Identification of the content, process orientation and basic electronics lab at 2 Universities in Banda Aceh

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Abstract, this study aims to identify practical enforceability Basic Electronics Laboratory (BEL) with a focus on content, process, and practical purpose. This descriptive study involved 2 University in Banda Aceh and documentation of data collection methods, observation, and interviews. Documentation made to the RPS and Practical Guidance is being conducted to observe the observation of practical implementation with a focus on obstacles during practicum, skills that emerged during the practicum, practical valuation techniques and application of technology in practical activities. Further observations were also conducted to observe the basic skills for a student lab practicum implement Basic Electronics. Interviews were conducted to corroborate the data documentation and identify the achievement of the objectives practical implementation Basic Electronics. From the research results can be concluded that the practical implementation still using verification models and without the use of augmented reality/virtual laboratory, lab design Basic Electronics does not equip student 21st-century skills and practical assessment methods to rely only on laboratory work reports and assess the skills of student lab.

1. Introduction
Industrial Supplies on the technology development is forcing everyone has competence in accordance with the needs of the times. Evolving technology requires a generation that has the skills and attitudes other than intelligence or cognitive ability. In the 21st-century, the reality is that students need a technology-based education to survive in a technological world [1]. Therefore, generation of people needs to be equipped with certain skills to survive in 21st-century.

Information and Communication Technology is inseparable from life. The application of technologies such as smartphones and social media networks online like Facebook, Instagram, WhatsApp, Messenger, Telegram, and Twitter is a revolutionary application in communication. Therefore, in order to survive the 21st-century, the mastery of technology is an important basic skill as reading, writing, and arithmetic [2].

Entry AFTA (ASEAN Free Trade Area) in 2015, the Government has prepared legislation and regulations governing employment issues. Employment gains recognition and equality by the global community that received the same award with a workforce with the same level of ASEAN countries. Therefore, the education system should be focused on equipping and development of 21st-century skills students. 21st-century skills are grouped into four groups, namely ways of thinking, ways of working,
tools for working and living in the world [3]. The skills included in the group ways of thinking is creativity and innovation; critical thinking, problem-solving, decision-making; and metacognition. Ways of a working group made up of communication and collaboration skills.

Universities as the highest educational institution in Indonesia has a claim against graduates of improving the competitiveness of the nation [4]. To survive the 21st-century in all fields, required higher education focused applying and developing science and technology and produce intellectuals, scientists, and/or professionals who have problem-solving skills, critical thinking, creativity, communication and collaboration, and dare to defend the truth for the sake of the nation [5].

Kerangka Kualifikasi Nasional Indonesia (KKNI) prioritizing equality of learning outcomes include attitudes and values, ability to work, mastery of knowledge, authority and responsibility [6]. It is seen from the students’ ability to produce work based on selected fields in education. The achievement of tertiary qualifications is expected to be achieved through each course that is charged to students [7].

In the lecture, in addition to understanding the concept as part of the cognitive abilities of the course, students should also be able to resolve the issue with a variety of ideas [8]. Therefore, the student must have sufficient skills to be able to survive in the 21st-century skills of the 21st-century can be built through theoretical lectures and practical [9]. One of the subjects on Physics Education Study Program to facilitate students in developing the skills, creativity, values, and concepts are Practice Basic Electronics.

BEL is compulsory courses for student teachers of physics in physical education courses. BEL discusses the logic gate which is the basis of development and electronics applications in the digital world. In the practicum, students simply devise tools or electronic component to be able to explain the working principle of the logic gates. However, these components are limited as vulnerable to damage, and the availability of components in the area farthest from the urban areas. To ensure the lab runs conformed to the achievements of the graduates, it is necessary to be prepared practical guidance, the process of practical implementation and practical assessment is in conformity with the achievements of graduates in the curriculum that have been enacted.

Therefore, it is necessary to do a study to obtain information related to practical implementation in accordance with KKNI curriculum and the extent to which the lab can provide 21st-century skills to learners.

2. Method
The descriptive qualitative study was conducted at two universities in Banda Aceh who organized Physics Education. The study was conducted by the method of documentation, observation, and interviews. Documentation is made to analyze the RPS and Practical Guidance on the 2nd University. Observations are being conducted on the implementation of the BEL and to observe the performance of student lab at the time of lab activities. To strengthen and deepen the data, interviews were conducted with laboratory assistants, laboratory assistants, and students.

