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Design of Instructional Strategy Model Based on the Brain's Natural Learning System (MS-SiPAO) in Inclusive Classrooms in Higher Education

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Abstract One of the problems faced by lecturers in achieving instructional objectives in inclusive classrooms in higher education is that they have not been able to design effective instructional strategies that are in accordance with all characteristics of all students. This study aims to determine the instructional strategy model that is based on a student problem and needs analysis. The study involved sixty elementary school teacher students at one university in Bogor, Indonesia. Data collection was conducted using questionnaires and open interviews. Meanwhile, data analysis used a qualitative data analysis model. The results showed that the instructional strategy model based on the brain's natural learning system (MS-SiPAO) is one of the instructional strategy models that are expected to accommodate all the needs of students in order to achieve the competencies and instructional objectives set by the lecturer. Finally, MS-SiPAO is a suitable model to be used because it is based on an analysis of the problems and analysis of the needs faced by students in implementing learning in inclusive classrooms in higher education.

Keywords Instructional Strategies, Natural Brain Learning System, MS-SiPAO, Inclusive Classroom, Higher Education

1. Introduction

The opportunity to obtain education in higher education is a right for every student, including students with special needs. Students with special needs (SSN) are entitled to services that meet their educational needs such as regular students (RS) in learning and other basic rights in education [1][2]. Fulfillment of this right means not only that they can participate in, but also be productive in society in accordance with the skills they obtain in college.

Institutions of higher education as places to provide various competencies in accordance with the strengths, weaknesses and characteristics of all students, are expected to create learning desires, as well as motivation in learning, so that instructional objectives that have been set can be achieved [3]. Lecturers are expected to develop creativity and innovation in learning, so that all students can obtain the expected competencies.

Therefore lecturers are expected to design instructional strategies that can accommodate all the needs and characteristics of students as diverse as the ones in inclusive classrooms. Instructional strategies that are appropriate and in accordance with the characteristics of inclusive classrooms must include paying attention to the subject matter that will be given to students, clear learning steps, innovative and non-monotonous instructional methods, flexible instructional media, and the use of learning time as effectively as possible but still refer to achievement of instructional objectives [4]. Lecturers are expected to be able to implement strategies that can create a learning-friendly classroom atmosphere, avoid bullying, increase mutual respect between students, allow for students to be able to work together and be able to display the best strengths and abilities of students at the end of instruction that can be used in their work in the future [5].

But in reality, learning in inclusive classrooms of higher education does not yet reflect instruction that can accommodate all the SSN. Lecturers tend not to care about student needs and competencies that must be achieved by

students at the end of instruction. Some lecturers still cannot understand the characteristics of students, especially SSN who have special needs, especially in learning styles, other obstacles such as difficulty interacting or communicating between students, or with lecturers [6][7]. This condition causes the learning outcomes of most SSN to often be below established standards. In addition, the instructional method used by lecturers at each meeting that starts from the beginning of instruction to the end of instruction only uses the narrative method or is centered on the lecturer [8]. Moreover, the use of instructional methods that do not vary causes instruction to become monotonous, boring resulting in lecturers finding it difficult to measure the achievement of the material being studied. In addition to the instructional method, the instructional media used only consists of Power Point presentations with a simple appearance, and are less attractive to students.

The problems that occur in inclusive classrooms are an obstacle for every student, including SSN, in obtaining competencies that must be achieved after lectures are finished [9]. The competencies that must be achieved are in not only the cognitive aspects, but also the affective and psychomotor aspects. But if in learning these three aspects are not described in the instructional activities, it is difficult for all students to be able to meet the instructional objectives or targets. For this reason, lecturers must be able to design instruction or be able to design instructional strategies that can generate and improve competence in all aspects of all students, including SSN.

