The Effectiveness of Seamless Mobile Assisted Real Training for Parents (SMART-P) Usage to Improve Parenting Knowledge and Children's Cognitive Development

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Abstract—This study will determine how SMART-P training affects parenting knowledge and children's cognitive development. This is a mix-methods research with an ADDIE development model and an experimental quantitative research approach. The method used is explanatory research with a non-equivalent control group design research involving the control and experimental classes. The population in this study are 714 parents with children aged four years from posyandu/KB in five sub-districts of Malang City, with a research sample of 150 parents with children aged four years and six experts. Data collection techniques in this study used questionnaires and observation checklists. Data analysis in this study used descriptive percentage analysis and SPSS analysis. The results show that 1) the SMART-P application is declared valid and acceptable to be implemented, 2) there is a significant effect of parenting knowledge in parents before and after being given parenting training using SMART-P, 3) there is a significant effect on the children's cognitive development before and after parents are given care using SMART-P, 4) there is a different effect of parenting knowledge on parents between the control and experimental group, and 5) there is a different effect on children's cognitive development between the control and experimental group. To maximize parenting knowledge and children's cognitive development, SMART-P parenting research must be ongoing.

Keywords—SMART-P, parenting knowledge, cognitive development

1 Introduction

Parenting knowledge is essential in child care [1]. Parents with high parenting knowledge will always try to meet the needs of their children by providing healthy food

for their children, creating a comfortable and conducive living environment for children's growth and development, and educating their children to wear polite clothes [2]. Meanwhile, parents with low parenting knowledge tend to raise children according to their wishes, even though children have talents and potential that need to be stimulated and developed [3]. Therefore, parenting knowledge in parents needs to be developed, considering that the responsibility of parents during the pandemic is not only accompanying children but also educating and providing appropriate stimulation so that children continue to develop optimally [4]. Branje & Morris, (2021) revealed that during the covid-19 pandemic, parents have a broad role during the pandemic, in which as a companion for academic education. It is because many educational institutions are closed to ensure the health of children, parents, and teachers. UNICEF [6] states that at least a third of school-age children globally cannot access learning when schools are closed, resulting in minimal interaction between children and instructors. It is where parents' informal education role as child educators can continue encouraging children's growth and development. In a report to UNICEF Research, parents play an essential role during the pandemic; 45.35 percent support and motivate children to continue learning, and 31.06 percent maintain a good learning environment at home. If parents can provide adequate facilities, their children will develop optimally.

One crucial aspect of child development for parents is cognitive development, especially when the child is four years in age; where at the age of four years, it relates to the child's individual ability in problem-solving [7], thinking logically and symbolically, processing information, processing experience, and creating new conclusions on knowledge [1]. One of the problems related to children's cognitive development is the delay in thinking; where it will also lead to other problem [8]. Problems that usually arise are related to delays in systematic thinking in children in the form of activities such as asking, predicting, searching, and discussing something where children have the experience to know [9]. Wahyuni [10] suggests that 39% of early childhood in Pekanbaru experience cognitive problems. It causes children to need more attention in terms of cognitive development. Shavit [11] stated that cognitive stimulation from an early age is significant in child development for the long term because children's brains for lifelong learning and abilities are formed early in life. One of the causes of this is the inability of parents to communicate and interact appropriately, which can hinder children's ability to think logically [12]. Therefore, cognitive abilities in children are essential to improve and maximize their development [13].

Many practitioners have highlighted how to care for parents during covid-19 pandemic and concern about the lack of parental knowledge require effective and efficient solutions [14]. Parents have many obstacles in taking over most of the responsibilities of teachers in providing education and stimulation to children [15]. Parents who lack parenting knowledge, one of which does not know the science of child development, can cause them not have sufficient information [16]. Low knowledge interferes with the ability of parents to make good parenting decisions and care for their children aged 1-6 years, thus disrupting the child's development [17]. If the environment does not stimulate talent, especially among parents, these talents will remain neglected [18]. In addition, inadequate parental social support, comparison with other children, inadequate role models, and overprotective parenting are also considered poor parenting

methods [19]. Parental ignorance about the growth and development of children will be a dangerous sign for child development [20]. The emergence of these problems is supported by Chung et al., (2022), as many as 313 parents complained about the more complicated way of parenting their children due to the impact of stress at home. It leads to hostile parenting, damage the relationship between parents and children, and the potential risk factors for child abuse. Therefore, parents need assistance in providing care for children by providing training, seminars, workshops, and learning media that can increase their knowledge so that they can provide appropriate stimulation according to the stages of development [22].

Many education observers provide online training, seminars, and workshops to facilitate parents in providing positive parenting for their children [23]. However, it cannot be considered a positive solution where parents cannot maximize the facilities provided [24]. Parents do not have enough free time to attend face-to-face training and have to divide their time between educating their children [25][26]. In addition, they do not have valid references if they are self-taught parenting. In addition, errors in providing care can cause fatal things for children's growth and development, especially children's cognitive development [27]. Therefore, parents need facilities in the form of flexible training containing valid information, which can increase parental knowledge related to children's growth and development as well as improve children's cognitive abilities [28].

