

Developing Professional Competency of Elementary School Prospective Teachers through Inductive Thinking Approach

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ABSTRACT

Professional competence which is the ability to communicate with students with broad knowledge, capabilities in the use of information technology and communicative attitudes in teaching. Teacher competence can be developed through several approaches, one of which is through an inductive thinking approach in developing higher-order thinking patterns and critical thinking. This study aims to describe the application of the inductive thinking approach in an effort to develop the competencies of prospective elementary school teachers, especially professional competencies. This research method is a quantitative method using pre-experimental design. The sample in this study used 78 prospective elementary school teacher students. The instrument used is a questionnaire of professional competence of primary school teachers who have been tested for validity and reliability showing high categories. Data analysis with descriptive analysis, then using SPSS applications with comparative analysis. The results showed that there was a significant increase in the professional competence of prospective elementary school teachers through an inductive thinking approach. The conclusion of this study, an effective inductive thinking approach is used to develop the professional competence of prospective elementary teachers. The inductive thinking approach model developed in this study can be implied in elementary school teachers on a wider scale to have more impactfull on professional competence in all elementary school teachers.

Keywords: professional competency, prospective elementary school teachers', inductive thinking approach

INTRODUCTION

Teachers played a significant role in coaching and assisting students for gaining success in education. The role of education in providing science for students, and creating professional, independent, and character resources was vital. According to Admaja (2017), education was the early stage for laying the foundation of cultural values, so it was significant to have clear and directed educational goals. Educators should have special competencies and abilities in carrying out their obligations. If they did not have qualified capacities, then the intended objectives would not be accomplished. Teachers needed complex capabilities based on the Law of the Republic of Indonesia Number 14 of 2005 concerning Teachers and Lecturers Chapter IV article 8 which stated that teachers were tasked to have academic quality, educator certificates, and competence, physical and mental health, and the ability to realize determined national education goals.

Teachers with proficient aptitude were able to master the knowledge and attitude skills based on standards, guidelines, ethical principles, and values of the profession. Certified proficiency was conceptualized as an attitude of understanding certain

situations, formed through a learnable acquaintance, talents, demeanors, and motivational variables (Hu et al., 2018). The educators' competence was a set of flairs, thoughts, and behaviors that should be possessed, grasped, and internalized by teachers in being professional. In every teaching and learning activity, the teacher should be able to comprehend the purpose of the development activity and be buttressed by trained skills in conquering the learning material.

In the process of assisting teachers in rising their specialized proficiency, an approach was needed, one of which was inductive thinking that was classified as a process of thinking from something specific to something more general (Fathoni, 2006). The components in the inductive thinking approach applied in the learning process were the use of information media and converting conceptual understanding into skills. According to Lee (2020), the main factor that should be completed to implement an inductive thinking approach was through presenting a set of data with the availability of information on a particular subject or field, and asking students to study the nature of objects in a data trap; then helping them in the process of evolving a conceptual understanding of a particular domain. The development of a hierarchy of concepts was established through meta-control to gain a more specific understanding of certain fields, convert conceptual understanding into a skill, and generate data to compare a field with others.

Teachers should not only be able to apprehend the process of an inductive thinking approach but also could implement, design, and evaluate a learning circle using this tactic. The fact indicated that numerous teachers were not capable to implement inductive thinking approach based on existing guidelines. An empirical study by Rapih & Sutaryadi (2018) displayed that 79% of respondents had difficulties in planning and applying HOTS-based evaluations, 59% acquired problems in delivering learning materials, 45% found

trouble in designing instructional media, 38% met challenges in planning tools for learning and 31% accepted strain in preparing teaching materials.

Taba in Joyce et al., (2009) arranged an inductive learning mode using strategic design to structure an inductive process and support to improve thinking capabilities for handling and categorizing information. The inductive thinking approach was a way of thinking to conclude a problem by observing, trying, and then drawing conclusions. Improving the teachers' professional competence required a right approach. Based on the results of interviews in teaching and learning activities with elementary school teachers in the Panggarangan sub-district, the respondents still had not carried out an inductive mindset, so growing the teachers' professional competence needed to be carried out. Based on the above experiments, this research was conducted to see the application of the inductive thinking approach in increasing elementary school teachers' professional competence. This paper was structured as follows. Part 2 provided a literature study. In Part 3, the research methodology was explained. Section 4 described the discussion analysis. Finally, section 5 designated the conclusions and suggestions for further research.