Instructional strategy is an approach used by educators in achieving learning, including the use of instructional methods such as demonstrations, discussions and lectures. Instructional strategies provide guidelines for inclusive educators to be able to design learning to be more active and effective [10] by involving all learning styles, behaviors and characteristics of all students. Through inclusive instructional strategies, it is expected to be able to build a comfortable and conducive learning climate [11] so that instructional objectives can be achieved in accordance with the abilities and needs of all students.

One model of instructional strategies that can be used in inclusive classroom learning in higher education is an instructional strategy based on the brain's natural learning system. The natural instructional strategy of the brain involves five (5) learning systems, namely emotional learning systems, physical learning systems, cognitive learning systems, social learning systems and reflective learning systems [12]. Emotional learning system is a learning system that places the teacher as a mentor, which creates a conducive classroom climate, making teacher-student and student relationships a warm relationship. The teacher functions to help foster a desire to learn have a strong desire to be the best in the future, by carrying out challenging learning, relevant in accordance with the knowledge students have.

Social learning systems place students as part of a group with a focus on interaction with others. Students and teachers collaborate with each other in a learning community, working together in making decisions and solving problems that can foster student and teacher creativity in learning. Cognitive learning systems place the teacher in the role of facilitator while students are problem solvers and decision makers. Teachers tend to provide learning spaces in positions that provide opportunities for students to exploit knowledge solve problems and make decisions based on the learning process that has been done. Physical learning system involves all class members in doing physical activities, or psychomotor and tactile activities on a topic being studied. The teacher is placed as a trainer, a companion and directs students to be successful in learning. The reflective learning system places the teacher to understand the learning styles, strengths and weaknesses of students after going through the learning process.

The linkage of the five natural brain learning systems for students will be able to align instructional objectives according to students' needs, gain knowledge and experience through collaboration, action and active involvement of students, so as to understand the strengths, weaknesses and progress that has been achieved. For teachers, it is providing alternative effective instructional strategies that can be implemented in inclusive classrooms [12].

Through this research, a design of an instructional strategy model will be found that has never been designed for inclusive classrooms in higher education, which are based on the brain's natural learning system (MS-SiPAO). This is a novelty that has never been done by any researcher in inclusive classroom learning especially at institutions of higher education. The purpose of this study is to determine an instructional strategy model and its design that is appropriate and based on an analysis of the problems and needs faced by teacher students in inclusive classrooms in higher education.

2. Materials and Methods

2.1. Research Design

This study aims to determine an instructional strategy model and its design that is appropriate and based on an analysis of problems and needs faced by teacher students in inclusive classrooms in higher education. The research used case study research to obtain a needs analysis through questionnaires and interviews conducted on teacher students who had carried out instruction in an inclusive education course.

2.2. Participants

Participants involved in this study amounted to sixty

teacher students, in the elementary school teacher education study program at a University in the Bogor Regency, Indonesia. Students consist of 6th semester students who had taken inclusive education courses in semester 5, consisting of 54 regular students and six SSNs. The SSNs were in the category of slow learning, and learning difficulties and students with reduced mobility.

2.3. Data Collection and Data Analysis

Data was collected through giving questionnaires to 60 students, as well as open interviews with 20 students, including SSNs. The questionnaire contained 25 statements about the problems in implementing inclusive education learning and the needs that students could have needed in inclusive classroom learning that had been implemented, using a Likert scale with a scale: strongly agree, agree, doubt, disagree, strongly disagree.

Data analysis was achieved using qualitative data analysis developed by [13] and modified by [14] with three steps of analysis, namely: (1) thematic analysis of all participants, analyzing the results of the questionnaire and the results of interviews relating to problems and the need to develop an instructional strategy model; (2) within-participant thematic analysis, identifying the general theme of needs analysis; and (3) cross participant analysis, identifying the general theme of the instructional strategy model. The final stage is analyzing the instructional strategy model finding a culture theme as a profile of the instructional strategy model in inclusive classrooms in higher education through deductive analysis. Table 1 is the result of qualitative data analysis**.**

