

Design thinking approach with cognitive internship model to improve innovative attitudes of teachers professional education students

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Corresponding Author

Mohamad Syarif Sumantri¹

Uswatun Khasanah²

Yustia Suntari³

Nadya Dewinda Agustin⁴

¹Educational Science Faculty, Universitas Negeri Jakarta, Jl.Rawamangun Muka Jakarta Timur, Indonesia.

*Email: Syarifsumantri@unj.ac.id

*Email: yustiasuntari@unj.ac.id

²Faculty of Teaching and Education, Universitas Nahdlatul Ulama Lampung, Jl. Lintas Pantai Timur, Purbolinggo, Lampung Timur, Indonesia.

*Email: uswatunkhasanah@unulampung.ac.id

³Universitas Negeri Jakarta, Indonesia.

*Email: nadyadewindaa@gmail.com

ABSTRACT

The educational aspect that drives teachers to perform their responsibilities is one of many aspects that affect the quality of their performance which is very challenging. The quality of education is currently considered low because it cannot fully provide competence by the educational stage undergone by prospective teacher students. The purpose of this initiative is to improve the innovative attitude of teachers and professional education students by using a design thinking method to create learning activities using a cognitive internship model and by performing comprehensive studies and research. This research design uses action research with more emphasis on the process of trying new things. The subject of this study is teaching professional education students in the odd semester of 2023-2024 at the State University of Jakarta with a total of 94 students. The research was conducted for six months. Data analysis is used in qualitative and quantitative ways to obtain data on the process and improvement of learning activities in improving students' innovative attitudes. The results of the study showed an increase in 5 indicators of developing students' innovative attitudes, namely 1) innovative learning design projects, 2) reflection and self-evaluation, 3) case studies of educational innovation, 4) collaboration with the business world and industry and 5) innovative idea competition. In the pre-cycle, it scored 2.7%, the first cycle got a score of 3.4%, and the second cycle got a score of 4.0%. It can be concluded that integrating design thinking with the cognitive internship model in improving the innovative attitude of teacher professional education students have proven to be effective with five indicators developed in this study.

Keywords: *Cognitive internship, Design thinking, Innovative attitude.*

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Highlights of this paper

- The current study aims to explore the innovative attitudes of students of the teacher profession program at the State University of Jakarta for one semester.
- Participants in the study were all students registered in the teacher profession program education.

1. INTRODUCTION

Teacher quality is one of the indicators of success in achieving educational goals (Permanasari, 2016). According to Rahardjo (2017) teachers at various levels and educational units must be committed to professionalism in their duties. They must be able to educate and build morals or personalities to produce a better generation. Teachers are responsible for the implementation of various educational programs through the learning process. Educational programs are highly dependent on the performance and professionalism of teachers. One of the efforts to form professional teachers is teacher professional education (Arifa & Prayitno, 2019; Putri & Imaniyati, 2017). The teacher professional education program aims to produce prospective teachers with character, superiority, and competence. The profile of graduates of the teacher professional education program will be colored by an attitude of sensitivity to the environment, discipline, cooperation, and honesty. Teacher professional education in positions is a program for teachers who do not have educator certification. The program is carefully designed and applies quality principles ranging from selection, learning, and assessment processes to competency tests. This program will produce professional future teachers who have character, excel, are competitive, and love the homeland (Pannen, Nurwardani, Ridwan, Sudarsono, & Bintoro, 2017). In addition to students, the abilities and qualifications of teachers must be considered to achieve national education goals.

An innovative teacher typically shows cognitive, affective, and psychomotor behaviors in addition to having a strong character. A teacher with an innovative attitude at work tends to excel, grow, want to advance, seek novelty, be able to adapt to changes and renewals and achieve good work results. The tendency to act consists of verbal responses to innovation acceptance, innovation rejection, innovation implementation, and the impact of innovation implementation. An innovative attitude is very important for a teacher to get satisfactory work results. Teachers' ability to become professionals is a result of their ability to plan learning programs. These abilities include the ability to develop competencies, indicators, learning experiences, subject matter, develop learning strategies (activities, methods, media, and time), and plan assessments. The ability to carry out the learning process professionally also includes activities to prepare tools/media, teaching materials, and environmental conditions in the classroom. Since innovative attitudes are related to teachers' professional abilities, the improvement of innovative attitudes allows for the improvement of teachers' professional abilities. Therefore, there seems to be a positive relationship between the innovative attitude and the professional ability of primary school teachers.

One of the approaches that can be done in developing the innovative attitude of a teacher (prospective teacher/teacher professional education student) is the design thinking approach. The concept of design thinking has been discussed in academia for more than 30 years (Baker III & Moukhliiss, 2020; Brown & Katz, 2009; Retna, 2016). The transition from investigating design thinking as a designer's cognitive process to examining how non-designers might apply design approaches is known as the "shift from design as a science to designing as a mindset." Two terms distinguish this discourse: "designer thinking" and "designer thinking". "Design thinking" refers to the theoretical framework and academic construction used by professional designers while "design thinking" refers to the discourse of design practice used by people without a scientific design background. Thus, thinking design is considered a simple interpretation of the designer's thinking to incorporate the designer's approach into fields other than professional design (Johansson-Sköldberg, Woodilla, & Çetinkaya, 2013; Wrigley, Nusem, & Straker, 2020).

