Pre-service Physics Teacher Perspective Towards E-Book for Basic Electronics Course: *A Preliminary Study*

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ABSTRACT
This paper investigates the instructional delivery progress in the lesson of basic electronics from the perspective of the physics education student at Sriwijaya University. This paper aims to describe the obstacles in learning electrostatics from student's perspective. It discovered that learning activity during the main electronics course is entirely hands-on with less analytical supports such as books. This study adopts a descriptive method with data were analyzed using data reduction. The population of this research is Physics Education student Faculty of Teacher Training and Education Sriwijaya University. Further results indicate, most of the learners are less motivated to learn electrostatics due to a lack of instructional resources and described as student preferences regarding the importance of textbooks as a solution to the obstacles. Based on the results of the research, it can be concluded that the findings will be used as a reference to developing an e-book in the basic electronics lesson for pre-service physics teachers.

Keywords: *Physics, Teacher's perspective, Electronic book, Survey.*

1. INTRODUCTION

Textbooks have an essential role in the learning process for both student and college students. For a student, coursebooks are used as sources of information in understanding material and doing assignment [1], [2]. As for college students, textbooks are useful in increasing learning motivation so that they understanding the material better [3], [4]. Electronics, for example, is a syllabus with several pieces of literature that students might access both digitally or traditionally through the internet or library, respectively. Electronics is useful as a provision for knowledge and practical skills for student [5].

Basic electronics is a compulsory course for the student in the Department of Physics Education, Faculty of Teacher Training, and Education at Universitas Sriwijaya. This course discusses the basic concepts of electronics that beneficial for them as a further teacher when delivering an electrics topic in high school. Based on the preliminary study questionnaire results, learners stated that so far there was no provided textbook as a learning resource in the lesson of basic electronics. This lesson was designed as a laboratory activity and learner-centered method. The students are custom to follow the instruction in their worksheet and analyzing the apparent phenomenon through the experiment. This laboratory experience might impact positively to students in terms of scientific process skills [6], problem solving [7], and higher-order thinking skills [8]. However, text-based instructional resources remain prominent for learners to deepen their comprehension and guide them to confirm the findings of the conducted experiments.

Teaching materials are instructional design or learning setting that contains knowledge, experiences, and facts which will further be collaborated with students [9]. This design is also used to facilitate tutors in transferring values and knowledge [10]. Textbooks, for instance, a well-known teacher's property. Moreover, coursebooks have a role as learning media both for teachers and students [11].

As the human resources requirement increase, the number of literature related to instructional development has rising [12]. For instance, integrating problem-based skills into the learning modules for basic electronic lessons. This refers to previous research with results test validity and reliability coefficient obtained 0.88 and coefficient value of Cronbach's Alpha is 0.892 [13].

Furthermore, developed an assessment for the related course. The type of assessment developed in previous research such as writing assessment of initial task, written report assessment, scientific attitude assessment and performance assessment [14]. Also, has analyzed the effect of studio design on students' cooperative learning and their attitude toward electronics. studio design on students' cooperative learning contributing more meaningfully to students intermediate level electronics skills [15]. The paper mentions that through that instructional design, impact positively on learners' outcome specifically on electronic skill. Furthermore, it is prominent to conduct research that involved pre-service teachers for determining whether they need learning material such as developed instruction and their experience regarding the existing learning setting.

Therefore, this paper aims to describe the obstacles in learning electrostatics regarding student's perspective and their preference to the proper instructional setting for basic electronics whether the digital tools such electronic book is required.

This paper is consist of four sections, the first section is explaining the introduction, the second is describing the research methods, and the third is describing the results and discussion. Finally, the last section outlines the conclusion.

2. METHOD

2.1 Research Design, Settings, and Participants

This study adopts a descriptive method. We choose this method because the goal of this apparatus is to describe the phenomenon along with the characteristics [15]. The survey was involving a pre-service physics teacher. There were 43 college students recruited for this research. It was decided that the best method for this study was to choose samples purposively as this technique is the deliberate option of a respondent because of the qualities the participant possess [16]. The samples consist of 18 college students from the Palembang class and 25 students are from the Indralaya class. Furthermore, Table 1 lists the sample identity information.

