Digital Storytelling for Early Childhood Creativity: Diffusion of Innovation "3-D Coloring Quiver Application Based on Augmented Reality Technology in Children's Creativity Development"

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Abstract—One of the important activities in children's learning that is rarely explored is creativity. This is an important concept for the successful implementation of early childhood education programs. Every child's creative talent must be developed. Opportunities and learning resources in the form of an environment to explore sources and media need to be given to children in realizing their creative potential. The growing digital world and children's interest in devices such as smartphones are an opportunity for teachers to take advantage of interactive and interesting ICT-based learning resources and media through audio, visual and audio visual media. Utilization through the wise use of digital resources and media for children is an important part of learning. Digital Storytelling in coloring activities through the "Quiver 3-D Coloring based on augmented reality technology" application offers the integration of virtual objects into a real environment forming three-dimensional animations on smartphones, color pictures for children, presenting digital stories at the end of the activity, so that children have an interest so that their creativity will develop. The purpose of this research is to spread "augmented reality technology with Quiver-3D coloring application in developing children's creativity" by presenting digital stories. The approach used in this research is descriptive analysis method through a qualitative-quantitative approach. The data in this research were obtained by direct observation and research-related questions to informants. The results of the research show that: "children's creativity develops well through digital storytelling learning with 3-D Coloring based on Augmented Reality applications".

Keywords—digital storytelling, diffusion of innovation, augmented reality, coloring creativity

1 Introduction

One of the main goals of education is to develop potential and better educate individuals. Individuals who are Human Resources (HR) who have a good education can

have creativity, knowledge, personality, independence and become a more responsible person in every action taken. Developing the potential of children (learners) to become human beings who believe and fear God Almighty, beberard mulya, healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens is the goal of national education based on Law No. 20 of 2003 article 3 on the National Education System.

In line with the above educational objectives, that creativity and creativity become one of the important points that are the focus of the government and contained in the law. In 21st century education and learning, there are four C's that are also important points and discussions, namely: Colaboration, Comunication, Creativity and Critical Thinking. Of the 4 important points, Creativity (Creativity) is included in the discussion of 21st century learning taught in schools and in colleges. Creativity needs to be created and defined as part of an innovative product. There are many ways to hone and create this creativity. One of them is by utilizing (utilization) Quiver-3D Coloring Application based on Augmented Reality Technology in Digital Storytelling activities. Something innovative needs to be disseminated to develop creativity and increase the potential of children, of course, which becomes the end point in the dedication of innovative and creative work.

Augmented Reality technology combined with Digital Storytelling is a new thing for children in PAUD institutions in Indonesia. This technology can be integrated with quiver-3D coloring applications which is also a new thing. Digital storytelling as a learning tool or medium to increase the interest, attention, and motivation of the digital generation in the classroom. Digital storytelling as one form of presentation of material as an effort to bridge various ways of learning students. Digital storytelling as a tool to create a creative generation by spurring students to search and tell topics from their point of view. The results of Digital Storytelling involve multimedia. The results of Digital Storytelling can be enjoyed by all people. The results of Digital Storytelling can be used for long periods of time. Therefore, something new (innovative) needs to be done diffusion of innovation with a combined strategy of theory and practice that is interesting and provides high motivation in developing its creativity.

The diffusion of innovation is one of the oldest social science theories developed by E.M. Rogers around 1962 and is still relevant today. The results of communication that come with the aim of explaining a product or idea to obtain an opportunity from time to time in the process of spreading through the existing population or social system. The spread has the result that people or human resources as part of a social system adopt an idea or new idea and behavior or product. This adoption means giving the meaning that someone is doing something different from before (buying or using a new product, acquiring, and performing new behaviors etc.). The key is that those human resources must view an idea, behavior, or product as innovative. It is through this adoption that diffusion becomes possible to be done and implemented. Several previous studies in various countries have studied augmented reality technology, such as research conducted in Spain on the use of Augmented Reality to improve English learning and motivation to build social-affective relationships. Augmented Reality as a digital game that shapes children's behavior patterns and cognitive achievement in early childhood in Turkey [1], and research analyzing how feasibility of Augmented Reality technology

in early childhood is based on characteristics of Augmented Reality and the child psychology side [2].