Design thinking is a versatile approach to organizing conflicting ideas, finding common goals and needs, productively utilizing diverse backgrounds, increasing empathy, and developing a shared vision (Elsbach & Stigliani, 2018; Panke, 2019). Finding ways to teach skills, work habits, and character in the twenty-first century has generated widespread interest in design thinking in education (Razzouk & Shute, 2012; Retna, 2016). The belief that design thinking can be used as a method of innovation has prompted educational programs to include design thinking as a component of their curriculum (Matthews & Wrigley, 2017). In this study, the selected theories represent various design thinking research fields. This includes Carlgren, Rauth, and Elmquist's (2016) consideration of design thinking research as a discipline and science combined with interview studies. Teacher professional education students with internship activities will be able to use the creative mindset of teachers in the classroom through the design thinking method.

Internship activities will have a significant impact on teacher professional education students who are prepared to become teachers in their field of expertise. One of the impacts resulting from internship activities is the readiness of students to show maturity in attitude and critical thinking which is beneficial during teaching practice (Sunaryo & Handayani, 2020). People learnt through internships long before education became a field of study at universities. It is a process in which more experienced people help less experienced people, provide support and give them examples so that they acquire new knowledge and skills. Internships allow parents to teach children to tie shoes. One can learn to become a tailor or chef because of this process. For example, one would not anticipate that the child would take part in the demonstration and be able to tie his shoelaces without help on the first try. In the same way, it seems reasonable for new chefs to start with easier tasks such as cutting ingredients or garnishing plates before moving up to higher levels to prepare the entire dish.

Experts can explain the covert processes through cognitive internships. This is different from traditional internships (Stalmeijer, 2015). Cognitive internships are considered essential for professional education and learning in adulthood (Schättin et al., 2019). However, little empirical research has been conducted in the workplace environment. In 2017, many vocational education programs already have internship programs. For example, one must undergo various levels of apprenticeship to become a daily electrician. However, internships can teach psychomotor skills. Internships can easily support cognitive and metacognitive learning and can occur in both formal and informal education settings. The cognitive apprenticeship model's concepts are briefly explained followed by a description of the teaching methods that make use of this approach.

There are many studies related to the innovative attitude of teachers. In this study, more emphasis is placed on the innovative attitude of teacher professional education students during the learning process through a design thinking approach with a cognitive internship model. Teacher professional education students are expected to be able to think critically and solve problems appropriately and professionally.

Based on observations made during learning activities for students of the pre-service teacher professional program in the odd semester of 2024 at Jakarta State University, the observations show that there are still many students who do not have an innovative attitude in learning activities. There are still many students who do not have an innovative attitude. Researchers are anxious to discover more about how to improve the creative perspective of students and teachers in their professional development. Some students think that a teacher only needs to have the intellectual ability to deliver the subject matter to their students but they do not know how to convey the subject matter so that it can be accepted and easily understood by students. Teachers' innovative attitudes will be shown by carrying out their duties and learning with their students. Teachers who fail in their assignments often think that teaching is just transferring various knowledge to students at school. As a result, they do not believe that students can discover knowledge on their own. This kind of thinking will pose a great danger to the national education system

because if this concept continues to develop, the revival of education will not be realized. There are very few indications of teacher performance including varied learning, task performance skills, and poor assessment of learning outcomes. Research conducted by [Maria \(2021\)](#) shows that the important role of teacher education in supporting the teaching profession emerges very clearly from this analysis. It can be concluded that the field of education needs to develop the capacity to ensure teachers' professional learning and that these efforts need to be informed by inspired research and a culture of inquiry in university-based teacher education programs. Positive results of [Mouraz, Pinto, and Cristina Torres \(2023\)](#) are indicated by process secrecy, voluntarism, multidisciplinary, flexibility in focus, and symmetry. These results are directly related to the influence of the program on the professional development of teachers and the development of reflective practices in the school community. The program also helps improve teachers' scientific, pedagogical, and relational knowledge. Collaborative work and improvement of teacher collaboration are the main tools to improve the pedagogical and scientific dimensions. Teachers are expected to meet professional requirements regarding (1) their role as teachers . (2) The capacity to teach and meet students' specific learning needs. (3) Managing classes effectively and (4) working closely with other professionals in the school. Teachers build competencies and experience the challenges associated with these requirements at different career stages. This study investigates the challenges and competencies that teachers perceive at various stages when dealing with professional requirements ([Keller-Schneider, Zhong, & Yeung, 2020](#)). According to the study conducted by [Dille and Røkenes \(2021\)](#) teachers' online professional development is a complex process. Teachers' internal factors are crucial in their dynamic interactions with content, facilitators and peers. Scaffolding is an overarching category. Four key concepts are revealed as the core of teachers' online professional development scaffolding: teachers, their context, online programs, and facilitating mutual understanding. Given the importance of teacher professionalism in learning to achieve maximum results, one of which is increasing innovative attitudes for teacher candidates in teacher professional education. Thus, improving the creative mindset of prospective teachers and teacher professional education is crucial for their professional application in elementary school teaching.

