

Research-based Lectures to Improve Students' 4C (Communication, Collaboration, Critical Thinking, and Creativity) Skills

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Abstract—Research is an activity that students need to actualize the understanding of the concepts they have with the ability to make solutions to problems that arise in the field. In research, all abilities possessed by students will be seen starting from communicating, collaborating, critical thinking, and creative. Thus, doing research can develop 4C abilities (communication, collaboration, critical thinking, and creativity). Therefore, the main objective in research is to develop the ability of 4C students and design research-based learning so that goals are achieved. Descriptive qualitative methods are used to obtain descriptions of the questionnaire data obtained. The questionnaire was distributed to 250 students from the Indonesian University of Education. The results of the questionnaire data were then analyzed and described. The results are used as a design to compile research-based syntax of learning that can improve the ability of 4C students. The results of the study indicate that research-based learning can improve the ability of 4C students. When students have been able to develop solutions to problems that arise, it shows that they have developed 4C abilities. This is based on data in research reports compiled and presentations made by students in groups. In addition, research seminars were conducted which were the results of selection from the best groups from each study program.

Keywords—*research-based lectures; communication skills; collaborative skills; critical thinking skills; creativity skills*

I. INTRODUCTION

Globalization that occurred in this century resulted in changes in the overall life of society, including the education sector. In this era, education must be able to develop the desired abilities in the 21st century. Facing learning in the 21st century, everyone must have critical thinking skills, literacy knowledge and abilities, and master information and communication technology [1]. Then Education in the 21st century aims to build students' intellectual abilities in learning so that they are able to solve the problems around them [2]. Based on these explanations it can be understood that the skills taught and must be mastered by students aim to solve problems that exist in the community.

Education in the 21st century must be able to form competent students to be able to meet the demands of the development of science and technology and the industrial world. Competencies that must be mastered by students include 4C abilities (communication, collaboration, critical thinking, and creativity). Students must hone skills and improve learning to be able to overcome global challenges, such as critical thinking skills, the ability to communicate effectively, innovate and solve problems through negotiation and collaboration [3]. Therefore, innovations in various educational methods and models must be developed. In this case a learning model needs to be developed that can accommodate these 4C abilities, including research-based learning. Learning with project-based models will be able to develop 21st century skills significantly [4].

Learning innovation aims to create outcomes that are able to compete in the world of work and adapt to the community. The same learning from mass to mass will not be very successful because it is problematic for each age to be different. The problems that will be faced by students in the development of industry 4.0 are very diverse so that it requires the ability to think HOTS (Higher Order Thinking Skills). Therefore, there are many abilities that students must be able to develop, including 4C. In order for output (students) to suit the needs of the industrial era 4.0, learning must be updated and innovated. The way you can do this renewal is to use research-based learning.

Research skills help graduates to critically investigate problems and if appropriate produce and evaluate relevant data, test ideas, theories, and hypotheses, and successfully guide the way for them to navigate the sea of information that characterizes the information age [5]. Writing a scientific work in it involves a process of scientific thinking. In an effort to support this, the skills that need to be trained by students are research skills. Research skills are skills in conducting scientific research in the framework of scientific truth seeking by applying scientific methods that rely on scientifically proven reasoning [6]. Based on these theories, it can be concluded that research is an academic activity that seeks to explore problems with clear research steps to solve a problem. In essence, research is an academic activity to synthesize

cognitive abilities possessed and developed by researchers with problems that are spread in the environment.

Research is a way to get answers to social theories and/or symptoms [7]. Based on this theory, it can be understood that research is a medium for developing student knowledge and media actualization, understanding concepts with factual problematic problems that are spread in the community. Students are required to master various concepts, theories, materials in the world of lectures, it will feel useless if there is no actualization media provided from these cognitive abilities. Research / research is a vehicle that can be used optimally by students to participate in solving problems that are spread in their environment. Researchers are people who think objectively so as to assess problems from various perspectives that are able to provide solutions objectively as well. This expectation can be realized by fertilizing the research activities carried out by students while undergoing higher education. Through research activities, they will be accustomed to providing objective solutions so that they can become the hopes of the whole community and be useful in the world of work.

