

The Use of Virtual Reality Media at the Level of High Order Thinking Skills in Sport Education

(Learning Practices of Sporting Pandemic Scene Covid 19 in The New Normal Era)

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Abstract:- Learning using Virtual Reality (VR) media can be accessed through many platforms such as on Smartphones and has been widely used for various purposes and carried out various studies, but until now no application has been found for sports education with High Order Thinking Skills (HOTS) in the atmosphere of the Covid-19 pandemic. Therefore, the purpose of this study is to examine the development of learning outcomes in sports education materials using Virtual Reality (VR) media with the HOTS model in the covid-19 pandemic atmosphere in the New Normal era. This type of research uses a quasi-experiment with a quantitative approach. The design of this research is One Group Pretest-Posttest Design. The participants were 80 students (38 girls and 42 boys) aged 11 to 13 years at the basic education level. Instruments for assessing the appearance of basic sports movements (volleyball, basketball, soccer), athletics, artistic gymnastics; and cognitive abilities. From the results of the analysis using the SPSS (Statistical Package for the Social Sciences) computer application version 21, it can be seen that the pre-test results of 80 participants had an average value of 35.32 standard deviation values of 27.64 and variance values of 764.35. Organizing aspect, the acquisition of t table value is 1.664 with $\alpha = 0.05$ for one party (one tail) and the t-count value is 2.048 with p-value 0.00041 with a confidence level of 95%. This shows that the null hypothesis (H0) is rejected and the working hypothesis (H1) is accepted. Attributing aspect, the acquisition of t-table value is 1.664 with $\alpha = 0.05$ for one party (one tail) and the t-count value is 3.533 with p-value 0.00041 with a confidence level of 95%. This shows that the null hypothesis (H0) is rejected and the working hypothesis (H1) is accepted. The HOTS model of virtual reality (VR) media in an atmosphere of the Covid-19 pandemic improves learning outcomes in sports education at the basic education level. The HOTS model of virtual reality (VR) media is suitable for use in the atmosphere of the Covid-19 pandemic in the new normal era.

Keywords:- Component Virtual Reality; High Order Thinking Skill; Learning; Sports; Covid-19 Pandemic.

I. INTRODUCTION

A. The learning situation in the covid-19 pandemic in the new era is normal

The Covid-19 pandemic is a health crisis for humans and has an impact on all life including educational activities. The ABC news report dated March 7, 2020, dozens of countries closed schools to prevent the spread of covid-19. The impact of covid-19 for all parties (teachers, students and parents) is enormous [1]. With the closing of schools, the government took steps so that the learning process was not left behind and students still received the right to gain knowledge. Therefore, the next government decision is that the process continues but not face-to-face but with distance learning or an online system. So that teachers must be able to carry out the learning process effectively at home (work from home / WFH). Teachers are required to be able to teach online, so they need mastery of information technology. Emphasis on learning at home to students must be properly monitored so that teachers who teach through crisp media remain smooth and smart in delivering lessons that must be understood by students [2]. Teachers need to reorganize learning plans with online methods, and prepare for various obstacles to distance learning. Teachers must use technology, so like it or not they have to learn and be ready to teach remotely using technology. Each school prepares distance learning tools and systems and provides technical guidance to teachers so they can use modern technology in learning to improve the quality of students in primary schools, Teachers should take their students' current cognitive development into consideration when designing course materials [3]. The Covid-19 pandemic also has an impact on students, lessons that are usually carried out in a classroom with an atmosphere of many friends must be inversely proportional to studying at home. Moreover, seeing the ability of each student is different so that it can have an impact on learning motivation and learning outcomes. Therefore, the teaching methods are mainly mixed, including online live broadcast, recording broadcast, communication with communication software and order auxiliary ways [4].

The weakness of distance learning systems from traditional learning processes to digital technology requires information technology equipment that brings the real world into the learning process. Education has metamorphosis to be more flexible, student-centered, constructivist and collaborative, and supported by the use of information and communication technology. Various research results show that student-centered learning is superior to teacher-centered, conventional education systems that rely on classical, face-to-face systems, being a flexible system both in implementing learning and assessing learning outcomes.