There have been many researchers who utilize Augmented Reality technology as one way to explore how the technology is effective in gaining knowledge, supporting, and improving learning [1][3]-[6]. Among some of the existing studies, there has not been a study that examines the use of augmented reality technology in terms of early childhood creativity development through Digital Sorytelling. Researchers also felt the need to coordinate this Quiver3D Coloring application based on Augmented Reality and Digital Storytelling Technology to teachers and children in paud agency units. Based on this background, this study has the following objectives: (1) the use of a 3D coloring quiver application based on augmented reality technology with Digital Storytelling for early childhood development, (2) analyze the utilization of Quiver-3D Coloring applications based on Augmented Reality technology. Digital Storytelling activities for the development of early childhood creativity.

2 Literature review

Research conducted by Tao et.al., [7] under the title "*Digital Twin and Virtual Reality and Augmented Reality / Mixed Reality"* is one of the studies that combines virtual and augmented into a technology called digital twin. *Virtual reality* (VR) and augmenteed reality (AR)/*mixed reality* (MR) are the merger of technologies to become more mature with related technological developments, such as advanced sensors, computer graphics, real-time registration tracking and others. The benefits brought by *Virtual Reality* and *Augmented Reality* combined with technology, making it a prevalent and beneficial trend for *digital twin* [7]. The revolution industry 4.0 program advocates for significant innovative developments in the processes of the engineering manufacturing industry. This suggests the massive introduction of new smart solutions such as *Additive Manufacturing* (AM) and *Augmented Reality* (AR) into modern factories [4]. Because AR becomes one of the alternative learning media options.

The rapid development of the digital world has had a positive impact on schools to develop their learning systems. Many schools provide support tools to facilitate learning activities. According to Smeda, [8] One of the reasons why digital stories fit perfectly with today's students is because they combine skills, tools, and practices that resonate with contemporary learners.

Gomez J. et.al., [9] argues, that: "Storytelling is an important asset in today's society because digital platforms for storytelling can facilitate collaborative story development, so the storytelling process, if properly facilitated, can lead to the creation of stories that enhance relationships. between players". There is good, important and interesting information conveyed through stories about players and interactions of course. Not only knowledge, but also a broad understanding with good media tools and resources needed in finding ways to facilitate storytelling activities for good and analysis in utilizing the power of the data that will be generated. Because storytelling activities are an important part of the interesting elements that are important to be expanded in the education and learning syllabus. This is to further enrich Students in their vocabulary and understand

structure and grammar naturally and can enjoy through good listening. Furthermore, Yussof et al., [10] stated: "Storytelling is one of the interesting elements that must be developed in the educational syllabus, so that students can enrich their vocabulary and understand grammar naturally by listening and enjoying stories".

Augmented reality (AR) is a technology designed to integrate or combine virtual objects. The combination of two or three-dimensional virtual objects is brought into a real three-dimensional environment which is then projected in real time. So that the coloring technique is more exciting with the use of augmented reality (AR) technology through the use of the quiver 3-d coloring application. After that, it will be more exciting in the next activity with digital stories that are included in the application and augmented according to the theme in the picture.

Edwin & David [11] in his research entitled "*Educational Mobile Application of Augmented Reality Based Markers to Improve the Learning of Vowel Usage and Numbers Children of a Kindergarten in Trujillo" mentioned that "Augmented reality is the vision of a physical environment by means of a device (smart phone, tablet), so that this real-world physical environment is shown in real time with an additional layer of virtual elements".* He mentioned that *Augmented Reality* is the vision of the physical environment using devices (smart phones, tablets), so this realworld physical environmen is displayed in real time with an additional layer of virtual elements.

Augmented reality (AR) technology is a field of research related to computer technology that combines 3D computer graphics data with the real world. According to Wibawa et al., [12], because of the support of a good technology and communication system, it makes it easier for students to learn and move from one place to another as they wish, by crossing space and across time, and there is no need to be afraid of learning activities that may be disrupted.The essence of AR is *interfacing* to put virtual objects into the real world. This research is growing rapidly. Researchers are utilizing this field as one of the new ways to improve learning and gain knowledge. In the field of education focused on early childhood education, research with *Augmented Reality* uses many educational game methods that can attract children's attention and motivation.

