Development Needs Analysis of Teaching Materials for Improving Critical Thinking Skills Students in Century 21

Ayu Perdanasari\textsuperscript{1a}, Sudiyanto\textsuperscript{1b}, Khresna Bayu Sangka\textsuperscript{1c}

\textsuperscript{1a},\textsuperscript{1b},\textsuperscript{1c} Master of Economic Education, Postgraduate, Universitas Sebelas Maret, Surakarta

Jl Ir. Sutarmi No 36A, Keningan, Surakarta, Indonesia

ayuperdanasari@student.uns.ac.id; soeddie.fkipuns@gmail.com; b.sangka@staff.uns.ac.id

Abstract: Critical thinking is a skill students need in 21st century learning. These skills will be useful for students to solve problems and lead to lifelong learning. Therefore, it needs teaching materials that fit the needs and demands of the curriculum. This study aims to analyze the need for developing teaching materials to improve critical thinking skills. Teachers, students and documents become subjects in research. The method of research used qualitative research. The findings show that the teaching materials used have not led to improve students' skills. Therefore, it is necessary to develop teaching materials based on the results of needs analysis in this research.

Keywords: Critical Thinking, Teaching Material, Problem Based Learning, Predict Observe Explain

1. Introduction

Development in the world today in the era of the industrial revolution 4.0 and 21st century with the rapid development of Information, Communications and Technology (ICT) that has affected human life. All things become borderless with unlimited data usage. This is influenced by the development of the internet and digital technology which is very massive. Therefore, the need for a response quickly and precisely because it will become a disruption of various human activities, including the fields of Science and Technology (Science and Technology) and higher education [1].

The Global Competitiveness index (2018) of data states that Indonesia ranks 36th out of 137 countries, Indonesia has shown its performance in all pillars, especially its position in the ranking driven by its large (market size market size), relatively strong (macroeconomic environment macroeconomic environment), and factors of innovation and business sophistication (Innovation and sophistication factors). Indonesia is one of the main innovators among developing countries. However, Indonesia is still below Singapore, Malaysia and Thailand. This is indicated by several indicators including they were still far behind in terms of technological readiness (Technological readiness) fact that despite having made progress over the past decade, the pillar of labor market efficiency has not shown significant progress. Therefore, the need for efforts to improve the quality of Human Resources.

Improving the quality of human resources can be done in various ways including improving the quality of education, maximizing the role of Vocational Training Centers, and promoting apprenticeship programs. Based on these methods, one effort to improve the quality of human resources can be done through education. This is in line with reports from the United Nations Educational, Scientific and Cultural Organization [2] that African, Arabic, Central Asian, East/ Pacific, South / West Asia, American and European countries recognize the importance and positive impact of access education for learning increases the quality of individual self.

Education can be pursued through formal, non-formal and informal education channels. Furthermore, formal education consists of basic education, secondary education and higher education.
Vocational secondary education in the form of Vocational High Schools (VHS) can be an option to improve the quality of human resources. This is in view of the profile of vocational graduates who are expected to have flexible vocational skills, solid competencies, complete with renewal of ongoing competencies and readiness to enter the world of business / industrial world with global competitiveness.

Accordingly, the 2013 curriculum is expected to be implemented in the 21st century learning framework. The framework demands integration in learning for 21st century character and skills education. The British Columbia Education Ministry [3] put forward design specifications to build 21st century learning and teaching competencies including 3 basic elements namely core subjects; 21st century themes and skills. Some 21st century skills needed: (1) critical thinking (78%); (2) information technology (77%); (3) health and fitness (76%); (4) collaboration (74%); (5) innovation (74%); (6) personal financial responsibility (72%) (Kay, 2008). Based on the data, critical thinking skills are the skills most needed in the 21st century and lead to lifelong learning. Critical thinking skills are very important and useful for every individual, especially in education. One of the ultimate goals of education is to produce critical thinkers [4] who can work effectively in the community [5].

