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Developing STEAM-Based Learning Tool to Internalize Pancasila Character Values for Early Childhood

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***Abstract**: Social, scientific, and technological changes require a flexible curriculum. The prototype curriculum emphasizes essential material, project-based learning, and teacher flexibility. Early childhood education must develop Pancasila character value, a new learning outcome for the students. This study uses the ADDIE development model consisting of 5 stages: analysis, design, develop, implement, evaluate. The setting of this study was in two Early childhood institutions in Surabaya and Sidoarjo. The Evaluation stage involves formative and summative evaluation at each development stage. This lesson plan and learning resources based STEAM for developing Pancasila character value was 85.4% based on an expert questionnaire. Therefore, it can be concluded that STEAM-based teaching modules to implant Pancasila values are ideal learning reference materials for kindergarten teachers.*

***Keywords:** Early Childhood Learning Tools; STEAM; Pancasila Character Values*

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INTRODUCTION

Planned and systematic education is believed to produce a complete human being. Countries with higher levels of total human output tend to develop more advanced societies. Looking at the curriculum used is one method to assess how well a government plans and executes its educational program. It is a successful educational program if it trains students to adapt to changing demands in the world (Nurhalim, 2018; Weldemariam et al., 2017). It is crucial that educational programs continuously develop and adapt to meet the needs of students based on rapid changes in society, science, and technology.

In early childhood education, independent learning is called independent play because children learn by playing. According to (Mustagfiroh, 2020), independent play is a change in the learning system from listening to teacher explanation to learning that combines indoor and outdoor classroom learning, commonly called an outing class. Here, children can interact directly with the teacher and the surrounding environment to form the character of children who are independent, brave, and sociable so that they can play while learning without feeling pressured to meet the teacher's standards (Silvia & Rakhmawati, 2021). The independent

learning or prototype curriculum emphasizes project-based learning, essential material, and teacher flexibility (Supangat, 2021). Early childhood education must develop the Pancasila character value, a new learning outcome (Kemenristekdikti PP Number 5 of 2022). Many early childhood educators struggle to translate Pancasila character value outcome because it is still new and its definition is too broad. Pancasila must be applied in real life during learning (Sulistyati et al., 2021). Implementing the independent learning or prototype curriculum will help early childhood education units create their operational curriculum for instilling Pancasila character values.

Science (study of the natural world), Technology (study of products made to meet human needs), Engineering/Engineering (design processes used to solve problems), Art (art/creativity), and Mathematics (mathematics) comprise STEAM (the language of shapes, numbers and numbers). STEAM allows cross-disciplinary transdisciplinarity (Nicolescu, 1999, 2018). Thus, it must include project-based and problem-based learning (Capraro et al., 2013). Thus, STEAM-based learning requires a device or tool. (Lou et al., 2011).

STEAM empowers teachers to plan and implement project-based learning across disciplines and creates learning environments where children can participate directly. Unlike traditional teaching models, the STEAM framework encourages dynamic synergies between modelling processes and math and science content. STEAM skills are transferable to most 21st-century careers and Pancasila values. STEAM-based learning tools can improve teacher competency in pedagogy, make it easier for stakeholders and service recipients to access learning resources, and meet the challenges of the Education 4.0 revolution in early childhood learning and instilling Pancasila character values.

Based on the previous description, the specific objectives of this study are to (1) improve teacher competence in pedagogic and professional aspects and (2) implant Pancasila character values in early childhood. For this reason, the urgency in this research is as follows (1) the COVID-19 pandemic directs education services centred on human resource development, educational innovation, and prototype curriculum tool development. (2) to make it easier for Early Childhood Education stakeholders to provide STEAM-based educational services that implant Pancasila character values.

METHOD

This study aims to create a design and test the feasibility of STEAM-based learning tools for implementing the Pancasila character values. This study used ADDIE development model research design. The ADDIE model is a development model that consists of five stages: analysis, design, development, implementation, and evaluation (evaluation).