As research conducted by Yilmaz [1] in his research entitled *"Educational magic toys (EMT) Developed with Augmented Reality Technology for Early Childhood Education":* states that "Teachers and children's opinions about EMT can be revealed from children's behavioral patterns and cognitive achievement; Teachers can use EMT in early childhood education in the future because they accept and have a positive attitude towards these toys that appear in 3D through *Augmented Reality Technology"*. Moreover, children are interactively able to play with these toys with cognitive achievement. The results showed that most of them preferred to point, respond, examine, and change behavior when playing with EMTs. Analysis of behavioral patterns shows the level of their interaction in detail. He further said that EMTs with *Augmented Reality* can be used effectively in early childhood education.

Research conducted by Dash et al., [13] under the title "*Designing of Markerbased Augmented Reality Learning Environment for Kids Using Convolutional Neural Network Architecture"* focuses on the use of augmenteed reality (AR) technology. "Augmented Reality (AR) to create visual aids through displays for early childhood learning and the working principle is to add 3D virtual media related objects". He

further stated: "The important steps of a typical marker-based AR application are, (1) detection of marker of camera, (2) identification of marker, (3) estimation of pose marker, and (4) rendering of 3D virtual content above marker in live video stream".

From the research can be seen that *augmented reality* created is a combination of visual and audio media and other components into multimedia so that it can be used for learning media that can convey information. Augmented reality as a learning medium is currently strongly supported by features that can be obtained through android smartphones making it easier for users to utilize a variety of applications for learning with the principle of *fun to learn*.

Augmented reality mobile app development for all is the title of a study conducted by Mota et al., [14] that contributes knowledge about the lack of programming skills for teachers so that it becomes a barrier to teacher involvement in the development and customization of applications. The visual environment for designing interactive learning scenarios, visual tools for designing, customizing, and using learning technologies, keeps teachers in a development environment at the bottom of the curve. Sensors in today's mobile devices are very complete and have the power for fairly modern processing using Augmented Reality (AR) technology. Although it is possible for mobile devices to be used very much in students' daily lives, the Augmented Reality mobile application used as a learning tool has not been widely spread among teachers.

The research provides information that his work presents a framework consisting of development tools and methods in order to design systems and use learning activities with a focus on augmented reality (AR) components. Then the researcher presented the results of the evaluation of the framework with 47 third-level educators, and two case studies of the implementation of the augmented reality mobile application class developed by the educators. The results illustrate the suitability of the author's framework and tools to support users without programming skills in developing their own applications. Then the results of the AR products made can be used as learning media for educators to students in their classes.

One of the basic potentials in children that needs to be developed early to help improve their cognitive abilities is the potential for creativity. Various efforts can be made to be able to develop children's creativity, among others through activities or learning of fine art, especially in the form of drawing and *coloring* activities. Images of coloring results by children become something important for their development and are a reflection of children in creative education.

In his research entitled "Creativity *in Early Childhood Education Program*", Yildirim [15] States that: *"Creativity is an important concept for the successful implementation of educational programs, so that teachers are expected to put forward the creativity of their children and themselves in every activity. In this case, the teacher's manual is prepared for the purpose of guiding teachers, because in this teacher's guide, there are annual and daily plans. only to guide the teacher of the way. In this study, the activities recommended in the PAUD program and the teacher's manual were examined in terms of creativity. In this study, a qualitative research method, in the form of document investigation, was used as an example of the activities that were examined and compared depending on regional development and were*

adopted when this guidebook was designed. From the results of the study, it was found that activities leading to daily life skills were more effective in developing creativity".

Therefore creativity is a very important concept in achieving the success of an educational and learning program implementation. Therefore, a teacher must be able to bring his students to have creativity in every activity. So it will be found the results of learning that skills and life skills activities will be more effective in developing creativity.

As Craft [16] suggests that in order to develop creativity in children, teachers and practitioners need to develop their own creativity to support others. Creativity is also related to morals, as expressed by Wang [17] with the title of his research "*Creativity as a Pragmatic Moral Tool*", according to him: "Although creativity is a highly desired and often scarce commodity in organizations, its moral implications have not been fully explored". Researchers try to take a new approach to investigating creativity as a moral tool, predicting that creativity produces pragmatic solutions by stimulating rule circumvention. According to him: "Results from four complementary studies show that when people are creative, they do not immediately break the rules; They show that when people are creative, they avoid moral and immoral laws because of different moral motives; suggest that in the workplace experiencing more creativity is associated with justification for morally debatable issues".