Schwartzbeck & Wolf that digital learning is "... any instructional practice that is effectively using technology to strengthen the student learning experience. Digital learning encompasses a wide spectrum of tools and practice..." [5]. The tools and practices in question can include (a) an interactive learning process using various digital learning sources, in the form of learning objects or software, which can engage students in studying academic substances, (b) the availability of digital access to various information data and documents for students, (3) personalized learning, (4) assessment of computer-based and online learning outcomes, (5) learning scenarios that intensify collaboration and communication between students and with tutors and experts [5]. The problem is what media can be used in the student-centered distance learning process in the sports education learning process has not found the research results.

B. The use of virtual reality media at the high order thinking skill level

Learning using Virtual Reality media can be accessed through many platforms, in the Journal of Educational Technology Systems by Eileen A. O'Connor and Jelía Domingo that, Since websites can be placed within the environment and videos, from platforms such as YouTube, can be streamed, instructors can easily customize an environment to have the concepts, information, web, and video resources that they might want to have continuously available in their actual or virtual learning environment [6].

Sport Education (Siedentop, 1994) [7] was built on the aspiration to provide to students a more meaningful curriculum alternative to the "decontextualized", "one-size-fitsall", "physical-education-as-sports-techniques" approach, which is traditionally present in the practice of many physical education teachers [8]. Nonetheless, although sport-based physical education has historically been the dominant form of physical education, evidence of the impact of Sport Education in students' competency in playing games is still "burgeoning and developing" [9] as this topic has received less interest of the researchers [10].

Until now, there has not been found a sports education learning process using virtual reality media at the high order thinking skill level, which is available in the form of learning videos without analyzing the level of cognitive or psychomotor abilities. The application of virtual reality media focuses more on the thinking aspect of the basic movements of sports skills. To avoid the tendency of learning to be monotonous and centered on mobile task information, the

learning strategy that was initially centered on the teacher (teacher centered) changed to being student centered [11] so the learning material that can be applied is learning by empowering to think level high (high order thinking). Thinking skills consist of four levels, namely: memorizing (recall thinking), basic (basic thinking), critical (critical thinking) and creative (creative thinking) [12].

Higher Order of Thinking Skill (HOTS) is the ability to think critically, logically, reflectively, metacognitively, and think creatively, which are high-level thinking skills that require critical, creative, analytical thinking on information and data in solving problems [13]. Higher order thinking skills are a thinking ability that not only requires the ability to remember, but requires order higher abilities, such as the ability to think creatively and critically [14].

Assessment is carried out by measuring students' level of thinking from low to high, not just memorizing concepts, measuring student work processes and outcomes and using student learning portfolios. Thinking is part of the cognitive domains which Bloom classified into six levels of cognitive processes: knowledge; comprehension; application; analysis; evaluation; and creat [14].

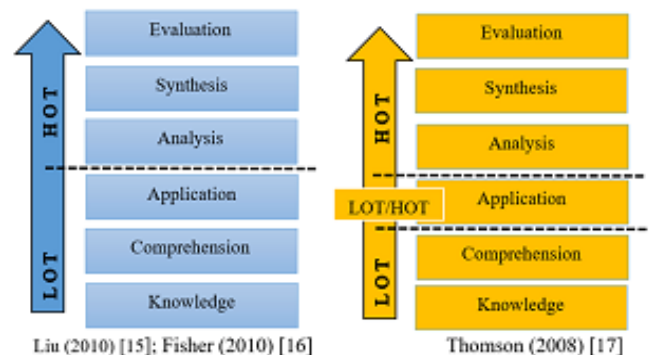


Fig. 1. Figure 1 HOTS in Bloom's Taxonomy

This level shows that thinking to know is the lowest level of thinking while assessing is the highest level of thinking. Thinking skills consist of four levels, namely: memorizing (recall thinking), basic (basic thinking), critical (critical thinking) and creative (creative thinking) [12].

Presseisen stated that high-order thinking skills are divided into four groups, namely problem solving, decision making, critical thinking, and creative thinking [18]. Ennis divides the indicators of critical thinking skills into five groups, namely: a) provide simple explanations, b) build basic skills, c) conclude, d) make further explanations, and e) set strategies and tactics [18]. High-level thinking is a type of thinking that tries to explore questions about existing knowledge related to issues that are not clearly defined and do not have definite answers [19]. Developing critical thinking requires practice finding patterns, constructing explanations, making hypotheses, generalizing, and documenting findings with evidence [20].

This shows that learning that triggers students to think at high levels requires the use of active student-oriented learning strategies, so that students have the opportunity to observe, ask, reason, try, and communicate. Most of the research on Sport Education focused on competency and participation found significant increases altogether in several components of students' game performance and game involvement [21].

