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Research Article

Development of "Child Friendly ICT" Textbooks to Improve Professional Competence of Teacher Candidates: A Case Study of Early Childhood Education Program Students

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Abstract

The purpose of this study is to develop child friendly textbooks of Information, Communication, & Technology (ICT) that are valid, practical and effective in improving the professional competence of students in teacher early childhood education program, Sriwijaya University. This study uses the R&D research model with the type of ADDIE model which consists of five stages, namely analysis, design, develop, implementation, and evaluation. The sample in this study was students in early childhood teacher education program. In the implementation phase, field trials were carried out as a result of the development of child-friendly ICT-based teaching books with a sample of 42 people consisting of 12 samples for the small group test and 30 samples for the large group test. Based on the test results of data analysis, it was found that the "child-friendly ICT" textbook that had been developed was valid, practical and effective. The results obtained prove that child-friendly ICT textbooks contribute to improving the professional competence of students. Child-friendly ICT textbooks not only provide new understanding and knowledge of ICT use in child-friendly learning, but also enhance the skills of prospective teachers in using ICT-based teaching materials.

Keywords

teaching materials, information, communication, & technology (ICT), child friendly, professional competence, prospective teacher students

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Introduction

The last decade of Information Communication and Technology (ICT) has developed enough messages in various branches of science, both in the fields of business(Kasayanond, Umam, & Jermsittiparsert, 2019), industry(Rufaidah, AtIrsyadi, Saregar, & Umam, 2018), community life to education. The issue of ICT has received considerable critical attention in the world of education (Deb Roy, 2015; Simin Ghavifekr, Afshari, & Salleh, 2012). The application of ICT in learning provides a dynamic, including in the learning process(Hartinah, Sholikhakh, et al., 2019). ICT not only has an effect on the relationship between students and teachers, but also provides an increase in the value of the learning system itself(Abdurrahman, Saregar, & Umam, 2018). Through the use of technology as part of ICT, it can increase the learning process to be more efficient, effective as well as providing competency skills, but also to students (Ramadhani, Umam, Abdurrahman, & Syazali, 2019). The link between technologies in increasing competence can be seen in Figure 1.

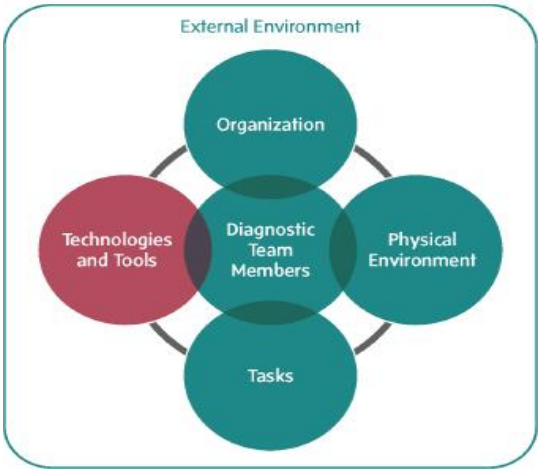

Figure 1

The Relationship Between Technology and Other Competencies in Education

Technology integration in education refers to the use of computer-based communication used in the learning process. In connection with ICT-based learning in the current digital era, teachers are seen as creators in using ICT in the learning process in the classroom (S Ghavifekr & Rosdy, 2015). ICT in the learning process allows to include both hardware and software such as audio, data (high and low speed), video, internet, computers to software (Widayanti, Abdurrahman, & Suyatna, 2019; Mostafa, Hashemi, Sosahabi, & Berahman, 2017; Peter Kayode, Bukola Olaronke, & Kayode, 2014). The development of technology penetrated all

segments of education, one of which was education for early childhood. Playing while learning is the essence of play that animates every early childhood learning activity(Lestari et al., 2019). By playing, the child interacts with the object and consciously and unconsciously learns the object's attributes, and this has been explained by Piaget that learning with real objects is very important for early childhood(Andini & Yunianta, 2018). However, in addition to real objects, there are other media that can be used to transform knowledge and abilities in early childhood, namely integrating learning objects with technology(Sagala, Umam, Thahir, Saregar, & Wardani, 2019).