Table1. Sample Identity Information

Variabel	Category	*N* (%)
Take course basic electronics	Already Not yet	43 (100,0) 0 (00,0)
Place of class	Indralaya Palembang	25 (58.1) 18 (41,9)
Generation	2017 2018	29 (43.28) 14 (13.43)

2.2 Instrument and Data Collection

The instrument utilized was a multiple-choice questionnaire. The questionnaire, furthermore, was distributed through Google form for college physics education students intake the year 2017 and 2018. This survey asked respondents about the obstacles they face during learning basic electronics. Moreover, the survey also verified whether they need instructional design such as a book for the related course.

2.3 Data Analysis

Data were analyzed using data reduction, by the research objectives in the introduction aims to describe the problems of implementing learning and the importance of basic electronics textbooks. The data reduction technique was carried out because it involves less creating yet greater variables by merging items. Our technique was to some extent [17]. Question results from the survey to illustrate the pattern of responses.

3. FINDING AND DISCUSSION

3.1 Demographics

A total of 43 students recruited in this study consisted of 29 students of class 2017 and 14 students of 2018 with 25 students from the Indralaya class and 18 students from the Palembang class.

Table 2 below describes information on student response preferences to constraints in basic electronics courses. From the table, it can be seen that 62.8 percent of the respondent found it difficult to learned electrostatics due to a lack of learning resources. Furthermore, 30.2 percent felt the material was difficult to understand and seven percent of students complained the lesson only delivered through experiment activity. Based on the results of Table 2, it can be concluded that the problem that is often experienced is the lack of learning resources. Lack of learning resources might impact students' comprehension. This is done with previous research where there are differences in conceptual understanding between groups of students who are taught using additional learning resources [18] also, by providing learning source such as a proper book, the teacher supports student's skill in reading literacy as textbook presents numerous information [19].

Table 2. Student responses to obstacles in basic electronics courses

Category	n	%
Lack of learning resource	27	62,8
The material is difficult to understand	13	30,2
Too many practicum	3	7

This obstacle, lack of learning sources, seems to lead to the second problem, the student experiences difficulty in understanding electrostatic. Laboratory activity in physics lessons supports learners to achieve better learning outcomes as mentioned in the introduction section. However, during its process, the teacher remains play as a key role in successful learning. By this, an experimental activity should be equipped with supporting instructional sources. For example, blending physical and virtual in learning atmosphere for improving student's conceptual understanding through science laboratory experience [20] . More specifically, regarding the fundamental book as a learning source, an instructional module with contextual based affects student's level of understanding of the concept positively [21]. Also, presents that multi representation in instruction might help the student to understand the work and energy concept better [22].

Based on Table 3, it can be described as student preferences regarding the importance of textbooks as a solution to the obstacles experienced by students in basic electronics courses. Overall, all of the participants stated that the textbook was necessarily required for studying electrostatics. 35 students considered textbooks are very important in overcoming the problems they face. The remaining eight students felt that textbooks were important to overcome these obstacles. This is because textbooks provide more theoretical based literature while experimental activity tend to prove to sculpt student's skill in science process [23]. Instructional design such as a book might stand as a determinant for learning strategies, delivering material by educators or prospective teachers, and fostering character during the learning process [24], [1].

Table3. Student responses related to the importance of basic electronics textbook in dealing with obstacles they experience

Category	n	%
Important	8	18,6
Very important	35	81,4

Additionally, the developed instruction should consider several factors as the quality requirement for human resources getting increases day by day. Regarding ICT growth, the learning paradigm has shifted to more digital. This, furthermore, brings the term 21st-century skills that impact to the alternation of the learning system and assessment [25]. For instance, presents an authentic instruction that suitable for the 21st-century paradigm to promote high-order thinking skills [26]. Moreover, researched implementation and assessment with 21st-century learning vision [27]. The study reported that after three years, changes occur significantly to both teachers and learners in knowledge and practical skills of the usage of information and communication software. By this, the development approach for instructional production should be further considered.