Table 1. Qualitative Data Analysis Model

Included Term	Semantic Relations	Cover Term
• The development of emotional aspects	Part of	Initial instructional activities
• The development of cognitive aspects • The development of psychomotor aspects • The development of social aspects	Part of	Main instructional activities
• Know the strengths and weaknesses of students	Part of	End of instructional activities

3. Results and Discussions

3.1. Findings on Instructional Problems

Based on the results of questionnaires and interviews that have been conducted, included in the results are problems raised by students regarding the implementation of learning in inclusive education courses. Table 2 illustrates the problems that occur in the implementation of learning in inclusive classrooms**.**

Table 2. Instructional Problems in Inclusive Classrooms in Higher Education

No	Problems	Percentage
1	Lecturers do not know all the characteristics of students	15%
2	Lecturers do not use instructional methods that are suitable for all students	29%
3	Lecturers do not use instructional media that is suitable for all students	24%
4	Interaction does not exist between RS and SSN	9%
5	Learning materials do not meet relevance for future needs	12%
6	Lecturers do not explain the steps of instruction at the beginning of instruction	11%

Table 2 shows that the biggest problem in the implementation of instruction, which is, the lecturer does not use methods that are appropriate for the characteristics of all students.

Some of the problems raised by students in the implementation of instruction, especially in inclusive classrooms, are still a major concern that must be carried out by lecturers so that the instructional objectives are suitable for all student needs [15][16]. The instructional method used by lecturers still uses narrative or expository methods, which do not trigger multi-directional interaction between lecturers and students and students and students. This condition runs from initial learning to the end of learning. In fact, the use of instructional interactions between lecturers and students or students and students will help lecturers know the extent to which students can absorb subject matter [17][18]. Lecturers still consider that delivering material until the end time is only limited to the teaching obligations, whereas in inclusive classrooms that have diverse characteristics, teaching practices should be developed that can improve all aspects of student skills [19], such as cognitive, psychomotor and affective aspects. This can be illustrated by one student about the use of instructional methods used by lecturers in inclusive classrooms:

Researcher: "what is the most important thing that lecturers must do in delivering subject matter?"
Student: *"Lecturers still often deliver material only by speaking from the beginning of the lesson to the end of the lesson, and of course it is very boring."*

The conversation above shows that students hope that lecturers can maximize classrooms by using different and varied instructional methods, so that learning can be fun and friendly for students with special needs. In addition to instructional methods, the use of instructional media is also a problem in inclusive classrooms in higher education [20][21]. The instructional media used by lecturers only consist of using Power Point presentations, which is done

by reading or explaining in one direction to students. This condition causes most students to not pay attention to the subject matter being explained by the lecturer. It also tends to be monotonous, boring and difficult for students with special needs in understanding the material. Some students gave their opinions about the use of instructional media:

Researcher: *"What is your opinion about the use of instructional media used by lecturers?"*

Student: *"Lecturers only use Power Point in teaching, often making me bored and sleepy when learning".*

The use of diverse instructional media and variation should be implemented by lecturers when teaching, because it can attract the attention of students, provide an easier understanding of learning for students, resulting in an increase in interaction and knowledge. With diverse student characteristics, an appropriate instructional media really helps students to understand the subject matter faster and easier, especially for students with special needs.

Another problem that often occurs in inclusive classrooms is, there is no two-way interaction between lecturers and students [22]. Instruction only takes place with students listening to the material explained by the lecturer completing the material displayed on Power Point. Lecturers do not explore students' abilities in critical thinking and practice solving problems in cases related to subject matter, so learning is more about completing material, without feedback from lecturers to students. Students are not given enough space to discuss or give their views on the material being explained, so it is difficult to measure the success of understanding the subject, especially for students with special needs [23].

