

HOLOGRAM TECHNOLOGY FOR E-LEARNING ARABIC LANGUAGE PRE-PRIMARY AND PRIMARY SCHOOL

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Abstract: The objective of this study was to find the starting grade class in pre-primary and early primary school that adjustable with e-learning hologram technology for e-learning Arabic language. This experimental design research used a mixed, quantitative method for a score of control groups- traditional learning and experimental groups- hologram e-learning of primary school, a qualitative method for descriptive assessment reports, interview, and observation of pre-primary school. for group A the instrument's data are taken from the content of LKS which has explained the detail in the previous paragraph and the group B from the hologram movie that contains the content of LKS by considering the time span of learning between 10-20 minutes, the content of Arabic learning must emphasis in writing and pronouncing and the exception for the pre-primary school as the writing is not compulsory yet. The population of 68 participants. The validation quantitative data were analyzed t-test and else Mann-Whitney test, meta-analysis to describe result for the conclusion. The qualitative used triangulation of descriptive data for validation. The result shows that 1st grade, the sig. result $1.00 > 0.05$ and 2sc of primary school, the sig. result $0.843 > 0.05$ with hologram are indicating no significant gap with traditional learning, same effectiveness, but for pre-primary school with hologram is less-classical completeness $52.5\% < 85\%$. The conclusion of this research is that hologram technology can be used for e-learning Arabic language subject that is adjustable for primary school starting 1st and 2sc grade.

Keywords: Arabic Language, E-learning, Hologram, Primary School, Pre-primary School

Abstrak: Tujuan dari penelitian ini adalah untuk menemukan kelas awal di sekolah pra-sekolah dasar dan sekolah dasar awal yang disesuaikan dengan teknologi e-learning hologram untuk e-learning bahasa Arab. Penelitian desain eksperimen ini menggunakan metode kuantitatif campuran untuk skor kelompok kontrol-pembelajaran tradisional dan kelompok eksperimen-hologram e-learning sekolah dasar, metode kualitatif untuk laporan penilaian deskriptif, wawancara, dan observasi sekolah pra-sekolah dasar. untuk kelompok A data instrumen diambil dari isi LKS yang telah dijelaskan secara detail pada paragraf sebelumnya dan kelompok B dari film hologram yang memuat isi LKS dengan mempertimbangkan rentang waktu pembelajaran antara 10-20 menit, Isi pembelajaran bahasa Arab harus ditekankan pada tulisan dan pengucapan dan pengecualian untuk sekolah pra-sekolah dasar karena menulis belum wajib. Populasi sebanyak 68 peserta. Data kuantitatif validasi dianalisis t-test dan uji Mann-Whitney, meta-analisis untuk menggambarkan hasil kesimpulan. Kualitatif menggunakan triangulasi data deskriptif

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untuk validasi. Hasil penelitian menunjukkan bahwa kelas 1, sig. hasil $1.00 > 0.05$ dan 2sc SD, sig. hasil $0,843 > 0,05$ dengan hologram menunjukkan tidak ada kesenjangan yang signifikan dengan pembelajaran tradisional, efektivitasnya sama, tetapi untuk PAUD dengan hologram ketuntasan klasikalnya kurang $52,5\% < 85\%$. Kesimpulan dari penelitian ini adalah teknologi hologram dapat digunakan untuk e-learning mata pelajaran bahasa Arab yang dapat disesuaikan untuk sekolah dasar mulai kelas 1 dan 2 SD.

