The designing E-SETSaR approach use theme of making shrimp paste Cirebon to develop problem solving skills and communication in learning basic concepts of science for prospective teachers

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Abstract. The purpose of this research is to produce a learning design of basic science concepts based on ethnoscience and SETSaR (E-SETSaR). This research is a research and development conducted to produce a learning program that is feasible and effective in improving creative thinking skills, problem solving, and communication. The design of this research consists of defining, designing, developing and disseminating. The results presented in this article are the research steps of defining and designing stages. The results showed that one of the community cultures related to the concept of science is the process of making Cirebon shrimp paste is related to the science concept such as quantity, unit and measurement, fermentation, material and its changes. In addition, the process of making shrimp paste can be studied from the aspects of the ethnoscience and SETSaR so that prospective teacher students get a comprehensive concept from one theme being studied. The learning design of the Ethno-SETSaR approach consists of problem orientation, formulating problem formulations, formulating hypotheses, collecting data that is studied from the aspects of science, environment, technology, society, and religion. designing problem-solving solutions, testing hypotheses, evaluating solutions and concluding.

1. Introduction
The problem-solving skills of prospective teachers are one of the factors for the success of effective learning and developing student problem-solving skills. Teachers who have good problem skills are able to carry out effective learning and improve learning outcomes [1]. In addition to problem solving, communication skills, which are skills for expressing new thoughts, ideas, knowledge, or information, both written and oral [2], are conveyed well [3] and are able to influence message recipients / listeners [4]. The 2017 National Association of Colleges and Employers (NACE) stated that 67.5% of students have low communication skills so that communication skills need to be equipped for prospective teachers to produce graduates who are professional in education [5]. Therefore, one of the efforts to improve these two skills is to carry out learning basic concepts of innovative science. One of the approaches used is the ethnoscience approach, and the Science, Technology, Environmental, Society (Ethno-STEM) approach.
The learning approach that connects the concept of science with indigenous knowledge resulting from culture and students translating natural phenomena they experience in their lives is called the ethnoscience approach [6]. Ethnoscience integrated science learning has three forms, namely the complementary model, the integrated model, and the separate model [7]. The integrated model, namely the implementation of ethnoscience is inherent in the curriculum program, curriculum, subjects, and implementation of learning. The obstacle to the implementation of ethnoscience learning is the lack of teacher interest [8], bridging the concept of indigenous science and formal science [9]. SETS learning emphasizes mastering the concepts of science and technology to solve community problems and their impact on the environment. SETS learning is the development of STS (Science, Technology, Society) learning [10]. SETS provide an opportunity to learn, see, and analyze the relationship between science in a more context [11]. The SETS learning steps are (a) motivation, which is to encourage students to be aware of the importance of the problem and the context; (b) exploration, students are encouraged to examine these problems and to find possible solutions; (c) brainstorming, brainstorming is used to gathering information and ideas, then interpreting the information; (d) decision making, students must decide the best class solution from presentations and discussions [12]. The development of Science Technology and Society (STS) research developed into SETS, and developing STR (Science, Technology, Religion) research with religious aspects was presented to complement the integration between fields of science. The SETS research integrated with religion is concluded to increase student motivation [13], understanding the concept, providing a meaningful learning experience [37], [38]. Ethnoscience in society contains elements of religion. The religious aspect that is integrated into science learning is thought to improve the learning outcomes of prospective teachers through basic science concepts courses. This study aims at the E-SETSaR approach is a learning process that presents a scientific knowledge structure already owned and produced from certain cultural processes of society. The indigenous scientific knowledge of the community is studied in terms of the use of science and technology used by society to solve problems faced and pay attention to environmental preservation. The approach is purposeful to improve skills of creative thinking, problem solving, and communication.

2. Methods
This research method is a research and development. The development design in this study uses the 4-D model developed by Thiagarajan (1974) [14]. The research stage carried out is defining, designing, developing and disseminating. In this research that has been carried out at the stage of defining and designing. The stages of defining what is done are (1) studying the problem-solving and communication abilities of prospective teachers, (2) conducting interviews. The instrument used in this study is a questionnaire to measure problem-solving and communication skills of prospective teachers. In addition, the interview sheets were used to obtain scientific concepts that exist in society from the process of making shrimp paste, (3) literature study of ethnoscience research journals and SETS and R. Design stage, namely designing learning steps for scientific concepts using the E-SETSaR approach for the theme of making Cirebon shrimp paste.