1. During the analysis stage, two activities are carried out: needs analysis and component analysis of early childhood education learning tools through focus group discussions (FGD) between the development team, colleagues, early childhood education practitioners, and stakeholders.
2. The design stage began with creating weekly lesson plans (RPPM), daily lesson plans (RPPH), and STEAM-based learning resources based on implemented theme.
3. At the development stage, development is carried out on each learning resource used based on the determined theme. In addition, material validation was made to determine whether the material used was suitable.
4. The next stage is implementation, 4 early childhood education institutions in Surabaya and Sidoarjo conducted the test on STEAM-based learning tools to implant Pancasila character values. The trial design used in this study is as follows:

a. Case study with a single shot (John W. Creswell; Cheryl N. Poth, 2017). In this study, children will be given treatment in using learning tools in the form of modules, learning videos, and games, followed by observations to determine the results of children's ability to implant Pancasila character values. This design was used in both the first and second trials. After collecting the data, it was analyzed by calculating the mean value and then drawing conclusions about whether there was an increase during the first and second trials.
b. One Design Group for Pretest-Posttest (John W. Creswell; Cheryl N. Poth, 2017). During the third trial, this design was used. In addition to being given trials using provided learning tools, data were collected in this study pretest (before being given treatment) and posttest (after being given treatment) to see if there were differences in the ability to implant Pancasila character values during the pretest and posttest. After collecting all data, the mean value of the pretest and post-test score was calculated and analyzed using the gain score model.

The difference between the pretest and posttest scores results in the gain score. The obtained gain score is then interpreted using the classification from Hake (Hake, 1998), as shown in the table below:

$$g = \frac{\text{pretest and posttest score}}{maximum\ pretest{-}posttest\ score}$$

The gain score is the difference between the pretest and post-test scores. The gain score obtained is then interpreted using the classification from Hake (Hake, 1998), as shown in the following table 1:

Table 1. Classification of Gain score (g)

Gain score	Kategori
G > 0.7	High
0.3 < g ≤ 0.7	Moderate
G ≤ 0.3	low

5. Evaluate stage is made in each stage of development. Formative and summative evaluations are used in the evaluation. Formative evaluations are conducted to collect data from analysis to implementation for product improvement. In contrast, summative evaluations are conducted at the end of the program to determine the effect of STEAM-based learning tools to implant Pancasila character values in children aged 5-6 years.

The research flowchart can be described as follows based on the research design in figure 1