Seamless Mobile Assisted Real Training for Parents (SMART-P), a parenting training media, is designed based on Android and has a seamless learning-based instructional design. SMART-P is a facility that parents can use to improve their parenting knowledge and cognitive abilities in children. The design based on cellular technology is used in the SMART-P application, aiming to pay attention to aspects of convenience and practicality for application users. In line with the opinion of Sharma et al., (2017), mobile learning is the most widely used learning system in the digital era. Meanwhile, seamless learning is flexible because it combines various settings, including mobile devices [30]. In general, limitless learning leads to changes in learning materials' content, so they are more adapted to user needs [31]. Another advantage is users' training using SMART-P, such as repetition, where users can repeat the material if they do not understand it. Users have more control over obtaining information related to parenting. Another benefit stated by Yogman et al., (2018) is that mobile-based training makes parents more active, diligent, creative, and flexible in continuing education and helps optimize information acquisition in learning.

Papadakis et al., (2019) argue that parenting training using mobile learning can increase parents' knowledge. It is because mobile-assisted parenting training is designed with exciting and easy-to-understand material for parents [33]. In addition, examples related to real life are also presented [34]. It will ease parents to receive mobile-assisted parenting training materials [35]. Several similar applications have been developed, such as e-Health [36], telehealth [37], the-practice [38], telerehabilitation [39], and mHealth [40]. These applications contain information on the health sector; but not many applications provide information related to parenting. The latest research was conducted by Sawyer et al., (2019) who developed the e-Mums Plus application to help mothers, especially young mothers, manage depression and parenting problems.

However, this mobile-based application is only used for postpartum mothers who experience difficulties in parenting. The research above shows that it is necessary to improve the quality of parental care both in terms of knowledgeof parents so that parents can maximize children's cognitive development [42]. Therefore, SMART-P is developed to meet the needs of parents related to children's growth and development to ease parents to obtain information about parenting as well as to improve cognitive abilities in children. Thus, this study aims to develop and test the effectiveness of the SMART-P application to improve parenting knowledge of parents and cognitive development in early childhood. Thus, this study includes 1) the development and implementation of SMART-P applications, 2) the effect of SMART-P training on parenting knowledge in parents before and after being given training, 3) the effect of SMART-P training on children's cognitive development before and after being given training, 4) differences in the effect of SMART-P training on parenting knowledge in the control group and the experimental group, and 5) differences in the effect of SMART-P training on children's cognitive development in the control group and the experimental group.

2 Literature review

2.1 Children's cognitive development

Cognitive development has a significant impact on children in living life. Cognitive development is remembering that children must think critically about what is around their environment [43]. Cognitive aspects are reasoning power, broad knowledge, memory, and creativity. Early childhood needs to know concepts such as recognizing color, size, shape, magnitude and direction. This development is comprehensive so that children must have optimal thinking skills because it is related to thinking skills such as the ability to reason, remember, memorize, solve real problems, have ideas, and be creative. Cognitive development has an influence on children's mental and emotional development as well as language skills [44]. Children's attitudes and actions are also related to their thinking abilities. Thus, cognitive development can be said to be the key to non-physical development [45]. Cognitive early childhood can also be improved from parental care.The dimensions and indicators of cognitive development that need to be developed by parents are modified from [12], [46].

2.2 Parenting knowledge

Parents must have parenting knowledge to provide good care for their children [47]. Parenting knowledge includes providing educational stimulation, child development, optimizing talent and potential, and providing comfort in the family environment [3]. To understand parenting knowledge, parents must know how to raise children, how children develop, and the various roles of parents in their children's lives [8]. Thus, parents must be equipped with skills to educate their children at home and information about nurturing and directing children to develop into quality human resources in the

future [48] [49]. In this study, parenting knowledge uses the standard Child development inventory (KCDI) knowledge developed by Ireton (1992). Dimensions and indicators of parenting knowledge are taken from the Child Development Inventory for children aged 3–4 years. Nine dimensions are mapped into nine aspects, including Social Scale, Self-Help Scale, Gross Motor Scale, Fine Motor Scale, Expressive Language Scale, Language Comprehension Scale, Letter Scale, Number Scale, and Other Development in general [51].

2.3 Seamless Mobile Assisted Real Training for Parent (SMART-P)

Seamless Mobile Assisted Real Training for Parents (SMART-P) is a mobile-based parenting training application for parents with seamless learning [33]. SMART-P has nine key features: a growth tracker that detects a child's growth rate and a development tracker that detects a child's developmental rate. This vaccination tracker records the vaccination schedule that has been or has not been carried out by a child. A nutrition tracker functions to detect what nutrients can be given to children. Tips serve to provide information and advice related to parenting. The consultation serves to bridge parents with experts and ask questions. However, parenting functions aim to contain information on how parenting should be carried out [52]. Parenting assessment measures three main variables of parenting: parenting knowledge, parenting skills, and parental locus of control. Finally, the log book functions as a parent's daily journal. SMART-P provides easy access for parents where they can provide education and learning anytime and anywhere [53].

3 Research method

3.1 Research design

This research uses Mix Method research with the ADDIE development model and experimental quantitative research approach. The ADDIE development model has a systematic structure and steps for developing android applications, so it is very suitable for developing SMART-P applications [54]. At the same time, the quantitative research approach is chosen to implement and test the effectiveness of the SMART-P product. The research method used is explanatory research with a non-equivalent control group design research involving the control and experimental classes. Data analysis in this study used descriptive quantitative analysis and SPSS analysis. The data in this study was conducted using a questionnaire and observation checklist. The pre-test and post-test in this training use the SMART-P application. This training was carried out for three weeks.