However, the facts in the field of the use of technology-based learning objects in early childhood education are still rarely applied. Researchers conducted observations and surveys at several early childhood education schools spread in the city of Palembang, South Sumatra, Indonesia. Based on observations and surveys conducted, it was found that there are only a few early childhood education schools that have implemented technology-based learning. The technology-based learning object used is only limited to the use of projectors and power points or animated videos that are displayed using a laptop(Diani, Herliantari, Irwandani, Saregar, & Umam, 2019). The use of these objects is still fully used by the teacher and there is no interaction of students in using the learning object. The learning object used is also still not friendly to children, especially the use of the Youtube application in the learning process in early childhood schools(Hartinah, Suharso, et al., 2019). The tendency of children to see animated videos through YouTube pages makes children uncontrolled and become addicted(Syahrir et al., 2018), and the use of these learning objects must also be completely under the guidance of the teacher entirely(Maulidi, Apriliani, & Syazali, 2019). The technology-based learning object should be developed by the teacher himself. It aims to enable teachers to develop learning objects based on student characteristics and learning themes that are being carried out(Maskur, Syazali, & Utami, 2019). The development of technology-based learning objects can also be controlled for their use and friendly to students in early childhood schools(Habibi et al., 2019). Learning objects that are developed can also be applied together, not only used by the teacher, but also can be used by students themselves.

Development of a learning object that is also part of learning material integrated with technology should be designed according to children's development and more specific goals. Technology-based learning provides an opportunity for early childhood to explore more about the elements of color, music to caricatures that children love(Kusumawati & Nayazik, 2018). This provides an opportunity for early age students to increase students' interests and abilities to avoid them from feeling boredom that often arises and able to foster high-level thinking skills(Abdurrahman, Nurulsari, Maulina, & Ariyani, 2019; Nisa, 2012).

The use of technology in the distribution of early childhood is very good and has a positive impact on the development of both cognitive, psychomotor and affective aspects of students(Diani, Irwandani, et al., 2019). To succeed in using technology in learning in the classroom, teacher education programs must provide a special curriculum. Teacher candidates must be prepared to be able to understand various types of media technology(Muhamad Syazali et al., 2019), procedures and steps on how to develop and provide ICT technology-based learning that can improve children's abilities to be friendly to early childhood(M. Syazali et al., 2019). In addition, prospective teachers can also improve their professional skills as teachers in managing learning in the classroom to be more effective and efficient through technology integration (Vrasidas & Nicosia, 2001). The importance of understanding technology in learning for teachers is supported by research conducted by Darling-Hammond and colleagues in 2009 stating that increasing student competency is closely related to the type of teaching carried out by teachers who must understand pedagogy, what content to study and what technology the right to use(Komala Sari, Syazali, & Farida, 2016). This results in the professional competence of a prospective teacher can develop. In a national survey conducted by Darling-Hammond and colleagues, it was also found that 59% of teachers who have good professional competence will provide good learning experiences for students to have an impact on the learning outcomes that students get (Ehsanipour & Gomez Zaccarelli, 2017). This is also supported by several previous studies that have reported that ICT that is integrated with the learning curriculum is proven to have a good impact on the ability of students to absorb learning material starting from the cognitive, psychomotor, affective, and creative thinking aspects (Khoiriah, Jalmo, & Abdurrahman, 2016). In addition, the application of technology in learning has a significant relationship to the teaching ability of prospective teachers. ICT technology-based learning also provides experience to improve the professional skills of prospective teachers who can be useful after they finish their studies in teacher education study programs for early childhood (Aoki, 2010; Aslan & Zhu, 2015; Relmasira & Thrupp, 2016). Seeing the importance of technology integration in learning (Putra, Nur Kholifah, Subali, & Rusilowati, 2018), especially for early childhood category students, researchers want to develop teaching materials titled child-friendly ICT as a guide for prospective teacher students to use technology in the learning process in the classroom.