Related to this, in the whole meeting conducted by lecturers, the relevance of courses with problems found by students in the field is rarely found. The material presented is not updated by the lecturer, and is not in accordance with the conditions faced by students in the future. This is in accordance with the opinion of the student below:

Researcher: *"Is the subject matter delivered by the lecturer relevant to the current problem?"*

Student: *"In my opinion, my lecturer's material is not up-to-date with what is happening now, for example regarding the current laws."*

Lecturers must be able to renew the subject matter that can support student skills that are expected to be used in the future, related to work or skills that must be produced by students in higher education, no exception for SSN. The SSN are entitled to obtain skills that match their needs and strengths, so that universities can be used as a place for them to acquire skills that are appropriate to their characteristics.

3.2. Need Analysis

Needs Analysis was obtained based on the results of the analysis producing a profile of instructional strategy models needed by students, as in Figure 1 below.

Figure 1 explains the needs of all students in inclusive classrooms where learning must be able to develop emotional aspects, psychomotor aspects, social aspects, cognitive aspects and finally the lecturer can determine the strengths and weaknesses of all students who can determine the direction of work in the future. The development of emotional aspects is very important for all students, because it is the first impression for students in starting learning [24]. Lecturers are expected to create conducive classroom conditions, which can comfortably accommodate all student needs. Students hope that the classroom atmosphere that is full of intimacy and affection will create fun learning so that instructional objectives can be achieved well. Student opinion about this emotional aspect can be seen in the following statement:

Researcher: *"What is the learning atmosphere that should make students comfortable?"*

Student: *"I hope the lecturer is friendly, not rigid, invites students to have fun together when learning, so that learning becomes fun."*

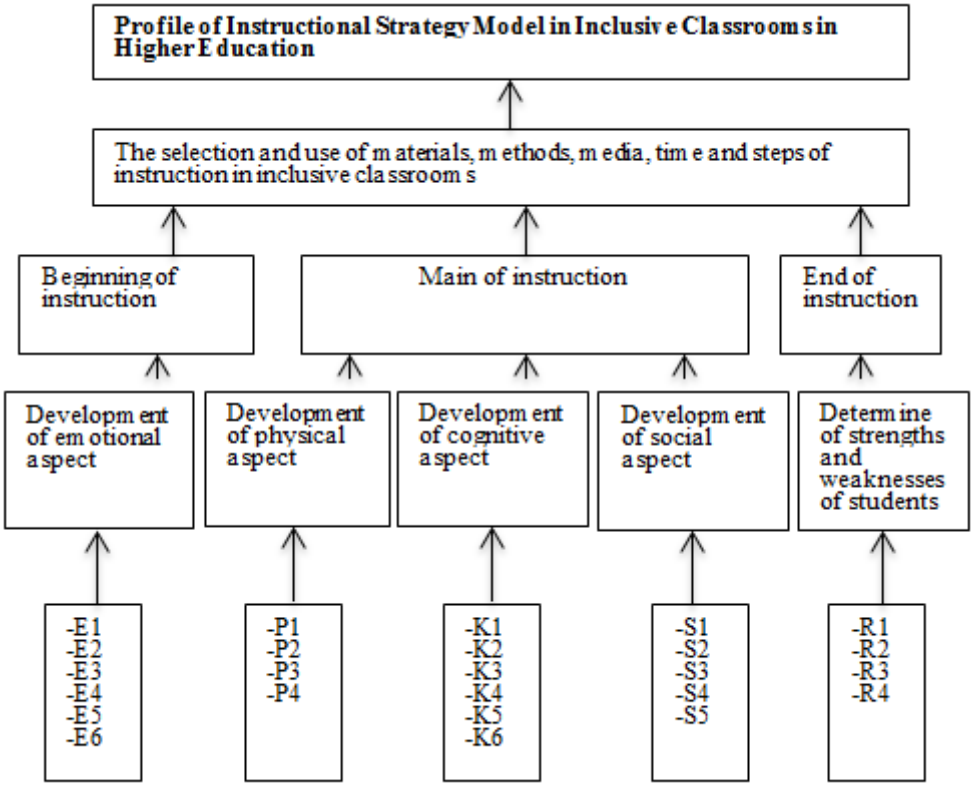


Figure 1. The Profile of Instructional Strategy Models in Inclusive classrooms in Higher Education