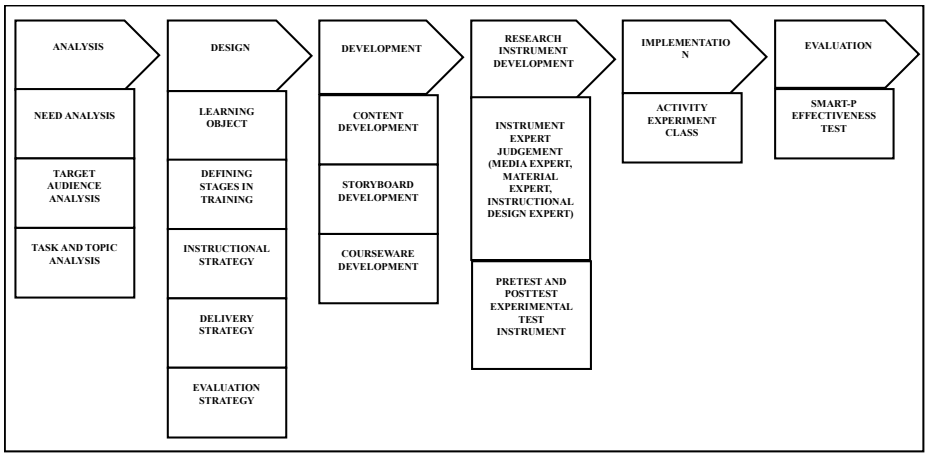

Fig. 1. Research Procedure

The first stage of research is analysis. At this stage, needs analysis, target audience analysis, and topic and task analysis are carried out. The needs analysis stage is used to identify the extent to which parents have mastery of material regarding parenting knowledge and children's cognitive development.

Next, the target audience analysis stage is used to identify time allocation, user interests, accessibility, demographics of residence, and ability to use technology. The final analysis stage is the analysis of user tasks and topics. Assignments and topics are developed based on theoretical studies from various book sources and research results, especially the latest journals published on related topics.

After conducting the analysis, the next step is to design the SMART-P application. This stage consists of several parts, which are material design, media design, and instructional design. Material design relates to preparing material that is considered relevant to be presented to participants in the form of e-books, video tutorials, and parenting modules. Media design includes application storyboards that provide an overview of the application from start to finish. The storyboard covers nine main features of the SMART-P application: growth tracker, development tracker, vaccination tracker, nutrition tracker, tips, consultation, parenting, parenting assessment, and logbook. Furthermore, the instructional design is designed to design the learning environment parents use in carrying out training using SMART-P. The instructional design comprises five processes, such as formulating learning objectives, defining learning strategies, instructional strategies, delivery strategies, and evaluation strategies.

The next stage is the development of the SMART-P application. At this stage, researchers create menu icons and display the SMART-P application. Then the display design is finalized at the program build stage using the Android application. The researcher also created a panel for submitting and editing materials in the application using an API with Laravel code whose operations were carried out by the admin. The material that can be input is in the form of text, images, videos, and links.

After the application development is complete, the researcher makes an instrument to test the feasibility of the application. The instrument is aimed at media, materials, and instructional design experts. The valid SMART-P application is then uploaded to the play store and implemented by participants through parenting activities that will be carried out online and offline. Activities are carried out offline on the first day for application distribution, installation, and the SMART-P application introduction. Furthermore, the training is carried out online using the SMART-P application. At the end of the meeting, an evaluation was conducted by holding a post-test through the SMART-P application to determine the effectiveness of the training carried out.

Table 1. Schedule of implementation program

Date	Group	Types of Courses	Types of Activities	Place/meeting
July 12th, 2022 – August 02nd, 2022	Control group	Parenting knowledge	Pretest with True or false questions	Face to face on first time using google form
			Conventional parenting training	1. Face to face training on the first meeting 2. Online (flexible) using WA
			Posttest	Online on the last date of program
		Children's Cognitive Development	Observation using Questionnaire	Online using google form.
July 13th, 2022 – August 03nd, 2022	Experimental group	Parenting knowledge	Pretest with True or false questions using smart-p	Face to face on first time using smart-p
			SMART-P parenting training program	Online using smart-p
			Posttest using smart-p	Online using smart-p in the last program
		Children's Cognitive Development	Observation using Questionnaire	Online using smart-p

3.2 Data collection techniques

The population in this study consists of 714 parents with children aged 4 years from posyandu/KB in five sub-districts of Malang City.

Table 2. Population

No	District	Population	Sample
1.	Blimbing	144	24
2.	Kedung Kandang	141	24
3.	Klojen	153	24
4.	Lowokwaru	143	24
5.	Sukun	133	24
Total		714	120

The samples in this study include:

1. Thirty respondents, parents with children aged four years, are selected to analyze problems and needs purposively outside the research sample;
2. 120 respondents consisting of parents and children aged four years, are selected using purposive sampling with two techniques, namely non-random sampling and sampling according to the criteria of (a) parents have children aged four years, (b) are willing to participate in a series of SMART training -P, (c) have a compatible android smartphone and be able to operate it, and d) be able to use the application, and;
3. Six experts are selected using a purposive sampling technique with the criteria of a) as program assessors who have been teaching and have experience in the scientific field for approximately five years. The experts consist of 2 media experts, two materials experts, and two instructional design experts.