Method

Research Design

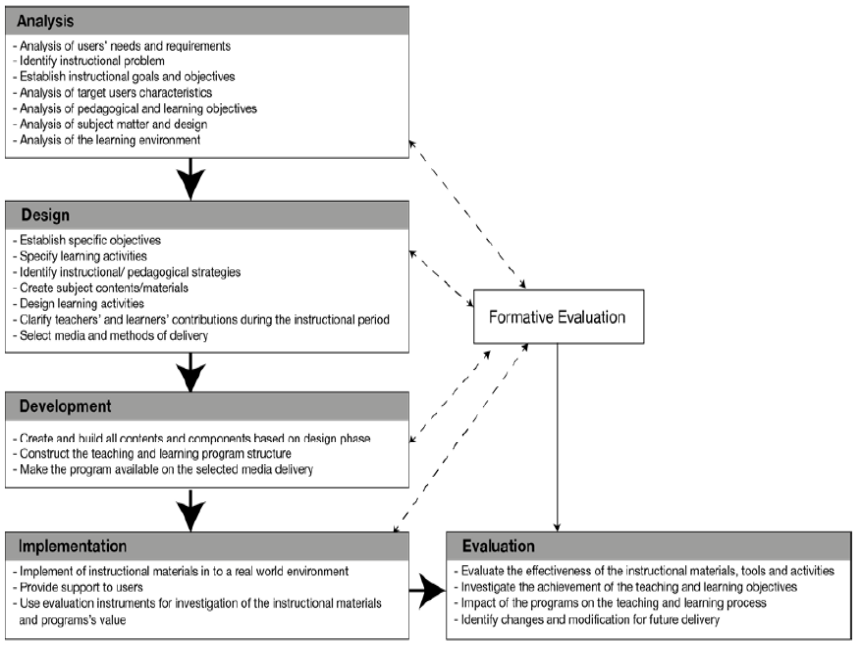

Figure 2

Stage of Analysis, Design, Development, Implementation, and Evaluation (ADDIE) Teaching Design Model

In previous studies it has been reported that, the analysis phase in the design of the ADDIE teaching model gives more attention to the characteristics of learners than at other stages, because students are the main element in learning (Ozdilek & Robeck, 2009). A big advantage of the development stage in the design of the ADDIE teaching model is that it systematically describes a well-organized process in helping the designer (educator) during the development process (Samsudin, Suhandi, Rusdiana, Kaniawati, & Coştu, 2016). The latest evidence shows (Figure 2) that each ADDIE stage is interconnected and interacts with each other (Aldoobie, 2015).

Participants

Participants in this study were prospective teacher students at the Early Childhood Education Study Program, Sriwijaya University. Participants in this study were divided into two groups, namely a small group consisting of 12 prospective student teachers and a large group of 30 prospective teacher students. The total number of participants in this study were 42 prospective teacher students. The two groups of participants will be taught using the "child-friendly ICT" textbook that has been developed using the ADDIE teaching design model. This study focused on the implementation of the results of the development of the "child-friendly ICT" root

book. Stages of analysis, design and development have been done before. In the implementation phase there will be a formative evaluation consisting of a pre-test and post-test which aims to see whether prospective student students have a theoretical understanding of the application of ICT in the learning outlined in the 'child-friendly ICT' textbook that has been developed previously. The results of the formative evaluation (pre-test and post-test) will be analyzed with the aim of seeing whether there is an increase in the professional ability of prospective students of early childhood education study programs after being taught using "ICT-friendly" textbooks.

Data Collection

Data on the results of small groups and large groups at the implementation stage are collected formative evaluation results that have been carried out on each group of participants. Formative evaluation is done in two parts, namely the pre-test and post-test. After taking the pre-test data collection, the next step is the provision of learning using "child-friendly ICT" textbooks, and ending with giving post-tests. The pre-test and post-test conducted consisted of 8 multiple choice questions which were divided into easy, medium and difficult questions. In addition to the results of the pre-test and post-test, research data collection was also conducted using questionnaires aimed at looking at the effectiveness and practicality of the use of "child-friendly ICT" textbooks that had been developed. Previously, "child-friendly ICT" textbooks were validated by experts in the field of teaching material development and the results were obtained that "child-friendly ICT" textbooks were valid and feasible to be used in the implementation phase. Validation of "ICT-friendly" textbooks was carried out at the development stage in the design of the ADDIE teaching model, because this model is very effective for developing student achievement.