3.2 Material Design for Basic Electronics Textbook According to Pre-Service Physics Teacher Perspective

The respondents' opinions on the material needs in basic electronics textbooks is showed in Figure 1 below.

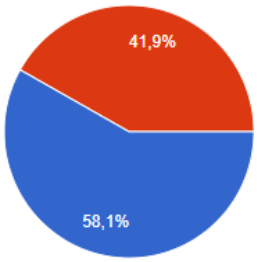

Figure 1. Results for respondents opinion about material needs in basic electronics textbook

In the picture is showed as much as 58.1 percent of students need textbooks that can be used for the public, the remaining 41.9 percent need textbooks that suit their needs as prospective teachers. This means that the books needed by college students are textbooks that can be used contextually. The context in question is useful for daily activities, for example fixing a malfunctioning fan by looking for damage to the circuit. This concurs with [19]. The contextual approach aims to teach students related to real-life contexts. So, we can conclude that textbooks made contextually will be very useful when dealing with damage to electronic devices. That might effectively improve student's literacy in the digital age through integrated science instructional material in daily life theme [28]. Combining life aspect to instructional such worksheet, furthermore, is affect student's outcome as resulted [29].

The information obtained was related to the results of the research carried out, namely that there were several obstacles when taking basic electronics courses in the Physics Education Study Program, Faculty of Teacher

Training and Education, Sriwijaya University. There are three main obstacles, namely the lack of teaching materials, difficulty in understanding the material provided, and too many practicums being carried out.

Based on the explanation regarding first obstacles obout the need for basic electronics teaching materials in the Physics Education Study Program of the Teacher Training and Education Faculty of Sriwijaya University, it shows that the main problem in learning basic electronics courses is the lack of learning resources. The previous description has also explained that basic electronics teaching materials for prospective teacher students are still limited to handouts made by the lecturer who teaches the course. The existing basic electronics teaching materials are more focused on Vocational High School students and engineering students . However, there are rare books on electronics specifically for student teacher candidates [30].

However, the discussion on the importance of using electronics teaching materials in basic electronics courses does not reduce the importance of using various learning methods to improve understanding of basic electronics concepts, especially for prospective physics teacher students. Several learning methods can be used, including cooperative learning, inquiry learning, project-based learning, and experimental implementation. Previous research stated that project-based cooperative learning made a significant contribution to high school students' electronic skills. Besides, the results of the study also showed that the attitudes of students after the learning were applied showed a positive effect [15]. The research that has been done shows that the difficulty of understanding basic electronic material can be overcome by using appropriate learning methods. This is an answer to the basic electronics learning constraints previously described.

The third obstacle is the number of practicums that are carried out during basics electronics lectures. This is because the curriculum in the Physics Education Study Program of the Teaching and Education Faculty does not have basic electronics practicum courses. This is what causes the number of practicums when lectures continue. However, practicum activities in basic electronics courses need to be carried out considering that some concepts will be more meaningful and easy to understand through the implementation of practicum both in real practice in the laboratory and virtually [31].

4. CONCLUSION AND LIMITATION

4.1. Conclusion

Based on the results of the research, it can be concluded that student-teacher candidates need basic electronic textbooks as a learning resource in dealing with the obstacles they experience and motivated to learn electrostatics. Textbooks are expected by students to contain supporting learning sources for describing the theoretical base of the learning material. This research is preliminary research to describe the need for electronic textbooks for the pre-service physics teacher.

4.2. Limitation

The limitation of this research is the lack of data it has because this article is based on an analysis of the need for basic electronics teaching materials in the Physics Education Study Program, Faculty of Teacher Training and Education, Sriwijaya University. The results of the research provided are preliminary information on the need for basic electronics teaching materials so that further research is needed in the form of the development of basic electronics teaching materials specifically for prospective teacher students in the Physics Education Study Program, Faculty of Teacher Training and Education, Sriwijaya University.