Types of Validators	Position	Department	University
Media Expert A	Head of Department	Educational technology	University A
Media Expert B	Senior Lecturer	Department of basic education and social science School of Education	University B
Material Expert A	Professor in educational science	Non-formal Education	University A
Material Expert B	Senior Lecturer	Department of basic education and social science School of Education	University B
Instructional Design Expert A	Master and Doctoral of Educational Technology Study Program	Educational Technology Study Program,	University A
Instructional Design Expert B	Lecturer	Department of Science Mathematics and Creative Multimedia School of Education	University B

Therefore, the sample in this study was 150 people with children aged 4 years and 6 experts.

3.3 Research instruments

Data collection techniques in this study used questionnaires and observation checklists. The required questionnaire includes:

1. The analytical instrument consists of Need Analysis with 8 question items and Target Audience Analysis with 7 question items, and
2. Instrument of parenting knowledge consists of 31 questions of 9 dimensions: two social items, four self-help items, two gross motor items, four acceptable motor items, three items of expressive language, three items of language comprehension, and three letters. Four items, Numbers 2 items and general development seven items;
3. Expert instruments consisting of a) media experts consisting of 5 dimensions covering the design of 5 question items, Easiness and Interaction of 5 question items, technology requirement of 4 question items, qualification of 5 question items, and

language and relevance of 11 items question, b) material expert consisting of 8 dimensions including Growth Tracker with 6 question items, Development Tracker with 29 question items, Vaccination Tracker with 6 question items, Nutrition Tracker with 6 question items, Tips with 6 question items, Consultation with 3 question items, Parenting as many as 9 question items, and Parenting Assessment as many as 22 question items; and c) an instructional design expert consisting of 5 dimensions including learning needs with five questions, lesson planning with five questions, learning objectives with two questions, learning strategies with ten questions, and learning evaluation and contextual assessment with four questions;

4. The checklist sheet for children's cognitive development consists of 30 items of 3 dimensions, namely symbolic thinking and as many as nine items, problem-solving with as many as 14 items, and logical thinking with as many as 7 items.

3.4 Data analysis techniques

This study used descriptive percentage analysis to describe the need for expert analysis and judgment. The testing the effectiveness of SMART-P on parenting knowledge and children's cognitive development includes 1) instrument validity test using product moment correlation, 2) instrument reliability using Cronbach's Alpha, 3) normality test using Kolmogorov Smirnov Statistic, and 4) homogeneity test using Levene Statistic. Furthermore, the data obtained were analyzed using the Statistical Package for the Social Sciences SPSS software with the Paired sample t-test (for research questions 2 and 3) and the independent sample t-test (for research questions 4 and 5).

4 Result

4.1 Respondent analysis

In this study, research respondents were taken from several categories based on the analysis of respondents, including gender, parent age, education, and child sex.

Table 3. Respondent Description

No	Characteristics of Respondents	Control Class		Experiment Class	
		∑	%	∑	%
1	Gender of Parents				
	Man	6	10%	9	15%
	Women	54	90%	51	85%
2	Parents Age				
	21 Years -25 Years	2	3.33%	2	3.33%
	26 Years -30 Years	21	35%	19	31.67%
	31 Years-35 Years	22	36.67%	22	36.67%
	36 Years-40 Years	9	15%	12	20
	>40 Years	6	10%	5	8.33%
3	Education of Parents				
	Junior High School	13	21.67%	12	20%
	Senior High School	23	38.33%	20	33.33%
	Diploma	5	8.33%	8	13.33%
	Bachelor	16	26.67%	16	26.67%
	Master	3	5%	4	6.67%
4	Child Gender				
	Boy	27	45%	29	48.33%
	Gir	33	55%	31	51.67%

The characteristics of respondents in this study were divided into four characteristics. It is determined by the parent's gender, age, education, and the child's gender. The features of respondents depending on parental gender are seen in the experimental and control groups. There are striking differences, namely the number of men and women, from the number of men, namely 90% and 10% in the control group and 85% and 15% in the experimental group. Second, the characteristics of respondents based on age in this study, both in the control and experimental groups, showed that the age group was mostly 31-35 years old with the same number of 36.67% and the least participating was the age group 21-25 years. Third, the characteristics of respondents based on parental education in both the control and experimental groups showed that most of the respondents had a high school education background, namely 38.33 in the control group and 33.33% in the experimental group. The minimum level of education is a master's degree. Fourth, the grouping of children's sex in the experimental and control groups showed almost the same percentage of girls with a large percentage of more than 50%.

4.2 SMART-P application development and implementation

SMART-P application

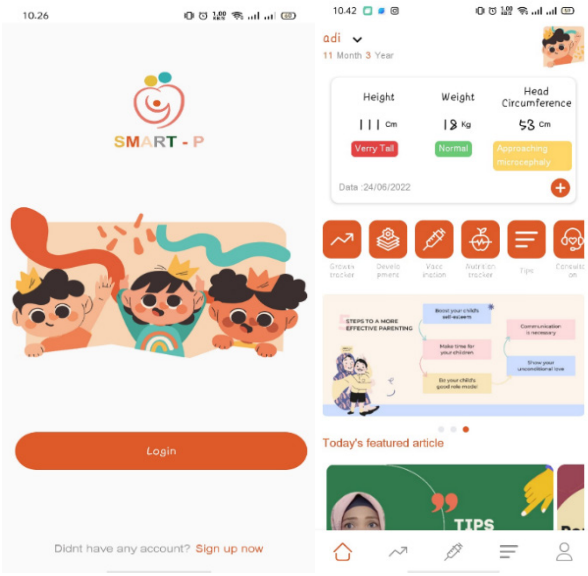

Fig. 2. SMART-P Interface Design

Validity expert result. The conclusions from the validation results of media experts in the SMART-P Application in the form of design, easiness and interaction, technology requirements, qualification, and language and relevancy have an average value of 47.4 with a percentage of 98.75%. The overall validation results make the SMART-P Application fall into Very Suitable / Very Good to use.

