

# Development of Neuroscience Approach Through Design Thinking Model in Social Studies Learning

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**Keywords:** Design Thinking, Neuroscience, Social Studies Learning.


**Abstract:** The quality of social studies education needs to improve continuously as an effort to adapt to curriculum changes in Indonesia. The dynamic development of community life demands that the national education curriculum always presents a contemporary educational process according to the needs of the times. Neuroscience approach is one of the learning approaches that prioritize the balance of the right brain and left brain on an ongoing basis. The goal is to produce students who have a balance between knowledge and feelings, not only intelligent but also noble, which is very relevant to the objectives of the independent curriculum policy. The Design Thinking model is a model developed in the independent curriculum through several phases, namely empathize, ideate, prototype, and test with the ultimate goal of providing learning innovations based on empathy for students. The focus of this research examines the pedagogical skills of social studies teachers in developing a neuroscience approach through the design thinking model in social studies learning as an innovation model developed to support the success of the independent curriculum program. The research method uses a research and development (RnD) approach model with the first year of research in the form of a quantitative descriptive study to analyze the pedagogical skills of social studies teachers in developing the neuroscience approach through the design thinking model in social studies learning as an innovation model developed to support the success of the independent curriculum program. The research method uses research and development (RnD) with the first stage of quantitative descriptive research to analyze the pedagogical skills of social studies teachers. The results showed that social studies teachers have good basic pedagogical skills, neuroscience design has not been implemented in the classroom, the design thinking model is needed by teachers to integrate competencies for students knowledge and good character.


## 1 INTRODUCTION


The acceleration digital era technology has implications for major changes in the pattern of human life. The factors of fulfilling life needs are increasingly complex and have undergone significant changes. To fulfill these needs, competent human resources in various fields are needed to keep up with the acceleration of technology from time to time. This expectation will certainly not be separated from improving the quality of education that creates future generations who have a creative way of thinking by combining brain ability and empathy. A smart


generation is indispensable for human success in the future, but not only intelligence but also high empathy towards solving social problems that may arise.

The neuroscience approach is an approach to stimulate a person to perform cognitive actions in the form of critical, creative, innovative thinking that is balanced with affective and spiritual (Hanafi, I., 2016). In terminology, neuroscience is the study of nerve cells or neurons. This science aims to study the biological basis that explains human behavior from the point of view of brain activity (Kushartanti, 2018). It was adapted by the world of education by integrating it into a learning approach, in this case the

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neuroscience approach is very instrumental in developing the brain's ability to perform several actions or efforts to improve memory, awareness and sensitivity. Neuroscience concept is the study of the nervous system in the human brain that relates to the brain's sensitivity in terms of perception, memory, biological aspects (Resti, VDA., 2013). The main task of neuroscience is to pay attention to the balance of right-brain and left-brain activities that affect human behavior.

Neuroscience is the study of biophysical components related to cognition, affection, and society using an interdisciplinary approach between cognitive psychology, neuroscience, artificial intelligence, and biology. In short, it's the study of the nervous system of living things, especially the intricacies of the human brain. The brain is an organ that plays an important role in regulating human consciousness as the main element that forms human identity. More than 100 billion nerve cells in the brain influence various aspects of decision-making, memory, perception, movement and more.

The neuroscience approach to learning is designed by prioritizing the ability between neurons or nerves that are interconnected centered on the brain as a coordination of cognitive and affective thinking. Learning is focused on the ability to coordinate between cognitive, psychomotor abilities combined into affective abilities in the form of spirituality that coordinate with each other so as to produce abilities that complement each other in balance. In this case, learning is expected to produce students as quality human resources, able to compete and have character in line with the challenges of 21st century education (Saputro, S.D., 2017), namely students are expected to survive by using skills to live and develop learning skills, innovate, technology and information media. They are also expected to master and apply higher order thinking skills (Suyadi, 2012) through the 4Cs (communication skills, collaboration in groups, critical thinking, creativity and innovation) (Wathon, A., 2016).

As a real form of learning practice in the classroom, this neuroscience approach needs to be supported by relevant learning models, including the Design Thinking model. Design thinking emerged in the early 1960s (Diamond, M., Hopson, J. 1998), which is a methodology or mindset that brings out the creative potential of students through the Trial and Error process by prioritizing process over results. The purpose of design thinking is to plan, implement, and evaluate the extent to which the experience is learner-centered, so the design is user-centered. Design thinking according to Roterberg (Brown, T., 2009) is

an integrative approach to problem solving that is user-oriented and emphasizes empathy. Design thinking consists of iterative cycles, requires a diversity of participants, creates a collaborative and creative workspace, and combines analysis and synthesis.

The development of the approach is offered as an alternative to solving social studies learning problems at school. This is based on the findings of interviews with teachers at the preliminary stage as listed in table 1 below.

Table 1: Social Studies Learning Issues.

Respondent	Statement
R1	Students often lack concentration and low interest in learning, even though teachers have implemented a variety of different learning methods.
R2	Some students show less social sensitivity in cooperating with friends, even though they have good academic abilities.
R3	The development of technology makes students adapt quickly, but critical thinking skills are still weak and there is a lack of awareness to empathize.