Results and Discussion

After the data obtained from the formative evaluation of prospective teacher students, it was found that the increase in student test results in small groups was higher than the results of the large group test. Different results were obtained that the spread of data in large groups was more diffuse than data in small groups. The average results of the pre-test and post-test in the two groups of participants taught using "ICT-friendly" textbooks can be seen in Table 1 below:

Table 1.

Results of Calculation of Pre-Test and Post-Test on Both Participant Groups

Descriptive Statistics						
	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Pre_Test_Experiment	12	49.00	67.00	57.00	5.592	31.273
Post_Test_Experiment	12	84.00	95.00	88.17	3.762	14.152
Pre_Test_Control	30	49.00	67.00	56.57	5.117	26.185
Post_Test_Control	30	80.00	95.00	86.90	3.717	13.817

Based on Table 1 above, it can be seen that the average pre-test in the small group was higher (57.00) than the average pre-test in the large group (56.57). The average post-test in the small group (88.17) was also higher than the post-test average in the large group (86.90). The same thing is also seen in the results of the standard deviation both at the pre-test average and the post-test average of the small group is higher than the large group. This means that the test results data (both pre-test and post-test) in the small group are more diffuse and different than the test results in the large group. The results of differences in the average test in both groups of participants can also be seen in the graph (Figure 3).

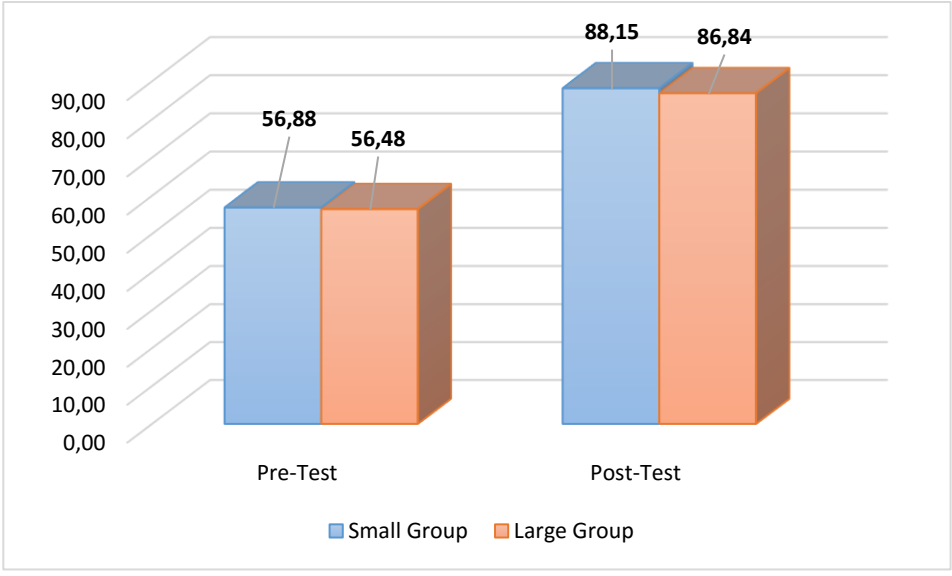

Figure 3.

Differences in Pre-Test and Post-Test in Both Participant Groups

The results of the calculation of the average increase (N-Gain) of the test results in the two groups of participants can be seen in **Table 2** below:

Table 2.

N-Gain Calculation Results for the Two Participant Groups

Descriptive Statistics						
	N	Minimum	Maximum	Mean	Std. Deviation	Variance
NGain_Experiment_Class	12	.55	.89	.7225	.10146	.010
NGain_Control_Class	30	.47	.89	.6923	.10078	.010

Based on the results of calculations in Table 2 above, the results showed that the average increase (N-Gain) test results in the small group (0.7225) were higher than the average increase (N-Gain) test results in the large group (0.6923). Before testing the hypothesis whether the use of "child-friendly ICT" textbooks provides a significant increase in the test results of prospective teacher students, analysis of data normality and analysis of data homogeneity is carried out as one of the parametric inferential statistical requirements. The group N-Gain data is tested for data normality and the homogeneity test of data can be seen in Table 3 and Table 4 below:

Table 3.