Table 4. Media Expert Validation Results

No	Dimension	%	Note
1	Design	100%	Very suitable/very good
2	Easiness and interaction	95%	Very suitable/very good
3	Technology requirement	96.87%	Very suitable/very good
4	Qualification	100%	Very suitable/very good
5	Language and Relevancy	100%	Very suitable/very good
Overall Media Expert		98.75%	Very suitable/very good

The conclusion obtained from all items in the parenting assessment material is that the average value in the parenting assessment is 84.62, with a percentage of 97.26%. The previous statement shows that the SMART-P application material is suitable for parenting training.

Table 5. Material Expert Validation Results

No	Dimension	%	Criteria
1	Growth Tracker	91.6%	Very suitable/very good
2	Development	99.56%	Very suitable/very good
3	Vaccination	100%	Very suitable/very good
4	Nutrition	100%	Very suitable/very good
5	Tips	100%	Very suitable/very good
6	Consultation	100%	Very suitable/very good
7	Parenting	87.5%	Very suitable/very good
8	Parenting Assessment	97.12%	Very suitable/very good
Overall Material Expert		97.26%	Very suitable/very good

Based on the overall dimensions result of the instructional design used in the SMART-P application, 89.98% was obtained. These results show that the instructional design on SMART-P applications is very suitable/good to be applied as a medium in parenting training using SMART-P.

Table 6. Design Instructional Expert validation results

No	Dimension	%	Criteria
1	Learning Needs	92.5%.	Very suitable/very good
2	Lesson Planning	97.5%	Very suitable/very good
3	Learning objectives	87.5%	Very suitable/very good
4	Learning strategies	92.5%.	Very suitable/very good
5	Learning Evaluation and Contextual Assessment	93.35%	Very suitable/very good
Overall Design Instructional Expert		89.98%	Very suitable/very good

The reliability test results on the parenting knowledge variable, which consists of nine dimensions, have a reliability value between 0.727 - 0.897. It can be seen that Cronbach's alpha (Table 8) shows a value above 0.7, so it is stated that these variables are declared good, and values above 0.8 are declared acceptable.

Table 7. Parenting Knowledge validity and Reliability Results

No	Dimension	Validities	Cronbach's Alpha Coefficient Value	Note
1	Social	0.683-0.683	0.811	Good
2	Self Help	0.378-0,586	0.727	Acceptable
3	Gross Motor	0.813-0,813	0.897	Good
4	Fine Motor	0.568-0,798	0.815	Good
5	Expressive Language	0.457-0,787	0.793	Acceptable
6	Language Comprehension	0.463-0,894	0.802	Good
7	Letters	0.389-0,668	0.738	Acceptable
8	Numbers	0.800-0,800	0.889	Good
9	General Development	0.348-0,544	0.767	Acceptable

The normality test is conducted to see whether the independent and dependent variables had a normal or abnormal distribution standard. The normality test is carried out using Kolmogorov-Smirnov test, showing that the data are normally distributed if the significance value is 5% or 0.05. Meanwhile, if the significance value is below 5% or 0.05, the data is not normally distributed. Based on the normality test results in the table above, the pretest and post-test values in the control and experimental groups showed a significance value of > 0.05. It shows that all variables in parenting knowledge can be said to be normally distributed.

Table 8. Data Normality Test Result

No	Group	Kolmogorov Smirnov Statistic	Asymp. Sig	Note
1	Pre-test Parenting Knowledge Control Group	0.200	0.084	Normal
2	Post-test Parenting Knowledge Control Group	0.200	0.074	Normal
3	Pre-test Parenting Knowledge Experiment Group	0.200	0.083	Normal
4	Post-test Parenting Knowledge Experiment Group	0.200	0.076	Normal

The homogeneity test is carried out to determine whether the data population variance is the same or whether there is a difference between the test criteria. If the significance value is > 0.05, it can be said that the variance in the group is said to be the same (homogeneous). Based on the results of statistical tests on parenting knowledge of the experimental group and the control group, a significance value of > 0.05 is obtained; thus, it can be said that there is no difference in variance between the samples in the group. It shows that the sample variation in the group is the same (homogeneous).

Table 9. Homogeneity Test Result of Variables

No	Group	Levene Statistic	Asymp. Sig	Explanation
1	Pre-test ParentingKnowledge Control Experiment Group	0.172	0.679	Homogenous
2	Post-test Parenting Knowledge Control Experiment Group	0.642	0.424	Homogenous

4.3 The effect of SMART-P training on parenting knowledge in parents before and after being given training

a. Effect of Conventional Parenting Training Programs on Parenting Knowledge

According to the below statistics, the average of all dimensions of parenting knowledge has improved by 12.11 points. In addition, the paired sample t-test also shows a t-count value of 15.365 > 2.003 and a significance value of 0.000 < 0.05. These results show a significant effect of conventional parenting training programs where the program can improve parents' parenting knowledge to improve child growth and development.