Improving the quality of teacher performance is very difficult and influenced by many factors, one of which is the educational factor that motivate teachers. The quality of education is currently considered low because it cannot fully provide competencies by the educational stage that students are undergoing. There are many reasons including low attendance, the teacher's inability to prepare for lessons, and the inability to demonstrate abilities that match the teacher's competence. The results of in-depth study and research are expected to identify components that can develop innovative attitudes of teachers and professional education students with a design thinking approach with a cognitive internship model.

2. LITERATURE REVIEW

2.1. Innovative Attitude

Innovative nature consists of the following two syllables: attitude and innovation. According to [Kreitner and Kinicki \(2008\)](#) "attitude is defined as the tendency learnt to respond consistently favorably or unfavorably concerning a given object". [Moorhead and Griffin \(2010\)](#) also say that "attitudes are important because they are the basis of a specific idea, situation, or another person". According to [Cherniss and Goleman \(2001\)](#) innovation is defined as being able to accept new ideas and techniques and be flexible in handling change. A teacher's ability to complete learning tasks in school and take responsibility for students under their guidance by improving student learning achievement is called teacher performance ([Fatonah & Helmy, 2021](#)). Innovative work behavior is defined as the ability of teachers to innovate and implement new ideas. This behavior is very important for all teachers and education staff because it will

produce innovations that will maintain the quality of schools (Megantara, Suliyanto, & Purnomo, 2019; Qurniawan & Suhendro, 2024).

In this case, the process of adopting an innovation or new idea is carried out in the following five stages (Unruh & William, 1974):

1. The awareness stage, where a person is aware of an innovation but there is not much information about it.
2. The interest stage, where a person begins to be interested in innovation and seeks information about it.
3. The evaluation stage, where a person begins to consider the benefits and drawbacks of the innovation or new idea.
4. The trial stage, where people start trying innovations, even if only on a small scale.
5. The adoption stage, where people decide to use innovations completely.

Innovation in schools will succeed if it considers teachers, students, facilities, programs and clear goals. Teachers are very responsible for the teaching and learning process because they are responsible for implementing educational innovations. The success of the innovative teaching and learning process in and outside the classroom is highly dependent on the ability and authority of the teacher. Teachers must be involved in the implementation of innovation from planning to implementation. In the teaching and learning process, students become subjects of education and participate in activities to learn new systems and knowledge. Learning is aided by students' feelings, intelligence, motor skills, cognitive strategies, and willpower. Students make innovations. Students can participate in innovation as innovative learners, active learners, and peer mentors. Therefore, in implementing educational innovations, don't just accept them but commit to the user. Innovation implementers, especially teachers will be very helpful with clear innovation programs and goals. The clarity of the program and objectives will be understood and implemented by the applicable program. Innovation will change the school environment directly or indirectly as well as the community and its people. What is to be applied from innovation will change society in terms of structure and lifestyle. The impact of innovation is community involvement in its implementation. In this study, innovative attitude is defined as the attitude of prospective teachers and students of teacher professional education at the State University of Jakarta towards innovation and changes in learning activities such as acceptance and rejection of innovation, application of innovation and the impact of innovation implementation. Innovative attitudes are measured through verbal responses, i.e., cognitive, affective, and conative.

2.2. Design Thinking

Design thinking has gained popularity over the last 20 years as a human-centered method for developing new products and as a method for making strategic decisions in a variety of fields, including commercial and social innovation. Unfortunately, the phrase "design thinking" suggests a philosophical or cognitive focus but the approach is about using practical problem-solving techniques. This methodology was established as a stand-alone and transferrable method based on human-centered design principles by a design agency (Brown & Katz, 2009) which was one of the industry leaders that advocated for this approach as a platform for design innovation (and the latter for its use in education). Although design thinking has expanded into two other areas, it is still the chosen phrase for human-computer interaction and the third-world social innovation sector (Sanders & Stappers, 2008). Five "discourses" regarding the meaning of this method have emerged as a result of its diffusion (Johansson-Sköldberg et al., 2013; Lindberg, Noweski, & Meinel, 2010; Lucy, 2011) and they are linked to design thinking as a field (Cross, 2001). For instance, this discussion covers topics such as problem-solving techniques, the act of producing meaning, and design thinking as a reflective discipline.