The inductive thinking approach is rarely given to teachers in elementary schools, so research related to the implications of inductive thinking approaches does not yet have many references. This is the main goal of researchers in proving empirically related to the application of an inductive thinking approach to prospective elementary teachers which will later become a new reference in improving the professional competence of elementary school teachers. The hypothesis in this study is that an inductive thinking approach can develop the professional competence of prospective elementary school teachers. This is also the basis for the next research related to the identification of the application of the inductive thinking model given to prospective elementary school teachers.

LITERATURE REVIEW

Inductive Thinking Approach

Taba in Joyce et al., (2009) conducted research in developing an inductive learning model using strategic design to shape an inductive process and assist students in mounting their thinking skills in categorizing and handling information. Inductive thinking was structured to train pupils in forming and teaching concepts, as well as establishing students' attention to always focus on logic, the meaning of words, language, and the nature of knowledge (Taba in Joyce et al., 2009). Inductive reasoning could be settled as concluding problems or data obtained by observing or trying a process.

Taba in Joyce et al., (2009) divided the structure of the inductive thinking model into three stages, with each stage consisting of three phases as the steps of the inductive thinking model, namely stage one: concept formation, including (1) calculations and making images (2) grouping, and (3) creating labels and categories. The second stage contained data interpretation, including (1)

identification of important relationships (2) exploration of relationships, and (3) formulating assumptions. Stage three covered the application of principles, including (1) prediction of results, explanation of phenomena and unrelated hypotheses, (2) explanation or support of hypotheses and predictions, and (3) testing of predictions.

Warimun in Fikri (2014) decided that the advantages of inductive thinking included (1) mastering the topics discussed thoroughly, (2) evolving mindset skills, (3) training to work and studying systematically, (4) teaching students to keep thinking effectively, and (5) growing students' motivation in learning activities. While the shortcomings of inductive thinking were (1) getting difficulties in finding common opinions, (2) taking a lot of time, and (3) requiring preparation traps that could make students move to observe the illustrations that had been given. An illustration of the inductive thinking approach model can be seen in the following figure.

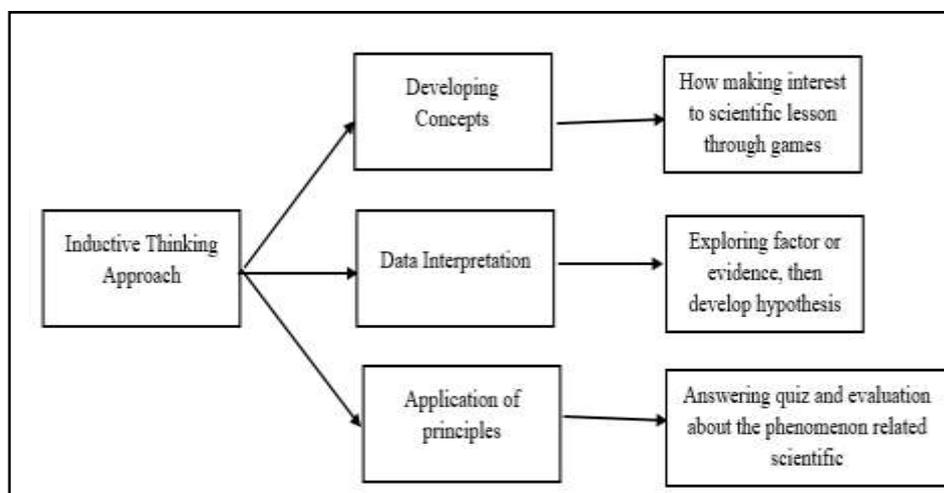


Figure 1. The Concept of Inductive Thinking Approach

Teacher Competency

Competence was a set of skills, knowledge, and behaviors that were required to be possessed, internalized, mastered, and updated by teachers in their professional practice (Kurniasih & Berlin, 2017). Markus in Tadjuddin (2014) defined competence as an achievement or ability, which encompassed the phenomena of intelligence,