Calculation Results N-Gain Data Normality Test for Participant Groups

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
N_Gain_Small_Group	.144	12	.200*	.977	12	.966
N_Gain_Large_Group	.172	12	.200*	.959	12	.767

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 4.

Results of Calculation of N-Gain Data Homogeneity Test on Participant Groups

Test of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
N_Gain_Total	Based on Mean	.048	1	40	.828
	Based on Median	.067	1	40	.797
	Based on Median and with adjusted df	.067	1	39.309	.797
	Based on trimmed mean	.050	1	40	.824

Based on the calculation of the normality test in Table 3, it was found that the N-Gain data of the participant group obtained the same significant value of 0.200. The

significance value obtained is greater than 0.05 *p value* (0.200> 0.05). This shows that the N-Gain data of the group of participants is normally distributed. Likewise with the homogeneity test calculation shown in Table 4 above. The results of the above homogeneity calculation show that the significance value Based on Mean is 0.828 and is greater than *p value* 0.05 (0.828> 0.05). This shows that the group's N-Gain data is homogeneous.

The N-Gain data is in accordance with the calculations in Table 3 and Table 4 above shows that the data are normally distributed and homogeneous. This is in accordance with the parametric hypothesis test conditions, where the research data must be normally distributed and homogeneous. To see whether there is a significant increase in the use of "child-friendly ICT" textbooks for prospective teacher students, hypothesis testing is done using the Independent Sample T-Test. The results of the calculation of hypothesis testing using the SPSS 25.00 statistical tool can be seen in Table 5 below:

Table 5.

Results of Independent Sample T-Test Hypothesis Test Calculation

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
N_Gain_Total	Equal variances assumed	.048	.828	.875	40	.387	.03017	.0344	-.0395	.0998
	Equal variances not assumed			.872	20.2	.393	.03017	.0345	-.0419	.1022

Based on the calculations in Table 6 above, it was found that the significance value of the N-Gain value using the "ICT-friendly child" textbook was 0.387 (equal variance assumed). The significance value obtained is greater than the p value of 0.05 which is 0.387> 0.05. This proves that there are differences in the average increase in the test results that are significant for the two groups of participants who are taught using "ICT-friendly" textbooks. The results obtained showed that the number of participants did not affect the quality of learning to increase the average test results

in the group of participants. The effect of "child-friendly ICT" textbooks has a large effect on increasing the average group test of participants. This also proves that the use of "child-friendly ICT" textbooks that have been developed by effective research teams to be used more widely for prospective students of the Sriwijaya University early childhood education program and proven to be able to improve the professional competence of prospective teacher students based on test results obtained.

To see whether "child-friendly ICT" textbooks are also practical to be used more widely in learning for prospective teacher students, a questionnaire was collected. The questionnaire contains statements that assess whether teaching materials used are in accordance with the needs of prospective teacher students. The number of statements in the questionnaire as many as 15 pieces and the results of the questionnaire calculation can be seen in the graph Figure 4:

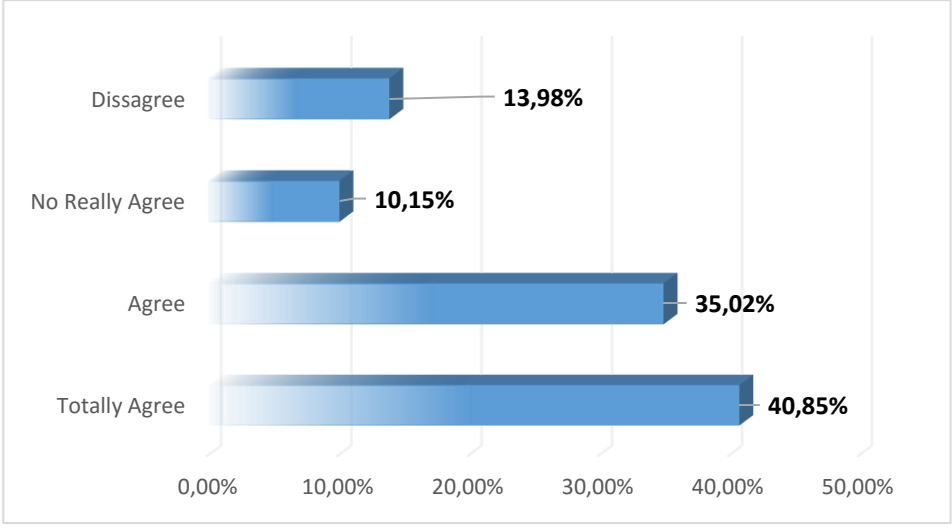

Figure 4.
Calculation of Chart Questionnaire Use of "ICT Child Friendly" Textbooks in Learning

The results seen in Figure 4 above, indicate that there are 75.87% of prospective teacher students who give a very agree and agree to the use of "child-friendly ICT" textbooks in improving their professional competence. Whereas as many as 24.13% of prospective teacher students who gave an assessment disagree and disagree with the use of "ICT-friendly" textbooks in learning. Based on the results of interviews with the prospective teacher students who fall into the category of lack and disagree with the use of "child-friendly ICT" textbooks stated that, they not only need theory in applying technology in the learning process, but also require real practice how

technology integration friendly to children in the learning process for early childhood.

Some literature has emphasized the importance of ensuring a reliable assessment of the level of ability and skills of PAUD teachers in technology (ICT) as the professional competence that they will have (Vitanova, Atanasova-Pachemska, Iliev, & Pachemska, 2015). The latest evidence shows that teachers must be equipped with the ability to use technology (ICT), because all literacy will gradually follow the development of an increasingly evolving era of digital literacy (Kirti., Mann, & Gupta, 2014), where the need to incorporate ICT into the learning curriculum for prospective teachers (Xiong & Lim, 2015). A number of authors have considered the effects of early childhood education teacher education, PAUD teacher candidates who need ICT competence so that teachers can provide ICT stimulation that is appropriate for early childhood to develop optimally (Drigas, Kokkalia, & Lytras, 2015; Kirti. et al., 2014; Lecluijze, Penders, Feron, & Horstman, 2015; Mertala, 2017).

There are a number of things that are important to note by teachers in teaching ICT in early childhood, so that ICT becomes child-friendly. The researcher sets out different ways in which the screen time or time to watch the gadget must be carefully arranged (Muhamad Syazali, 2015). Because of several studies (Hale & Guan, 2015; Hewitt et al., 2018; Hinkley, Carson, Kalomakaefu, & Brown, 2017; Lauricella, Wartella, & Rideout, 2015; Sanders, Parent, Forehand, Sullivan, & Jones, 2016) suggesting the use of ICT should be considered because it interferes with sleep and concentration in carrying out daily routines. Limiting screen time will have a good effect on student performance (Salomon & Ben-David Kolikant, 2016). Another study concluded that by providing a safe web for children. Children's website is a great web that combines education (Putra et al., 2018) and entertainment (Misirli & Odabaşi, 2009). In addition, in order to be effective and directed at how students become optimally helped in the use of ICT in the learning process, the teacher needs to understand the importance of scaffolding and carry out the right scaffolding process for students (Rahman, Abdurrahman, Kadaryanto, & Rusminto, 2015;Nurulsari, Abdurrahman, & Suyatna, 2017).

Conclusion

The "ICT Child Friendly" textbooks proved to be valid, practical and effective after being applied to prospective teacher students in early childhood education programs. The developed textbook is able to improve ICT professional competence in prospective teacher students which can be integrated in all aspects, namely the cognitive, affective, psychomotor domains. The benefits of this development can also be felt by early childhood, where children can construct their knowledge based on their experiences through learning using ICT that is appropriate, safe, and healthy

to be held by PG-PAUD teacher candidates who have ICT professional competence. The effects of early childhood education teacher education, ICT can provide ICT stimulation that is appropriate for early childhood to develop optimally.

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