Over time, design thinking has spread from product innovation to other domains, e.g., management, until five new discourses have been developed on their meanings that emphasize their direct relationship with design practices, innovation, or the universality of the approach as a complement to the humanities and science thinking approaches (Johansson-Sköldberg et al., 2013; Lucy, 2011). According to Lucy (2011) practice is not an aspect of his theory that is the element that defines a method, then it is 'making' and 'doing'. An approach is based on a series of heuristics. This is related to the principle of experiential learning which was first popularized by Kolb (1984) and is commonly used as a reference in design education. Learning experience is a process in which knowledge is created through the transformation of experience. Knowledge results from a combination of attachment and transforming experience. It is a process of learning by doing through drafting or prototyping new concepts and ideas. In addition, design thinking in education is a teacher-centered approach to innovations taken from learning design tools to integrate student needs, technological knowledge, and learning success requirements. In education, it empowers students and teachers to develop creative problem-solving skills by focusing on empathy, experimentation and continuous learning (Brown, 2008).

In recent years, design thinking has been applied practically in every field of education, research, and industry. It has also been the focus of real-world teaching and research. Constructivist theoretical principles in the process of learning through design thinking. This work creates an integrative approach to theory, methodology, and practice by creating a taxonomy of constructivist principles to map the steps and activities of design thinking (Pande & Bharathi, 2020). However, design thinking provides a framework to address the difficult practice issues that teachers encounter (Henriksen, Gretter, & Richardson, 2020). Teachers in the course discover that practicing and being exposed to design thinking models enables them to come up with innovative solutions to practical problems that are pertinent to their setting. Teachers specifically mentioned the following three key lessons learned from the experience: (1) appreciating empathy, (2) remaining receptive to new ideas and (3) viewing instruction as a form of design. One cutting-edge approach that places teachers at the forefront of problem-solving is design thinking. In addition to discussing the factors that may influence teacher quality in Education 4.0, it provides a review of the literature on strategies that can help develop successful teaching strategies to meet the needs of the workforce in the context of the Fourth Industrial Revolution (Noh & Abdul Karim, 2021). Design thinking has the potential to be a groundbreaking and captivating real-life teaching method in addition to being an effective and innovative approach to problem-solving in the development of tourism products because it can bring lessons to life and enhance communication, teamwork, and creative thinking (Sándorová, Repáňová, Palenčíková, & Beták, 2020).

2.3. Cognitive Internship

The theory of behavior modeling was created by Bandura (1997). He also discussed the cognitive internship period. Sanna (1995) said that during cognitive internships, a person can learn a skill by helping others who already have those skills. This theory of cognitive apprenticeship emerged to overcome the problem when a person who is an expert in a particular skill cannot teach the skill to others due to problems related to that skill. Cognitive apprenticeship also known as "cognitive apprenticeship" is one of the theories of constructivism that aims to make it easier for students to observe, try, and practice their skills with the help of teachers or experts. However, according to Bandura (1997) students must have strong attention and motivation to learn to truly master the skills taught. In addition, skills must be taught contextually for students to truly succeed. According to constructivists, students must go through three stages during a cognitive apprenticeship. Among them are the following:

1. The first stage is the cognitive stage, where students gain an understanding of declarative knowledge and skills.

2. The second stage is the associative stage, where students become aware of mistakes at the cognitive stage and learn how to solve them.
3. The third stage is the autonomous stage, where students sharpen their skills.

Cognitive learning allows students to see and listen to an expert (teacher) perform the skills to be learnt. Then, under the supervision of the teacher, students try to do what the teacher did and receive additional corrections and explanations if they are wrong. Reciprocal learning which is one of the approaches of the cognitive apprenticeship strategy involves students working together in small groups and helping each other while learning. It is a cooperative learning method (Glazer, Hannafin, & Song, 2005). The following four main strategies are used in this approach: structuring the question, predicting the answer, providing an explanation of the answer, and making a summary. The following is an explanation of the four learning strategies mentioned earlier.

- a. The questioning strategy is used to monitor and evaluate students' understanding of the lesson. In this case, the student asks himself.
- b. Predicting Answers: At this stage, students are asked to relate their knowledge to the information from the reading results. They were then asked to predict the answer to a question they had created themselves.
- c. Explaining the Answer.
At this point, students explain their answers by referring to the subject matter given by the teacher.
- d. Creating a Summary: Creating a summary requires the ability to distinguish important information from what it doesn't. For lessons to be meaningful, reading and evaluation activities are also needed (Nielsen, 2010).

3. THE STUDY AND RESEARCH METHODOLOGY

3.1. Research Design

This study will use descriptive qualitative and quantitative methods with an action research design. The qualitative method explains the process of improving the development of innovative attitudes through the design thinking approach with the cognitive internship model and the quantitative method explains the results of improving the development of innovative attitudes through the design thinking approach with the cognitive internship model. This action research is participatory and collaborative because it involves researchers directly in their work. In addition, researchers can involve others in their research so it is collaborative.

This action study uses Elliott's (1991) model with Kemmis and McTaggart's (1988) spiral action model. The researcher chose this model because it is considered the most suitable for the circumstances and conditions of teacher professional education. This research emphasizes more on the process of trying new things. Using a design thinking approach is a new thing that researchers want to achieve because the development of innovative attitudes in teacher professional education with a cognitive internship model has never been done before. Researchers will try to use a design thinking approach with a cognitive internship model in developing innovative attitudes of teacher professional education.