Table 10. The results of the paired sample t-test parenting knowledge in the control group

No	Dimension	Pre-test		Post-test		Gain	t-Count	Sig
		Mean	*SD*	*Mean*	*SD*			
1	Social	66.67	16.50	75.83	22.39	9.17	2.504	0.015
2	Self Help	56.25	20.29	71.25	24.55	15.00	6.948	0.000
3	Gross Motor	39.17	22.39	49.17	17.68	10.00	3.013	0.004
4	Fine Motor	51.25	12.35	60.83	18.18	9.58	4.457	0.000
5	Expressive Language	58.33	24.55	68.89	27.10	10.56	4.867	0.000
6	Language Compre-hension	51.11	6.74	72.22	11.34	21.11	5.819	0.000
7	Letters	58.33	17.16	72.50	19.08	14.17	6.521	0.000
8	Numbers	47.50	20.03	60.00	16.50	12.50	4.086	0.000
9	General Development	77.41	11.80	87.22	11.41	9.81	8.194	0.000
Overall		61.18	11.82	73.28	10.83	12.11	15.365	0.000

b. Effect of SMART-P Based Parenting Training Program on Parenting Knowledge

In the experimental group, the average value of the pretest improved by 21.95 points in the overall dimension of the Parenting Knowledge measure. The results of the paired sample t-test showed a t-count value of 22,536 > 2,003 and a significance value of 0.000 < 0.05. These results indicate differences in pretest and post-test scores or a significant effect of the parenting training program using SMART-P, where the program can improve the overall dimensions of children through parents after training.

Table 11. The results of the paired sample t-test parenting knowledge assisted by the SMART-P application in the experimental group

No	Dimension	Pre-test		Post-test		Gain	t-count	Sig
		Mean	*SD*	*Mean*	*SD*			
1	Social	64.17	10.61	82.50	8.25	18.33	3.369	0.001
2	Self Help	53.33	15.52	83.33	13.40	30.00	9.575	0.000
3	Gross Motor	43.33	18.86	67.50	10.61	24.17	4.606	0.000
4	Fine Motor	47.50	10.05	73.33	15.58	25.83	7.572	0.000
5	Expressive Language	53.33	21.86	83.33	15.00	30.00	7.194	0.000
6	Language Comprehen-sion	55.00	6.01	78.33	10.14	23.33	5.855	0.000
7	Letters	58.33	17.16	81.25	14.74	22.92	8.168	0.000
8	Numbers	52.50	17.68	66.67	7.07	14.17	3.953	0.000
9	General Development	74.44	9.69	90.56	8.51	16.11	9.229	0.000
Overall		57.56	12.89	79.52	9.53	21.95	22.536	0.000

4.4 The effect of SMART-P training on children's cognitive development before and after being given training

a. The effect of conventional parenting program training on children's cognitive development

In the overall dimensions of the child's cognitive development variables, the average value of the pretest experienced an average increase in the cognitive development of 15.92 percent. The paired sample t-test showed a t-count value of 2.280 > 2.003 and a significance value of 0.000 < 0.05. These results indicate differences in pretest and post-test scores or a significant effect, where the program can improve children's cognitive development after parents are given conventional training.

No.	Dimension	Pretest (Mean) %	SD	Posttest (Mean) %	SD	Gain (%)	t-count	Sig
1	Think Symbolically	53.75%	0.86	70.25%	1.11	16.50%	2.215	0.000
2	Problem Solving	52.75%	0.89	67.75%	1.23	15.00%	2.214	0.000
3	Think Logically	54.50%	1.02	70.75%	1.27	16.25%	2.41	0000
Overall		53.67%	0.92	69.58%	1.20	15.92%	2.280	0.000

b. Effect of parenting training program using SMART-P on children's cognitive development

In the overall dimensions of the child's cognitive development variables, the average value of the pretest experienced an average increase of 33.33 percent in cognitive development. The paired sample t-test showed a t-count value of 2.310 > 2.003 and a significance value of 0.000 < 0.05. These results indicate that there are differences in pretest and post-test scores or a significant effect, where the program can improve children's cognitive development after parents are given parenting training using SMART-P.

No.	Dimension	Pretest (Mean) %	SD	Posttest (Mean) %	SD	Gain (%)	t-count	Sig
1	Think Symbolically	56.25%	0.87	88.75%	1.15	32.50%	2.225	0.000
2	Problem Solving	53.75%	0.94	89.75%	1.27	36.00%	2.234	0.000
3	Think Logically	55.75%	1.07	87.25%	1.30	31.50%	2.470	0.000
Overall		55.25%	0.96	88.58%	1.24	33.33%	2.310	0.000

4.5 Differences in the effect of SMART-P training on parenting knowledge in the control group and the experimental group

The average value of the pretest increased by 12.11 points in the control group and 21.95 points in the experimental group in the overall dimensions of the parenting knowledge variable of parents. The paired sample t-test shows a t-count value of 7.886 > 2.003 and a significance value of 0.000 < 0.05. These results indicate differences in pretest and post-test scores or a significant effect, where the program can improve parents' parental knowledge after training using SMART-P.