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REFERENCES

[1] N. Fitrianingrum, W. Sunarno, And D. Harjunowibowo, Analysis of circular motion misconceptions in electronic school book (Bse) Physics High School Class X Semester I," *J. Pendidik. Fis.*, Vol. 1, No. 1, Pp. 75–80, 2013.

[2] I. K. Hasan Khoiri, Andika Kusuma Wijaya, Identification of misconceptions of class X high school physics textbook on the subject of straight motion kinematics *J. Ilmu Pendidik. Fis.*, Vol. 2, No. 2, Pp. 60–64, 2017.

[3] T. Cheng, J. Rao, X. Tang, L. Yang, And N. Liu, Analog memristive characteristics and conditioned reflex study based on au/zno/ito devices, *Electron.*, Vol. 7, No. 8, 2018, Doi: 10.3390/Electronics7080141.

[4] Y. Yustina, L. Halim, And I. Mahadi, The effect of 'fish diversity' book in kampar district on the learning motivation and obstacles of kampar high school students through online learning during the covid-19 period, *J. Innov. Educ. Cult. Res.*, Vol. 1, No. 1, Pp. 7–14, 2020, Doi: 10.46843/Jiecr.V1i1.2.

[5] S. Suwannakhun And T. Tanitteerapan, Design and development of distance laboratory package for teaching basic electronics via cloud computing, *Ijoe*, Vol. 13, No. 8, Pp. 60–78, 2017.

[6] F. Karsli And A. Ayas, Developing a laboratory activity by using 5e learning model on student learning of factors affecting the reaction rate and improving scientific process skills, *Procedia - Soc. Behav. Sci.*, Vol. 143, Pp. 663–668, 2014, Doi: 10.1016/J.Sbspro.2014.07.460.

[7] L. H. Gunawan, A. Harjono, H. Sahidu, Computer-based experiment of free fall movement to improve the graphical literacy, *J. Pendidik. Ipa Indonesia.*, Vol. 6, No. 1, Pp. 41–48, 2017, Doi: 10.15294/Jpii.V6i1.8750.

[8] H. Mubarok, N. Suprapto, and A. S. Adam, Using inquiry-based laboratory to improve students' higher order thinking skills (hots), *J. Phys. Conf. Ser.*, Vol. 1171, No. 1, 2019, Doi: 10.1088/1742-6596/1171/1/012040.

[9] S. Bahri, M. Rahayu, M. Arsyad, S. Supriyadi, K. Arafah, and R. S. Waremra, Implementation of basic physics i computer-based teaching material on physics education students of masamus university animation teaching material of basic physics i, In *International Conference On Science And Technology (Icst)*, 2018, Vol. 1, No. Icst, Pp. 1116–1119, Doi: 10.2991/Icst-18.2018.225.

[10] A. Imswatama and H. S. Lukman, The effectiveness of mathematics teaching material based on ethnomathematics, *Int. J. Trends Math. Educ. Res.*, Vol. 1, No. 1, P. 35, 2018, Doi: 10.33122/Ijtmer.V1i1.11.

[11] G. S. Pratama and H. Retnawati, Urgency of higher order thinking skills (hots) content analysis in mathematics textbook, *J. Phys. Conf. Ser.*, Vol. 1097, No. 1, 2018, Doi: 10.1088/1742-6596/1097/1/012147.

[12] R. E. Davies, R. S., & West, Technology integration in schools. in handbook of research on educational communications and technology, Pp. 841–853, 2014.

[13] M. A. Hamid, D. Aribowo, and D. Desmira, Development of learning modules of basic electronics-based problem solving in vocational secondary school, *J. Pendidik. Vokasi*, Vol. 7, No. 2, P. 149, 2017, Doi: 10.21831/Jpv.V7i2.12986.

[14] F. Asrizal, Hufri, Development of authentic assessment for supporting the inquiry learning model in basic electronics 1 course, *Icomset*, Pp. 163–166, 2015.