In the atmosphere of the Covid-19 pandemic, the entire learning process is carried out online and to continue carrying out the distance learning process the use of digital technology is very much needed. To maintain the quality of learning, a material level is needed at the high order thinking skill level. This study reveals the use of virtual reality media at the high order thinking skill level in sports education learning carried out on elementary school students in the atmosphere of the Covid-19 pandemic in the new normal era until now there have been no research results.

C. Research Objectives

Based on the current conditions due to the COVID-19 pandemic, the learning process is carried out online, so online-based digital technology is needed. Research results have not been found in VR media at the HOTS level, so this study aims to study the impact of using VR media at the HOTS level in the learning process of sports education conducted online. In this regard, the research objectives are defined as follows:

1. Analyze VR technology capabilities in the field of sports education
2. Determine the criteria for an efficient and high quality sports education process
3. Testing the impact of HOTS level VR technology on students' expectations between online and conventional models, and comparing the results of the assessment with the expected and desired basic criteria
4. Evaluating the knowledge and skills acquired through the use of VR services at HOTS level during sports theory and physical practice education programs
5. Estimating overall student satisfaction with the use of VR media HOTS level

II. METHODS

A. Research design and sampling

This research uses a quantitative approach, with a quasi-experimental method [22]. There are two variables, namely the independent variable and the dependent variable, each variable being studied then draws conclusions on each variable [23]. Independent variables: Use of HOTS level virtual reality media in sports education learning and dependent variable: Students' analytical thinking skills in the aspects of distinguishing, organizing, and attributing as well as basic sports practice skills.

The design used the Nonequivalent Control Group Design method of Pretest-Posttest to see the comparison after and before it was given [23]. The researcher used the experimental class and the control class as a comparison, which began with a pretest. The experimental class was treated with learning using Virtual Reality media at the high order thinking skill level and at the end of the lesson each

sample was given a posttest. Meanwhile, the control class uses presentation media which is usually applied in the school. The purpose of this design is to determine the differences in the class using the HOTS level Virtual Reality media with the class using conventional learning, whether there are differences in the improvement of analytical skills or not.

The selection of the experimental class and the control class was chosen based on the recommendations of the teacher for the related subject and the researcher could not change the existing class in the population. The experimental class received special treatment in the form of the use of HOTS level Virtual Reality media and measurements were made of students' analytical skills, while the control or comparison class received treatment using presentation media and only measurements were taken.

Research design is determined by the specificity of the problem under study. This study is based on an online physical education platform to examine the impact of VR technology on the high order thinking skill (HOTS) level on the quality of sports education practice. The experiment took place from April 2020 to June 2020. This study involved 80 students with an age range of 11 to 13 years of grade V basic education in Tasikmalaya City, West Java.

The preliminary study of the problems found in the learning process for sports education in an atmosphere of the Covid-19 pandemic must be carried out online while maintaining the quality of learning outcomes, especially at the primary school level, so that effective learning media is needed. Affordable population for research conducted on fifth grade elementary school students in Tasikmalaya City, West Java, Indonesia. The sample that has been formed in the sports education subject is all class V public elementary schools Citapen 01 and 02 totaling 40 (forty) students as the experimental class and class V public elementary school Galunggung 01 and 02 as the control class totaling 40 (forty) students.

B. Instrument

The research instrument was used as a tool to measure how effective the HOTS level VR media was in improving students' analytical skills. The instrument used the essay test, in which students answered the essay test material and the test of basic sports practice skills used in reference to the sports education textbook for class V elementary schools. The scoring guidelines used in this instrument range from zero (0) to four (4).

This knowledge instrument can be used as a valid instrument to obtain data on learning outcomes in sports education subjects. The product of knowledge instruments for sports education subjects can make it easier for students to carry out knowledge tests, and the results can be known directly, as well as simplify the teacher's task [24].

The technical implementation of the essay test is divided into two, namely the pretest and posttest in each class. The pretest was carried out before the treatment was carried out and ended with the posttest. This was done once to see the

student's gain score and how effective the use of HOTS level Virtual Reality media was to increase the analytical skills and basic movements of students' sports practice compared to classes using presentation media. In this case the instrument aims to determine the reliability, validity and feasibility of the instrument before it is used in research.

