LITERATURE REVIEW : THE APPLICATION OF 'DESIGN THINKING' APPROACH IN EDUCATION CONTEXT

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Abstract
The aim of this research is to analyze scientific articles in order to collect relevant sources associated with 'Design Thinking' approach. Design thinking is an approach that gives solution and pay attention to the need of the students. There are 5 stages in design thinking approach, they are empathize, define, ideate, prototype, and test. The role of technology takes part to this kind of approach and become the solution to solve the problem. The method that is used in this scientific article is *literature review*. It begins with looking for the scientific articles that relate to the topic of research. The scope of the collected articles is on education area, published in 2020-2023. There are 6 selected scientific articles. This research focuses on how the stages of design thinking implemented in each step/process and how is the result and the application. The result of this research is that all stages in design thinking approach is applied in each article. The prototype results are in the form five applications, and one of the result is in the form of learning media. After passing the testing phase, the result of the researches are mostly acceptable and worthy to use in order to solve the problem of the students.
Keywords : application, design thinking, education, problem, students

Introduction

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, society, nation and state (UU National Education System article 1 paragraph 1). Education is a tool and a place for students to be able to develop themselves so that they continue to process and form themselves into virtuous human beings.

In the midst of the influence of globalization and the times, education plays an important role in facilitating the learning process and shaping someone's character. When referring to Ki Hajar Dewantara's understanding, education must refer to the nature law and the nature of the times. In a fast-paced and dynamic era like today, reforms in the world of education are certainly very needed. Everything related to the world of education and various aspects in it demands to be renewed. Therefore, it is impossible to continue to put forward the same method. It needs a 'renew' or renewal that can adapt to the nature of the era.

To face the challenge of industry 4.0, the existence of technology plays an important rule. Technology is a tool that makes everything more easy. The existence of technology in the field of education is really helpful for learning and teaching activity. There are several examples of the existence of technology in education that already enjoyed in some schools, such as laptop, internet access, smart phone, lcd projector, etc. Therefore, today's learning activity should aligned with the use of technology.

In the process of learning and teaching activity, sometimes there is difficulty faced by the students. It can be in the form of basic skills that have not been fulfilled, learning media that suits with student's needs, the limitations faced by students to learn the subject, the facilities needed in school facilities, etc. Therefore, it is required a new innovation in order to solve the problem in this education context. This is where design thinking contributes as a solution to the renewal of learning activities in the world of education by presenting the role of technology in it.

The definition of *design* based on language context derived from the word 'design' (Italia) that means picture [1]. The experts interpret design thinking (English) as "pemikiran

desain" or "design thinking" which is the process of introduction to generate creative ideas and concepts.

Design thinking is a kind of method that utilizing a human-centred approach in order to solve problem for every human needs, technology and business, etc. [2] There are 5 stages of design thinking approach, such as :

1. Empathize – Understanding problem of target users.
2. Define – Defining the needs and problems of target users.
3. Ideate – Mapping the assumptions and solutions.
4. Prototype – Creating a prototype of the solution.
5. Test – Testing the prototype result of the solution.

Those 5 stages become the tool to analyze each article. To know the gap of this research with previous researches, the selected literature for this research should fulfill several selection criteria, such as :

1. The literature contains about the implementation of design thinking in education context.
3. The literature contains about the discussion of application planning that used design thinking approach.
4. The literature contains about the way to solve the problem in education context by implementing design thinking approach.

Method

The method that is used in this article is *literature review* from various studies that have been researched and reviewed before. The data collection is done by looking for literature in previous research, which is associated with the implementation of 'Design Thinking' method. The scope of selected literature is in the field of education. The data collection in the field of education used several keywords such as "the implementation of design thinking in education context", "the implementation of design thinking in English education", "scientific article about design thinking". The searching process used *Google Scholar* by inserting keyword. The searching process finished on July 24th, 2023. Furthermore, the next step was sorting the scientific article based on these several criteria.

To make it more clear, here are several research questions (RQs) that guided this research :

1. What are the scientific article(s) used in this research? How many?
2. What are the stage(s) of 'Design Thinking' method that applied in each article/literature?
3. What are the steps that have been done in each stage of 'Design Thinking' method, they are Empathize, Define, Ideate, Prototype and Test ?
4. Why 'Design Thinking' method often used for finding solution to solve the problem especially in education context?

Findings and Discussions

In this part, the author will discuss about the mapping of collected literature and the description of each in Table 1. After that, the collected literatures will be analyzed based on the stages that belong to design thinking method, as described in Table 2.