No	Dimension	Gain Control	Gain Experiment	t-count	Sig
1	Social	9.17	18.33	1.398	0.165
2	Self Help	15.00	30.00	3.942	0.000
3	Gross Motor	10.00	24.17	2.282	0.024
4	Fine Motor	9,58	25.83	4.029	0.000
5	Expressive Language	10.56	30.00	4.137	0.000
6	Language Comprehension	21.11	23.33	0.412	0.681
7	Letters	14.17	22.92	2.466	0.015
8	Numbers	12.50	14.17	0.354	0.724
9	General Development	9.81	16.11	2.925	0.004
Overall		12.11	21.95	7.886	0.000

4.6 Differences in the effect of SMART-P training on children's cognitive development in the control and experimental group

In the overall dimensions of the child's cognitive development variables, the average value of the pretest increased by an average of 15.92 percent in the control group and 33.33 percent in the experimental group. The results of the paired sample t-test showed a t-count value of 2,541 > 2,003 and a significance value of 0.000 < 0.05. These results indicate differences in pretest and post-test scores or a significant effect, where the program can improve children's cognitive development after parents are given parenting training using SMART-P.

Table 12. The result of the independent sample t-test on children's cognitive development

No	Dimension	Gain Control	Gain Experiment	t-count	Sig
1	Think Symbolically	16.50%	32.50%	2.398	0.000
2	Problem Solving	15.00%	36.00%	2.942	0.000
3	Think Logically	16.25%	31.50%	2.282	0.000
Overall		15.92%	33.33%	2.541	0.000

5 Discussion

5.1 Design and development of Seamless Mobile Assisted Real Training Program for Parent (SMART-P)

The development of the SMART-P application goes through five stages, namely Analysis, Design, Development, Implementation, and Evaluation, abbreviated as ADDIE. The ADDIE model is considered a more flexible research procedure and is not intended to be rigid [55]. Before starting the program planning, an analysis is carried out in three stages, such as need analysis, target audience analysis, and task and topic analysis. All three have functions for collecting data to have an accurate picture of what application users need. Next, the design section consists of 3 parts, which are media design, material design, and instructional design. Material design relates to preparing

material that is considered relevant to be presented to participants. The media design includes application storyboards that are used to provide an overview of the application from beginning to end. The storyboard contains nine main features of the application, including a growth tracker that detects a child's growth rate and a development tracker that detects a child's development rate. This vaccination tracker records the vaccination schedule that has been or has not been carried out by a child. A nutrition tracker functions to detect what nutrients can be given to children. Tips serve to provide information and advice related to parenting. The consultation bridges parents with experts and asks questions about parenting functions to contain information on how parenting should be carried out. Parenting assessment measures the three main variables of parenting, namely parenting knowledge, parenting skills, and parental locus of control, and finally, the log book functions as a parent's daily journal. The third stage is the instructional design which aims to design a training system for the SMART-P application. After the SMART-P design and design have been completed, the next step is to develop the SMART-P application.

At the courseware development stage, the design includes making designs such as user interfaces, feature buttons, and interactive dialogue boxes that appear through specific commands. The design for this application is done with the help of Corel Draw X8 software. Furthermore, after the design display is finalized, it enters the program build stage. The application used is Android Studio which is the official Android IDE. Next, a panel developed using an API with Laravel code is needed. This panel is intended for in-app content editing. Admins usually carry out the operation by changing the content structure, which includes text, images, and video links. The outcomes of creating all aspects, both in terms of appearance and function availability, when run. The features that have been developed are divided into the registration menu, the main application menu, and the application's main features. After the program is completed, then an expert assessment is carried out. Validator experts provide several notes on changes such as the inclusion of the android os version, details on how to use the application at the beginning of use, changes in the image components used, the inclusion of media sources, and changes in the assessment format in the parenting assessment. Furthermore, the SMART-P application is applied to users as a parenting training medium through the installation, distribution, and training process.

5.2 The effect of SMART-P toward parenting knowledge before and after program implementation among parent

After given conventional training, the overall dimensions of the parenting knowledge variable experienced a significant increase in parenting knowledge. It means that conventional training can increase the knowledge of parents or respondents in research. This increase was due to the absorption of knowledge experienced by parents regarding parenting materials. The increased knowledge is offset by the flexibility factor in accessing materials that parents can use [56]. Participants have entered the first and second taxonomy bloom levels in this section, namely knowledge and understanding [57]. Through these two levels, parents have absorbed the material related to parenting knowledge, which helps track children's growth and development.

The training used based on SMART-P shows that the dimensions of the parenting knowledge variable have increased significantly. It means that training with the help of the SMART-P application can increase the parenting knowledge of parents or research respondents. Increasing parental knowledge is facilitated by a parenting support application, namely SMART-P. The application answers the needs of participants who require valid parenting references as a source of information and exciting parenting media and have the flexibility to be used anytime and anywhere. Leitjen (2020) states that applications on smartphones have a significant effect on increasing parenting knowledge.

The main advantage of the SMART-P application is the ease of access; anyone can use it anywhere, anytime. For parents, it is helpful given that parenting activities take place all the time, and learning activities tend to bind and provide tremendous stress. The pressure is in the form of limited time and learning space for parents with the dynamic demands of their role. Thus, parental knowledge about parenting is challenging to increase if it is not balanced with flexibility in access to information. It follows the seamless learning theory proposed by Wong (2016) where learning participants can be more flexible anytime and anywhere through asynchronous-based learning. Seamless learning takes advantage of the wide range of materials accessible to authentic participants. Direct involvement can also be done through activities inserted in the SMART-P material so that participants can gain new knowledge through their experiences.