3.2. Study Population

The subjects in this study are teacher professional education in the odd semester of 2023-2024 in the teacher professional education program of the State University of Jakarta. The students consisted of 87 female students and 7 male students. The age of the students ranges from 20 to 24 years old. Students of this pre-service teacher profession program have diverse educational backgrounds, both from education and non-education graduates. This research was conducted in February -June 2024. This study is action research consisting of 2 cycles, cycle 1 and cycle 2 as well as a pre-cycle to determine the initial ability of the innovative attitude of teacher professional education. Research was

conducted during the learning process and collaboration with other lecturers (*team teaching*) in conducting observations and reflections.

3.3. Instruments

The instrument used in this study is a non-test instrument developed by Aiken (1996) to measure the innovative attitude of teacher professional education using the Likert scale. Aiken (1996) explained that to be able to conduct a performance assessment that includes an assessment of the process and results seen by the eye about skill, it is as follows: a) to prepare the main tasks and functions of the job; b) compiling a detailed list of activities or operational-operational procedures; c) determining the weight of each activity (if necessary); c) determining the scale of the score results based on the rubric of the success of each activity.

Based on the conceptual theoretical synthesis stated earlier, what is meant by innovative attitude is defined as the ability of educators and prospective teachers (students, professional education and teachers) to innovate, promote these ideas, and apply new ideas to achieve learning goals. This behavior is very important for all education staff and professional teacher candidates because it will produce innovations that will maintain the quality of education, learning, and schools. Using a checklist with a Likert-scale answer pattern to identify research subjects through observation. The score interval ranges from one to five for each ability shown. Subjects scored one if they were unable to, two if they were able to do it with assistance, three if they were able to do it without assistance, and four if they were very capable. (1) creating/discovering new ideas in project innovative learning design; (2) promoting/expressing new ideas through reflection and self-evaluation; (3) case studies of educational innovations; (4) implementing new ideas in learning and collaboration with the business world and industry; (5) innovative idea competition. The following are the grids and instruments for the development of innovative attitudes of teacher professional education with a design thinking approach and a cognitive internship model (see Table 1).

Table 1. Innovative attitude development assessment instrument.

No.	Characteristics and indicators	Never able	Usually unable	Sometimes able	Usually able	Always able
1.	Students can apply groups to identify problems or challenges in the learning process in the classroom.	1	2	3	4	5
2.	Students can apply the designing method in designing innovative solutions at the empathy stage (Understanding the problem from the perspective of students and teachers).	1	2	3	4	5
3.	Students can apply a group of design thinking methods to design innovative solutions at the stage of identifying problems.	1	2	3	4	5
4.	Students can apply a group design thinking methods to design innovative solutions at the stage of making solution ideas.	1	2	3	4	5
5.	Students can apply a group of design thinking methods to design innovative solutions at the stage of making a solution prototype.	1	2	3	4	5
6.	Students can apply a group of design thinking methods to design innovative solutions at the stage of testing solution prototypes.	1	2	3	4	5
7.	Students can apply weekly reflections on their cognitive internship experiences challenges faced and innovative solutions.	1	2	3	4	5
8.	Students can evaluate themselves in terms of	1	2	3	4	5

No.	Characteristics and indicators	Never able	Usually unable	Sometimes able	Usually able	Always able
	creative thinking skills, problem-solving, and innovation using the assessment rubric given.					
9.	Students can study case studies of successful educational innovations in different parts of the world.	1	2	3	4	5
10.	Students can analyze the factors that drive the success of innovation.	1	2	3	4	5
11.	Students can adapt innovations in a local context.	1	2	3	4	5
12.	Students can present their analysis and provide recommendations to implement similar innovations in their environment.	1	2	3	4	5
13.	Students can collaborate with local industries or communities to identify real problems or challenges they face.	1	2	3	4	5
14.	Students can apply design thinking methods to design innovative solutions that can be applied in the industry or community.	1	2	3	4	5
15.	Students can present their solutions to industry or community representatives and get feedback.	1	2	3	4	5
16.	Students can compete for innovative ideas at the school institution level.	1	2	3	4	5
17.	Students can propose innovative ideas in learning methods.	1	2	3	4	5
18.	Students can propose innovative ideas in the curriculum.	1	2	3	4	5
19.	Students can propose innovative ideas in educational technology.	1	2	3	4	5
20.	Students can apply innovative ideas in making prototypes in real life.	1	2	3	4	5

Note: Never able= 1, Usually unable= 2, Sometimes able= 3, Usually able= 4, Always able= 5.

3.4. Validity and Reliability Test

3.4.1. Validity Test

The purpose of the validity test is to ensure that the instrument used is the right tool to be able to collect the required data. The validity test conducted in this study is a theoretical validity test based on expert considerations. This theoretical validity consists of the validity of the content written with the design that has been reviewed by the *member rating*, validity in the form of written questions, namely the validity of sentences in the form of questions so that the intent and purpose are clear.