Observation instruments used will explore the obstacles that occur during practical implementation, 21st-century skills that arise during practical implementation, assessment techniques and the application of technology in practical implementation.

3. Result and discussion

3.1. Study documentation
Table 1 shows the results of the study documentation on 2 University in Banda Aceh on RPS BEL course.

| Documentation aspects | University 1 | University 2 |
|-----------------------|-------------|-------------|
| RPS available         | Yes         | Yes         |
|                       | No          | No          |
Table 1. Cont.

| Systematics RPS in accordance with PP no. 44 thn. 2015 | √ | - | √ | - |
| RPS is provided at the beginning of each semester | √ | - | √ | - |

Table 2 shows the results of studies documenting the Practical Guidance BEL on 2 campuses organizers Physics Education Study Program in Banda Aceh.

**Table 2.** The study results in Practical Guidance documentation BEL.

| Documentation aspects | University 1 | University 2 |
|-----------------------|-------------|--------------|
| Practical Guidance provided | Yes | No | Yes | No |
| Practical Guidance drew up with reference to the Practical Model verification, which includes | √ | - | √ | - |
| 1. Title | √ | - | √ | - |
| 2. Aim | √ | - | √ | - |
| 3. Tools and materials | √ | - | √ | - |
| 4. Basic Theory | √ | - | √ | - |
| 5. Experimental procedure | √ | - | √ | - |
| 6. Tasks Before Trial | √ | - | √ | - |
| 7. Duties After Trial | √ | - | √ | - |

Based on the results of the RPS documentation study, it was found that the preparation of the RPS compliance with the standards and always be prepared before the semester running, this indicates a professional commitment to delivering our lecturers teach responsibly. Thus, RPS set up already according to Standard KKNI and is predicted to be able to support the understanding of concepts and skills in the lab that will be implemented in the course BEL.

Guidance lab provided a practical guide type of verification where the goal is simply to understand the working principles of logic gates and prove the truth table, therefore students are not equipped with practical skills during the practicum. However, the facts observed evidence of concrete truth learned concepts or principles, so understanding students more in depth [10]. Supposedly lab has a function to support the strengthening of understanding of the concept as well as to provide skills for proceeding [11].

To explore these findings, interviews conducted on laboratory, laboratory assistants, and student practitioner identifies that practical guidance designed with a little theory and just to prove the truth table. So it does not provide 21st-century skills to students in the practical implementation.

3.2. Observation

Studies conducted observation in this study for two aspects in practical implementation to observe barriers, practical skills, assessment/appraisal, and implementation of technology in the lab. The second aspect used is the performance of student laboratory in conducting BEL. Table 3 shows the results of observational studies on two campuses in the city of Banda Aceh on the practical enforceability of the BEL and the extent to which the practicum has been equipping student 21st-century skills.

Based on observations of the practical implementation shows that students have difficulty in assembling the tools on the circuit board, this condition is found in both the campus where observation. Furthermore, in guiding the student indicates that lab assistants have difficulty in guiding the practical implementation.

Practical implementation in two campuses is only designed to understand the working principles of logic gates and prove the truth table. In addition, the involvement of students in the practicum experience is not maximized, laboratory assistant practicum dominating start since prepared a draft of the circuit was used up a circuit that will be the task of the group. So that in practice, the lab conducted not provide life skills and skills whatsoever including 21st-century skills except the fulfillment of cognitive ability.
Assessment activities during practicum of work done on the various aspects, namely participation, response, preliminary duties and tasks after lab, laboratory reports the journal collection. All campuses observed the same techniques in assessing the results of student practicum. No assessment of the tasks and projects assigned to students. A number of previous studies have been widely found that the use of Project Based Learning (PjBL) Model in teaching, especially teaching electrical and electronics can provide a learning experience to improve students' skills in independent learning, teamwork and project management [12].