In order for children's creativity to develop and cognitive abilities to also increase, there needs to be a new innovation that is able to add value to children's development. The use of relevant and innovative digital learning media as an effort to stimulate children's interest in learning should be captured as a positive opportunity. The rapid development of technology and the emergence of new applications are increasingly adding to the list of existing developments. *Augmented Reality* (AR) technology is expected to answer the challenges of the 4.0 industrial revolution and 21st century learning. Teachers and children need to be introduced and educated about *Augmented Reality* technology that is actually a long time in the world of technology but is new in the world of Indonesian education.

Along with the development of *Augmented Reality* that appears through applications, more and more other applications are applying this *Augmented Reality* technology. One of them is the *Quiver-3D Coloring* application found on *Quivervision* (http://www.quivervision.com). Broadly speaking how to use *the Quivervision-3D Coloring* application there are 3 steps, namely: *print, color, and play*. *Quivervision-3D Coloring* is a startup that specializes in *Augmented Reality* technology and focuses on coloring techniques that can be utilized by all ages.

Augmented Reality is a technology that combines two-dimensional or three-dimensional virtual objects and then projects them in real time [18]. *Augmented Reality* is defined as a technology that combines the real world with the virtual world, is interactive according to real time, and in the form of three-dimensional animation [19]. *Augmented reality* can be defined as a technology capable of combining virtual objects in two dimensions or three dimensions into a real environment and then projecting them in *real time*. Augmented *Reality* technology is a field of research that uses computer technology that combines 3D computer graphics data with the real world. The essence of *Augmented Reality* is *interfacing* to put virtual objects into the real world. *Augmented*

Reality research is growing rapidly. Researchers are leveraging the field of *Augmented Reality* as one of the new ways to improve learning and gain knowledge. Including research for early childhood using *Augmented Reality* technology that researchers propose.

Quiver-3D Coloring application based on augmented reality technology as a learning medium, so anyone can use this coloring application, not limited to children only. Parents and teachers can take advantage of this app to guide the child. Children can learn 3D shapes from images that have been colored and are expected to improve their creativity and cognitive. Parents and teachers as the main environment for children have a greater role in the development of children. Munadi [20] states: "Learning media are anything that can channel messages from sources in a planned manner in an effort to create an effective and efficient learning process. So that learning media is an intermediary between educators and students in learning that is able to connect, inform and give and channel messages so as to create an effective and efficient learning process".

Utilization of learning media using *Augmented Reality* can stimulate the mindset of learners because the nature of the learning media is to help learners in the learning process. So that the utilization of learning media with *Augmented Reality* directly provides learning to learners. Augmented reality (AR) as a learning media is able to describe various abstract concepts in providing understanding and model structures for various objects that allow AR as a more effective medium as well as the goals and principles of learning media as a transmitter and receiver of messages. The function of learning media in the learning process is as a medium of information conveying. The use of media in the learning process is able to generate motivation and interest in learning activities.

3 Method and material

This study uses descriptive analysis methods to provide an overview and explanation of the diffusion process of Augmented Reality (AR) technology through the use of the 3D Coloring quiver application on digital storytelling activities for the development of early childhood creativity. The approach is qualitative and quantitative. This combined approach is used to analyze the diffusion of Augmented Reality (AR) technology innovation through the use of the quiver 3d coloring application in the development of early childhood creativity. It is also oriented to the challenges, obstacles or obstacles faced by teachers in the implementation of digital storytelling learning through the use of *Quiver-3D Coloring* applications based on *Augmented Reality* technology.

This research was conducted in August-September 2021 at the PAUD unit institution in Lampung, namely: PAUD Anggrek Tejo Agung Metro Timur Metro City; PAUD Alazhar 2 Way Halim Bandar Lampung; PAUD PKK Tunas Pertiwi Bekri Lampung Tengah; PAUD Bhakti Ibu PT ASDP Bakauheni Lampung Selatan; PAUD PKK Pakuan Aji Sukadana Lampung Timur; who have learners at the age of kindergarten A and kindergarten B, the Playing group.

How this application works is very easy and can be directly learned or practiced for use. Broadly speaking how to use *the Quivervision-3D Coloring* application there are 3 steps, namely: print, color, and play.

a) **Print:** First download the sheet to be colored through the pc in the http://www.quivervision.com/coloring-packs/, then print.
b) **Colour:** After the images are *printed out* the next step is to color the image (coloring) according to the desired imagination.
c) **Play:** Point the camera from the QuiverVision app that has been installed to a sheet or image that has been colored until it appears blue box, hold until an interesting 3D image appears, livelier and more fun and adds knowledge.