The validity used in the essay test is the validity of the content, the aim is to determine the extent to which students can master the subject matter and changes in terms of improving students' good analytical skills [25]. Validity test uses grids and instruments that are validated by experts or (experts) who are qualified in their field. In this case the appointed expert is a teacher of sports education subjects, in the process the grid and test instruments are reliable and valid for use as data collection tools. Reliability is the degree and level of consistency of an instrument, to test the reliability of the test description Spearman Brown's split half method formula is used.

C. Research limitations

According to the aim of this paper, a partial assessment of the qualitative characteristics of HOTS-level virtual reality products is carried out as part of e-learning. The initial step of this research is to make VR products that can be used for the learning process of sports education in grade V elementary schools. As regulated in development research, the product can be used. Thus, expert judgment must also be taken into account to form a better e-learning product.

D. Statistical analysis

Quantitative data analysis techniques in the form of test result data to determine the improvement of students' analytical skills and media utilization. The data through the normality test is intended to show that the sample data comes from a normally distributed population. Testing for normality uses the SPSS (Statistical Product and Service Solution) version 20.0 data processing program with the Kolmogorov Smirnov one-sample normality test with the test criteria if the significance value is < 0.05 , the distribution value is not normal, whereas if the significance value is > 0.05 the distribution value is normal. Hypothesis testing in this study used an independent t-test formula assisted by SPSS (Statistical Product and Service Solution) Version 20.0 [26].

Hypothesis testing is carried out to test the comparison of students' analytical skills before and after treatment with Virtual Reality media to increase analytical skills in the aspects of distinguishing, organizing, and attributing as well as basic sports practice skills.

E. Ethical issues

All experiment participants were informed about their role in the examination, as well as research goals and specifics. Each student signed a written agreement regarding consent to participate in the study and the use of survey data. For all the involved, the highest possible confidentiality was granted.

III. RESULTS

A. Assessment Virtual Reality Product HOTS Level

Prior to the implementation of experimental activities on virtual learning media that will be used, the HOTS level VR media is first made in the process as a research development step until it is suitable for use. This research is a research that aims to develop a prototype of a HOTS-based learning development model, therefore the Research and Development (R&D) method. The development design used refers to the Dick and Carry models that are tailored to the needs of this study [27].

The procedure for developing a HOTS-based learning development model prototype includes: (1) Pre-development, a needs analysis is carried out related to student characteristics and the HOTS learning concept that will be developed. The first step is to map the relationship between core competencies, basic competencies, indicators, materials, and characters and activities according to HOTS characteristics and learning materials. (2) Learning development begins with developing indicators, objectives, learning activities, teaching materials, student activity sheets, media, and HOTS-based learning assessments. (3) Post-development, an instrument is made to measure the validity of the resulting learning development draft. (4) Trial phase 1 (Expert Validation of Content and Learning Design) aims to obtain input on the validity of the content and learning design developed as revision material. (5) The phase 2 trial (small group) was carried out in a small group, namely a group of fifth grade elementary school students outside the respondents for experimental activities. (6) The trial phase 3 (large group) was carried out in a larger group, namely the group of students with a greater number and to elementary school teachers who were teaching sports education in grade V of elementary schools.

The form of the learning development model is depicted in the image below:

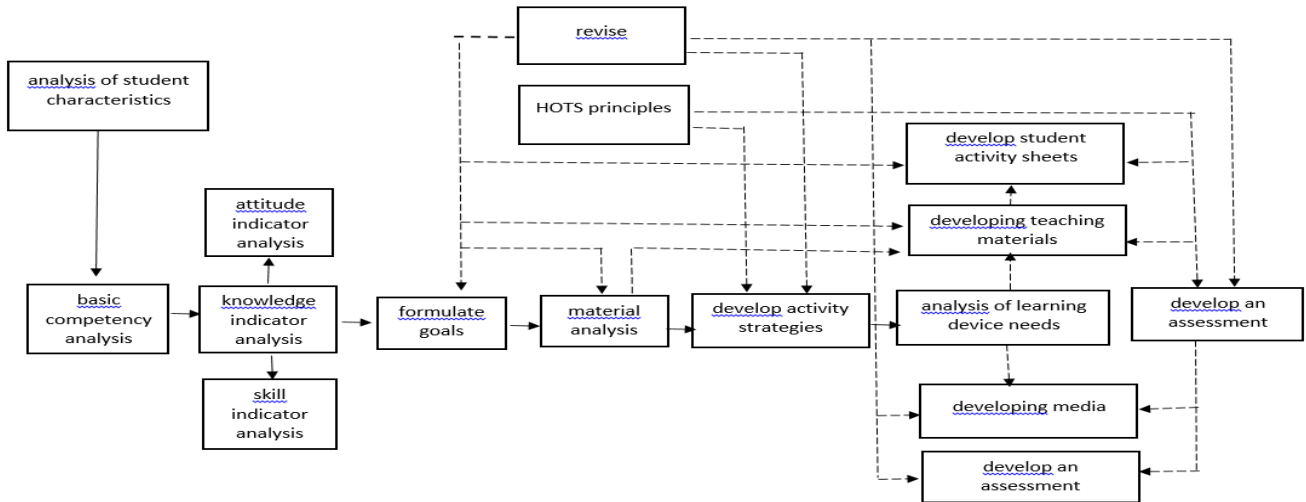


Figure 2 Learning Development Model

From the HOTS-based learning development process that has been described, it can be seen that HOTS-based learning outcomes in sports education learning materials with the sub-theme of football games, volleyball games, basketball games, athletics, artistic gymnastics for grade 5 elementary school students include: 1) Learning activities in implementing basic movement skills experiments, 2) teaching materials in the form of modules and articles on sports activities that affect games and competitions, 3) student activity sheets in carrying out game experiments and competitions, 4) video media for game activities and sports competitions and 5) assessment of student activities in carrying out experiments on basic motion sports activities.

The results of the learning device validation are depicted in a graphic according to the quality aspects of the development of the device as shown below:

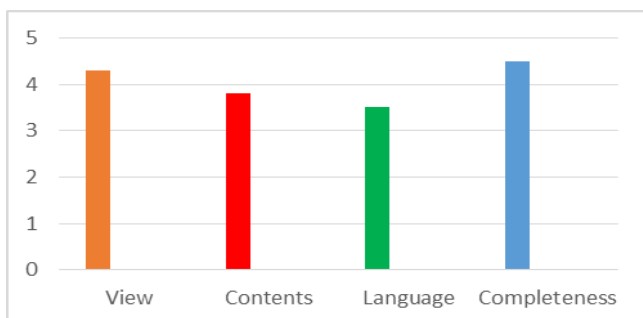


Figure 3 The Results of The Validation of Learning Devices

The results of the teacher's response to the results of the development of learning tools based on the measured aspects are depicted in a graphic like the picture below:

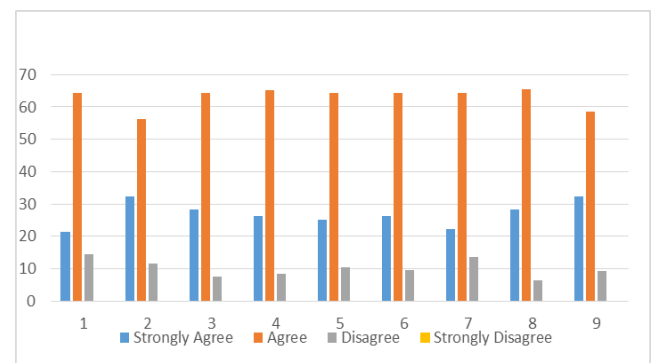


Figure 4 Informatics Expert Response Graph to Learning Device Development

Information:

1. Display device
2. Depth of content
3. Compliance with the Curriculum
4. Conformity with the principles of evaluation
5. Clarity of material
6. The suitability of the characteristics of students
7. Build the character of students
8. Elements of Creativity
9. High-order thinking skills

The results of the validation analysis of the development of learning tools show that the display aspect obtains a mean value of 3.89 which means good, the content aspect obtains a mean value of 4.28 which means good, the language aspect obtains a mean value of 3.58 which means good while for the completeness aspect reaches a mean value 3.75 which means good. For the overall mean value of the validation results from the development of learning tools reached 3.86 which means good.