5.3 The effect of SMART-P toward children's cognitive development before and after program implementation among parents

After training using conventional parenting, parenting practices carried out by parents can improve children's cognitive development. It means that conventional parenting training for parents can improve children's cognitive development. The increase was due to the acceptance of knowledge during training parents. Rowe et al. (2020) mention that parental knowledge influences parenting. It is in line with the opinion expressed by Benjamin (2018) that parents' attitudes, personalities and knowledge about children's growth and development are essential for continuity in providing brain stimulation, where children's brain development is more rapid at the age of 0-4 years. Therefore, maximizing providing stimulation to children can help improve their cognitive development.

While parenting training conducted using SMART-P showed a significant increase in children's cognitive development, parenting training using the SMART-P application could improve children's cognitive development. The increased cognitive development of children is caused by SMART-P-based parenting facilities that can support parents' parenting knowledge so that parents have the basics of providing stimulation for children's cognitive development. The SMART-P application helps in enhancing parents' knowledge base so that they can give developmental stimulation. The application provides an alternative for parents who are still confused about studying children's cognitive development and what kind of stimulation should be given to children at the age of 4 years.

Parents are the first education for children. Parents are responsible for educating and providing developmental stimulation to children's growth and development, especially cognitive development in children [62]. Cognitive development in children can be improved by parenting applied by parents, for example, by meeting the nutritional needs of children to help stimulate children's brain growth [63], providing stimulation in the form of games that stimulate children's thinking abilities [64], and others. Parents should give appropriate stimulation to children, of course, should not be done arbitrarily [65]. Children have developmental stages according to their age. Parents are led to know aspects of children's development so that they can maximize the potential possessed by children [66]. Thus, parents need to continue to upgrade their parenting patterns so that a child's cognitive development can be maximally stimulated.

5.4 The effect of SMART-P for parenting knowledge in the control group and the experimental group

Seven of the nine dimensions contained in parenting knowledge, 7 of which show significant differences. The seven dimensions are self-help, gross motor, fine motor, expressive language, letters, numbers, and general development. The experimental group has a substantially more significant gain than the control group, yet the two dimensions have roughly the same gain. Hence, it is ruled inconsequential. The two dimensions are social and language comprehension while the gain on the parenting knowledge variable as a whole experienced a higher value in the experimental class than in the conventional class. The high gain value in the experimental class is because the training is provided with the help of the SMART-P application. Knowledge of parents gets support from the various features available. Through the growth tracker feature, parents can make observations about their child's growth in real time without manually filling in a notebook. Meanwhile, through the development tracker feature, parents have access to the stages of development experienced by their children. Several other features, such as vaccination tracker, nutrition tracker, and consultation, make parents more aware of the needs that must be given to their children. SMART-P is an application that can increase knowledge because of the flexibility of its use. Application-assisted training makes it easier for parents to access materials and information about parenting. They are considering parents' condition who cannot continuously seek information due to parenting activities. Through the help of the application, parents are facilitated with a reminder feature to record the child's growth and development and a reminder so as not to miss the vaccine schedule.

Access to materials can be done by parents without limits, anywhere and anytime. Wong (2016) states that the borderless learning model is also known as seamless learning. The main principle of seamless learning is the concept of continuity and continuity in the learning process. SMART-P, as a parenting companion application, adheres to this principle. Participants who have the opportunity to receive training are given recurring tasks, which can be done flexibly according to the time they have. The material provided is continuous and can be accessed from the features in the application.

5.5 The effect of SMART-P for children's cognitive development in the control group and the experimental group

Based on the results of the study, there were differences in the treatment of parenting, so that the results of the training intervention using SMART-P influenced the high cognitive development of children. The high increase in cognitive development in children is since parents have been given parenting training using SMART-P to increase parenting knowledge. Thus, parents can act following the pattern of children's cognitive development. Jeong et al., (2021) describe the existence of positive caregivers on children's cognitive development after parents have good parenting knowledge. In addition, cognitive development in early childhood has enormous potential to be developed so that through the SMART-P application, parents can learn about their child's cognitive development through the available features. Lanjekar et al. (2022) found that good parent-child interactions during a child's cognitive development can help their child grow up with optimal thinking intelligence.

Parenting training using the SMART-P application is undoubtedly very easy for parents, especially in meeting children's nutritional needs and stimulation design to sharpen parental knowledge. Parents are given easy access to information by having consultation sessions with experts who can complain about their problems, especially in helping children maximize their potential, talents, and cognitive development. Through SMART-P application, parents are not worried about the achievement of their child's growth and development because the SMART-P application can detect the development of child's stage of child development.

6 Conclusion

Based on the research, the following results were obtained: (1) the design and development of the SMART-P application can be used as a media for parenting training. This can be seen from the results of expert validation, which states that the SMART-P application is valid and acceptable for use; 2) there is a significant effect on parents' parenting knowledge before and after being given parenting training using the SMART-P, 3) there is a significant effect on children's cognitive development before and after being given parenting training using the SMART-P application. Parenting training using SMART-P increases all dimensions of parenting knowledge and aspects of children's cognitive development. SMART-P-based parenting training needs to be provided to parents on an ongoing basis to maximize results.

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