Kata Kunci : Bahasa arab, Hologram, Pembelajaran elektronik, sekolah dasar, sekolah pra sekolah dasar

INTRODUCTION

The COVID-19 pandemic has encouraged teachers and school principals to find alternative learning solutions rather than traditional learning. Government regulations in Indonesia through Presidential Decree *Nomor 11 Tahun 2020 about Covid 2019 and followed by Governor Decree 420/1780/101.1/2020, Mayor City Decree 360/3324/436.8.4/2020, Ministry of Education & Culture Decree Nomor 719/Pl/2020*, rules that students to carry out the learning process from home. The implication is applying the distance learning method to substitute traditional learning. One of the impacts of the distance learning phenomenon is the decline in linguistic subjects during the pandemic, according to Arimi from the Linguistic and Culture Faculty of Gajah Mada University stated in normal conditions, teachers can teach a material of language contextually, but by online which not even all students learn virtually, it causes the absorption of teaching material to be more textual. A decrease in language teaching and linguistic abilities in virtual learning during pandemics (Grehenson, 2021). Arabic language, which is a lesson subject at Islamic Boarding School (IBS), mostly uses the Thariqah Mubasyarah method or direct learning (Oensyar, 2015) in traditional learning, facing difficult experience to present the teacher in real during the pandemic, especially according to Arifin (2017) the Arabic language is a boring subject for several students in primary school level of IBS. Because of it, as Arabic is a language category that has exhibits distinctive linguistic features on all different levels, phonological, semantic, morphological, and syntactic (Al-Huri, 2015), it is necessary to find the right solution as an alternative teaching method. One form of distance learning is the e-learning method (Khasanah, 2019) that carries education by using hologram technology (Loh, 2019) for the complexity of Arabic subjects (Gayraud, 2018).

The objective of the study is to find the proper level grade class in early school-age span range from grade class pre-primary till early primary school for able to understand Arabic language subject in e-learning using hologram technology by the research questions: What the starting grade of early childhood school can adjust with hologram technology in Arabic e-learning?

This research is expected to know the grade level of schools that starting to adjustable with hologram technology in Arabic e-learning subjects. The historical research about hologram tools started in 1947 by British-Hungary scientist Gabor with developing a theory of hologram. In 1960, Basso, Prokhorov, Charles Towns developed holograms using a laser system. Then in 1962, Leith, Upatnieks invented the first laser transmission hologram of 3D objects. Also in the same year Yuri. Denisyuk, Lippmann produced a white-light reflection hologram. Later in 1968, Stephen A. Benton invented white-light transmission holography on the research of holographic television. In 1972, Lloyd Cross developed the integral hologram by combining white-light transmission holography with conventional cinematography to produce animated 3D images.

While the usage of hologram technology for several learning subjects have been applicable for increasing the spatial visualization ability for students which students with low spatial ability did not show any significant difference in students who already possessed high spatial abilities (Katsioloudis, 2018), visualizing and interacting with educational content teaching industrial practice for higher education student (Mavrikios, 2019), more attracting and motivating for students who had an interest in Science, Technology, Engineering and Mathematics (STEM) (Orcos, 2018). The 3D hologram was observed able to attract students' attention and interest in grades one, two, and three of primary school in the scientific subjects (Hoon, 2019).

The term hologram is from the Greek words holos, meaning "whole," and gramma, meaning "message". At the time the light source was only monochromatic or one color, from a single point, and of a single wavelength. The hologram in the short definition is a physical structure that diffracts light into an image, the encoded material, and the resulting image (holography.ru). Robert Workman in Livescience described it as a photographic technique that records the light scattered from an object and then presents it in a way that appears 3D. There are 4 types of hologram display:

1. Laser Plasma

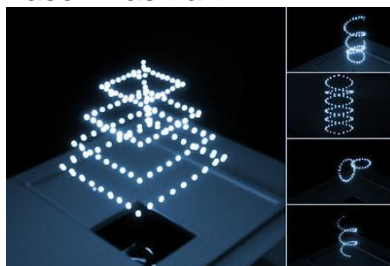


Figure 1. Laser Plasma hologram.
Source: pocket-lint

2. Micromagnetic Piston



Figure 2. Micromagnetic Piston.
Source: phys.org

3. Holographic Television



Figure 3. Touchable hologram.
Source: shefalitayal

4. Touchable Hologram



Figure 4. Touchable hologram.
Source: realview

How holograms work are categorized: (1) reflection hologram that a three-dimensional image is seen near its surface and (2) transmission hologram which is recorded and viewed with laser light that directed from behind the hologram and an image is transmitted to observer side (Korulkar, 2017). This research uses 3D Pyramid Hologram System (3DPHS) that is adopted from a holographic television display (Yamanouchi, 2016).