dexterity, skills, and proficiency. Law Number 14 of 2005 identified that competence was a set of data, abilities, and outlooks that should be lived and carried out by educators in carrying out their professional duties. Abykanova et al., (2016) mentioned that competence was the amount of knowledge and personal qualities required to enable a professional approach and answer

questions efficiently according to knowledge, practical and scientific activities. Crick (2008) concluded that competence was best described as a complex combination, and was effectively related to human behavior. Competence could be described as an intricate blend of skills, knowledge, values, understanding, desires, and attitudes manifested in a particular domain. From some of the explanations above, it could be determined that competence was the educator's ability in teaching and learning activities. Alkornia (2016) specified teacher competence as the authority and capability of educators in finishing their responsibilities and obligations. For the reason that teachers were a specific profession, particular competencies were needed in running learning activities. Teachers were required to understand the students' diverse characters in the learning process and think about the future of each learner. According to Niemi et al., (2016), teacher competence involved interaction both inside and outside the school community. Gordon & Browne in Sadownik et al., (2019) assumed that professional teacher knowledge and competence comprised personal qualities, including affection, devotion, and flexibility, sense of humor, strength, patience, and self-confidence.

Cooper in Christianti (2012) argued that teachers should have four abilities, namely (1) educational skills related to planning, process implementation, and evaluation activities as well as performance, protection, and education maintenance; (2) professional skills referred to the ability for understanding child development, responding to education, and working with parents in the areas of care, education, and protection; (3) social competence was the ability of teachers to adapt to the environment and communicate effectively with students and parents; (4) personality competence was the capacity to act and behave following the children's psychological needs based on the rules, norms, religion, culture, pupils' view of life, and allow the kid to express himself in noble characters.

Teachers' Professional Competency

According to Hashyim (2018), professional competence was one of the four proficiencies that should be controlled by educators to master learning materials. In every learning process, the teacher was obliged to recognize the development actions. Zhu & Wang (2014) categorized teachers' professional competencies into learning competencies (active, open, and independent), social competencies (cooperative, communicative, persistent, courageous, democratic), educational competencies (love of teaching, responsibility, problem sensitivity, knowledge, educational research, rapid response), and technological competence (maximizing the use of the internet to search and extract information, using multimedia and ICT in education).

Koster et al. (2005) classified the teachers' professional competence into five categories and subcategories. 1) The expertise covered and maintained current information required for being a professional. 2) Communication consisted of communiqué with students from various backgrounds, the direction of assignments, and analysis and clarification of various views. 3) Establishment of the student assessment system and organization enclosed time and curriculum management based on organizational goals. 4) Pedagogy was concerned with helping students to identify their learning needs, creating a curriculum based on the learners' various requirements, and designing activities as facilities for students to develop and learn. It consisted of four elements involving the use of information technology in educational activities. 5) Behavioral skills were related to some categories such as democratic approach, positive attitude, and curiosity about news, honesty, and wholeness.

Situation of the Problem

Professional competence plays an important role for teachers in the continuity of learning. However, some teachers in educational institutions are not fully prepared to have these competencies. This is because the educational approach at universities has not

been specifically conceptualized to develop the professional competence of prospective teachers. In fact, in educational institutions, there are still many teachers who have not been able to apply inductive thinking in learning based on planning guidelines in schools. Lecture material teaches about an inductive thinking approach, but this is not understood by prospective elementary school teachers so a special depth is needed to ensure their readiness and professional competence in designing, implementing and evaluating inductive thinking approaches when learning. The infrequent provision of inductive thinking approach material has resulted in a number of teachers still having difficulties planning lessons, applying HOTS-based evaluations, the difficulty of facing several problems when delivering learning materials, and also teachers were often having problems in designing learning media.