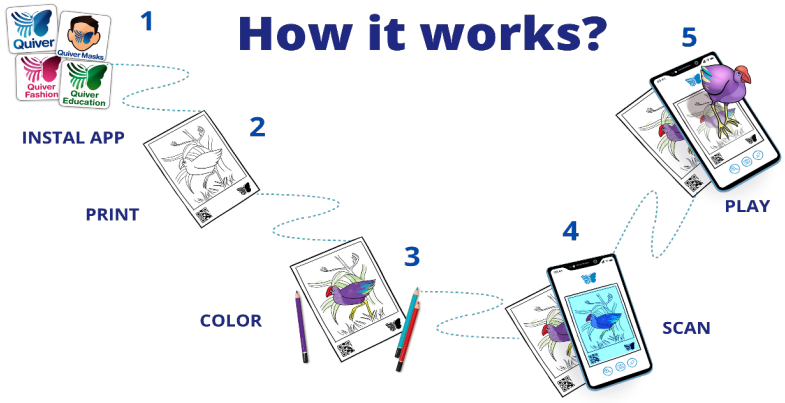

Fig. 1. How coloring activities work for Digital Storytelling with Quiver 3-D App AR-Based Coloring

After all the steps are passed well, then the implementation of quiver -3D coloring application based on augmented technology in digital storytelling activities can also be used easily. So that the skills, knowledge, and creativity of learning for early childhood can develop. With regard to the acceptance of The Diffusion of Digital Storytelling Innovation Quiver-3D Coloring Application Based on Augmented Reality in Early Childhood Creativity Development is inseparable from the innovation adoption process that has adoption rates and adoption stage indicators.

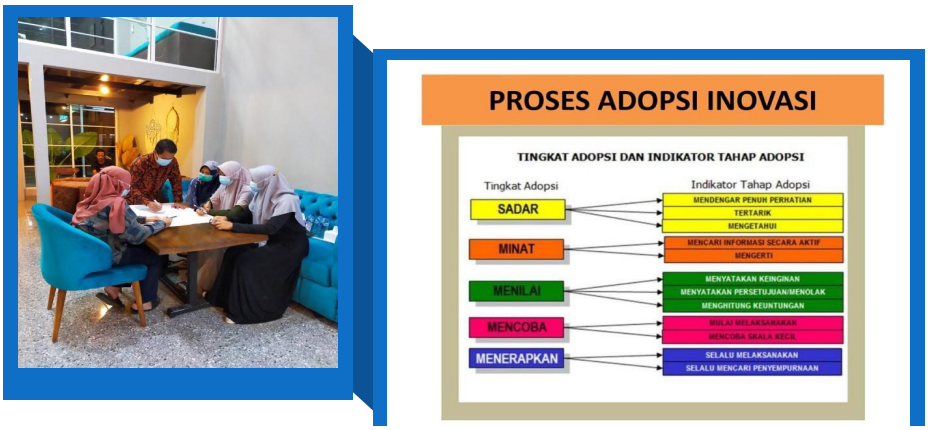

Fig. 2. The process of adoption of innovation

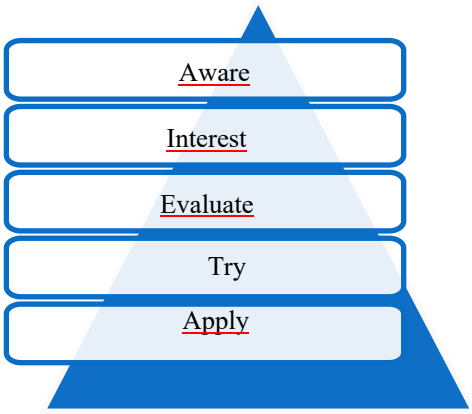

Fig. 3. Adoption rate in accepting innovation

Correlation between adoption rates, approaches, methods, and media that invite adoptors to be aware, interested, judge, try and apply. Starting from the mass, group, and individual approach. With methods and media that can be used such as: home visits, business visits, school visits, office visits, letters, telephone; meetings (discussions), groups, campaigns, slide demonstrations; rallies, radio broadcasts, tv, movie screenings, brochure deployments, folders, leaflets. By maintaining in-depth observation and paying attention to the characteristics of prospective adoptors.