Table 1. The Description of Collected Articles (Data)

Num ber	The name of author (s)	The name of journal (Year, Vol, Number, Page)	The title of article
1.	Intan Permata Sari, Annisa Hasna Kartina, Ajeng Mubdi Pratiwi, Fitri	Jurnal Pendidikan Multimedia. Vol. 2, No. 1 (2020), pp. 45–55.	Implementasi Metode Pendekatan Design Thinking dalam pembuatan aplikasi Happy Class di Kampus UPI Cibiru

	Oktariana, M Farhan Nasrulloh, Sahla Analia Zain		
2.	Muhamad Ali Kasri, Yerlin Novan, Indri Anugrah Ramadhani	Jurnal PETISI (Pendidikan Teknologi Informasi). Vol. 2, No. 2, Juli 2021	Penerapan Model Design Thinking pada Pengembangan Media Pembelajaran berbasis Macro Media Flash
3.	Ahmad Jaisy Rahman, R. Rizky, Muhammad H., Nur Avin Maulana	Jurnal Pendidikan Multimedia (EDSENCE). Volume 4 Issue (1) (Juni 2022) 43-52	Implementasi Metode Pendekatan Design Thinking dalam Pembuatan Aplikasi Membaca Berbasis Visual 3D Untuk Anak Satu Sekolah Dasar
4.	Riski Mayang Sari, Imam Ma'ruf Nugroho, Moch Hafid T.	INFORMATION MANAGEMENT FOR EDUCATORS AND PROFESSIONALS. (Vol. 6, No. 2, Juni 2022, 121 - 130)	Perancangan UI/UX Aplikasi Pembelajaran Bahasa Inggris Usia Sekolah Dasar dengan Metode Design Thinking
5.	Rholand Deo Eka Putra	Januari 2023	Rancang bangun aplikasi pembelajaran dan latihan mengenal Abjad berbasis Android Menggunakan metode pengembangan design thinking
6.	Ivan Farhan Abiyyu, Muhammad Yazid Abu Sahal, Luthfia Rizqi Maharani, Ismi Lailiyah, Sentot Achmadi	JATI *(Jurnal Mahasiswa Teknik Informatika).* Vol. 7 No. 1, Februari 2023	Penerapan Metode Design Thinking Pada Perancangan User Interface dan User Experience Aplikasi Bimbingan Belajar Bahasa Inggris Online

Research Question 1 : What are the scientific article(s) used in this research? How many?

To get selected literature that relate to the discussion topic, the author has selected the literature based on title and content which discuss design thinking approach. There are 6 selected scientific articles that discuss about the implementation of design thinking in the field of education in general, 2 literatures discuss about application production by using design thinking approach, 1 literature discuses about application planning by using design thinking approach, 2 literatures discuss about planning of user interface and user experience on application by using design thinking approach and 1 literature discuses about developing learning media by implementing design thinking approach. The next step will be discussed in result section below.

Table 2. The Analysis of Each Stage in 'Design Thinking' Method

Article	The steps of 'Design Thinking'	Steps
1	Empathize, define, ideate, prototype, test.	a. Empathize : Interview and observation b. Define : Determine the core problem c. Ideate : Find the idea d. Prototype : Paper prototype and digital prototype

		e. Test : Paper and digital prototype by providing the application and by interviewing the respondents
2	Empathize, define, ideate, prototype, test and implement.	a. Empathize : Interview and observation b. Define : Defining the most urgent problem conclusion c. Ideate : Brainstorming d. Prototype : Using Multimedia Development Life Cycle (MDLC) method e. Test : Validation test from science teacher and lecture. f. Implement : Present the learning media
3	Problem, empathize, define, ideate, prototype.	a. Problem : Issue to be raised b. Empathize : Interview c. Define : The research team conducted a discussion (Brainstorming) d. Ideate : Specify the needs of parents e. Prototype : Making "Membaca asyik" application media by using "proto.io" website.
4	Empathize, define, ideate, prototype, and test.	a. Empathize : Interview and observation b. Define : Identify the result of observation and interview regarding the point of view of 'user's problem into a user persona c. Ideate : the process of making features into the form of information architecture. d. Prototype : Adapted from the result of analyzing user persona and the result of previous steps. e. Test : Using SUS method by giving link prototype and questionnaire towards user candidate.
5	Empathize, define, ideate, prototype, and test.	a. Empathize : Bodystorming (See the problem from user's point of view). b. Define : Using "How Might We" question that trigger brainstorming. c. Ideate : Determining the solution. d. Prototype : Implementing the planning stage and design that have been made using prototype for empathy method. e. Test : Using Usability Testing method, and interview.
6	Initiate, empathize, define, ideate, prototype, test.	a. Initiate : Looking for the problem that happen in surrounding environment a. Empathize : Collecting validate problems and get persona profile. b. Define : The process of translating collected problems into 'Table Measurement". c. Ideate : Making wireframe and high-fidelity design. d. Prototype : Making user flow from high-fidelity design that have been made. e. Test : Using SUS method by collecting respondent's opinion via google form.

Research Question 2 : What are the stage(s) of 'Design Thinking' method that applied in each article/literature?