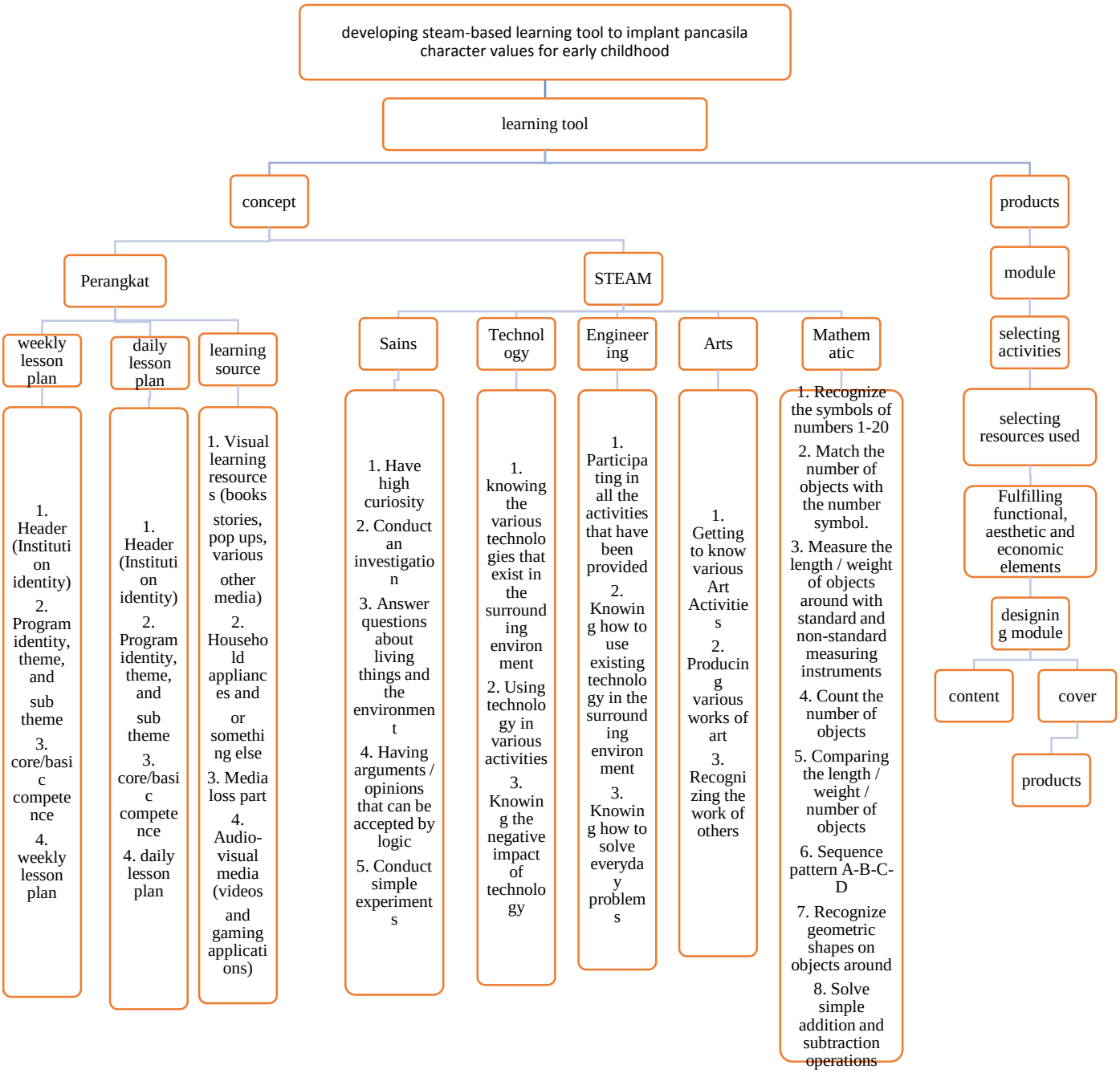


Figure 1. Research Flow of developed STEAM-Based Learning tool

This study was conducted in four early childhood education institutions located in cities or districts in East Java Province as partners in this study. The research subjects were divided into two categories of institutions, namely public and religion-based institutions, with a total of 74 students.

Data were collected using observation, interviews and surveys. The observation was made to obtain data during product implementation, the interviews were used during product development needs analysis, and surveys were conducted to obtain user product feasibility data. A questionnaire is used to administrate the validation instrument. Learning tools in the form of modules are evaluated using four response options: "very feasible", "feasible", "less feasible", and "not feasible".

Table 2. The feasibility level of the guidebook by the teacher

Percentage	Criteria	Description
81% - 100%	very good	very feasible
61% - 80%	Good	feasible
41% - 60%	Good enough	Feasible enough
21% - 40%	Not good	less feasible
0% - 20%	Not very good	Not feasible

(Riduwan, 2013)

Data from the questionnaire results obtained from material experts can be calculated using the following formula:

$$K = \frac{Tse}{Tsh} \times 100\%$$

The achievement Indicators of the design component for developing STEAM-based early childhood education learning tools as follows table 3:

Table 3. the design component for developing STEAM-based early childhood education learning tools

Developed product	Component	Description
Program Semester	a. Header (Institution identity) b. Program identity, theme, and sub -theme c. core/basic competence d. Learning strategies e. Time Allocation	The semester program is structured as a teacher's guide in carrying out learning activities for one semester. The semester program is arranged based on the characteristics of each institution.
• Weekly lesson plan	1. Header (Institution identity) 2. Program identity, theme, and sub -theme 3. core/basic competence 4. weekly lesson plan	The weekly program is structured as a teacher's guide for one-week of teaching based on the theme in one week.
• Daily lesson plan	1. Header (Institution identity) 2. Program identity, theme, and sub -theme 3. core/basic competence 4. Learning objectives 5. Material load 6. Learning scenarios (opening, core and closing activities) 7. Learning resources / media 8. Assessment plan	The daily program is structured as a teacher's guide in a day teaching consisting of opening, core and closing through STEAM learning steps.