Those who test the validity of the instrument have expertise in the field of teacher professional education to validate research instruments and *member rating* material to validate the assessment rubric (question items). The grid of instruments that have been prepared is given to experts to be reviewed for validity. The results of the assessment from experts are used to revise the instrument.

3.4.2. Reliability

The researcher seeks to be directly involved in the overall research activities in the classroom to check the validity of the data in the context of reliability. This is intended to avoid things or perceptions usually caused by existing mistakes. This is by actively teaching in learning with a design thinking approach and a cognitive internship model to improve the innovative attitude of teacher professional education students assisted by other lecturers who act as collaborators.

In addition, researchers will also actively discuss with collaborators or colleagues in an effort to obtain constructive input. In addition, the researcher will also ask teachers about the difficulties they face while participating in the learning process in improving innovative attitudes which will greatly help the researcher in making the next action plan. In this study, researchers will also analyze the data quantitatively by observing the results of the initial and final tests at the end of the cycle in addition to analyzing the data obtained qualitatively.

3.5. Data Analysis Techniques

3.5.1. Quantitative Data

Quantitative analysis was carried out to see changes in the increase in innovative attitudes of teacher professional education in the initial and final assessments. In this case, the researcher used descriptive statistical analysis to describe the percentage increase in innovative attitudes of teacher professional education.

$$P = \frac{\sum \chi}{n} \times 100 \%$$

Data analysis is carried out before, during, and after data collection in a cycle that starts with planning, implementing, and evaluating actions at each stage of research.

3.5.2. Qualitative Data

Qualitative data analysis techniques were developed by Mills (2000) and Miles, Huberman, and Saldana (2014) namely using data reduction, data presentation, data verification, and conclusions drawn. Data reduction is carried out by sorting the collected data taken by the research objectives. Data presentation has been sorted in tables to make it easier to read. Data verification is carried out using data triangulation, namely comparing data obtained from observation results and interview results, and then comparing with other data sources. This is to ensure the accuracy of the data. Conclusions are drawn based on the results of all the data that have been obtained. Qualitative data analysis was carried out by the researcher concerning Mills (2000) and Miles et al. (2014) with the following steps:

1. *Data collection:* This step is the initial stage in analyzing data. Here, the researcher will collect the data needed through the instruments made, a grid of innovative attitude instruments for teacher professional education students through a design thinking approach and a cognitive internship model.
2. *Data sorting:* The researcher sorts selects, and separates the data obtained from the field. The researcher grouped the data based on the steps obtained. The data will be classified into three groups, namely data from interviews, data from test results, and data from observation results in the classroom in improving the innovative attitude of professional teachers through the design thinking approach and cognitive internship model.
3. *Data Presentation:* After the data is successfully grouped based on existing categories, the next step that the researcher will take is in the form of data presentation. The data obtained will be displayed and set for further action and conclusion-making. The results of the observation of an increase in the innovative attitude of teacher professional education during learning activities took place in one semester.
4. *Conclusions/verification:* In this case, the researcher will verify the data that has been presented.

Meanwhile, in analyzing quantitative data, researchers will do so by comparing the presentation of the results of improving the innovative attitude of teacher professional education in learning through the design thinking approach and the cognitive internship model in the initial test and the test at the end of each cycle.

4. RESULTS AND DISCUSSION

4.1. Result

4.1.1. Qualitative Observation Results

Based on the results of the above research, the results of the development of innovative attitudes towards teacher professional education can be explained. In each activity, students for eight times implement innovative learning design projects, conduct self-reflection and evaluation, implement and solve case studies of educational innovations. It collaborates with the business world and industry, and conducts innovative idea competitions. The development of innovative attitudes through a design thinking approach with a cognitive internship model for teacher professional education can be explained as follows:

4.1.1.1. Innovative Learning Design Projects

The development of innovative attitudes in emphasizing innovative learning design projects is shown through a design thinking approach with an internship model which is one of the important components of teacher professional education showing that the competence of teacher professional education is very good and aims to improve students' ability to create innovative and effective learning designs. Teacher professional education can carry out various activities during the innovative learning design project, including choosing topics and learning problems, conducting literature reviews, designing innovative learning scenarios, implementing innovative learning scenarios, and documenting and presenting innovative learning design projects. Students' ability to implement innovative learning design projects shows an improvement in learning activities.

4.1.1.2. Self-Reflection and Evaluation

The ability of teacher professional education to reflect and self-evaluate to become professional teachers. The ability to conduct reflection and self-evaluation is very important and can improve their ability to think critically and judge themselves. The ability that develops in this activity is that students can integrate reflection and self-evaluation in the teacher's professional education curriculum, providing support and guidance.

4.1.1.3. Educational Innovation Case Studies

The ability of teacher professional education to complete and solve case studies of educational innovations. Students' ability to complete and solve case studies in the process of case understanding, case analysis, solution development, solution implementation, reflection, and learning is one of the effective ways to improve the quality of learning, improve teacher competence, and encourage educational progress to involve teacher professional education students in completing and solving case studies of educational innovations. Students can contribute to a better future of education by acquiring the necessary skills and knowledge.