To find out the response of informatics engineering experts and grade V elementary school teachers to the results of developing learning tools, a response questionnaire technique was used. The response questionnaire is divided into 9 assessment aspects. Of these 9 aspects, they are broken down in more detail into 25 assessment indicators. The results

of the questionnaire analysis of the responses of informatics engineers and teachers show that the display of the equipment states agree (78.13% and 91%), the depth of content of each states agree (93.75% and 95%), conformity to the respective curriculum states agree (66.25% and 100%), conformity with the principles of high-order thinking skills respectively agree (65.63% and 85%), clarity of material states agree (50% and 75%), suitability with students each agreeing (67.5% and 79%), building the character of students respectively agreeing (87.5% and 90%), the elements of creativity respectively agree (79.13%) and 91.66), and evaluations respectively agree (83.33% and 83.33%)

Data from the limited trial results were analyzed by looking for the percentage and the determination of the completeness of each basic competency as determined by the curriculum, namely a minimum value of 2.66 that the completeness was 90% while 10% was not complete. This means that virtual reality media with an assessment level of high order thinking skills can be used in learning sports education at grade V elementary school level.

Furthermore, the researchers tested its effectiveness with quasi-experimental. In practice, the researcher uses two classes, one class as the experimental class and one class as the control class. Both classes discussed the same subject matter, namely the subject matter of soccer, volleyball, basketball, athletics, and artistic gymnastics. The difference lies in the treatment given to each class.

B. The Results of Using VR media Level HOTS and Conventional

The implementation of this research used an instrument in the form of an objective description item with a total of 10 items and a practical skill test. In the experimental class of 40 students, the pretest results obtained a total score of 934 with an average score of 23.4 and the lowest score of 9 and the highest score of 33. The posttest results obtained a total score of 1314 with an average of 32.9 and the lowest score of 18 and the highest score, namely 40. Then for the control class with 40 students on the pretest results obtained a total score of 796 with an average of 19.9 the lowest score of 11 and the highest score of 29, for the posttest results obtained a total score of 1015 with an average of 25.4 the lowest score of 16 and the highest score is 33.

After the research was carried out, the pretest and posttest data were obtained in the experimental and control classes with treatment in the aspect of distinguishing the difference in the increase in students' analytical skills which can be seen through the gain in the following table.

TABLE I. AVERAGE SCORE OF PRETEST AND POSTTEST IN DISTINGUISHING ASPECTS

Class	Pretest	Posttest	Gain
Experimen	9,9	13,4	3,5
Control	7,9	9,7	1,8

After the research was carried out, the pretest and posttest data were obtained in the experimental and control classes with treatment in the aspect of distinguishing the

difference in the increase in students' analytical skills which can be seen through the gain in the following table.

TABLE II. AVERAGE SCORE OF PRETEST AND POSTTEST ASPECTS OF ORGANIZING

Class	Pretest	Posttest	Gain
Experimen	6,2	9,4	3,2
Control	5,9	8,2	2,3

After the research was carried out, the pretest and posttest data were obtained in the experimental and control classes with treatment in the aspect of distinguishing the difference in the increase in students' analytical skills which can be seen through the gain in the following table.

TABLE III. AVERAGE SCORE OF PRETEST AND POSTTEST ASPECTS OF ATTRIBUTE

Class	Pretest	Posttest	Gain
Experimen	7,3	10,3	2,9
Control	6,1	7,5	1,4

C. Data Analysis

The total gain of the experimental group was 0.661, the Gain for Distinguishing aspect was 0.799, the Gain for the Organizing aspect was 0.405, and the Gain for the Attributing aspect was 0.302. It can be concluded that from the above data processing with a significance > 0.05 , the sample data from the population is normally distributed.

The total gain of the control group was 0.806, the Gain for the Distinguishing aspect was 0.557, the Gain for the Organizing aspect was 0.143, and the Gain for the Attributing aspect was 0.012. It can be concluded that from the above data processing with a significance > 0.05 , the sample data from the population is normally distributed.

Hypothesis testing is done to test the truth or prove the researchers' allegations are accepted or not. The hypothesis proposed by the researcher can be proven or tested by the two-sample free t test (Independent-sample t-test). Distinguishing aspects, the acquisition of t-table value is 1.664 with $\alpha = 0.05$ for one party (one tail) and the t-count value is 1.788 with a p-value of 0.00041 with a confidence level of 95%. This shows that the null hypothesis (H0) is rejected and the working hypothesis (H1) is accepted.

Organizing aspect, the acquisition of t table value is 1.664 with $\alpha = 0.05$ for one party (one tail) and the t-count value is 2.048 with p-value 0.00041 with a confidence level of 95%. This shows that the null hypothesis (H0) is rejected and the working hypothesis (H1) is accepted. Attributing aspect, the acquisition of t-table value is 1.664 with $\alpha = 0.05$ for one party (one tail) and the t-count value is 3.533 with p-value 0.00041 with a confidence level of 95%. This shows that the null hypothesis (H0) is rejected and the working hypothesis (H1) is accepted.