Therefore, the preliminary study has produced a frame of mind about the characteristics of the teacher, the characteristics of the child, the characteristics of the school / class and the characteristics of learning as described below.

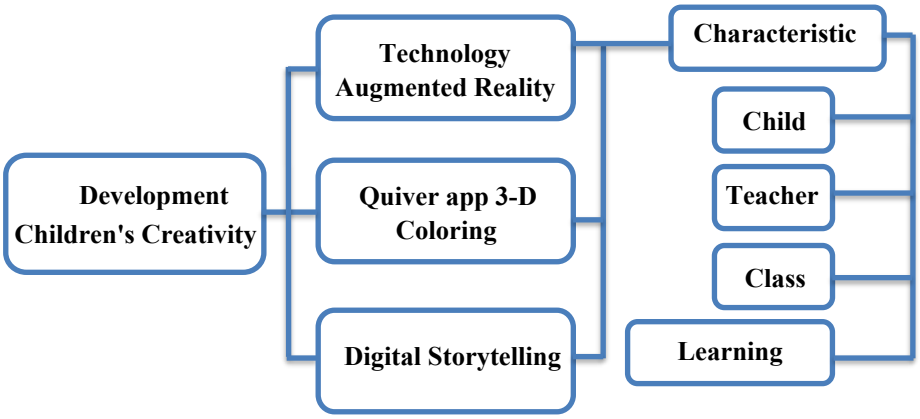

Fig. 4. Flowchart of the research framework

Innovation in the rapid development of technology so that it is able to provide 21st century learning support and answer the challenges of the industrial revolution 4.0, especially in the field of education. Technology as a medium must be able to improve the skills, productivity, and creativity of learning.

4 Result and finding

Based on the results of research that has been done, from the results of interviews and observations conducted by researchers at the time of the study, there are several obstacles faced. These obstacles are seen from two major sides, namely teachers and students. From the teacher side, the obstacle faced is the application process of accepting the adoption of the diffusion of innovation quiver 3D coloring digital storytelling on learning is the use of applications that are still difficult, because it is not familiar. Sometimes teachers are still a little difficult to direct the camera to detect the results of images that children have done. So many children can't wait to see the results. And finally make the teacher's focus hampered. But this does not reduce the spirit of teachers and students in learning activities and acceptance of messages from the diffusion of innovations carried out by researchers. From the Child's side, for his ability to know colors is good enough so that the interpretation of the object he sees is in accordance with what he thinks. There are many advantages that are felt when aligning children with digital storytelling through the use of this Augmented Reality-based Quiver-3D Coloring application. In practice, teachers are easier to make children more focused and orderly in doing their tasks and high curiosity about the objects seen makes the spirit and motivation in the learning carried out.

Furthermore, for children's creativity seen from indicators and assessment criteria based on the adoption process and the resulting form, namely: Creative personality consisting of interests, attitudes and temperamental qualities; Creative products and the output or results of activities undertaken; Appreciate the beauty; Be able to appreciate either yourself or others ; It is not easy to despair; The child's ability to know color; The

child's interpretation of the object he sees; The idea of giving color (cheating or not) ;d smoothness in communicating the thing seen. The following is a table of indicators and assessment criteria based on the process and form produced

Table 1. Indicators and assessment criteria based on the adoption process and the resulting form

No.	Indicator		Criteria (%)		
		Less	Pretty	Good	Excellent
1.	Acceptance of innovative new things	12%	26%	31%	31%
2.	Creative personality consisting of interests, attitudes and temperamental qualities	19%	29%	22%	30%
3.	Creative products and outputs or results of activities undertaken	14%	30%	30%	22%
4.	Appreciate creativity in beauty	7%	17%	31%	45%
5.	Can appreciate either yourself or others for the creativity done	9%	9%	33%	49%
6.	It's not easy to get discouraged in creating.	3%	9%	39%	49%
7.	Children's creativity in knowing colors	10%	34%	27%	29%
8.	The child's interpretation of the objects he sees creatively	3%	25%	29%	45%
9.	Creative Ideas in giving color (cheating or not)	9%	30%	27%	33%
10.	Creativity and fluency in communicating what you see	4%	22%	45%	29%