Critical thinking is one of the higher-order thinking skills that enables students to make decisions and do appropriate action [6] as well as helping to be independent and proficient in problem solving. Yeh suggests the skills critical thinking of reflective thinking is the ability to develop and deploy a person's cognitive and metacognitive skills through analysis, interpretation, inference, induction, deduction and evaluation. These skills can be trained through questions that lead to the cognitive level of analyzing, evaluating and creating what is known as high order thinking skills or High Order Thinking Skills (HOTS).

In this connection, Government Regulation No. 13 of 2015 [24] concerning National Education Standards states that standards directly related to Graduates Competency Standards are process standards. Minister of Education Regulation No. 22 of 2016 [7] concerning basic and secondary education process standards explains that the learning process needs to be carried out interactively, inspiratively, fun, challenging, motivating students to participate actively, as well as providing sufficient space for initiative, creativity, and independence in accordance with talents, interests and physical and psychological development of students. Therefore, teachers need to develop learning implementation plans that are in accordance with 21st century curriculum and learning demands so that they can motivate students to actively participate in class so that learning objectives can be achieved.

Prastowo [8] said that learning that is interesting, effective, and efficient requires innovative teaching materials not just conventional teaching materials. Teachers are required to be creative to arrange teaching materials that are innovative, varied, interesting, contextual and in accordance with the level of student needs. One of the teaching materials that can be used is a module. Teaching materials as all materials (both information, tools and texts) are arranged systematically, which displays material from competencies that are controlled by students and used in the learning process with the aim of planning and studying learning implementation [9]. Therefore, it is important in designing teaching materials that fit the 21st century curriculum and learning so as to be able to provide learning experience and practice critical thinking skills for students.

Critical thinking skills of students can be trained in learning activities carried out in class. These skills are integrated into every material of the subjects taught by the teacher. One of the subjects taught in the VHS curriculum is Accounting. Accounting is part of economics. Economics is one of the ten core subjects of the 21st century [10]. Therefore, Accounting Lessons are not merely memorizing material but the applicative abilities that students will need in real life.
But in reality the results of observations that have been made in one of Surakarta VHS related to students’ critical thinking skills are still not optimal. This can be seen in learning activities especially teaching materials used by students. Teaching materials in the form of textbooks are borrowed by students in the school library before learning activities begin. The textbooks are used in learning without being combined with other forms of teaching materials that aim to improve students’ skills in accordance with the demands of 21st century learning. In addition, the presentation of material and questions in the textbooks has not been adapted to the situations and conditions that might be faced by participants in real life. This resulted in students only memorizing the material taught not to understand the purpose and objectives of the learning material due to lack of motivation in actively participating in learning activities. Trilling & Fadel [11] states that learning has the potential to increase significantly when students engage in activities through problems in daily life. Therefore, the need for other forms of teaching materials used to achieve learning activities that are in accordance with the curriculum and learning in the 21st century. Based on the presentation of problems related to the conditions of teaching materials used in classroom qualitative research is aimed at analyzing the need to develop teaching materials to improve skills critical thinking of 21st century students.

2. Research question

Researchers also conducted several improvements in the quality of human resources can be done in various ways including improving the quality of education, maximizing the role of Vocational Training Centers, and promoting apprenticeship programs. Based on these methods, one effort to improve the quality of human resources can be done through education.

Accordingly, the 2013 curriculum is expected to be implemented in the 21st century learning framework. The framework demands integration in learning for 21st century character and skills education. Critical thinking skills of students can be trained in learning activities carried out in class. These skills are integrated into every material of the subjects taught by the teacher. One of the subjects taught in the VHS curriculum is Accounting. Accounting is part of economics. Economics is one of the ten core subjects of the 21st century [10]. Therefore, Accounting Lessons are not merely memorizing material but the applicative abilities that students will need in real life.

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3. Method

The research method used to answer the problem is qualitative research. The research subjects were teachers and students. Source of data comes from informants and documents. Data collection uses observation and interview techniques. Data analysis using qualitative data analysis techniques include 1) data reduction; 2) data presentation; 3) data verification and 4) drawing conclusions [12].