Based on the results of the description previously described that using the HOTS level Virtual Reality media is effective to improve the analytical skills in the differentiating

aspects of students, it can be concluded that based on the test results data shows that there is a significant difference in improving students' analytical skills in the aspects of distinguishing, organizing, and attributing in the use of Virtual Reality media in experimental classes in sports education subjects with soccer, volleyball, basketball, athletics, and artistic gymnastics as evidenced by the gain score is greater than the control class gain score.

IV. DISCUSSION

The Covid-19 outbreak is a type of outbreak that has a very high and rapid spread. This epidemic attacks the human immune and respiratory systems [28]. Prevention of this outbreak is carried out by avoiding direct interaction of infected people with people who are at risk of being exposed to this corona virus [29]. Regulating distance and physical contact that has the opportunity to spread the virus is called social distancing [30]. The government has prohibited crowding, social distancing and physical distancing, wearing masks and always washing hands. According to Stein, doing social distancing is a good solution to prevent the spread of Covid-19 [31]. Furthermore, WHO recommends that maintaining distance can prevent transmission of Covid-19 [32].

Furthermore, the teaching effect was verified by the questionnaire method, and the result demonstrates that the teaching model improves both teachers' online teaching capability and students' online learning quality [33] and [34]. Schools in Indonesia have implemented online learning in anticipation of the spread of Covid-19 [35]. There are many advantages of using information and communication technology in the implementation of online learning, including that it is not bound by time and space [36]. The ability of smartphones and laptops to access the internet helps students to take part in online learning [37]; [38]; [39]; and [40]. The use of online learning using zoom cloud meetings has the advantage of being able to interact directly between students and lecturers as well as teaching materials but it has the disadvantage of being wasteful and less effective when there are more than 20 students [41].

The global transformation of the educational paradigm, caused by the development of digital technologies, creation of labor, research, and educational groups in the digital space, as well as free access to educational resources, scientific research, digital games and virtual libraries, continues to be the reason for systemic changes in the educational environment [42].

The use of digital technology can carry out the learning process even though they are in different places [43]. Online learning is learning that uses internet networks with accessibility, connectivity, flexibility, and the ability to generate various types of learning interactions [44]. Online learning is able to bring together students and teachers to carry out learning interactions with the help of the internet [45]. The use of the internet and multimedia technology is able to change the way of conveying knowledge and can be an alternative to learning that is carried out in traditional

classrooms [46]. Online learning can occur through interaction via the web even though they are located far away and different [47]. The existence of teachers and students who are in different places during learning eliminates physical contact and is able to encourage the emergence of social distancing behavior [48].

At the implementation level, online learning requires the support of mobile devices such as smartphones or Android phones, laptops, computers, tablets, and iPhones which can be used to access information anytime and anywhere [49]. The use of mobile technology has a major contribution in educational institutions, including the achievement of distance learning goals [50]. Online learning has become a demand in the world of education since the last few years [51]. Online learning is needed in learning in the era of the industrial revolution 4.0 [36].

Various media can also be used to support the implementation of online learning, for example virtual classes using Google Classroom, Edmodo, and Schoology services [52; 53; 54]; and instant messaging apps such as WhatsApp [55]. Furthermore, online learning can even be done through social media such as Facebook and Instagram [56].

Online learning also has advantages such as the absence of physical barriers and space and time constraints, making students more comfortable communicating [57]. In addition, the use of on-line applications can increase learning independence [58], because it is more student-centered which causes them to be able to generate responsibility and autonomy in learning [59], and can increase student interest [60]. Learning online requires students to prepare their own learning, evaluate, organize and simultaneously maintain motivation in learning [57; 61]. The use of smartphones and laptops in online learning can improve student learning outcomes [62].

Apart from its several advantages, online learning has its own strengths, challenges and barriers [63]. Online learning has a weakness when internet services are weak, and teacher instructions are poorly understood by students [64]. The use of online learning using video conferencing is quite expensive [65].