Table 3. Practical implementation of results of observation and debriefing 21st-Century Skills.

| aspects of Observation                                      | University 1 | University 2 |
|-------------------------------------------------------------|--------------|--------------|
| Students experiencing difficulties during the performance lab | √ Yes        | No Yes       | Yes √        | No √          |
| Assistant difficulty in guiding practical                   | - No         | √ Yes        | - No         | √ Yes         |
| Practicum conducted to support understanding of the concept of BEL student | - No         | √ Yes        | - No         | √ Yes         |
| Practicum conducted to support life skills (thinking Skills, Social Skills, and Academic Skills) | - No         | √ Yes        | - No         | √ Yes         |
| Practicum conducted to support critical thinking skills.    | - No         | √ Yes        | - No         | √ Yes         |
| Practicum conducted to support creative thinking skills.    | - No         | √ Yes        | - No         | √ Yes         |
| Practicum conducted to support collaborative skills.        | - No         | √ Yes        | - No         | √ Yes         |
| Practicum conducted to support communication skills.        | - No         | √ Yes        | - No         | √ Yes         |
| The type of assessment applied practicum are:               |              |              |
| Activeness/Participation                                    | √ Yes        | No √         | √ Yes        | No √          |
| exam Response                                               | √ Yes        | No √         | √ Yes        | No √          |
| Introduction and task assignment after practicum             | √ Yes        | No √         | √ Yes        | No √          |
| journal of the practicum                                    | √ Yes        | No √         | √ Yes        | No √          |
| Project Report                                              | - No         | √ Yes        | - No         | √ Yes         |
| Organize, process/analyze and interpret data using software | √ Yes        | No √         | √ Yes        | No √          |
| Demonstrating how the tool works through a video/computer simulation | - No         | √ Yes        | - No         | √ Yes         |
| Combining real virtual lab to lab in practical implementation | - No         | √ Yes        | - No         | √ Yes         |
| Applying augmented reality in practical activities           | - No         | √ Yes        | - No         | √ Yes         |
| Using the help of a smartphone/gadget in the lab activities  | - No         | √ Yes        | - No         | √ Yes         |
| Collect assignments and reports via email                    | - No         | √ Yes        | - No         | √ Yes         |

The only use that technology to organize, process/analyze and interpret data using software Microsoft Office. Both campuses are observed not use the LCD to demonstrate video/simulation, not implementing a virtual lab augmented reality, do not use the help of a smartphone/gadget, and not collect assignments/projects via email, so the lab implemented have a positive impact on mastery of concepts and debriefing skills 21st-century [11,12,13].

Table 4 shows the results of observations of laboratory performance during the practicum students. These observations were made by four observers to the representatives of each group 2. Descriptive, observational results are shown in table 4.
Laboratory performance of students according to the results of observations show that the student has had a basic ability in BEL. Ability to know the electronic component on a second campus in the observation has shown very good category. Students' skills in designing circuits on two campuses, to show that students have difficulties in designing a set of tools in the circuit board and require assistance by the assistant. Involving students in the lab is still low.

Observations on the practical implementation on Campus 1 shows that the skills operate the gauge and interpret the data can be done well without any assistance by the assistant laboratory. While on campus 2, this skill still needs assistance laboratory assistant.

**Table 4.** The results of observational studies laboratory performance.

| Aspects of Observation            | University 1 | University 2 |
|-----------------------------------|--------------|--------------|
|                                   | 1 | 2 | 3 | 1 | 2 | 3 |
| The ability to know the components of electronics | √ | - | √ |   |   |   |
| Skills designing the circuit board tools | √ | - | √ |   |   |   |
| Skills Using Gauges               | - | - | √ | - | √ | - |
| Skills to interpret data          | - | - | √ | - | √ | - |

To explore the data of observation, interviews conducted at a laboratory assistant, showed that the students during practical difficulties caused by the background understanding of the concept and a low learning media. Guidance practicum with the type of verification, lack of involvement of students in the learning process and the absence of the use of ICT or virtual lab. Very supportive debriefing 21st-century skills [13].

Based on observations of the barriers and skills of students in practical activities, that the current assessment methods practicum that depends only on the report/journal portfolio of laboratory work to be revised or after performing data processing. Therefore, new and modern assessment methods should be designed to assess the student's knowledge and practical skills related to laboratory experiments. Practice is a combination of the triumvirate of curriculum, pedagogy, and assessment [14]. Student practicum performance should be assessed by providing a test laboratory performance. A comprehensive assessment of the performance of students in the laboratory is important in producing graduates who are able to integrate the theory and practice of lectures and practical electronics as well as to train students to utilize these skills after the lab [15].

4. Conclusion
Based on the results of research and discussion, we can conclude that the practical implementation still using verification models and without the use of augmented reality/virtual laboratory. In addition, the design BEL does not equip student 21st-century skills. Practical assessment methods are not designed to be able to measure the skills, values, and knowledge of students.

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