Aim of the Study

The purpose of this study is to find out 1) how the level of professional competence of prospective elementary school teachers is used as the subject of research, 2) whether the inductive thinking approach can improve the professional competence of prospective elementary school teachers or not, and 3) whether prospective elementary school teachers who get the classical method with the inductive thinking approach have differences in professional competence or not.

MATERIALS & METHODS

This study was quantitative research with pre-experimental designs dividing the respondents into two categories, namely the experimental and control classes. The experimental class was taught using an inductive thinking approach with model illustrated figure 1 while the control class was trained with another approach. Subject of this research were teachers' in elementary

school in Surabaya. The participants are counting in 78 prospective elementary school teachers in students' of elementary school department in one of university in Indonesia. Data collection techniques were employed using tests and documentation. Documentation was executed to obtain data on the initial ability of elementary school teacher candidates from the mid-semester examination (UTS) while the test was used to attain data on inductive thinking skills in solving problems for prospective elementary school teachers. In this study, the validity of instrument with 29 questions show significance level of 5% was 0.456. Through the validity test of 10 items, eight questions were valid while two items were invalid. The reliability of the instrument show coefficient was 0.780.

The research data will be analyzed using descriptive statistics and inferential statistics. Descriptive statistics through the MS Excel application, while inferential statistical analysis is a comparative test using SPSS software with a t-test. The data analysis technique applied was quantitative and experimental analysis using the T-test with SPSS version 22. Before testing the hypothesis using the t-test analysis, the data will be tested for prerequisites which include tests for normality and homogeneity of the data to find out the distribution of the data from the research subjects. After that, the researcher conducted a documentation study where the researcher analyzed the results of the teaching practice test results of each research subject as a reference for research-supporting data.

RESULT

This research states that there are differences in the professional competence of prospective elementary school teachers who get an inductive thinking approach with elementary school teachers who get a direct learning approach. This difference can be illustrated by the following chart.

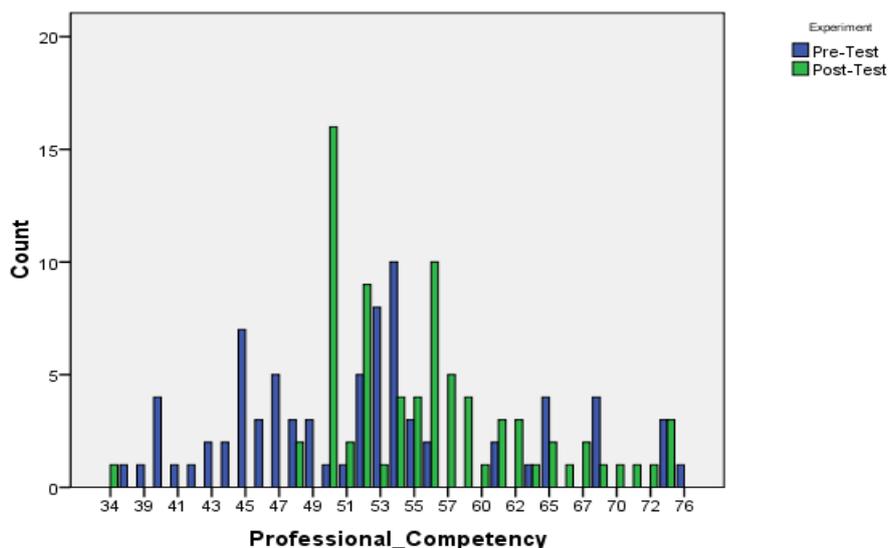


Figure 2. The Differences of Professional Competency Prospective Elementary Teachers

Based on the graph above, it can be assumed that prospective elementary school teachers who get a direct learning approach (blue) predominantly get a score of 34-56, while prospective elementary teachers who get an inductive thinking approach (green) have a score range of 47-76. The difference in scores is very significant, although there are also teacher candidates who get an inductive thinking approach who get low scores of 34 and 48.