3. Results and Discussion
3.1. Define Stage
The define stage conducts a preliminary study to obtain data on the problems of learning science concepts, profiles of problem-solving and communication skills of prospective teachers and study of literature ethnoscience approach and SETSaR approach. Based on the results of the research in the define stage as follows:

3.2. Problem Basic Science Concept Learning
Basic science oriented towards understanding the content of science knowledge taught. Learning science has not developed creative thinking skills by giving problems in everyday life and giving opportunities to develop students to produce creative thinking. The substance of the material presented tends to be less developed in the process high level thinking. The implementation of science learning is
carried out in the classroom with activities to learn lectures, discussions and presentations. Delivery approach the material presented is only science as knowledge, no integrate and connect with other fields of study / science. Not yet connecting existing science society with formal science so that perception students in the basic concepts of science are difficult to understand, not interesting, memorize formulas and memorize science concepts. Inclined laboratory facilities simple and less supportive of learning the basic concepts of science. Learning has not presented problems and provided opportunities for students to do problem solving. Practical activities that train students to train student communication, it was not chosen as a learning method basic concepts of science.

3.3. Study of Problems Solving Skills and Communication and Problems Solving Skills Prospective Teacher

Prospective teachers as 333 were given a questionnaire developed by Soliman [15], and Arici [16] which was immediately used after going through the language translation stage using google form services. The survey is disseminated through Gmail services. The descriptive analysis was used to analyze the data. The analysis of the data resulting was converted and classified into five categories namely Very Good, Good, Medium, Less and Very Poor according Azwar [17]. The research data obtained at this stage shown in Table 1 and Table 2.

| Gender   | Communication Variable |
|----------|------------------------|
|          | Mental Aspect | Emotional Aspect | Behavioral Aspect |
| Male     | 3.0 | 2.4 | 2.7 |
| Female   | 3.8 | 2.9 | 3.2 |
| Average  | 3.4 | 2.7 | 3.0 |
| Category | Medium | medium | medium |

| Gender | Problem Solving Skills |
|--------|------------------------|
| Male   | Confident | Approach Avoidance | Personal Control |
|        | Style |                  |                 |
| Male   | 3.4 | 3.4 | 3.8 |
| Female | 3.8 | 3.4 | 3.5 |
| Average| 3.6 | 3.4 | 3.7 |
| Category| medium | medium | medium |

3.4. Literature Review of The E-SETSaR Approach

Literature review examines studies on the positive impact of ethnoscience learning to train students to be able to think creatively [18], problem solving [19], increase learning activity [20], cognitive learning outcomes and critical thinking skills [21], scientific literacy and character [22], interest in studying science [23]. Research on the SETS approach can optimize thinking skills, scientific work, and scientific communication. The results of the SETS research have an impact on the achievement of scientific work [24], scientific literacy [25], attitudes towards science [26], mastery of concepts [27], knowledge of nature of science (NOS) [28], decision-making skills, argument and explanation [12], problem solving [10], higher order thinking skills [29], critical thinking [30], generic science skills [31], process skills [32] and scientific thinking [33]. SETS research in Indonesia which integrates religious values concluded that students experienced an increase in religious attitudes, discipline and responsibility [34]. SETSaR can improve students in making decisions about problems and can link them to Islamic values and increase understanding of concepts.
3.5. Develop Stage
The design stage is to develop the stages of learning the basic concepts of science with an ESETSaR approach. In the basic concepts of science subject, students are expected to gain learning experience in the study of basic science concepts and be able to teach them to elementary school students properly. Ethnoscience of making shrimp paste. The results of the analysis of the concept map of science and ethnoscience of the Cirebon fishing community shown in Table 3.

| Topic | Subtopic | Formal science | Ethnoscience Context |
|-------|----------|----------------|----------------------|
| Quantities and Measurements of Principal Quantities and Units. | Measurement of mass, length, time, and temperature | Measurement of mass, length, time and temperature | The composition of brown sugar, rebon, and salt with a ratio of 100 kg of rebon, 1 kg of brown sugar and 20 kg of salt to make shrimp paste |
| The material and its changes | Properties of matter and classification of matter | Mixed Compounds, Chemical properties, Physical properties, Physical change Chemical changes | Chemical changes The ingredients for making shrimp paste are salt which is a compound (NaCl), brown sugar/Java contains lots of sucrose (C_{6}H_{12}O_{11}). This compound can be described the constituent elements. The shrimp paste is a mixture. Physical properties of shrimp paste, salt, and brown sugar, Chemical changes in rebon during the manufacturing process |
| Acids, bases and salts | Acids, bases and salts properties | Acids, bases and salts properties Acids, bases and salts in daily life | The use of salt in making shrimp paste by producers |