• Learning sources	9. Visual learning resources (story books, pop ups, various other media) 10. Household appliances and or the like lain 11. Media *lose part* 12. Media audio visual (video dan aplikasi game)	Learning resources are prepared to support the implementation of STEAM learning approach and adapted to the learning objectives

RESULT

The first stage is analysis (Analysis), in which researchers examine the basic needs of educators and the difficulties during the implementation of the learning process. According to the results of interviews and focus group discussions, no guidebook or module is available as a STEAM-based learning tool for implanting Pancasila character values in early childhood. Furthermore, the interviews and focus group discussions were conducted to compare each perception of the research topic being discussed between teachers and other early childhood education academics in the form of the need to develop STEAM-based learning tools based on the independent curriculum to implant Pancasila character values in early childhood, with the following results table 4

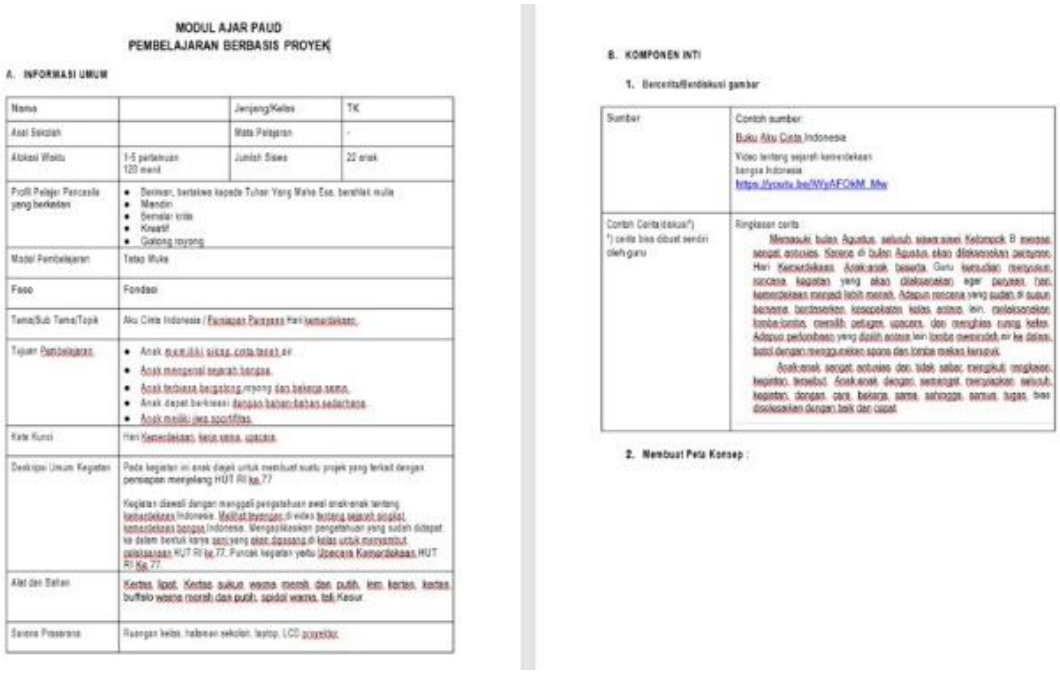
Table 4. Analysis Results of Needs for STEAM-Based Early Childhood Education Learning tool

General component	Sub-component	Description
	1. School Identity 2. Initial competence 3. Infrastructure 4. Target learners 5. 5. Learning models	1. The school's identity includes the school's origin, name of the developer, school year, semester, level of education or class, number of students, teaching and learning activity, time allocation, and academic year phase. 2. Initial competence includes faith, piety to God Almighty, noble character, independence, critical reasoning, creativity, and cooperation. 3. The infrastructure includes classrooms, school yard, laptops, LCD projectors, learning tools and materials, including folding paper, red and white paper, red and white buffalo paper, colourful markers, and mattress straps. 4. The target students describe the services provided to students (services for regular students, services for students with learning difficulties, services for students with high achievement). 5. The learning model contains offline/online / hybrid meeting models.
Core component	1. Theme/Sub-theme/Topic 2. Learning Objectives 3. Brainstorm Activity 4. Meaningful understanding	1. Themes/sub-themes/topics can be seen in each institution unde the theme "I love Indonesia / celebrate the Independence Day, garbage and plants". 2. Learning objectives are taken from learning achievement, which contain NABP, Identity, Literacy & STEAM.