From the table appears indicators as a benchmark of children's activities with assessment criteria ranging from less, sufficient, good and very good, showing that the percentage of students in responding to the activities they do in this study is acceptable. Acceptance of the new thing indicates good and excellent criteria of 31%, sufficient criteria of 26% and by 12% with less criteria. In the Indicator creativity of children in knowing color is also shown by a fairly bai percentage on very good criteria, which is 29%, and enough criteria on this indicator by 34%. Overall the percentage of acceptance to the diffusion of quiver 3D coloring application innovation based on augmente reality technology is excellent. As seen in the diagram image of indicators and creativity assessment criteria coloring in the diffusion of quiver-3d coloring application innovation based on the following augmented reality technology:

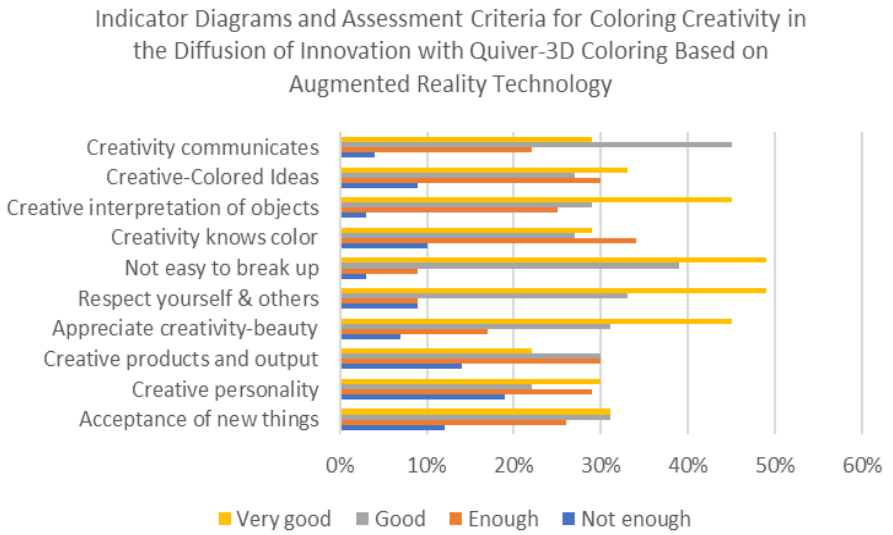

Fig. 5. Indicator diagrams and creativity assessment criteria coloring in diffusion of quiver-3d coloring application innovation based on augmented reality technology

Between one child and another child has differences in achieving indicators and criteria that serve as a measure of assessment. Children have shown their expression, the product of creativity, the way they appreciate beauty, respect themselves and others, their ability to recognize colors, how to interpret objects seen, generate ideas or ideas coloring, and creativity in communicating. The most important thing is also their acceptance of the diffusion of innovation activities that are perceived as something new. This is in line with research conducted by Kardipah and Wibawa [21] with the research title A Flipped-Blended Learning Model with Augmented Problem.

From this research, it is said that computer-based learning to improve students' skills shows that there is a significant difference between course performance with computer applications in the experimental group and post-test in the control class, and shows an increase with the treatment of the learning model. From the learning activities, it is explained that students are also challenged and motivated by the many tasks that are not easy. With this strategy students feel guided and feel free in the scope of time in class. It means learning through practice is more motivating and more creative because it frees up time and space.

Based on the results of research on Digital Storytelling on The Diffusion of Quiver-Augmented Reality (AR) technology-based three-dimensional coloring application innovation in child development Creativity is obtained that:

1. Diffusion of Quiver-3D Coloring application innovation based on Augmented Reality Technology with digital storytelling is acceptable among, teachers and children in paud agency units.
2. Through direct theory and practice on the use of Quiver-3D Coloring Applications based on Augmented Reality Technology with Digital Storytelling can improve skills in the development of children's creativity.

From the results of the study, it is increasingly clear that along with the development of Augmented Reality (AR) and Digital Storytelling that appear through applications, more and more applications are applying this augmented reality technology. One of them is the Quiver-3D Coloring application found on Quivervision (http://www.quivervision.com), a startup that specializes in Augmented Reality technology and focuses on coloring techniques that can be utilized by all ages. The Quiver App combines physical coloring of the "past" with advanced technology to give us and our children an incredible magical experience.

Quiver-3D Coloring is a suitable application for drawing of all ages. In addition to adding creativity in drawing, it also entertains us because the results of the picture seem real. It's even more fun to teach children about the creativity of drawing and telling stories. The application has complete features including: a wide selection of images with barcodes; not only bringing up the results of images, but making moving images; a variety of intuitive and interesting animated movements; also has sound for each image. As the following application work system sequence image.