4. Results and Discussions

The results of interviews conducted with teachers related to learning activities obtained some information as follows: 1) the teacher has used other forms of teaching materials used in learning activities in the form of power points. It is used for conveying material taught and have not directed students to master 21st century skills; 2) The teaching material used in the form of textbooks only
contains material and practice questions. Presentation of the material begins with a concept map and then goes directly to the material to be studied, while the practice questions in the textbooks are limited to measure cognitive learning outcomes of students at the level of remembering, understanding and applying or known as low order thinking skills / LOTS) is not at the HOTS level as it should be. Although in some practice questions found problems to measure cognitive ability to analyze level; 3) Teaching materials in the form of power points that are designed have not used a particular learning method approach so that the use of power points is still limited to help convey information to students and has not yet aimed at improving 21st century skills.

Furthermore, information obtained from interviews with students follows: 1) the teacher has used other teaching materials in addition to the textbook used in the classroom. Even though the teaching materials used are considered not able to arouse students’ motivation to participate actively; 2) students feel teaching materials in the form of textbooks are less attractive in learning the material being taught. This is caused by the presentation of material in the less innovative package books only in the form of lines of writing; 3) students tend not to learn the material to be taught before attending learning activities in class. This is because teaching materials in the form of textbooks are less attractive and are not easy to carry anywhere. The behavior shows there is no independence in learning to find other learning resources; 4) Students will actively participate in learning activities if the teacher notifies that certain grades and rewards will be given. This shows the lack of awareness of students to actively participate in learning activities in class.

Correspondingly, the results of the document observations obtained information as follows: 1) display of teaching materials used in learning activities related to the material to be studied can be seen in Figure 1. Presentation of the material for each chapter begins with the chapter title, learning objectives, concept maps, content/material and evaluation questions.

![Figure 1. Presentation of material in module](image)

2) The evaluation questions at the end of the chapter consist of multiple choice and essays. Evaluation questions in textbooks lead to measuring cognitive abilities at the level of remembering, understanding and applying can be seen in Figure 2.
5. **Future Trends and Conclusions**

The results presented above show that the use of the main teaching materials used are sourced from the package book. The package book used contains material and evaluation questions. Then the teacher uses power points to facilitate the delivery of material to students. However, the results of observation indicate that students have not been motivated in activities to follow learning activities so that they actively participate. Students actively participate if the teacher gives an award in the form of value that will be given if active in learning activities. The power points that are used are felt to be less able to arouse students’ interest because the purpose of using power points is to facilitate the delivery of material without any purpose to improve the skills of 21st century students. Therefore, teaching materials become an important source in learning activities to achieve learning objectives. Teaching materials must be prepared and designed according to the curriculum [13] and 21st century skills of students [10]. One of the instructional materials that can be selected is a module. Modules are tools used in planned learning activities, designed to help students achieve their learning goals. Correspondingly, [14] states that one of the goals of using modules is to develop students’ skills in interacting directly with the environment and other learning resources so as to gain a learning experience that is closer to real conditions. Therefore, the module has advantages compared to other forms of teaching materials and module design is directed at improving the 21st century skills required by students. One of the skills being trained is critical thinking [10]. Setyowati, Sari & Habibah [13] also asserted that critical thinking is a process thought for making decisions from various conditions such as evidence, methods, criteria, context, and conceptualization and relevant sources of information. In the end, this can be practiced by students in real life.

The results of the student interviews and observations conducted show that the teaching materials used are in the form of textbooks containing material and evaluation questions. Without any design intervention from the teacher, therefore, it results in the perception that the use of teaching materials is felt to be less attractive so that students do not actively participate in learning activities. Modules are selected as teaching materials that can be designed and used in learning for the purpose of improving the skills of learners that are oriented towards meeting the needs of students and 21st century curriculum and learning.

Stack & Battey [15] confirms that in designing module teaching materials the modules take into account the following three components: 1) the purpose and objectives; 2) teaching and learning strategies; and 3) assessment and feedback. This opinion confirms that modules need to be arranged...
based on a particular approach so that they are more effectively used in learning activities. In line with that, emphasized that there is also a need to rethink the learning objectives, learning strategies, assessment and professional development in making curriculum transformation to address the educational learning goals of developing students' critical thinking.