Cirebon terasi is an indigenous Cirebon community that can be used as a learning resource [6]. Ethnoscience as knowledge related to things and natural events organized in public knowledge and resulting from a particular culture [8]. The theme of Cirebon shrimp paste is viewed from a scientific aspect, namely the concept of unit quantities and measurements. The process of making the raw material for shrimp paste is 100 kg of rebon, 6 kg of salt and 12 kg of brown sugar. In addition, salt is chosen by producers because salt has the function of inhibiting microorganisms so that shrimp paste has long durability. Environmental aspects of shrimp paste in the manufacturing process do not produce hazardous waste. There is a distinctive smell of shrimp paste that some people don't like. The technological aspects of the shrimp paste making process use simple methods and manual equipment. The process of making it from drying the shrimp, making shrimp paste, salt and sugar is then pounded to make it smooth. The shrimp paste dough is kept tightly until there are buyers. making shrimp paste creates jobs for the community. Cirebon people become craftsmen of shrimp paste as a source of income. Cirebon people who depend on marine products hold religious tradition called Nadran. According to some Cirebon fishermen, said “Nadran” which has a meaning in Islam, namely fulfillment of promises. Small shrimp as raw material for shrimp paste is the main factor in the sustainability of the shrimp paste business. Therefore, Nadran tradition is related to the process of making shrimp paste as an annual tradition so that fishermen's catch is abundant.
3.6. Learning Design Stage

The results of the analysis of the relationship between the basic concepts of science and ethnoscience are then used as the basis for compiling the design of the developed Science learning syntax with the Ethno-SETSaR approach. Syntax design of science learning with the Ethno-SETSaR approach shown in Table 4.

| Step                  | Fase                        | Activity                                                                 | Problem solving skills developed | Communication skills developed |
|-----------------------|-----------------------------|---------------------------------------------------------------------------|----------------------------------|-------------------------------|
| Problem Orientation   | Presenting study material   | Students recognize study materials, objectives, and problems that need to be resolved in the ethnoscience context of the Cirebon | Understand the problem           | Receive messages              |
|                       | (science concept), its objectives and problems to students which are sourced from the process of making shrimp paste by Cirebon people and its religious traditions |                                                                                           |
| Problem Formulation   | Facilitating students to ask basic questions in the form of problems to students originating from the process of making shrimp paste by the people of Cirebon and its traditions | Students formulate basic questions to get problem solving solutions related to making shrimp paste by the Cirebon people and its traditions. | Understand the problem       | Send messages, ethics, verbal and non verbal communication |
| Hypotheses            | Facilitating students to formulate hypotheses as answers to basic questions to answer the problems to students which originate from the process of making shrimp paste by the Cirebon people and its traditions. | Students formulate hypotheses as answers to basic questions to answer their problems to students who come from the ethnoscience of the Cirebon community | Understand the problem       | Send messages, ethics, verbal and non-verbal communication |
| Collecting data studied from the aspects of science, environment, technology, society, and religion. | Conditioning students to group and collect information and study the science, environment, technology, society, and religion aspects of the process of making shrimp paste by the | Students form groups and collect important information related to problems and analyze information on aspects of science, environment, technology, society, and religion | Planning problems            | Send and receive messages, self-adaptation, message form, communication channels, context, impact, and ethics. |

Table 4. The stages of learning the basic concepts of ipa are based on the esetsar approach
Cirebon people and its traditions

| Testing Hypotheses | Students implement the survey plan and compile the report to obtain data on solutions to the ethnoscience of the Cirebon community | Carry out problem solving. | Send and receive messages, self-adaptation, message form, communication channels, context, impact, and ethics |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------|
| Evaluation         | Students evaluate the results of the investigation as an effective solution to solving the ethnoscience problems of the Cirebon people. | Problem solving evaluation  | Send and receive messages, self-adaptation, message form, communication channels, context, impact, and ethics |
| Conclusion         | Students conclude the best solution from the ethnoscience problems of the Cirebon community. | Evaluation of problem solving | Receive messages. |

A learning approach that connects scientific concepts with indigenous knowledge resulting from culture and students translate natural phenomena they experience in life is called the ethnoscience approach [6], [8], [22]. Making cirebon shrimp paste has science that can be aligned with science in school. Cirebon ethnoscience is used as a learning resource for science concept courses and students learn it with the ESETSaR approach.

4. Conclusion
The results of the research at the defining stage obtained data on problem solving and communication skills of prospective teachers in the sufficient category so that it needs to be improved through science learning. The results of the literary study show that the ethnoscience and SETSaR approaches can improve problem solving, creative thinking and communication skills. The results of the interviews with the Cirebon shrimp paste craftsmen showed science concepts related to the process of making shrimp paste. The learning design of the Ethno-SETSaR approach consists of problem orientation, formulating problem formulations, formulating hypotheses, collecting data that is studied from the aspects of science, environment, technology, society, and religion, designing problem-solving solutions, testing hypotheses, evaluating solutions and concluding.
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