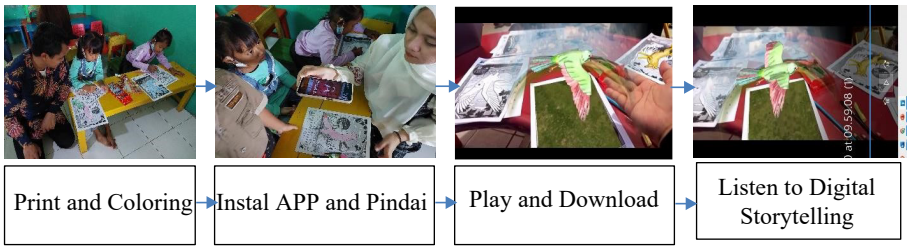

Fig. 6. Order of work systems quiver application based on AR and Digital Storytelling

Quiver is a drawing app that kids love. The uniqueness of this application is that it has a physical element. To get it we have to log on to his website and print the available images. The images can be colored by opening the application and seeing the image changed to 3D with colors that match the coloring results. Simple and fun and has the excitement of coloring activities that have this added value [22]. This is in line with the opinion of Fatmawati et al., [23] who stated that the message of innovation received by children and teachers in paud institution units that are the subject of research produces an innovative learning and motivates children.

Digital Storytelling on the innovation activities of "Quiver-3D Coloring application based on Augmented Reality Technology in developing early childhood creativity" has shown positive acceptance, usefulness and real success. Furthermore, the message of innovation received by children and teachers at paud institutions in Lampung Province that were the subject of this study resulted in an innovative learning and motivated children and researchers themselves. With the problem that is the object of research to be studied, namely the diffusion of innovation of quiver-3D coloring applications based on augmented reality technology in digital storytelling activities in the development of early childhood creativity.

From the results of the study showed the development of children's creativity in knowing objects creatively, that children can know objects based on their function,

children are able to classify objects based on their shape, color, and size, children are able to be cooperative with their learning friends, children are also able to show tolerance, children are able to understand rules with discipline even with the excitement of seeing augmented results. In reality, children are proud of their own work in coloring activities on the quiver-3D coloring paper, children are also able to appreciate the excellence of their other study friends and take turns trying each other's work in quiver-3D coloring practices based on Augmented Reality technology and Digital Stories.

Related to creativity, children have also done activities that show perseverance focus in coloring images creatively; appreciate the work of themselves and others; be patient while waiting for their turn (queuing); show imagination and interest through images; do new things in their own way (have initiative); show curiosity about the object being seen; engrossed and dissolve in the observed object; combine ideas in new ways (usually only looking at 2D and 3D images respectively but with quiver-3d coloring applications) Children can see both at the same time. In each process produces values and percentages that vary from less, sufficient, good and excellent criteria that are judged based on the process and form of the results of the bruising activity.

Interaction occurs in a learning environment where learning becomes exciting [24]. In a certain period of time for approximately half a semester of innovation diffusion which is a theory of how a new idea and technology (innovation) can be spread in a school culture system consisting of teachers and children at an early age and students who help in this activity through communication channels both conducted in person and online. From the spread activity (diffusion of innovation) which in the process is directly faced with the adoptor. So in the process of taking a step-by-step process the individual takes a decision whether to accept or reject the new product which is then referred to as adoption. Through individualized approaches, group approaches and mass approaches used with effective communication, this process of diffusion of innovation is acceptable and begins to be applied.

5 Conclusing

Digital Storytelling for early childhood creativity in the diffusion of Innovation "Quiver-3D Coloring application based on Augmented Reality in the development of children's creativity" provides important information and improves skills in coloring activities and has added value through Augmented Reality technology. integrated in these digital applications and stories. Also important to understand is the correlation between adoption rates, approaches, methods and media that invite adoptors to be aware, interested, judge, try and apply. Starting from the mass, group, and individual approach. With methods and media that can be used such as: home visits, business visits, school visits, office visits, letters, telephone; meetings (discussions), groups, campaigns, slide demonstrations; rallies, radio broadcasts, tv, movie screenings, brochure deployments, folders, leaflets. Thus, the goal will be achieved as expected.

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