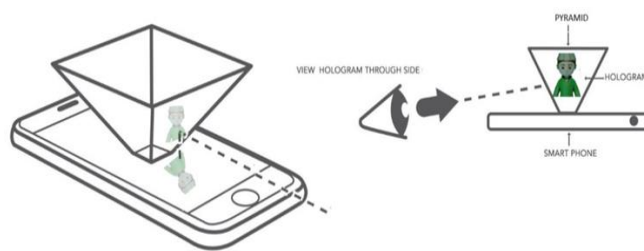


Figure 5. 3D Pyramid Hologram System and the appearance in this study

The holographic pyramid is a reflective prism display that different perspectives through the multi-side of prism in 4 viewports (front, back, left, right), using glass or any transparent reflective material to reflect light an illusion of 3D objects floating in the middle of the pyramid (Siang, 2017). The 3D hologram pyramid display could give a better representation of the object compared to the 2D display because the combination of the lighting hologram setting and 3D hologram rendering generates the halo lighting style (Qahtan, 2017) and also less-expensive material in visualization pyramid for educational (Ramirez, 2016).

The term 'language' can be used to refer to a variety of concepts/things, such as "the particular form of words and speech used by the people of a country, area or social group", or "the method of human communication using spoken or written words" (Dostert, 2009). Arabic definition is the Semitic language of the Arabs, spoken by some 150 million people throughout the Middle East and North Africa.

The conception of early childhood for schooling (formal education) is a wide range and variety. It is according to the country's regulation that reflects social norms and financial support capability. The age range

between 4-7 years old students that compulsory to join the formal education (Stover, 2019). According to those range ages, the standard school is equal the pre-primary school and early primary school. In 2011, the pre-primary school was starting defined by the International Standard Classification of Education system (ISCED) under UNESCO for the level of school before primary school. A primary school (elementary school or grade school in US & Canada) is a school for children, in which they receive primary or elementary education. It can refer to both the physical structure (buildings) and the organization. The primary school typically comes after pre-primary school, and before secondary school. ISCED is considering primary education as a design to provide fundamental skills in reading, writing, mathematics and to establish a solid foundation for learning. Early primary school starts from 1 and 2-grade classes.

E-learning is the stage of learning activities selection consisting of the components of the learning sequence, methods, media, and learning time, which using the learning media either with a computer, mobile phone, electronic media, or internet network supported (Kristiyani, 2019). Nowadays, e-learning outcomes are higher than the results of learning that using print media (Khasanah, 2019). Holography is one of best known as a method of generating three-dimensional images/objects. The usage of 3D objects and referents is as close as possible to the student to enhance their meaningful learning. The common object types usually depend on how to create objects in a visual scene that can be three-dimensional (3D) objects or two-dimensional (2D) shapes. Those both separation categories are found in the geometry of creation (Broadman, 2013). The 3D object is created in 3-dimensional space. Three-dimensional space consists of three basic directions defined by three axes: X, Y, and Z that consist of three separate planes: the XY plane, the YZ plane, and the ZX plane which is visible from the top, left, and front viewports (Murdock, 2014).

METHOD

This research is experimental research with quantitative and qualitative data methods by using comparison unpaired groups. The research design was by making 2 groups from the different populations for each level class: Group A with traditional learning which the students gather in class where the teachers teach and present in real. The scoring test from LKS (assignment papers). Group B was treated with hologram e-learning which the student learned holograms independently whether individual or in the group without interfering with the teacher. The students did the test based on the material in the hologram. Teachers make assessments of the students writing on paper and when they follow the pronouncing from the hologram.