Problem Based Learning (PBL) is one of the learning methods that can be used to improve critical thinking [16]; [17] and PBL activities are directly related to real world conditions and encourage students to acquire important knowledge and concepts from learning material [18]; [19]. Then Predict, Observe, and Explain (POE) is a learning model that was originally developed for science education. However, with the development of social education science and technology also requires the learning model. This is consistent with the advice of [20] POE arising from constructivist theory, which emphasizes the importance of exploring students' background knowledge. The syntax in learning with the PBLPOE approach is felt to be able to cover the shortcomings of the learning model. the syntax that will be used in compiling the module is a combination of PBLPOE syntax as follows:

| Pbl | Poe | Pblpoe |
|-----|-----|--------|
| The students actively formulated questions | The teacher explained the background of a situation so that the students could make some relevant predictions. | The teacher distributed a text and the students actively formulated questions based on the book. |
| They sat in groups and the teacher-directed them to make questions relevant to the learning objectives | The teacher facilitated the students’ investigations | The students were guided to sit in groups and select appropriate questions to discuss |
| The teacher facilitated the students’ group and individual investigations | The teacher provided scaffolding so that the students were able to discuss the comparison between the results of the investigation and predictions. | The teacher helped the students make predictions based on the problems |
| The teacher encouraged the students to present the results of the investigations | The teacher facilitated the students’ group and individual investigations | The teacher facilitated the students' group and individual investigations |
| The teacher guided the students to reflect and evaluate the learning process | The students presented the results of the investigation and compare them with the prediction | The students presented the results of the investigation and compare them with the prediction |
| | | The teacher together with the students reflected on the process and evaluated the available solutions |

(Source: Arend,2012 [18]; Bowen & Haysom, 2014 [21]; Fitriani, Zubaida, Susilo & Mudhar, 2020 [22])
Further needs analysis related to the results of the student interviews state that teaching materials are less attractive and impractical to carry. Therefore, the desire to prepare learning before class is not done. It is known that the factors that cause problems are the form of teaching materials in the form of hardcopy and thick books. Based on this, the PBLPOE module teaching materials that have been designed to address the needs of learners will be presented offline and online for practicality. The offline form of the model such as printed teaching materials is generally just that the components in the module have been adapted to the needs of students and the presentation is made attractive but contains content that is weighted and the thickness of the module is considered [8]. Furthermore, the form of online modules will be presented in the form of files that will be stored in Google Drive so that they can be accessed online. This is done to overcome the problem of students who are lazy to open the open so that there is no reason not to learn before learning in class [23].

Based on the results and discussion conclusions can be drawn to answer questions in research as following: 1) Teaching materials needed by students in the form of teaching materials for modules; 2) Modules are designed based on problem-based learning and Predict, Observe, Explain (PBLPOE); 3) Teaching materials are given access facilities both offline and online. This research is limited to the analysis phase of the need to develop critical thinking teaching materials. It is hoped that further research will develop module teaching materials to improve critical thinking of 21st century students.

6. References

[1] Yunanto, D., Herlina, S., Boediono, S., Pravita, Ayu & Fajri, M.S. (2018). Ristekdikti: kreatif dan Inovatif di Era Revolusi Industri 4.0. Jakarta: Kemenristekdikti.

[2] United Nations Educational, Scientific and Cultural Organization. (2006). EFA Global Monitoring Report 2007. Strong foundations. Early childhood care and education (2nd ed.). Paris, France: Published by the United by United Nations Educational, Scientific and Cultural Organization (UNESCO) for the Secretariat of the International Consultative Forum on Education for all. Retrieved from www.unesco.org/new/en/education/themes/leading-theinternational-agenda/efareport/reports/2007-early-childhood/

[3] British Columbia Ministry of Education. (2012b). Personalized learning parents’ guide. Retrieved from www.bced.gov.bc.ca/personalizedlearning/parentsguide/index.html#10

[4] Alkharusi, H. A., Sulaimani, H. A., & Neisler, O. (2019). Predicting Critical Thinking of Sultan Qaboos University Student. International Journal of Instruction. 12 (2): 491-504.