Data on the prospective elementary school teachers' professional competence and the results of the mid-semester exam (UTS) were obtained. Initial teachers' competency records were used as the basis for pairing scores between the experimental class using an inductive thinking approach and the control class using the direct model. The initial competency score consisted of 10 questions located on a scale of 0 - 10, so the highest ideal score was 10 and the lowest score was 0, with $M = \frac{1}{2} (10 + 0) = 5$ and $Sd_i = \frac{1}{\sqrt{5}} (10 - 0) = 2,7$. So the initial competency classification was as follows.

Table 1. Comparison Prospective Elementary School Teachers' Competence

Group	Average		Standard Deviation	
	Pre-test	Post-test	Pre-test	Post-test
Experiment	8,10	9,40	0,498	1,213
Control	7,07	7,07	1,484	1,484

From the above classification, it was found that the average initial competence of the experimental class was 8.10 which was categorized as high, while the control class average score was 7.07 which was included in the medium category. Data on the prospective elementary school teachers' professional competence after being given an approach was obtained from the provision of a test (post-test) consisting of eight description questions. Each question was given 8 as the maximum score and 1 as the minimum score. Then, data on the prospective elementary school teachers' professional competence after being given an approach are could be seen that the average professional ability of elementary school teacher candidates was 9.40 in the experimental class and 7.07 in the control class.

Based on the data analysis technique used to test the hypothesis, prerequisite tests were first carried out which included homogeneity, and distribution normality tests. Normality test was conducted to determine whether the values were normally distributed or vice version with the SPSS application. Normality requirements could be met if the test results were not significant for a certain level of significance (α), namely 0.05. To determine the normality test, the applicable criterion was gained if the calculated significance level acquired was

greater than 0.05, and the research sample came from a population with a normal distribution. From the results of the calculations for the experimental group, it was found that the significance value of the calculation was 0.124, greater than (0.065 > 0.05) so that the sample came from a normally distributed population. Thus it could be concluded that the sample originated from a normally distributed population.

The population homogeneity test was used to measure whether the variances of several populations were the same or not (Budiyono, 2009). The criteria were used to see the level of significance. If the significance level was greater than 0.05, the variance was homogeneous. The F-test was applied with

the help of SPSS calculations. From the calculation, it could be seen that the significance level value was 0.120. Since the significance value was greater than 0.05, it could be concluded that the variance of the control and experimental groups was homogeneous. In this study, hypothesis testing was carried out using a correlated t-test (Sugiyono, 2011). Hypothesis testing was implemented to assess the professional competence of prospective elementary school teachers in the experimental class (using an inductive thinking approach) and the control class (using a direct approach). The results of the analysis of normality and homogeneity as prerequisite tests can be illustrated in the following table.

Table 2. Prerequisite Test Results

	Experiment	Tests of Normality			Test of Homogeneity	
		Statistic	df	Sig.	F	Sig.
Professional_Competency	Pre-Test	.929	78	.060	2.449	.120
	Post-Test	.912	78	.065		

Based on the results of the prerequisite test above which states that the data is normally distributed and homogeneous, the hypothesis test can be qualified to be carried out using parametric statistics. The results of the hypothesis test analysis can be described in the following table.

Table 3. Hypothesis Test Results

		t-test for Equality of Means				
		T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Professional Competency	Equal variances assumed	-3.006	154	.003	-3.923	1.305
	Equal variances not assumed	-3.006	146.872	.003	-3.923	1.305

Based on these results, it can be concluded from the results of this study that a comparison was obtained between prospective elementary school teachers who got an inductive thinking approach in contrast to the control group who got a direct learning approach which showed a significance of 0.003. This means that the score of prospective elementary school teachers who get an inductive thinking approach is higher than the control group who get a direct learning approach with a difference of 7.13. This meant that the professional competence of prospective elementary school teachers who were taught using an inductive thinking approach was

better than those who were instructed using a direct learning approach.

DISCUSSION

The professional competence of prospective elementary school teachers increased after being given inductive thinking approach. This was following Taba's opinion in Joyce et al., (2009) that developing an inductive learning model with strategies designed was effective to build inductive processes and assist individuals in developing thinking skills to categorize and handle information. This finding presented that the inductive thinking approach was appropriate to use for improving thinking skills and emerging the

professional competence of prospective elementary school teachers.