The research has 3 phases: (1) Scoring based on traditional learning, (2) Scoring based on 3D hologram animation demonstration

using a 3D hologram simulation tool, (3) Validation: (i) quantitative data using SPSS software: independent t-test and Mann-Whitney U test for students' scores. (ii) Triangulation for teacher's reports (qualitative data) with classical completeness percentage $\geq 85\%$ based on the formulation of counting Depdiknas in 2003:

Formula:

$$a = \frac{n_0}{n} \times 100\%$$

a = The percentage of classical completeness, n_0 = The number of students who completed the task, n = The number of students.

The five assumptions required for the use of the independent sample t-test are as follows: The two samples are not paired with each other. The amount of data for each sample (group) is less than 30. The data used in this test is in the form of quantitative data (original numbers) on an interval or ratio scale. The data for both samples is a normal distribution. If it is not one, then shall the test use the Mann Whitney U test, instead of an independent t-test. There is a similarity of variance or homogeneity for the two samples of research data (not an absolute requirement). If it turns out that the variance of the data for the two samples is not homogeneous, then the independent sample t-test can still be done. However, decision-making is based on the results in the SPSS output "Equal variances not assumed".

A total 68 participants are students from IBS: Khoirul Huda, Pabean – Sidoarjo (group A as control group) and Al Falah Darrussalam, Tropodo – Sidoarjo (group B as experimental group), divided into : (a) pre-primary students: $A_0 = 8$, $B_0 = 8$, (b) 1st class of primary school students: $A_1 = 18$, $B_1 = 16$, (c) 2sc class of primary school students: $A_2 = 10$, $B_2 = 8$.

The content Arabic language subject is pre-primary Tadribiyah: learning count numbers 1-10 and short song for counting number, assignment and practice book (LKS) Husna Bahasa Arab – Madrasah Ibtidaiyah (primary school 1st class) for level grade 1 of the first semester, chapter 3 pages 37-47, and LKS Husna Bahasa Arab – Madrasah Ibtidaiyah (primary school 2sc class) for level grade 2 of the first semester, chapter 2 page 16-26. All contents are converted into 3D object animation for the content hologram.

LKS Husna Bahasa Arab – Madrasah Ibtidaiyah (primary school) for 1st class of first semester, chapter 3 p. 37-47, vocabularies of family members, and the singular demonstrative adjectives: this and that.
2sc class of 1st semester, chapter 2 p. 16, vocabulary school stationeries and the singular demonstrative adjectives: this and that.

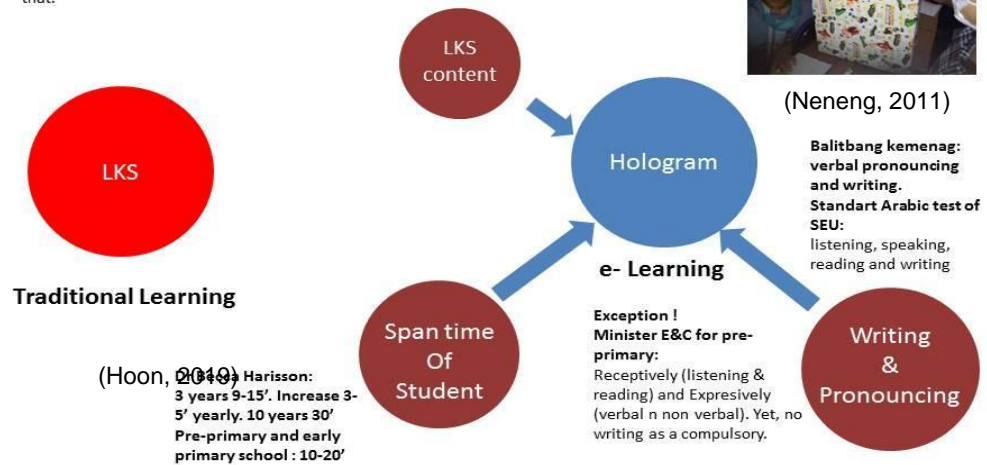


Figure 6. Diagram comparison of the content teaching material between traditional learning and hologram learning.