General component	Sub-component	Description
	5. Trigger Questions 6. Learning activities 7. Assessment 8. Teacher's Reflection	3. Brainstorming activities include alternative initial activities to encourage children's ideas/imaginations and alternative play activities (in centres, groups, or areas). 4. A meaningful understanding contains material concepts children understand regarding themes, sub-themes, and topics discussed. 5. Trigger questions Contain a list of questions (you can use 5W +1H) to get children to have ideas and imaginations related to themes, sub-themes, and topics discussed. 6. Learning activities include themes/sub-themes/topics, semester/week, learning, day/date, activity objectives, tools and materials, and descriptions of learning activities (introduction, core activities, and closing). 7. The assessment includes diagnostic assessments (non-cognitive and cognitive assessments), formative assessments (notes of anecdotes, works, checklists), and summative assessments. 8. The teacher's reflection includes notes on the results of learning activities, difficulty, or changes to activity plans. This note is a follow-up activity plan.
Attachment	1. Student Activity Sheet 2. Teacher and Student Reading Materials 3. Reference	1. Student activity sheets contain direct practice/performance-based activities. 2. Teacher and student reading materials contain titles and sources of books or video titles and sources used in the learning process. 3. The bibliography contains learning resources used in the form of video links or books

Each component has explained the details of the sub-components, which refer to three things that need to be considered in developing the format of learning tools in the core components, namely learning objectives, learning activities and assessment (Maulinda, 2022).

The next stage is the design stage; the lesson plan components are prepared based on the needs analysis results in the previous stage. The initial design obtained is as follows figure 2



MODUL AJAR PAUD
PEMBELAJARAN BERBASIS PROYEK

A. INFORMASI UMUM

Nama		Jenjang/Kelas	TK
Asal Sekolah		Mata Pelajaran	-
Alokasi Waktu	1-5 pertemuan 120 menit	Jumlah Siswa	22 anak
Profil Pelajar Pancasila yang berkesan	• Beriman, bertakwa kepada Tuhan Yang Maha Esa, berakhlak mulia • Mandiri • Bernalar kritis • Kreatif • Gotong royong		
Model Pembelajaran	Tatap Muka		
Fase	Fondasi		
Tema/Sub Tema/Topik	Aku Cinta Indonesia / Persiapan Pancasa Hari kemerdekaan.		
Tujuan Pembelajaran	• Anak [illegible] • Anak mengenal sejarah bangsa. • Anak berbasa bergotong royong dan bekerja sama. • Anak dapat berkreasi dengan bahan-bahan sederhana. • Anak mobil jeu sportifitas.		
Kata Kunci	Hari Kemerdekaan, kerja sama, upacara.		
Deskripsi Umum Kegiatan	Pada kegiatan ini anak diajak untuk membuat suatu projek yang terkait dengan persiapan merayakang HUT RI ke 77 Kegiatan diawali dengan menggali pengetahuan awal anak-anak tentang kemerdekaan Indonesia. Melihat tayangan di video tentang sejarah singkat kemerdekaan bangsa Indonesia. Mengaplikasikan pengetahuan yang sudah didapat ke dalam bentuk karya seni yang akan dipasang di kelas untuk merayakan pelaksanaan HUT RI ke 77. Puncak kegiatan yaitu Upacara Kemerdekaan HUT RI Ke 77.		
Alat dan Bahan	Kertas, lipat, Kertas sukun warna merah dan putih, lem, kertas, kertas buffalo warna merah dan putih, spidol warna, tali Kasur.		
Sarana Prasarana	Ruangan kelas, halaman sekolah, laptop, LCD proyektor.		

B. KOMPONEN INTI

1. Bercerita/Berdiskusi gambar

Sumber	Contoh sumber: Buku Aku Cinta Indonesia Video tentang sejarah kemerdekaan bangsa Indonesia https://youtu.be/WyAFOkM_Mw
Contoh Cerita (diskusi*) *) cerita bisa dibuat sendiri oleh guru	Ringkasan cerita Memasuki bulan Agustus, seluruh siswa-siswi Kelompok B sangat antusias. Karena di bulan Agustus akan diselenggarakan peringatan Hari Kemerdekaan. Anak-anak, beserta Guru sekolah merencanakan kegiatan yang akan dilaksanakan agar peringatan Hari kemerdekaan menjadi lebih meriah. Adapun rencana yang sudah di susun bersama, berdasarkan kesepakatan kelas antara lain, melaksanakan lomba-lomba, memilih petugas upacara, dan menghias ruang kelas. Adapun perlombaan yang dipilih antara lain lomba memindah air ke dalam botol dengan menggunakan sendok dan lomba makan kerupuk. Anak-anak sangat antusias dan tidak sabar mengikuti rangkaian kegiatan tersebut. Anak-anak dengan semangat menyiapkan seluruh kegiatan, dengan cara bekerja sama, sehingga semua tugas bisa diselesaikan dengan baik dan cepat.