Note:
E1: Learning is always fun
E2: Learning motivation becomes higher
E3: Comfortable and conducive learning atmosphere
E4: The material is very useful for students for the future
E5: The relationship between lecturers and students, and between students is very good
E6: Lecturers are very responsive
P1: Perform joint movements in learning
P2: Sing together
P3: Do group activities together
P4: Play together
K1: Lecturers provide opportunities so each student can learn
K2: All students get the same material
K3: Increase new knowledge
K4: Provide assistance to students who do not understand the material
K5: Fulfill student curiosity
K6: Can make the right decisions
S1: Learning interactions between lecturers-students, good students
S2: Mutual learning together
S3: Collaborate collaboratively in completing assignments
S4: Care and attention between students when faced with problems
S5: Mutual help in Learning
R1: Lecturers can fairly assess student learning
R2 : Direct student strengths and reducing student weaknesses
R3: Lecturers can find out the characteristics of students
R4: Lecturers know students' learning styles

The emotional aspects are very important in learning. In addition to a fun classroom, class atmosphere should be filled with excitement, and interaction between all class members, making learning motivation become strong in students, especially for SSN. All students respect each other; help each other because of the equal rights in obtaining subject matter, so that SSNs are not left behind in learning.

Meanwhile, students also hope that learning can take place using various methods including games, movements and songs, so that the class becomes more enjoyable. For that physical or psychomotor aspect at the beginning of learning is very necessary. Physical movement at the beginning of instruction can increase the enthusiasm of students to learn [25] while playing because this is very useful to apply when they have become elementary school teachers. Group games, will increase friendships, and can be useful in understanding feelings between students, including engagement with SSNs that tend to be closed. Games that involve all students in groups are very helpful for lecturers in creating fun and friendly learning for each student. Good cooperation between students in a game can increase the positive emotional aspects and high learning motivation in achieving learning goals.

The students also hoped that through games and group cooperation, social aspects would be improved. This can train students' social sensitivity, which so far tends to be selfish or unconcerned with the presence of students with special needs. But the instructional method using group discussion, working on joint projects, or group observations will greatly help all students work together, respect each other and care about the difficulties faced by SSNs. In one activity that is carried out in groups, students contribute to each other in the completion of a job or assignment given by the lecturer, so that the cognitive aspects can be improved together. Lecturers must be able to position themselves as facilitators and motivators so that all students can develop all aspects they have, so that they can be used in the future.

3.3. Design of Instructional Strategy Models in Inclusive Classrooms in Higher Education

Based on needs analysis, the instructional strategy model that is compatible with inclusive classrooms instruction in higher education is the Natural Brain Learning System Learning Model (MS-SiPAO). The MS-SiPAO used in instruction is a suitable and appropriate picture to be applied to inclusive classroom learning, and of course in the next stage it must undergo effectiveness testing. Analysis results obtained from questionnaires and interviews must be the basis for the selection and design of instructional model that can meet all the problems of students in inclusive classrooms. Differences in characteristics, learning styles, as well as strengths and obstacles contained in the classroom must be adapted into a instructional strategy that can meet all student needs. Some student opinions from the interview results provide an overview of the design of instructional strategy such as:

Table 3. Student's Opinions about Design of Instructional Strategy Model

No	Student's Opinions about design of Instructional Strategy Model	Reflection's Researcher
1.	"I hope the lecturer can use an instructional model that can involve all students, including students with special needs. We have to know knowledge about education"	Lecturers must be able to accommodate the cognitive abilities of students in instruction
2.	"The instructional model that suits me should be able to involve all students when studying. For example a joint discussion that can train communication and outreach, because later when working is very necessary. In addition, we can also find out what our strengths and weaknesses are "	Lecturers must be able to accommodate the social abilities of students in instruction
3.	"I need learning that can increase my instructional motivation".	Lecturers must be able to accommodate the emotional abilities of students in instruction
4.	"Because I am a prospective elementary school teacher, in addition to theories about education, I also need instructional practices that can train my psychomotor skills, because I have to be active when dealing with students"	Lecturers must be able to accommodate the psychomotor abilities of students in instruction