4.1.1.4. Collaboration with Business and Industry

The ability of students in teacher professional education and the business and industrial world. By working together, it provides opportunities that are beneficial for both parties. Teacher professional education students gain practical work experience and insight into the world of work while the business and industry can help improve the quality of education and human resources. Teacher professional education students gain practical work experience and insight into the world of work while the business world and industry can help improve the quality of education and human resources. Teacher cooperation programs with the industrial world can be carried out through teaching practices, research and development, community service and entrepreneurship development.

4.1.1.5. Innovative Idea Competition

The ability of teachers to professionally educate students has great potential to help advance education through innovative ideas. The right ability for teacher professional education to demonstrate innovation and their ability to solve educational problems is the educational innovative idea competency. Teacher professional education students can do the following: Conduct observations in schools to find educational problems and talk to teachers, students, and parents to understand educational problems. Examining trends and problems in Indonesian education data and statistics. Read scientific journals and articles on educational innovation for inspiration and new insights.

4.1.2. Quantitative Observation Results

The results of the quantitative observation of the development of innovative attitudes through the design thinking approach with a cognitive internship model for teacher professional education students are shown in the table below. From the table, the results of the development of innovative attitudes and the success of the classical learning process can be seen.

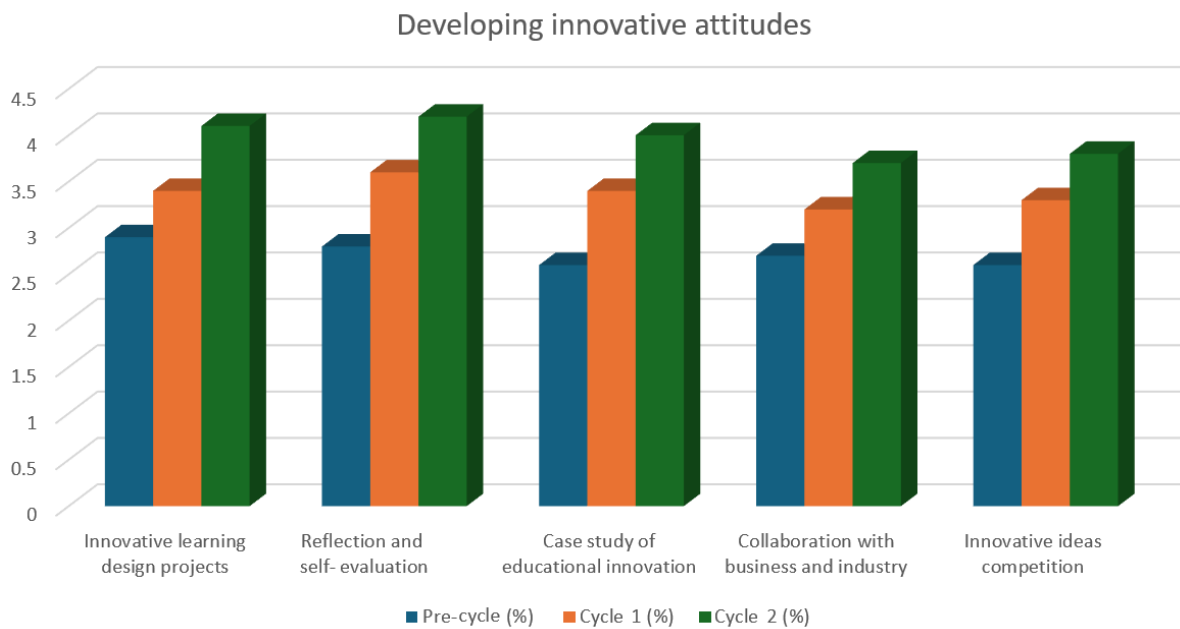


Figure 1. Results of developing innovative attitudes in pre-cycle, cycle 1, and cycle 2.

According to Figure 1, the child's social-emotional interaction increases from pre-action to the second cycle. This is shown by the score of 94 students on the pre-action for the innovative learning design project indicator of 2.9%. Cycle 1 increased to 3.4%. Cycle 2 increased to 4.1%. The indicators of reflection and self-evaluation in the pre-cycle reached a score of 2.8%, and cycle 1 increased to 3.6%. Cycle 2 reached 4.2%. The indicator of the case study of educational innovation in pre-cycle reached 2.6%, cycle 2 increased with a score of 3.4%, while cycle 2 increased with an achievement of 4.0%. The indicator of collaboration with the business world and industry in the pre-cycle received an achievement score of 2.7% increasing to 3.2% in cycle 1. Furthermore, cycle 2 got a score of 3.7%. In the indicator of the innovative idea competition, the cycle reached 2.6%, cycle 2 increased with a score of 3.3%, and cycle 2 increased with a score of 3.8%.