2. Membuat Peta Konsep :

Figure 2. Initial Design of STEAM-Based Learning Tool

From this design, an evaluation phase with eight teachers found several components in the learning tool that were incomplete and not explained in detail, so new teachers could not understand them, no learning resources in the form of games to support the learning process, and the cover must be designed as attractive as possible. Thus, at this stage, it is necessary to improve basic educator needs and to solve problems by compiling components to develop complete and detailed learning tools and cover design.

Based on the design stage evaluation, the learning device design is developed in the development stage. Development results are in figure 3

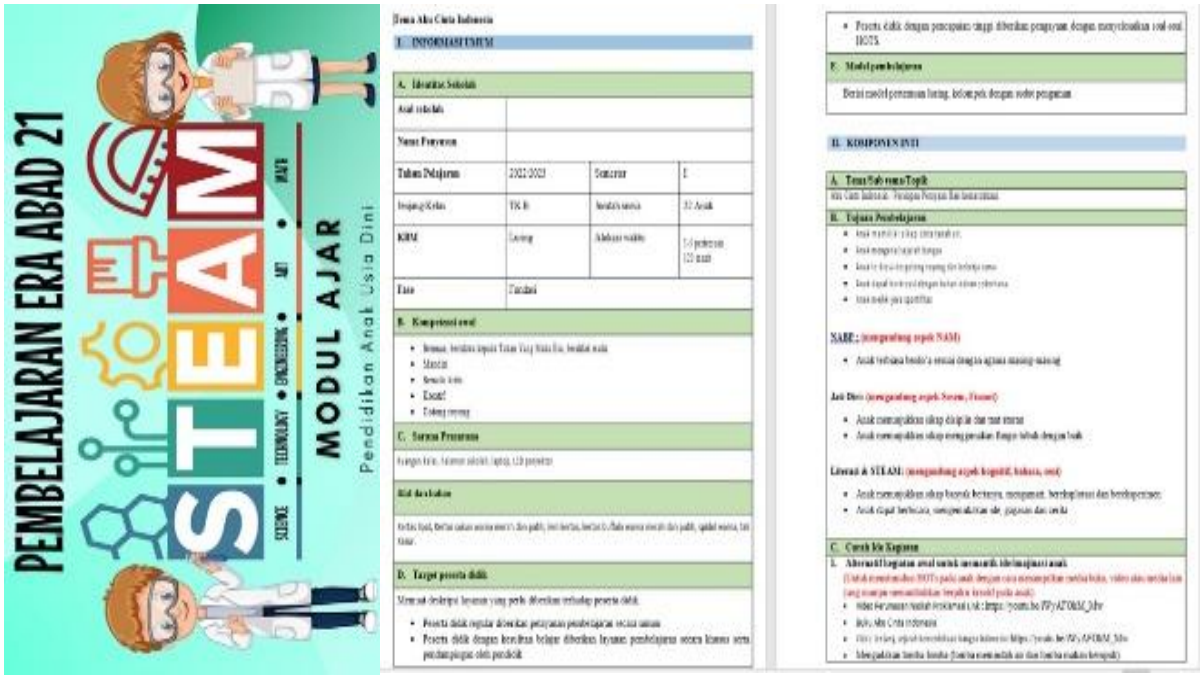


Figure 3. Designing STEAM-Based Learning tool

The design of STEAM-based learning tools to implant the latest Pancasila character values is in the final module developed based on the learning theme "I Love Indonesia, Garbage and Plants" which also includes learning resources in the form of games and learning videos about waste and plants. The work done so far has been to develop the front cover of the teaching module, which includes the title and illustrations that support the contents of the STEAM-based learning teaching module in instilling Pancasila character values. After the learning tools have been developed, the content validity is evaluated by showing the development results to six teachers and then providing a questionnaire that the teacher must fill out. The table below shows the obtaining of values from six respondents:

Table 5 shows the results of tests conducted on six kindergarten teachers in Surabaya and Sidoarjo using learning device products.