Table 3 reinforces the basis for selecting and designing instructional strategy model in inclusive classrooms. Instruction is expected to be able to develop students' cognitive, social, psychomotor and emotional abilities. This reason is very rational and appropriate because after graduation, they will teach as teachers who of course have to put out all abilities. The complete design of the MS-SiPAO instructional strategy model is as follows:

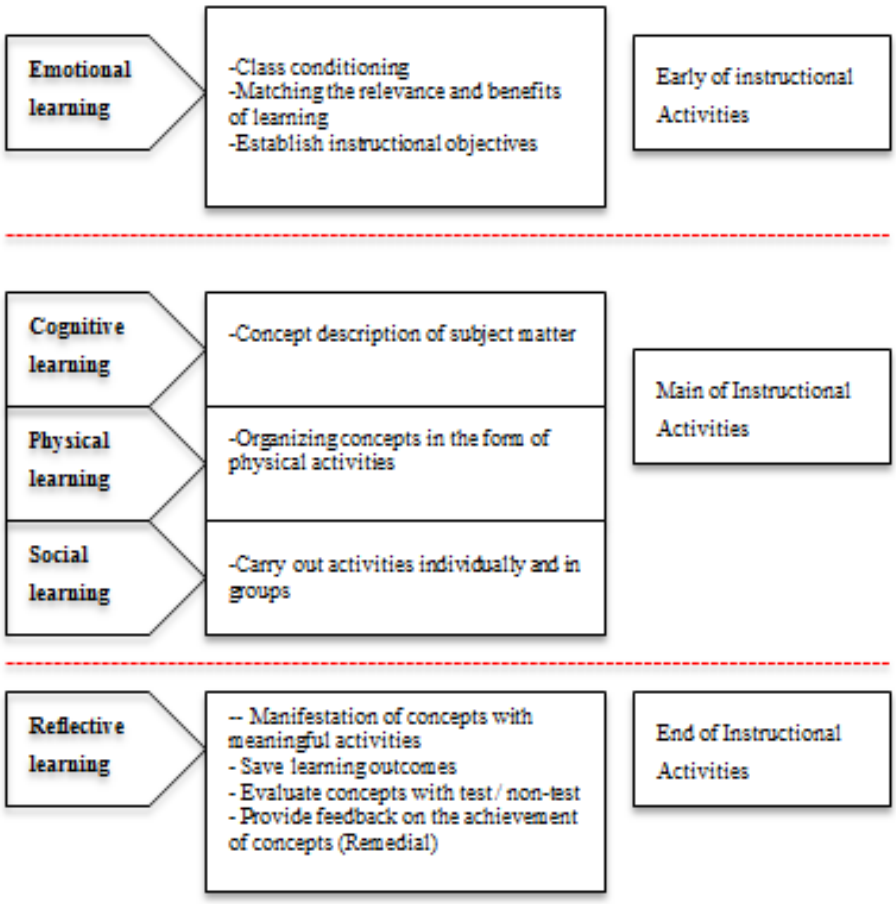


Figure 2. Design of Instructional Strategy Model (MS-SiPAO) in Inclusive Classrrom in Higher Education (Source: Barbara K. Given developed by Rasmitadila)

MS-SiPAO is an instructional strategy model designed in three stages of the instructional process that reflects the five learning systems of the brain, which are, the emotional learning system, the system of learning, cognitive physical learning system, the system of social learning and reflective learning system. Integrating the five learning systems is necessary in instructional activities from the initial learning activity to the final learning activity in an effort to meet the instructional objectives for all students including SSNs.