In addition, the above opinions are also supported by the urgency of the competence of elementary school teachers which is very high in supporting the implementation of inductive thinking learning that has taken place. Actually, not only learning using an inductive thinking approach can affect the professional competence of elementary school teachers, but there are also several other factors that were not studied in this study, one of which is the factor of teacher readiness in teaching themselves.

The direct learning approach is one of the approaches that is classically used by teachers in general. Nowadays, higher-order thinking skills have developed with varying implementations in learning. This is offset by the large amount of training for elementary school teachers. Not only in elementary school, in early childhood education, it has been proven that the teacher's ability can affect students' self-concept, intrinsic motivation, and increased reading willingness (Guay et al., 2019).

The learning applied by the teacher in the classroom can basically also affect the way students think. If the teacher's way of thinking and teaching style practiced in the classroom are good, then students will also be able to think broadly and have unlimited insights. The correlation between teacher teaching practice in the classroom related to self-efficacy through teaching thinking skills and teachers teaching styles has a positive relationship has been proven by research conducted by Tezci and also his colleagues (Dilekli & Tezci, 2016). Inductive thinking learning can also be provided through writing, debate, project-based learning, problem-based learning, and so on (Fern et al., 2019).

In an inductive thinking approach, teachers are needed who can think and behave in accordance with the class culture faced (Knezic et al., 2010). Each class has students with different characteristics, where if inductive thinking learning is applied not in accordance with the culture and

characteristics of the students then this approach will not work effectively. Another recommended provision besides using inductive thinking is Teacher Quality Improvement (TQI) which is expected to improve the professional competence of elementary school teachers so that they can make learning in the classroom conducive (Ramdhani et al., 2012).

Learning conditions created by teachers who have higher professional competence will make elementary school students feel more happy learning because the learning is fun. Not only that, the innovations created by prospective teachers who get an inductive thinking approach will be better when presenting learning in the classroom. Students are stimulated with several story questions where the story will produce inductive thinking results and will invite elementary school students to practice answering questions not with stressful situations. The inductive thinking approach can also be combined with humor so that students are not boring. If applied to classroom learning, it can be improvised with the help of puppets to illustrate a story with a social theme for easy understanding. After that, students can be given problems in the form of social problems to be solved through inductive thinking.

Not only that, students in elementary school felt their psychological is increasingly understood by teachers with learning provided according to their developmental age. This makes difficult lessons easier, because in principle a teacher's job professionally is to educate students but must pay attention to the psychic condition of the students as well. The learning situation with an inductive thinking approach will not be boring because the material presented does not seem like a lecture alone but the teacher is also communicative with students as an illustration of the teacher's competence both in terms of professional, social, personal, and pedagogy in teaching their students.

CONCLUSION

This study found that professional competence in prospective primary school teachers has a high category, but there are still 3 people who have a professional competency score below 50 after being given an inductive thinking approach. In addition to these three people, it has a high level of professional competence in the category. The professional competence of prospective elementary school teachers who were taught using an inductive thinking approach was better than those who were trained using the direct learning model. Based on this research finding, the authors suggested providing direct training related to active and creative approaches such as the inductive thinking approach so that prospective and experienced elementary school teachers could apply an inductive thinking approach in the learning process at school. The implication of this study is a model of inductive thinking approach can be applied to elementary school teachers on a wider scale and become one of the reference approach models in an effort to develop the professional competence of elementary school teachers.

SUGGESTIONS

The results of this study suggest as an effort to deal with the professional competence of prospective elementary school teachers who are still in the low category to get further training using several approaches, one of which is inductive thinking by providing sessions tailored to the needs that have been proven to have effectiveness in improving these competencies. In addition, researchers can further develop standard guidelines that can be used in learning theory in elementary schools through an inductive thinking approach. This is intended to reduce prospective teachers who still have a way of learning that still uses the lecture method only. Thus, through this inductive thinking approach, it is hoped that teachers will be more communicative by bringing active learning in the classroom to elementary school students to solve problems together and think inductively.

Declaration by Authors

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