NO	Score	CRITERIA
1	79,1%	good
2	87,5%	very good
3	87,5%	Very good
4	75%	good
5	95,8%	very good
6	87,5%	very good
Average		85,4%

The content validation results show that the learning tool is suitably based on Pancasila character values. However, several revisions are suggested by the teacher, including improving the command words used in the game, using Indonesian instead of English, making the display on cellphones full screen, and removing some difficult tools.

The researcher prepares teachers to apply STEAM-based learning activities to implant Pancasila character values in early childhood under the teaching modules developed in the fourth stage, namely implementation. The first trial stage was held in public schools in Surabaya for two days, with ten children as test subjects. The activities during the first trial were on the theme "I love Indonesia" like watching the proclamation of Indonesian independence day video, clapping Pancasila, singing independence songs, dividing tasks during ceremonial activities, cleaning the class and school environment, and decorating the class in groups with various paper materials and the provided lose parts.

Faith, piety to God Almighty, noble character, independence, cooperation, global diversity, and critical and creative reasoning were observed in trial I (Sulistyati et al., 2021). The second trial was held at a religious institution in Sidoarjo, with 22 students as research subjects. The second trial was conducted in two days and consisted of activities in which children were asked to explore their surroundings, make plant pots out of used bottles, and play plant-related games. 1). The results of the first and second trials are shown in the table 6.

Tabel 6. results of the first and second trials

No	Indicators	first trial								second trial							
		Number of students				Percentage				Number of students				Percentage			
		4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1
1	Faith and piety to God Almighty	4	5	1	-	40%	50%	10%	-	14	6	2	-	63%	27%	9%	-
2	Independent	7	2	1	-	70%	20%	10%	-	8	12	2	-	36%	54%	9%	-
3	Cooperation	8	1	-	1	80%	10%	-	10%	8	12	2	-	36%	54%	9%	-
4	Global diversity	8	1	1	-	80%	10%	10%	-	4	12	5	1	18%	54%	22,5%	4,5%
5	Critical reasoning	4	6	-	-	40%	60%	-	-	19	1	2	-	85,5%	4,5%	9%	-
6	Creative	5	2	3	-	50%	20%	30%	-	19	-	3	-	85,5%	-	13,5%	-

Data on the results of the two trials were collected after the trials were completed using STEAM-based learning tools to implant Pancasila character values. There are differences in the results on the dimensions of independence, cooperation and global diversity, that children in public schools get higher scores. Children who attend religion-based schools may score higher in the dimension of the ability to have faith, piety to God Almighty, and have a noble character, and reason critically and creatively.

The third trial followed the same trial model as the first and second trials, except it was conducted in two different institutions with a total of 22 students for each. In this trial, data on pretest and post-test abilities were also collected, and the data were analyzed using the gain score index. As a result, the following is the result (table 7):

Table 7. Results of the third Trial Pretest and Posttest

Data	Score		Gain Index	Category	Data	Score		Gain Index	Category
	Pretest	Posttest				Pretest	Posttest		
1	21	24	1	High	1	18	23	0,8	High
2	19	22	0,6	Moderate	2	20	24	1	High
3	18	24	1	High	3	18	24	1	High
4	19	22	1	High	4	19	23	0,8	High
5	19	22	0,6	Moderate	5	19	23	0,8	High
6	18	24	1	High	6	19	23	0,8	High
7	19	22	0,6	Moderate	7	18	24	1	High
8	19	23	0,8	High	8	21	23	0,5	Moderate
9	21	24	1	High	9	18	23	0,8	High
10	21	24	1	High	10	20	23	0,7	Moderate
11	19	24	1	High	11	18	23	0,8	High
12	20	24	1	High	12	20	23	0,7	Moderate
13	21	23	0,6	Moderate	13	18	23	0,8	High
14	19	22	0,6	Moderate	14	20	23	0,7	Moderate
15	19	24	1	High	15	19	23	0,8	High
16	18	23	0,8	High	16	18	24	1	High
17	18	24	1	High	17	20	23	0,7	Moderate

Data	Score		Gain Index	Category	Data	Score		Gain Index	Category
	Pretest	Posttest				Pretest	Posttest		
18	18	22	0,6	Moderate	18	18	22	0,6	Moderate
19	21	24	1	High	19	18	24	1	High
20	19	22	0,6	Moderate	20	19	23	0,8	High
21	18	23	0,8	High	21	19	23	0,8	High
22	21	24	1	High	22	19	23	0,8	High
Average			18,6		**Average**			17,7	
score			0,84	High	**score**			0,80	High

For the third trial, learning tools on under the theme "waste" were used. The test was done at each school for two days, and activities included watching videos about different kinds of garbage, sorting garbage, putting garbage through a process, and playing games about garbage. The table above shows that each school's average scores on the pretest and posttest are 0.84 and 0.80. Therefore, we can conclude that STEAM-based learning tools are very good for teaching Pancasila values.