In the initial stages of instruction, an emotional learning system is a learning system that emphasizes the efforts of lecturers to be able to condition the classroom, arouse students' enthusiasm and motivate students by giving an overview of the subject matter they will carry out and will provide benefits in the future. The aim is to make students understand their work as prospective teachers, so that they are expected to be able to solve learning problems in class in accordance with student characteristics, setting learning goals, specifically giving students an idea that there is an achievement that they must understand and is very beneficial for fluency when they teach.

Meanwhile, at the stage of the main learning activities, there should be the implementations of three learning systems, namely cognitive, physical and social learning systems. Instructional objectives that have been explained in the initial stages of learning are described in the concept of the material or as an initial introduction for lecturers in explaining the subject matter to be achieved. Lecturers can only give illustrations as an initial introduction to the material, and then it can be carried out with a variety of instructional methods that vary according to the characteristics of students, as well as the material being given. For example, observation methods to understand student-learning characteristics, by interviewing students on campus, or discussion methods that can provide information about effective reading.

Cognitive learning system is a learning system that provides equal opportunities for all students to become decision makers and problem solvers of a case being studied. All students can hone cognitive abilities in the form of statements of opinion, argue in accordance with the theory or data that they can maintain to be able to obtain a joint conclusion [26]. Lecturers can make or design cases which, then using appropriate instructional methods and instructional media, will enhance students' critical thinking skills. For SSNs, learning together with other students can improve critical thinking skills. The

next stage in the main activity uses a physical learning system that involves all students in conducting learning with interesting, fun methods. As a prospective elementary school teacher, it is very important to attract the attention of students who always want to play even in learning. Inviting students to play, sing or do physical activities that involve all students can provide high motivation to learn, as well as students' curiosity about the implementation of learning is greater. Students, who learn in a fun or friendly learning environment, will improve relations between students and lecturers to be able to make learning successful, so that instructional objectives can be achieved. For SSNs, the game is collaboration expected to open up to other friends, so learning is a joint activity that can be done in order to improve good relations with others.

Furthermore, in the social learning system, it provides opportunities for students to be able to work together respect each other's opinions and make decisions together [27]. Achieving learning goals becomes very easy when learning is done in a pleasant atmosphere and does not cause conflicts between students, especially in problem solving or decision-making. In inclusive classrooms, providing opportunities for SSNs can increase empathy and high appreciation for equal rights to learn and obtain the same education and learning.

The final learning activity is an activity that is expected to provide more value than understanding the subject matter being carried out. Lecturers can reflect on all students and groups on the achievement of the material that has been implemented. This activity aims to make students understand their strengths and weaknesses in the learning achievements that have been carried out. Lecturers can conduct remedial or reinforcement sessions with SSNs if the results achieved are still lacking or not in accordance with indicators of learning achievement. Lecturers can also provide input to students regarding weaknesses in working with other students, and can even give appreciation to students or extraordinary achievements that must continue to be trained, which they can apply when they become real teachers [28].

The involvement of the five natural learning systems of the brain in instructional activities is expected not only to achieve instructional objectives, but more than that, namely, MS-SiPAO can increase the desire and motivation of student learning, can create a pleasant learning atmosphere and friendly learning environment, can improve students' critical thinking through acquired knowledge which is the basis in problem solving and decision making. In addition to the cooperation space and increasing mutual respect, empathy between students can also be established properly. Lecturers can evaluate learning fairly and provide an overview of the strengths and weaknesses that must be corrected in the future, so that instructional objectives can be achieved.

4. Conclusions

Based on the findings, the analysis of problems and needs illustrated, MS-SiPAO is one of the instructional strategy model suitable to be implemented in learning in inclusive classrooms in higher education. MS-SiPAO is one of the instructional strategy model that is expected to accommodate all the needs of students in order to achieve the competencies and instructional objectives set by the lecturer. MS-SiPAO is a suitable model to be used because it is based on the analysis of problems and analysis of the needs faced by students in implementing learning in inclusive classrooms.

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