[15] Ö. Korkmaz, The effect of project-based cooperative studio studies on the basic electronics skills of students' cooperative learning and their attitudes, *Int. J. Mod. Educ. Comput. Sci.*, Vol. 10, No. 5, Pp. 1–8, 2018, Doi: 10.5815/Ijmecs.2018.05.01.

[16] H. Nassaji, Qualitative and descriptive research: data type versus data analysis, *Lang. Teach. Res.*, Vol. 19, No. 2, Pp. 129–132, 2015, Doi: 10.1177/1362168815572747.

[17] R. S. A. D. Ilker Etikan, Sulaiman Abubakar Musa, Comparison of convenience sampling and purposive sampling, *Am. J. Theor. Appl. Stat.*, Vol. 5, No. 1, P. 1, 2016, Doi: 10.11648/J.Ajtas.20160501.11.

[18] Z. Dörnyei And K. Csizér, How to design and analyze surveys in second language acquisition research, *Res. Methods Second Lang. Acquis. A Pract. Guid.*, Pp. 74–94, 2012, Doi: 10.1002/9781444347340.Ch5.

[19] S. R. Goldman, Y. Ozuru. J. L . Braasch F. H Manning and Lawless, K. A. A multiple source comprehension illustration. developmental cognitive science goes to school, 2013.

[20] G. Olympiou and Z. C. Zacharia, Blending physical and virtual manipulatives: an effort to improve students' conceptual understanding through science laboratory experimentation, *Science Education*, 96(1), 21-47, 2012.

[21] P. Y. A. Dewi and K. H. Primayana, Effect of learning module with setting contextual teaching and learning to increase the understanding of concepts, *Int. J. Educ. Learn.*, Vol. 1, No. 1, Pp. 19–26, 2019, Doi: 10.31763/Ijele.V1i1.26.

[22] M. R. A. Taqwa, A. Zainuddin and C. Riantoni, Multi representation approach to increase the students' conceptual understanding of work and energy, *In Journal of Physics: Conference Series* (Vol. 1567, No. 3, p. 032090. 2020

[23] S Assefa, The role of experimental activities in supporting knowledge constructionin the Ethiopian secondary school physics textbooks,"

[24] S. Sukaesih and N. E. Kartijono, Development of biological microteaching textbook based on competency and conservation character, *J. Pendidik*. Ipa Indones.3, 79–85 .2014.

[25] K. F. Geisinger, 21st century skills: What are they and how do we assess them?, *Applied Measurement in Education*, 29(4), 245-249. 2016.

[26] B. Preus, Authentic instruction for 21st century learning: Higher order thinking in an inclusive school, *American Secondary Education*, 59-79. 2012.

[27] T. M. Gunn, and M. Hollingsworth, The implementation and assessment of a shared 21st century learning vision: A district-based approach, *Journal of Research on Technology in Education*, 45(3), 201-228. 2013.

[28] A. Amran, A. Ananda and S. Khairani Effectiveness of integrated science instructional material on pressure in daily life theme to improve digital age literacy of students, *In Journal of Physics: Conference Series* (Vol. 1006, No. 1, p. 012031). 2018.

[29] A. Amran and A. Ananda, Effects of science student worksheet of motion in daily life theme in adaptive contextual teaching model on academic achievement of students, *In Journal of Physics: Conference Series* (Vol. 1185, No. 1, p. 012093. 2019.

[30] Abi Hamid, M., Aribowo, D., & Desmira, D. Development of learning modules of basic electronics-based problem solving in Vocational Secondary School. *Jurnal Pendidikan Vokasi*, *7*(2), 149-157. 2017.

[31] Saparini, S., Wiyono, K., & Ismet, I. Pengaruh penggunaan virtual laboratory dengan real laboratory dalam pembelajaran hukum kirchoff terhadap hasil belajar mahasiswa program studi pendidikan fisika fkip universitas sriwijaya. In *Seminar Nasional Pendidikan IPA* (Vol. 1, No. 1, pp. 77-86). 2017.