DISCUSSION

Pancasila as the ideology of the Indonesian nation must be implanted from an early age, because Indonesia is a very broad country and has its diversity. The government recently made significant changes to Indonesia's national curriculum, known as the Merdeka curriculum. The Pancasila character value is a relatively new learning outcome that must be developed in early childhood education (PP Kemristekdikti Number 5 of 2022). Implementing Pancasila character values is a type of educational service to create early childhood with moral integrity, character, and intelligence that can be reflected in everyday life (Kartini & Kusmanto, 2022). By implanting Pancasila character values, it is hoped that it can solve the problem of moral degradation experienced by Indonesian students in the swift currents of digitalization.

In early childhood, STEAM-based learning tools in teaching modules, learning videos, and games implant Pancasila values. This learning tool was evaluated by six Surabaya and Sidoarjo teachers. After being developed into learning tools for teaching modules with complete components, teaching modules were developed to meet educators' basic needs, especially for teaching modules that were previously incomplete and difficult to understand.

In the early stages, researchers conducted observations at various educational institutions and in two different cities, namely Surabaya and Sidoarjo, to determine the analysis of teacher needs on STEAM-based teaching modules in implanting Pancasila character values in early childhood. The result is that the learning tools previously used by educators were simple ones that only consisted of the general and the specific components.

Learning tools, such as STEAM-based teaching modules, can also be widely disseminated for implanting Pancasila character values in early childhood. Riduwan (2013) states that STEAM-based learning tools in implanting Pancasila character values in early childhood were categorised as feasible on the validity criteria of learning tools. It is expected to expand not only within the scope of educational institutions in Surabaya and Sidoarjo, but also to all other regions.

Preparing the development of STEAM-based learning tools in implanting Pancasila character values theme "I Love Indonesia, Garbage, and Plants" was feasible and fulfilled all the components in a curriculum referring to Goffin (in Nelson and Lindeman, 2000) that curriculum is a learning experience prepared for early childhood with specific themes so that the

curriculum is thematic (Gullo, 2013). The thematic content in the curriculum is made into themes regarding children's experiences. Through learning themes, children will have the opportunity to learn material that is more contextual, real, and allows children to broadly and deeply explore more on the selected themes (Finch et al., 1997). Thus, the learning experience is also thematic so that children understand the concept entirely.

Implanting Pancasila character values in early childhood can be planned and carried out on each learning theme, including during discussion activities related to the competition, then followed by joint discussions regarding the implementation of the commemoration ceremony of 77th Indonesian Independence Day. Here, the teacher first asked who wants to become a ceremonial official. In this case, the children were very enthusiastic in the discussion to select who wanted to be the leader of the ceremony, who would be the reader of the ceremony script, bringing the Pancasila script, who would be the conductor, and also the reciter of the prayer. Then from several children who had already nominated themselves, other friends were asked by the teacher to vote to decide who was more suitable to be the ceremonial officer. According to Sulistyati et al., (2021) Pancasila is not limited to the context of knowledge but must arrive at how to apply it in real life and lead students to think critically and comprehensively, accept diversity and are proud of an identity as an Indonesian child. Therefore, implanting Pancasila values should appear in every learning material and the habituation of Pancasila values in schools.

CONCLUSION

The study can be concluded as follows: The STEAM-based learning tool for implanting Pancasila character values in early childhood has been developed according to planned procedures and a validation test by the teacher with a score of 85.4%. Thus, it can be concluded that STEAM-based teaching modules in implanting Pancasila character values are very feasible for teachers in kindergarten educational institutions to use learning reference materials it means There is a high level of category effectiveness in STEAM-based learning tools in implanting Pancasila character values

SUGGESTION

Based on the results of research and product development of STEAM-based learning tools in implanting Pancasila character values, suggestions can be given that for future researchers, they should be able to conduct more in-depth tests on the Pancasila character values of children in other environmental settings. As well as, developing STEAM content on other learning themes.

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