4.2. Discussion

In recent years, design thinking has become a topic of research and teaching in almost all fields of education, research, and business. This study explains how the principles of constructivist learning theory are used in the teaching process of design thinking. This research establishes an integrative approach to theory, methods, and practice by creating a taxonomy of constructivist principles to describe the process and activities of design thinking (Pande & Bharathi, 2020). Using the cognitive internship model and design thinking approach, innovative attitudes, which are an important component of modern education can be improved. These methods help students acquire problem-solving, innovation and creative thinking skills which are crucial in a competitive global era. Using a design thinking approach, the study found that users feel comfortable with mobile apps because all their features are important and easy to use. Mobile learning apps *UNI Courses* (App Name *Mobile Learning*) were successfully created with the help of a thinking approach (Saputra & Kania, 2022). UNI Course, an e-learning product developed by CV Unindo Hestama Kreatif, is a mobile learning application that has newly transformed its system from web-based e-learning platforms.

Design thinking has been considered an ideal method to teach engineering and entrepreneurial science students. The results show that this training is not only a great challenge for students but also provides an opportunity for them to acquire knowledge and tangential skills about technology commercialization. In addition, evidence of transformational learning emerges when students apply design thinking outside the context of training (Lynch, Kamovich, Longva, & Steinert, 2021). The most appreciated cross-disciplinary design technique is to follow a structured learning process, engage in active listening, and focus on other people's perspectives. In addition, consistent evidence was found that design thinking can support a decolonizing approach to teaching and learning that decolonizes students' perceptions of power and provides opportunities to co-create (McLaughlin, Carolina, & Chapel, 2024).

The cognitive apprenticeship model allows learners to see, imitate, and apply innovative skills under expert guidance. On the other hand, thought design provides a systematic framework that encourages learners to identify problems, interact with users, develop creative solutions, and come up with new ideas. The cognitive internship model was developed by Feinstein (2021) for psychotherapy training and supervision, new psychotherapy training programs for psychiatric trainees who have a specialized bachelor's degree in psychotherapy have used this type of training. This program is also included in the adult psychiatric residency training program. This paper offers an elaboration of the new model, considerations on the implementation and supervision of apprenticeships, and clinical information on the lessons learned. The four dimensions of this model are as follows: (1) understanding of psychotherapeutic content; (2) the application of the cognitive internship supervision model, which utilizes modeling, instruction, scaffolding, articulation, reflection, and exploration as important tools to create a real and tangible supervision experience; (3) clinical sequence of psychotherapy training activities and (4) the application of existing learning and community practice as an important part of psychotherapy training.

The scientific practice of explanation and argumentation describes our efforts to design and implement cognitive internship interventions to assist academically diverse students in the construction and critique of explanations and arguments. The results of this application can be learnt by others interested in improving learning and supporting student involvement in scientific practice through writing. The findings of the study suggest that cognitive internships in this area should 1) provide ample opportunities for criticism and constructs exemplified by teachers and carried out collaboratively. 2) Provide scaffolding that helps students pay attention to prominent elements in explanations and arguments and 3) by the goals and expectations of teachers, local communities, and districts (Levin, De La Paz, Lee, & Escola, 2021). The development of a cognitive internship model self-regulation strategy is used to

improve students' text composition skills. This suggests that the strategies used by students who learnt to write schematic argumentative essays were stronger, more qualitative, and longer compared to their counterparts in the control group (Tsiriatakis, Spiliotopoulos, Grünke, & Kokolakis, 2021). A consistent finding in the development of the cognitive apprenticeship model is that teaching based on a learning design that focuses on cognitive apprenticeship improves students' writing ability in the early grades (Akhavan & Walsh, 2020). Cognitive internships and the strategies used have a positive impact on learning the skills to stand on the shoulders. Because of this role, teachers do not need to supervise which means more time teachers spend on education (Hasan, Hussein, Abdullah, & Al-Jadaan, 2022).

Teachers are encouraged to promote experiential teaching practices as well as to use those practices in their learning. Teachers generally have a positive attitude towards experiential practices for individual learning and instructional purposes. Teachers with more experience in research and teaching see evidence-based practices and better use of evidence. On the other hand, less experienced teachers are considered (Diery, Vogel, Knogler, & Seidel, 2020). Students positively rated the application of active and innovative teaching methods because of getting better scores on variables such as collaboration, motivation, and creativity. Therefore, it continues to be observed that the application of innovative methodologies through technology encourages the improvement of various skills in students' innovative attitudes. This research aims to prove that active methods improve students' innovative skills, so we must encourage the continued use of pedagogy to drive real innovation in the classroom (Moreno-Guerrero, Rodríguez-Jiménez, Gómez-García, & Ramos Navas-Parejo, 2020).

The merger of these two methods creates a rich and interactive learning environment where students can develop their innovative attitudes. In this process, they not only acquire theoretical knowledge but also acquire the practical skills and mindset necessary to become innovators in their respective fields. In its implementation, it is important to consider elements such as teacher readiness, institutional support, and curriculum adjustments. Continuous evaluation and improvement are also needed to ensure that the program successfully achieves its goal of fostering innovative attitudes.

5. CONCLUSION

An effective approach to developing students' innovative attitudes by combining cognitive internship models and design thinking prepares them to face real-world challenges and become innovators and agents of change in the future in education.

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