[5] Peter, E. (2012). Critical thinking: essence for teaching mathematics and mathematics problem solving skills. African Journal of Mathematics and Computer Science Research, 5(3): 39-43.

[6] Ennis, R. H. (2013). Critical thinking across the curriculum (CTAC). In D. Mohammed, & M. Lewiński (Eds.), Virtues of Argumentation. Proceedings of the 10th International Conference of the Ontario Society for the Study of Argumentation (OSSA) (pp.1-16). Windsor, ON: OSSA.

[7] Ministry Education of Regulation No. 22 Tahun 2016 Tentang Standar Proses Pendidikan Dasar dan Menengah

[8] Prastowo, A. (2013). Pengembangan Bahan Ajar Tematik. Yogyakarta: Diva Press.

[9] Prastowo, A. (2012). Panduan Kreatif Membuat Bahan Ajar Inovatif. Yogyakarta: Diva Press.
[10] Kay, K. 17 January, 2008. Preparing Every Child for the 21st Century. Paper Presented In APEC EdNet - Xi’an Symposium, China. Retrieved from http://www.seiservices.com/APEC/ednetsymposium/downloads/Partnershipfor21CenturySkills.pdf

[11] Trilling, B., & Fadel, C. (2009). 21st century skills: Learning for life in our times. San Francisco, CA: John Wiley & Sons.

[12] Miler, M. B. & Huberman, A. M. (2005). Qualitative Data Analysis (terjemahan). Jakarta : UI Press.

[13] Setyowati, R. N., Sari, M. M. K., & Habibah, S. M. (2020). Improving Critical Thinking Skills of Students through the Development of Teaching Materials. Advances in Social Science, Education and Humanities Research, volume 226, 1st International Conference on Social Sciences (ICSS 2018): 240-245.

[14] Mulyati, Y. (2002). Pokok-Pokok Pikiran Tentang Penulisan Bahan Ajar dan Diklat. Pendidikan dan Latihan Bahasa Indonesia dan Bahasa Inggris. Jakarta: Direktorat Jenderal Pendidikan Dasar dan Menengah.

[15] Stack, D., & Battey, N. (2013) Reflections on Designing a Biology/ Humanities Interdisciplinary Module. Bioscience Education. 21(1): 64-74.

[16] Applin, H., Williams, B., Day, R., & Buro, K. (2011). A comparison of competencies between problem-based learning and non-problem based graduate nurses. Nurse Education Today, 31 (2): 129-34.

[17] Sahyar, Ridwan A., Sani, & Malau, T. (2017). The effect of PBL model and SRL toward physics problem solving ability of students at senior high school. American Journal of Educational Research, 5(3): 279-283.

[18] Arends, R. I. (2012). Learning to teach. New York. McGraw-Hill.

[19] Carriger, M. S. (2015). PBL and management development-empirical and theoretical considerations. The International Journal of Management Education, 13(3): 249–259.

[20] Bilen, K., Özel, M., & Köse, S. (2016). Using action research based on the predict-observe-explain strategy for teaching enzymes. Turkish Journal of Education, 5(2): 72-81.

[21] Bowen, M., & Haysom, J. (2014). Predict, observe, explain activities enhancing scientific understanding. USA: NSTA Press.

[22] Fitriani, A., Zubaida, S., Susilo, H. & Mudhar, M. (2020). PBLPOE : A Learning Model to Enhance Students’ Critical Thinking Skills and Scientific Attitudes. International Journal of Instruction. 13 (2): 1-18.

[23] Limongelli, C., Lombardi, M., Marani, A., Sciarrone, F., & Temperini, M. (2015). A recommendation module to help teachers build courses through the Moodle Learning Management System. New Review of Hypermedia and Multimedia, 22(1-2): 58–82.

[24] Peraturan Pemerintah Nomor 13 Tahun 2015 tentang Standar Nasional Pendidikan.