II. RESEARCH METHODS

The study uses descriptive qualitative methods that focus analysis of the data obtained, namely questionnaire data. Qualitative research characteristics are, 1) using the natural environment as a direct data source, 2) descriptive analytical nature, 3) research pressure on the process not on results, 4) inductive nature, and 5) prioritizing meaning [8]. Primary data comes from a questionnaire distributed to 250 students from various departments and faculties at the Indonesian University of Education. The questionnaire includes ten questions submitted to students. The questionnaire basically asks about the experience of students in research, the urgency of research-based learning, the hope of learning that is carried out, the purpose of taking higher education, etc. Based on the results of data analysis, then the syntax of research-based learning models was formulated. The next step, the syntax is tested to determine its effectiveness in improving the ability of 4C students.

III. RESULTS AND DISCUSSION

A. Research-Based Lectures to Improve 4C Skills (Communication, Collaboration, Critical Thinking, and Creativity) Students

Based on the analysis of the questionnaire obtained a result that there are still many students who prioritize the cumulative achievement index during their education. They have not yet realized that achievement indexes do not help in the world of work and everyday life in society. The expected ability in the world of work is academic development in the category of expertise, such as communicating, collaborating, critical thinking, and creativity. These things must be developed during higher education. The development certainly requires a process and time, so that from the beginning becoming students must be taught until they graduate. In order to develop these abilities, an effort is made with research-based learning. In addition, other answers are included in the category of

organization, expanding/forming relationships, achieving achievements, and developing skills.

Research is a way to get answers to assumptions about problems that have sprung up in the community, both in the education community and in problems in society at large. Research is a systematic investigation into answers to a problem [9]. Research is a systematic investigation to find answers to a problem. The point is to answer a question or problem that exists with systematic steps. In this case there is a meaning, that research is a way to arrange a solution to the existing problematics.

Research is also a bridge for students to develop abilities that demand to be mastered. These capabilities include communication, collaboration, critical thinking, and creative spirit. It can also be categorized into life skills that must be owned by anyone, especially students, to be able to compete in the workforce. This is illustrated in table 1.

TABLE I. LEARNING AND INNOVATION SKILLS

| 21 st Century Skills | Description |
|---------------------------------|--|
| Learning and Innovation Skills | 1. Think critically and solve problems; students are able to use various reasons such as inductive or deductive for various situations; using systematic thinking: making decisions and overcoming problems. 2. Communication and collaboration; students are able to communicate clearly and collaborate with other members. 3. Creativity and innovation: students are able to think creatively, work creatively and create new innovations. |

Based on this explanation, it can be understood that research is a way out for students to develop language skills that must be mastered in the digital age now, such as the ability to communicate, collaborate, be able to think critically, and have a creative spirit in order to determine and develop practical solutions. Research carried out through careful and perfect investigation of a problem [10].

The ability to communicate and collaborate is important because students are required to be able to be part of the community. This is very reasonable because in social life there will be various kinds of problems that students must criticize and wait for an appropriate solution to solve the problem. Solutions will be designed and implemented by people who are creative and able to think critically. Creative individuals will be able to develop the ability to generate creative and original ideas, and determine strategies for learning [11]. Creativity and innovation will develop if students have the opportunity to think divergently [12]. Students must be triggered to think outside of their existing habits by involving new ways of thinking. Then given the opportunity to convey new ideas and solutions, and submit allegations of answers. These skills can be improved and optimized by doing research.

In an effort to succeed this must be designed a learning step that is integrated with research. The following is a syntax of research-based lectures to improve students' 4C capabilities (communication, collaboration, critical thinking, and creativity).



Fig. 1. Research based learning syntax to improve 4c ability.

Based on the learning syntax, it can be understood that there are six steps of learning that are integrated with each other. The learning step has a sequential flow, so that when carried out in learning must be in the order that has been listed. Each part of learning has its own role in improving 4C capabilities. The details of the syntax are explained further as follows.

1) *Selection of research problems (background, problem formulation, and research objectives)*: Lectures begin by determining the problems each group will try to solve. The problems presented can be determined by the teacher or discussed directly with students. However, in this model it is more recommended that problems be discussed with students. It aims to hone students' critical thinking to determine the problems that will be solved by the group. From this, the attraction is also expected to appear to solve the problems that they have set themselves. These assumptions are very reasonable because students determine the problem, so from the outset, alternative solutions are expected to be made to solve the problems raised.