As a response to social studies learning problems, the author presents a design thinking that can be implemented as a solution. Design thinking has five main phases, namely empathize, define, ideate, prototype, and test/evaluate (Dadana, et, al., 2013). Teachers must build empathy, formulating learning objectives based on the current curriculum, creating solutions, developing prototypes, and testing prototypes. Based on these stages, as a design thinker, teachers who develop design thinking models must pay attention to several conditions including having high empathy, integrative thinking, optimistic, experimentalist, collaborative, and joyful. In this case, it is certainly very relevant to the neuroscience approach that seeks a balance between brain power and empathy. Both are very relevant to be developed in social studies learning as a subject that prepares students to take the knowledge, attitudes and ability to be ready in society.

## 2 LITERATURE REVIEW

An in-depth understanding of the development of the neuroscience approach through Design Thinking must be understood through the supporting concepts and theories of neuroscience, the syntax of design thinking, and its implementation. It is described more fully in this section.

## 2.1 What is Neurosains Approach?

The neuroscience perspective sees that a person's behavior is influenced more by internal than external factors (Kelley, D., 2022). It's a multidisciplinary study of the nervous system in an integrated manner from the perspectives of biology, psychology, and medicine that examines everything from neurochemical studies to behavior and thinking (Brown, T., 2008). Specifically according to Sussman, O., (2023), an overview of neuroscience is contained in the following figure 1.



Figure 1: Overview of Neurosains.

The idea of learning in the neuroscience perspective is learning that authorises the brain's abilities according to its evolving stage and optimizes brain performance through the construction of a challenging, fun, meaningful learning environment, and inspires students to be active (Lin, J., et.al. 2024).

The neuroscience approach is one of the alternative approaches that is relevant to be implemented in learning today (Tsoori, S.S. 2024). Its existence as a variation that supports each other with various other learner-centered learning approaches. We are all familiar with several approaches such as project-based learning, problem-based learning, inquiry, scientific approaches, and others. In its position, the neuroscience approach is an enlightening alternative to match learning that pays attention to the balance between the right and left brain so that students are able to have complete competence.

## 2.2 The Importance of Design Thinking in Learning

The optimal implementation of Design Thinking in schools reflects a vision of education that is purposeful and innovative. Student-centered and problem-based learning processes bring about strong

collaboration, flourishing creativity, and the development of skills essential for success in the modern era. In an environment that facilitates exploration and hands-on experience, students achieve deep understanding and satisfaction in learning. Teachers serve as facilitators, while students become change agents who lead with empathy and innovative Solutions. Overall, the implementation of Design Thinking shapes a school that not only prepares students for the future, but also encourages them to become leaders who bring about positive change in society (Loescher, S.T., 2019).

The purposeful and innovative learning process obtained through the implementation of Design Thinking in schools illustrates several important features. First, the collaborative and interactive approach allows learners to be actively involved in solving problems and creating solutions (Setyowibowo, B., 2023). Second, experiential learning allows students to better explore concepts through relevant practical experiences. Third, by centering learning on problem-based projects, students can apply their knowledge in a real-world context, preparing them to face challenges outside the classroom environment. Thus, this approach not only develops academic skills, but also nurtures students' ability to critical thinking, collaborate and innovate in dealing real-world situations (Doorley, S., 2018).

Learning design is made to improve social competence, educators and provide opportunities for students to developing creativity and communication skills by presenting the results of group discussions in front of the class so as to create meaningful experiences. The steps that can be taken include:

1. Choose the right learning objectives that must be mastered by students.
2. Selection of problems that are relevant to the material to be presented.
3. Use of appropriate methods, models, and approaches according to the conditions in the classroom.
4. Using learning media that suits the needs of students.
5. Conducting feedback activities and learner-centered learning.

Through design thinking, the school culture will be filled with a spirit of creativity and innovation, where new ideas are not only accepted but also deeply valued. In addition, the school will be an environment that is open to change, recognizing that educational needs and demands are constantly changing. In this atmosphere, values such as empathy, cooperation and engagement will become the cornerstones of the

school culture, allowing all members of the school, both students and staff, to feel heard, valued and actively elaborate in the process.

### 3 RESEARCH METHOD

This study used a research and development approach. This model aims to develop and validate educational products. The research steps refer to a planned cycle in product development based on research findings. It begins with preliminary studies, limited trials in specific situations, improvement of trial results, and dissemination of trial results. As for this article, the research presented in stage one results in the form of preliminary study results and model design for testing.

## 4 RESEARCH RESULT

### 4.1 Design Thinking Phase Design

Design thinking is closely related to methodology, mindset, efforts to bring out creative potential through the process of trial and error. The design thinking approach prioritizes process over outcome. User-centered design aims to plan, implement, and evaluate the extent to which learner-centered experiences develop a product.

