ICT strongly influences pedagogical knowledge and speaking ability in English [82]. Technology-based media in language learning, especially in early childhood, positively affects children's language skills [83]. In addition, teachers also have a

positive attitude towards the role of ICT in language teaching among early childhood students [84].

The use of interactive multimedia videos aims to present information in a fun, engaging, easy-to-understand, and straightforward form so that children can engage in learning. Interactive multimedia can improve children's ability to speak, process stimuli, and engage in active learning because of the communication process between media and children after treatment with interactive multimedia [85]. Using audio-visual media makes learning more enjoyable; learning motivation will increase; children will more easily understand new material, and there will be two-way communication between teachers and children and other activities such as observing, demonstrating, and others [35]. Audio-visual media can improve children's speaking skills [34]. Using technology or multimedia media as a learning tool in carrying out learning activities can positively impact language acquisition [86]. The development of technology and communication of these gadgets dramatically affects the world of education, not only for adults who use them but also for the development and education of early childhood [87]. In addition, learning media are very important in learning activities, emphasizing process skills and active learning. Students can act as messengers and recipients of messages [38]. Therefore, the development of technology is very beneficial for early childhood, where knowledge becomes more effective and interactive [88]. This will help early childhood learners learn to master more interactive speaking skills [74].

Interactive animated media can help language acquisition and literacy in early childhood. In line with the opinion [8] that technology as an educational medium can support children's language skills and literacy to involve and motivate children's learning. The animation successfully develops the child's vocabulary knowledge despite explicit teaching in small groups [53]. The animations provided during instruction in small groups can improve a child's vocabulary mastery [54]. The child is actively involved because the interactive energy is child-centered [52]. Research by [81] showed improved children's speaking skills through animation media. Examining empirical studies that the use of technology as one of the interactive animation media in children needs to be introduced to children because the existence of interactive animation media can help teachers and children understand the material so that learning is fun and not dull [62]. Technology can be used to develop aspects of early childhood development, including speaking skills [75]. Developing speech or language skills is an effort to develop children's communication skills with their environment [71]. Speaking children can develop their intelligence through thought processes and train listening, reading, and writing skills [74]. The development of speech is a means of communication for children by symbolizing thoughts and feelings to convey meaning to others [47]. The intended communication is writing, vocabulary, symbol language, facial expressions, gestures, and art [84].

Thus, using interactive learning multimedia can develop the speaking skills of early childhood students by using simple sentences with excellent and correct language [70]. Using multimedia in learning can increase children's involvement in the learning process and the success of achieving learning objectives [89]. Language development in children aged 5–6 years is in the form of increasing the ability to master communication tools, both oral and written [54]. Language development is divided into four skills: reading, writing, speaking, and listening [83]. Developing speaking skills in early childhood can lead children to use and express their thoughts through words. In other words, language development is more directed so that children can process words comprehensively, express words in body language that

others can understand, understand every word, interpret and convey entirely to others, and communicate convincingly to people through spoken words [81].

4.3 Challenges faced when using interactive multimedia in early childhood learning

The use of interactive multimedia in early childhood learning still faces several challenges such as limited infrastructure and resources, and not all schools have adequate facilities for the use of technology-based learning media, especially in developing countries. Limited Internet access, hardware (laptops, projectors), and maintenance costs are obstacles [60]. In addition, to the lack of teacher competence, some teachers do not have sufficient skills to utilize various learning media optimally, this includes the ability to operate devices, integrate media with the subject matter, and evaluate the effectiveness of their use [90]. The lack of teacher creativity is also one of the biggest challenges in implementing interactive multimedia in early childhood learning [91]. Therefore, teachers need to have skills in using interactive multimedia as a learning medium that supports the learning process in the classroom.

Interactive multimedia is a new finding that is suitable to be applied in the current era, namely when technological developments have been increasingly advanced, so it is hoped that education can be aligned with technological developments [61]. Interactive multimedia can be created by teachers from different places and in situations that are not limited by space or time [47]. This is influenced by the existence of applications that have been provided for free and can be downloaded by teachers via smartphones and laptops [92]. Through interactive multimedia learning, the learning process in early childhood education becomes more interesting and fun, and children become wider in understanding, feel more like they are in real-life situations and able to foster attention or enthusiasm for learning topics delivered by teachers in class [93]. In addition, interactive multimedia learning has positive benefits for children's growth and development because children can simultaneously learn by using their senses of vision and hearing, making it easier to learn [94]. Interactive multimedia is proven to improve various aspects of children's abilities and can be a new experience [28] [18]. Interactive multimedia learning can be used in learning environments aimed at helping teachers increase their understanding, knowledge, and confidence to use multimedia in teaching and learning activities [95] [96].

5 CONCLUSION

Based on the findings and discussion, it can be concluded that: a) the use of interactive multimedia in early childhood learning is dominated by Android-based interactive multimedia (50%), video (30%), and animation (20%); b) the use of interactive multimedia in stimulating early childhood speaking skills is dominated by Android media (45%), video (40%), and animation (15%); c) the challenges faced when using interactive multimedia in early childhood learning are limited infrastructure and resources, and not all schools have adequate facilities for the use of technology-based learning media and lack of teacher creativity. Interactive learning multimedia has special menus that can be accessed by users (early childhood) to bring up information in the form of audio, visual, and other features to stimulate

children's speaking skills as one way to develop learning media in the context of early childhood. Multimedia can be used through computers and gadgets equipped with animation, audiovisual, and button functions to attract children's interest in growing speaking skills. The contribution of this research is to provide insight into the use of interactive multimedia to stimulate early childhood speaking skills effectively and efficiently. The recommendation for practitioners is that it can be a reference in choosing appropriate and effective interactive multimedia to be used to optimally stimulate early childhood speaking skills.

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