Figure 6 shows that for group A the instrument's data are taken from the content of LKS (assignment papers of the student) which has explained the detail in the previous paragraph and the group B from the hologram movie that contains the content of LKS by considering to of learning between 10-20 minutes. According to the Balitbang Religion Ministry and the standard of the Arabic test of SEU – Saudi Arabia, the content of Arabic learning must emphasize writing (mean student also able to read) and pronounce (also able to listen correctly). Even though, the Minister of Culture and Education gives exceptional for the pre-primary school as the writing is not compulsory yet.

RESULTS

Quantitative data in scoring primary school A₁&A₂ the content subject is taken from LKS Husna Bahasa Arab – Madrasah Ibtidaiyah (primary school). For group B₁&B₂ the general instructional in hologram movie: reading, listening, pronouncing & writing and students did the task on the blank paper as the hologram instruction. The mean score is calculated from every sub-subject of topics assessed by the teacher. The result of the student's scores as the following tables:

Table 1. Mean score A₁&B₁

A ₁		B ₁	
No	Mean	No	Mean
1	99,4	1	87,5
2	96,8	2	95
3	95,8	3	95
4	98,6	4	90
5	99	5	90
6	99,4	6	100
7	98,4	7	100
8	97,4	8	100
9	99,8	9	100
10	100	10	95
11	98,4	11	95
12	96,8	12	90
13	96,8	13	100
14	97,8	14	100
15	95,2	15	100
16	94,6	16	100
17	96,4		
18	97,2		

Table 2. Mean score A₂&B₂

A ₂		B ₂	
No	Mean	No	Mean
1	97,5	1	87,5
2	96,7	2	92,5
3	87,5	3	88
4	99,2	4	2,5
5	83,3	5	7,5
6	90,8	6	1,5
7	80,0	7	85
8	98,3	8	95
9	100,0		
10	84,2		

Table 1 is the result mean scores of test students from group A₁ (traditional learning) &B₁ (hologram e-learning) at 1st primary school. Table 2 is the test scores of group A₂&B₂ from 2sc primary school.

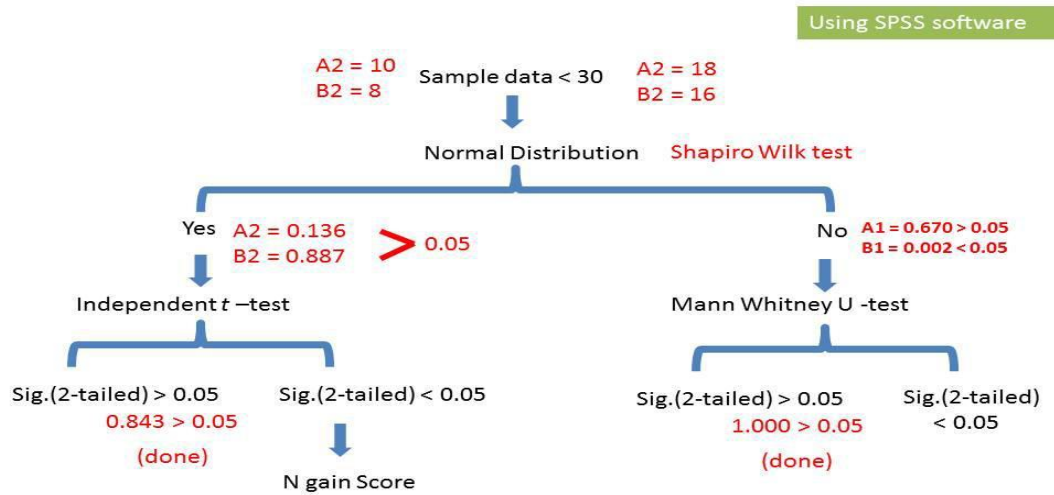


Figure 7. Diagram validation procedure of quantitative data using SPSS software.