Design thinking has several characteristics including: an integrative approach to problem solving; user-oriented and emphasizes empathy; consists of iterative cycles; needs to have a diversity of participants; creates a collaborative and creative workspace; combines analysis and synthesis.

The implementation of the design thinking phase is adapted into the preparation of teaching modules as a reference for lesson planning. The empathize phase is an effort to build empathy. In this phase, teachers need to form a deep understanding of the characteristics and needs of students (Speicher, M., 2016). The define phase is the process of formulating the objectives of the learning project design, in this case it must be relevant to the applicable curriculum at school. The ideate phase is the process of teachers exploring various alternative ideas that can be a solution to a problem/need. The prototype phase is the time for the designer to realize the idea in the form of a model that shows the features of the solution.

The next phase in design thinking is evaluation. Testing is an important phase in Design Thinking, it is in this phase that the teacher-designed solution idea (already in the form of a prototype) is checked for effectiveness. It is through the process of continuous improvement in the observations in the testing phase that the designer will gain insights that are useful for evaluating the development and improvement of the design.

Design Thinking can be used to build democratic educational practices, tackle problems in schools, and build the competencies of learners and teachers (Polat, S. and Bayram, H. 2022). Values such as equality, empathy, cooperation and openness to new things can be implemented in general school policies.

Equitable Learning Practices aims to transform education to be more democratic, contextual, and learner-centered (Luka, I., 2014). Learning practices by integrating social, emotional and academic learning make schools a comfortable learning space by dismissing racial/ethnic, cultural and privilege inequalities.

In identifying the effectiveness of design thinking, it is necessary to examine what conditions can hinder? How facilitate support the implementation of design thinking? Through these questions, an overview of envisioning is obtained. It is a method of formulating goals that can be used to develop a vision of the ideal conditions that teachers expect to see in students.



Figure 2: Phase of Design Thinking.

## 4.2 Implementation of Design Thinking in Social Studies Learning

The implementation of the neuroscience approach through the design thinking phase in social studies learning aims to foster the students to develop critical thinking ability and solve problems more effectively and efficiently. It is expected that students are formed into a more creative person and become more open with the teacher because the phases of empathize, define, ideate, prototype and test have been carried out.

As an initial model, design thinking is designed to accommodate social studies learning problems. In the empathize phase, teachers identify students' learning needs through observation, discussion and brainstorming with students. Based on the principle of empathy, teachers use define phases for considering student characters, learning styles, and identification of student learning weaknesses, teachers design various alternative needs. Continuing at the ideation stage, through the double diamond process the teacher narrows down the most urgent problems that must be resolved and offers various alternative solutions to then choose the most relevant one. The next stage is prototype, classroom practice trials and reflection on the strengths and weaknesses of design thinking implementation. The reflection of the results becomes an evaluation material regarding design improvements for the next treatment. Details can be seen in Figure 3.

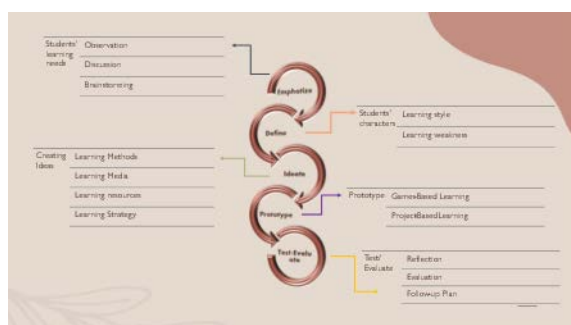


Figure 3: Design Thinking Models.

The learning process that successfully applies Design Thinking will result in enjoyable learning because the learning process is carried out innovatively and problem-based in accordance with the stages of design Thinking. If it has been

successfully applied, the relationship between teachers and students will be better established.

The successful of the model is highly dependent on the readiness of teachers and the support of relevant stakeholders. Therefore, aspects that must be prepared include:

1. Identifying the characteristics of student needs in the classroom through profiling mapping of cognitive, social, emotional abilities and general classroom characteristics.
2. Brainstorming the efforts made by teachers, obstacles faced, supporting facilities, support from the principal, and communication with parents.
3. Propose various alternative neuroscience-based learning designs as problem-solving solutions. Through discussion, the most relevant alternative to the problems in the classroom is selected.
4. Organize teacher training on design thinking in an egalitarian and intensive manner.
5. Implementation of the design in the classroom, observation, reflection and improvement for a refined design.

The implementation of Design Thinking is supported by a strong school culture, with learners actively engaged in collaborative learning and teachers utilizing multimedia facilities to create interactive learning experiences. This culture encourages creativity and innovation, maximizing the potential of Design Thinking in the learning process. With diverse learner characters, teachers need to understand and design learning using appropriate models, methods and media. The implementation of game-based learning lets students to learn happily and actively, creating a fun and effective learning experience.

## 5 CONCLUSIONS

The implementation of design thinking learning in schools requires support from all parties. Especially for educators, teaching staff, students and student guardians. This is necessary for the successful implementation of design thinking. As a teacher also designs problems that underlie the needs of students. And as a facilitator to bridge students to achieve what is needed.

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