In building idea by using design thinking approach, there are several stages included such as empathize, define, ideate, prototype, and test. Table 2 categorizes the stages in design

thinking used in previous literatures that have been collected. Each literature has several stages that should be done by the researcher. There are several literatures/articles that are not applied all stages. One of the reason is because the development topic of description context depends on the field and the complexity of method to get best solution. Therefore, it is already clear if the literature uses certain stage in order to solve the problem.

There is one literature that did not apply all stages of design thinking approach such as in 3rd literature. 3rd Literature did not use *'test'* stage because it has found a clear settlement related to the offered solution and in accordance with the topic. Therefore, the product that has been created through innovation, process and intended target, suitable with the users that is being considered. Not only that, in the first stage before empathize stage, there is '*problem*' stage and make this literature has 6 stages. This stage describes the problem that will be raised and the objective of the research.

Meanwhile, in 6th literature, it has 6 stages of design thinking, they are initiate, empathize, define, ideate, prototype, test. In *initiate* stage, it is similar with *problem* stage that exists in 3rd literature. It is the stages that looking for the problem that happen in surrounding environment. One problem is raised and this problem is presented by making "Proto Persona" that represents a group of users that has certain goal, and criteria. By applying this stage, it means before the researcher look forward into empathize stage, they try to know the background of the users.

Research Question 3 : What are the steps that have been done in each stage of 'Design Thinking' method, they are Empathize, Define, Ideate, Prototype and Test ?

From table 3, it can be seen that almost all literatures used 5 stages of design thinking approach, except 3rd literature. Therefore, it can be analyzed that each stage has its own framework that mostly used. Here is the explanation :

1. Empathize : Interview and observation (1st, 2nd, 3rd, 4th literature)
2. Define : Find the most urgent/core problem (1st, 2nd, 6th literature)
     Brainstorming (3rd, 4th, and 5th literature)
3. Ideate : Find idea (1st literature)
     Brainstorming (2nd literature, 3rd literature)
     Determining solution : (4th, 5th, 6th literature)
4. Prototype : Making mock up (3rd literature, 4th literature, 5th literature)
     Low and high-fidelity (6th literature)
     Paper and digital prototype (1st literature)
     Multimedia life cycle (2nd literature)
5. Test : SUS method (4th, 6th literature)
     Usability test (5th literature)
     Interview (1st, 2nd literature)

Research Question 4 : Why 'Design Thinking' method often used for finding solution to solve the problem especially in education context?

The first reason, why design thinking used for finding solution, is that design thinking is an approach and process in collecting information where the users involved there. The use of design thinking is used as new innovation for finding solution. In the process, design thinking approach seeks to understand the users, not only their needs but also in each stage of design thinking itself. It is to reach the goal of the users. This repeated process in design thinking can build a design process that suits with the users.

The second reason, design thinking approach has been known since early 20th century. It can be said that this approach is already familiar in the society. This approach not only pays attention to the user needs but it is also an approach with many method. Design thinking not only focuses on what is seen and felt, but it is also focuses on the experience (daily activity of the users). Design thinking is applied to find the most effective and efficient solutions to solve complex problem.

The third reason, why design thinking is also needed in education context, is that because deign thinking pays attention to the need of the users (for this context in the need of students). Students are the people who use educational facilities. In this technology era, the existence of product of application that can be a solution to solve the needs and problem of learning activity is really needed. The high use of internet and smart phone can be positive support in order to implement design thinking to solve the problem in education context which is also complex. There are many types of difficulty and limitation of students to learn something. Therefore, design thinking can be a very helpful approach to overcome many problems in learning activity (education context).

Conclusion

Design thinking approach has been known since early 20th century. It means that this approach already used in many fields. Because of its popularity and usefulness, design thinking approach is also used in education context recently. It can be seen from the selected article/literature review that published since 2020 until 2023, there are 6 selected article.

In building ideas in design thinking, there are several stages such as empathize, define, ideate, prototype and test. Table 1 describes the selected article used as data in this research which explain the title, the author (s), and journal description. Meanwhile, table 2 describes several stages in design thinking approach and its implementation.

There are 5 articles that applied all stages of design thinking approach. There is 1 article that does not apply all stages of design thinking approach. It is found in the 3rd article, the stage 'test' does not exist whereas this stage is very important to check the response of users. The reason is because the development topic of description context depends on the field and the complexity of method. There are 3 articles that used 6 stages. In 2nd article, there is 'implement' stage in the last section. In 3rd article, 'problem' stage exists before empathize stage. And in the 6th article, 'initiate' stage exists before empathize stage.

The mostly used stage in selected articles that have been reviewed, interview and observation are easily found in 'empathize' stage. In 'define' stage, it is found the step that mostly used is defining core problem. And, determining solution is the best part that mostly used in 'initiate' stage. While, in 'prototype' stage, the most activity is making mock up. The product is in the form of application (5 literatures) and in the form of learning media (1 literature). The last stage, 'test', it is mostly used SUS method. After passing the testing phase, the result of the researches are mostly acceptable and worthy to use in order to solve the problem of the students.

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