In this case, the instructor/lecturer is only tasked to facilitate the thoughts that emerge from the students' critical power. The lecturer directs the substance matters, so that the way of thinking of students is not too broad, so that they discuss matters outside the research that will be conducted. After getting the problem to be discussed, then students develop the background of the research conducted. The background is factual and objective, usually starting from unrest, not between expectations and reality. Patterns of background development must be adapted to rules and academic ethics, at a minimum it must include supporting theories that can strengthen the opinions of the author (student). This is also a demand for students, besides having to be able to think critically in determining problems and

alternative solutions, they are also directed to think like an academic community.

This first phase is a very important phase for students to understand, because it determines the preparation of the next steps. It can also be said that this phase is the heart of a study, because each study begins with problems that arise in the community. From this, a research title can be formulated that matches the problems raised and the solution is to be prepared. In addition to the research background, establishing the research problem formulation will be the focus of this section. The research problem formulation will determine the types of data to be sought and the data collection instruments to be used. Achievements in this section are explained in table 2.

TABLE II. ACHIEVEMENTS IN SELECTION LEARNING STEPS RESEARCH PROBLEMS

| Syntax Learning | Lecturer Activity | Student Activity | Achievement 4C Target |
|--------------------------------|-------------------|--|---|
| Selection of Problems Research | Guiding | a. Discussion b. Develop research problems, the urgency of research, basic assumptions c. Design an initial alternative solution | a. collaboration and communication b. critical thinking c. creativity |

2) *Selection of Supporting Theories to Formulate Alternative Solutions Parameters*: after completing the introduction, the next step is to determine the theories that can support the research. Supporting theories are very dependent on the determination of the research title and background that are listed, so this section depends heavily on conformity in the introduction. Research or research is an investigation activity carried out according to a systematic scientific method to find scientific information [7]. In addition, supporting theories will be used as a reference for compiling a data collection instrument, namely compiling instrument parameters. Instrument parameters are a very important part because each point included in it is the result of understanding and analysis of the theories listed. So, the preparation of parameters remains within the scope of the research conducted. Achievements in this section are explained in table 3.

TABLE III. ACHIEVEMENTS IN LEARNING STEPS SELECTION OF RESEARCH SUPPORTING THEORIES

| Syntax Learning | Lecturer Activity | Student Activity | Achievement 4C Target |
|--------------------------------|-------------------|---|---|
| Selection of Supporting Theory | Guiding | a. Discussion b. Determine supporting theories c. Formulate solution parameters | a. collaboration and communication b. critical thinking c. creativity |

3) *Develop evidence of research/research originality*: At this stage, students will be guided to compile a proof of the originality of the research conducted. This is no less important

than the other sections, because in this section students will risk their research as being original or imitation of existing research. Why should the evidence of research originality be included? This assumes the effectiveness of research, not to let students do research that has been researched by others, it is a futile job. The way to compile evidence of research originality is to include previous studies that are almost similar to the research that will be conducted.

Previous research that was included and then analyzed to look for significant differences with the research to be conducted. Based on the results of the analysis then compared with the research that will be conducted, the similarities and differences are explained. So that there will be evidence of research originality if the results of the analysis with previous studies are stated differently. This is in accordance with academic ethics and the ethics of scientific writing, because it is not permitted to steal the ideas/results of research belonging to others. Achievements in this section are explained in table 4.

TABLE IV. ACHIEVEMENTS IN LEARNING STEPS ARRANGE EVIDENCE OF RESEARCH ORIGINALITY

| Syntax Learning | Lecturer Activity | Student Activity | Achievement 4C Target |
|----------------------------------|-------------------|---|---|
| Proof of Originality of Research | Guiding | a. discussion b. determine previous studies c. compile evidence of research originality | a. collaboration and communication b. critical thinking c. creativity |

4) *The research methodology used (research methods, research instruments, data collection instruments, etc.):* The next stage is the research methodology. At this stage there are actually many things that can be included in relation to the research conducted, for example the location of research, operational definitions, population and samples (if quantitative research), research findings (if learning research), research data processing, etc. Of the many things that can be included, there are several things that must be understood and mastered by students, namely research methods, subjects, research instruments, and data collection instruments.