Social media has entered the realm of early adult life [66]. Students access social media in the context of self-expression, build networks of friendships and opinions [67]. Unfortunately, many people are addicted to devices due to excessive use, it is necessary to worry about the inclusion of misleading and inattentive information during learning due to playing social media [68], in addition, students who are addicted to devices have academic and social problems [69], and have emotional and behavioral problems [70]. In addition, students envision online lectures more frequently than face-to-face lectures [71].

Research by Sun et al., Informs that the flexibility of time, learning methods, and place in online learning has an effect on student satisfaction with learning [57]. Therefore, it is suggested that online learning should be held in a short

time, considering that students find it difficult to maintain their concentration if online lectures are held for more than one hour [72].

The use of virtual reality media in education is an innovation. This innovation aims to make something new and useful, in terms of time, place, and material more effective and efficient. Technological advances that are increasingly developing make an information media now switch to Virtual Reality (VR) media [73]. Virtual Reality is the appearance of three-dimensional computer-generated images so that they look real with the help of certain equipment, which makes the user seem to be physically involved in the environment [74]. Several VR roles such as simulation, interactive learning, promotion, and games are now being developed [75]. Telepresence is defined as the experience of one's presence in the environment through a medium [73].

VR is a computer-based technology that combines special input and output devices so that users can interact deeply with the virtual environment as if they are in the real world [76]. VR enables developers to create virtual environments with potential simulated ways [77]. Visualizations that occur in the virtual world (virtual world) when using VR consist of visually, audibly (auditory) or order stimuli [78].

The term categorization of the level of cognitive or level of thinking skills arose after a committee led by psychologist Benjamin Bloom formulated higher forms of thinking in education in 1956 (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). The level categorization is arranged into 6 levels, namely knowledge, comprehension, application, analysis, synthesis, and evaluation. Then it was revised by Bloom's students (Lorin Anderson, et al) to be Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating [79]. Higher Order Thinking Skill (HOTS) is a high-order thinking skill that demands critical, creative, analytical thinking on information and data in solving problems [80]. High-level thinking is a type of thinking that tries to explore questions about existing knowledge related to issues that are not clearly defined and do not have definite answers [81]. Developing critical thinking requires practice finding patterns, constructing explanations, making hypotheses, generalizing, and documenting findings with evidence [82]. In addition, higher order thinking skills are critical, logical, metacognitive, reflective, and creative thinking [83]. The experimental study results affirmed a high degree of adaptability of VR technology to the educational process [84]. This research provides a reference for the application of computer-aided physical education platform in physical education and has certain practical significance [85]. In addition, this study strengthens the concept of using audio-visual media to improve learning outcomes for physical education [86].

Thus the results of this study can strengthen and clarify theories, opinions and concepts related to the learning process carried out online with virtual reality media, with a high level of order thinking skills in sports education.

V. CONCLUSION

The research findings show that VR media at the HOTS level helps achieve the quality of sports products both theoretically and practically as desired and opens up new opportunities to master practical skills in the field of sports education. In experimental studies, the application of VR technology at the HOTS level allows a better understanding of more complex concepts and contributes to gaining experience in a selected professional field. The results reveal that digital technology based on VR at the HOTS level can be the basis for training or sports education processes at a higher level effectively and with high quality with an orientation to practice and learning materials.

The initial step of this research is to make VR products at HOTS level according to research and development procedures. The next step is testing its effectiveness by making a comparison to the conventional physical education learning process. After going through various stages of the quasi experimental procedure, the results of the use of VR media at the HOTS level were effective and superior to conventional processes for sports education. This shows the evidence that virtual reality technology at the high order thinking skill level brings learning outcomes in sports education that are superior to conventional ones. Therefore, the significant impact of HOTS-level VR technology can be used in the e-learning or online learning process.

Apart from this research, there are deficiencies such as not all students have a smartphone with good image quality, the occurrence of internet network disruption, and sports facilities and infrastructure available in their neighborhood.

The results of experimental studies confirm that VR media technology at the HOTS level can be applied to the sports education process at the elementary school level. Moreover, the results of this study prove to be significantly more effective than conventional models. This means that in the atmosphere of the Covid-19 pandemic in the new normal era, the learning process for sports education can still be carried out with a virtual system. This fact shows the important impact of the sophistication of technological media for the distance learning process.

VR technology with HOTS level can also be made for order subject matter besides sports education, provided that it has the ability to create content that is centered on student activities or children centered. The results of this study can be used as a reference for further researchers in a more comprehensive manner in making distance learning media with superior quality in a variety of desired content.

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