The research shows that is no significant gap between the traditional learning and hologram e-learning outcomes for primary school as the following validations: for 2sc class of primary school using independent t-test the sig. (2tailed) result 0.843 > 0.05. Based on the

independent samples test in the equal variances not assumed section, the Sig. (2-tailed) of $0.843 > 0.05$, so as the basis for decision making in the independent sample t-test, it can be concluded that there is no significant difference (Field, 2017 & SPSSIndonesia) between the average student learning outcomes in group A2 and group B2. The two-sample test is a type of inferential statistic used to determine if there is a significant difference between the means of two groups, called t-test, one is independent sample t-test (group t-test), which is performed when the samples typically consist of the independent population (Liang, 2019).

For 1st class of primary school using Mann-Whitney test the sig. (2tailed) result $1 > 0.05$. Normal fitting tests, including the Shapiro-Wilk test for small sample size ($n \leq 50$). In the test, the mean is smaller than its standard deviation, then the data is not in the normal distribution, so the t-test may also be inappropriate (Liang, 2019). In this case, it is better to perform Mann Whitney U-test (Field, 2017 & SPSSIndonesia).

Table 3. Reports description of the pre-primary school control group and experimental group

A ₀		B ₀	
No	Description	No	Description
1	Able to count 1-20. Pronouncing as on the image and matching the word with the image. Still needs more practice.	1	Followed the lesson well.
2	Able to count 1-10. Pronouncing the object's name and matching the word with the object. Still needs guidance.	2	Ruggedly
3	Able to count 1-10. Pronouncing the object's name and matching the word with the object. Still needs guidance.	3	Quite slow to follow the lesson, focused on the image first, before pronouncing it.
4	Able to match the word with the object's name. Even able to write it.	4	Followed the lesson well.
5	Confused to match the word with the object. Still needs a very big effort of guidance.	5	Followed the lesson well, but the problem with pronunciation
6	Able to count 1-20. Pronouncing as on the image and matching the word with the image. Still needs intens guidance from the teacher.	6	Passive, only simple words.
7	Able to match the word with the object's name.	7	Followed the lesson well.
8	Able to count 1-10. Pronouncing as on the image and matching the word with the image. Still needs intens guidance from the teacher.	8	Followed the lesson well, but low voice.

Table 3 is showing the descriptive reports from the teacher class of each group which group A₀ is a control group and B₀ is an experimental group using a hologram. The columns with highlight text on table 3 are showing the student who failed during the test. So it describes that from group A₀ is 1 Of 8 students who failed, and group B₀ is 3 of 8 students. Triangulation Pre-primary School Data: Standard: classical completeness $\geq 85\%$. From the calculation research found: Group A₀ = 12.5% failed. Group B₀ = 47.5% failed, so the result of classical completeness: A₀ = 87.5% $> 85\%$ B₀ = 52.5% $< 85\%$

Table 4. Randomly students interview from experimental groups (B₁&B₂)

Pros		Cons
1. Exciting		Difficulty in writing because the too small size of this hologram
2. Interesting		
3. Easy to use		
4. Attractive imagineries		
5. Following the instructional and understanding well		
6. Able study with friends in the group		
7. Nice like in cinema theater		

Table 4 is showing the resume of descriptive reports according to students interviewed randomly in primary school, to support the experimental group in descriptive data for further discussion in this research. Pros column for explaining the advantages of using hologram during the learning process and cons column for the disadvantage that the student faces it while studying with hologram.