The research method that is determined is very dependent on the type of research and the data to be sought, so this part is very dependent on the determination of the title and formulation of the research problem. If research related to numbers is identical to quantitative research. While research with analysis, studies are identical to qualitative research. But this is not a benchmark for research, basically it is still associated with the purpose of research and the type of data needed. This must be understood by researchers / students because of errors in determining the type of research will make it difficult for students to process data and discuss the data.

The research instrument that will be determined by the student/researcher is very dependent on the formulation of the problem listed earlier in the introduction. Each formulation of the problem set will produce a research instrument that is needed, for example test instruments, observations, questionnaires, interviews, etc. Determination of research

instruments will affect the type of data collection instrument needed, so that this part is bound together. Data collection instrument is the result of representation of the research instruments that have been determined. Data collection instrument is a tool used by students to collect data in the field. Achievements in this section are explained in table 5.

TABLE V. ACHIEVEMENTS IN LEARNING STEPS RESEARCH METHODOLOGY

| Syntax Learning | Lecturer Activity | Student Activity | Achievement 4C Target |
|----------------------|-------------------|--|--|
| Research Methodology | Guiding | a. discussion b. understand the research methods used. Suitability of data collection instruments with data needed in the formulation of the problem | a. collaboration and communication b. critical thinking |

5) *Discussion of practical solutions:* This stage teaches students to develop and implement solutions that have been designed. Students learn to make solutions based on data that has been obtained in the field. The data is real evidence of the problems that occur in the field, so data collection must really be done and without intervention. Data is the most important part of developing solutions that are thought to solve problems that occur in the field. The proposed solution must be practical, this is so that the solution can directly address the problem at the core of the research. Practical solutions are the result of critical thinking and creative thinking, because solutions are still found in the results of research that are still "wishful thinking". This will have an impact on solving problems that have not been resolved. In practice, this stage will show the results of critical thinking, collaboration, creativity, and communication of each group member with the research objectives. Achievements in this section are explained in table 6.

TABLE VI. ACHIEVEMENTS IN LEARNING STEPS DISCUSSION OF SOLUTIONS

| Syntax Learning | Lecturer Activity | Student Activity | Achievement 4C Target |
|--|-------------------|---------------------------------------|---|
| Discussion of Practical Solutions Guiding | Guiding | implementation of practical solutions | collaboration, communication, critical thinking, and creativity |

6) *Conclusions and recommendations:* The final stage of the research is to explain the conclusions of the study from the beginning to the discussion previously described. So that the conclusions will appear to be achieved or not the research that has been done. In the conclusions section, the ability of students to process words will appear. Broadly speaking, the conclusions section seeks to provide an explanation and understanding to the reader in connection with the formulation of the problem that has been answered in the previous section.

But basically, the explanation in conclusions is not in the form of points, but an overall explanation.

Another important part of the rest is recommendations. In this section (recommendations) students try to provide further research opportunities that can be implemented by themselves or by others. In other words, recommendations are the last stage that try to provide information that based on the research that has been done can be followed up with various other things. Achievements in this section are explained in table 7.

TABLE VII. ACHIEVEMENTS IN CONCLUSION LEARNING STEPS AND RECOMMENDATIONS

| Syntax Learning | Lecturer Activity | Student Activity | Achievement 4C Target |
|---|-------------------|---|---|
| Conclusions and Guiding Recommendations | Guiding | a. discussion b. give conclusions c. research recommendations | a. collaboration and communication b. critical thinking c. creativity |

IV. CONCLUSION

Today's education must be able to answer global challenges and needs in the world of work. In the 21st century, education must produce outcomes that have competencies that are in accordance with the demands of the times. Competencies in question include 4C capabilities (communication, collaboration, critical thinking, and creativity). The development of these capabilities can be accommodated in research-based learning models. Research is a means for students to learn to respond to factual problems in the field and develop practical solutions to overcome these problems. In the process of drafting a solution it will require 4C capabilities, so that getting used to doing research will increase the ability of 4C. Research is a solution to develop the ability of 4C students,

because research is a systematic activity to produce solutions. Students who are skilled in 4C abilities will show quality research results.

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