Table 5. Teacher's observation from the experimental group

Teacher	Pros	Cons
B ₀	<ul style="list-style-type: none"> a. Various b. Useful for learning c. A solution during an outbreak 	<ul style="list-style-type: none"> a. Should present the material in more colorful imaginaries b. More varieties of animations that familiar with children c. Should adding music and games in proper duration
B ₁	<ul style="list-style-type: none"> a. Excellent b. Attractive. c. Students are so exciting d. Not bored 	Need bigger size
B ₂	<ul style="list-style-type: none"> a. Very helpful for students in vocabulary and writing. b. Excellent response c. Very enthusiastic about learning d. Very exciting in pronunciation and writing. e. Replayable 	Need bigger tool size.

Table 5 is a descriptive report from teachers' observations (Halim, 2018) for every class in experimental group B. From the table can be observed that students took advantage of the usage of hologram technology in primary school rather than the pre-primary school which was still preferring the attractiveness in content material as prior. That descriptive table observation data is supporting the result of validation quantitative data B_1 & B_2 and the triangulation of descriptive data B_0 .

To firm the statement of teacher group B_0 from observation, the researcher had changed the content of hologram from counting 1-10 into being playing family topic (as of 1st class content material) that more interesting because of available various 3D objects in hologram. The result in-camera video capture showed that students are more interested and got attracted to the content by focusing keenly and following the instructional with fun and different gesture. This fact conducts with research that regarding meta-analysis and observation, a basic overview, and assumptions with the whole concept of learning abilities are correspond to the main focus that derived from elements are media, engagement, and processing information (Loh, 2019).

DISCUSSION

This research implication is giving a guide to the school or teachers that starting grade 1st by Mann-Whitney test the sig. (2tailed) result $1 > 0.05$ and 2sc grade class students of primary school by independent t-test the sig. (2tailed) result $0.843 > 0.05$ showing that an adjustable and understand well the e-learning Arabic language subject by using the hologram technology. The indication is no significant gap with traditional learning results. While this is also as proven as an alternative e-learning media solution for studying during outbreak/critical conditions when there is no present teacher in real nor online at the same time. In a previous study, holograms are applied in the school subjects: science (Hoon, 2019), engineering (Mavrikios, 2019), technology, and mathematics pedagogical (Orcos, 2018 & 2019). It is important to explore other subjects for the researchers along with this hologram.

This research is also giving basic leading on other research on how expensive-less technology such as pyramid hologram system can be applied into e-learning, so in the future able to develop more advanced technology hologram as e-learning media but affordable for students. Because based on the fact, the use of 3D hologram technology in the teaching process is very expensive, It needs a high cost of installation and also high-speed internet bandwidth (Sudeep, 2018). 3D holographic technology is not fully developed and still needs to be assessed for cost-effectiveness, many educational institutions may be uncertain if the cost is worth the investment at this stage (Katsioloudis, 2018).

While this study uses a hologram technology simulation kit as known as 3D Pyramid Hologram System (Yamanouchi, 2016). The usage of advanced hologram technology such as the 7D hologram (Kundalakesi, 2018) for further research may be there to lead to a significant impact on student e-learning (Durge, 2016). Also, it is necessary to find out the suitable attractive content for the pre-primary school using another type of hologram.

CONCLUSION

The hologram technology can substitute the traditional learning for Arabic language subject in e-learning primary school because the research showed that is no significant gap between the traditional learning and hologram e-learning outcomes for primary school as the following validations: for 1st class of primary school using independent t-test the sig. (2tailed) result $0.843 > 0.05$, and for 2sc class of primary school using Mann-Whitney test the sig. (2tailed) result $1 > 0.05$. For pre-primary school, there is a big gap in result percentage classical completeness learning (ratio assessment for successful learning process) which the result using hologram 47.5% students were not able to do the instructional well as seen on the classical completeness learning using hologram showing $52.5\% < 85\%$, but the traditional learning showing $87.5\% > 85\%$. (ratio assessment for successful learning process).

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