Development of MOOCs synchronized life-based learning to improve the quality of outcomes in prospective vocational teachers in the era of education 4.0

Tuwoso[1], A B N R Putra[1], A Mukhadis[1], A K B Mahamad[2] and A I Sembiring[1]

[1] Universitas Negeri Malang, Jl. Semarang no.5, Malang, Indonesia
[2] Universitas Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, Malaysia

E-mail: andika.bagus.ft@um.ac.id

Abstract. The objectives of this study include 1) mapping aspects of the need to improve the quality of prospective vocational teacher's outcomes; and 2) the attractiveness test of the developed Massive Open Online Courses (MOOCs) product. This research uses research and development (R&D) methods. The subjects of this study were all vocational students at Malang State University. Data collection techniques through questionnaires and interviews. The results of this study include: 1) aspects of the need to improve the outcome of prospective vocational teachers namely learning aspects (awareness has a percentage of 78%, knowledge has a percentage of 85%, attitudes has a percentage of 97%, and special skills have a percentage of 82%.), The aspect of action (behavior has a percentage of 86%, practice has a percentage of 90%, and decision making has a percentage of 88%), and aspects of conditions (economic conditions have a percentage of 82%, social conditions have a percentage of 84%, individual conditions have a percentage of 90%, and environmental conditions have a percentage of 94%); 2) MOOCs products developed are feasible and interesting (average score 92%); and 3) media/product innovation MOOCs that are developed can be used as a reference for the development of technologies that have deeper content and content complexes.

1. Introduction

The education system in all parts of the world is currently undergoing a process of metamorphosis. The process of change towards digital technology in total [1]–[3]. The 4.0 industrial revolution will create many new jobs, also encourage even higher economic growth in Indonesia. Therefore, all countries must adapt to these changes, especially in preparing human resources who can face these digital challenges. Not only in the system and management but also the learning media used. So far, relatively many are still using one-way learning media. Even in developed countries, this phenomenon has not yet been completely overcome. That happens because the development of technology continues to increase rapidly. These developments also have an impact on the type of education that focuses on the needs of the world of work and industry. Vocational education that should be able to produce a 'sophisticated' and capable workforce, but in reality prospective vocational teachers are still relatively not 100% capable and proficient in the era of education 4.0 [4], [5].

In many developed countries, prospective vocational teacher uptake reaches 82% with a rate of speed of getting a job of 77%[6]–[8]. The news is not good news. That is because, after work, they are less able to upgrade their abilities. They forget about self-floating activities, so there are still many who are

left behind in understanding each new technology. Also, the effects of the learning process when studying on campus are less active in making good relations with people in the industry [9], [10]. The problem is that it is not easy to invite experts in the industry to regularly teach students on campus. In addition to the reason that the distance is not close to the location of the campus, busyness at work also becomes a significant obstacle.

The difficulty of synchronizing and matching vocational education with the industrial world is a severe problem in various countries [11], [12]. Developed and developing countries have difficulty in upgrading knowledge quickly for their graduate graduates, especially in the vocational field. One way that is quite effective is through the use of distance learning technology. This technology is commonly known as MOOCs. In principle, MOOCs have the main content in the form of online courses, learning materials, and in-depth evaluations. Online courses in the form of explanatory videos from experts in accordance with their fields. In MOOCs containing videos of various competencies, users only need to choose the course/video which they want to follow. In addition, the evaluation aspect provides various types of tests. The test can be in the form of questions, opinion questions, multiple-choice questions, or structured questions. In principle, MOOCs act as virtual instructors that can be easily accessed anytime, anywhere [13], [14]. MOOCs offer a variety of efficient and interactive distance learning technologies. In some countries, MOOCs are used as mandatory media by lecturers in conducting learning in class. MOOCs technology has great potential to improve prospective vocational teachers.

2. Method

This research uses research and development (R&D) methods. The instruments used in the mapping were questionnaires, interview guidelines, and documentation. The research is focused on the Universitas Negeri Malang. Informants on the mapping included prospective vocational teachers who had worked, lecturers, and university stakeholders. In detail, the product development process undertaken is shown in Figure 1.

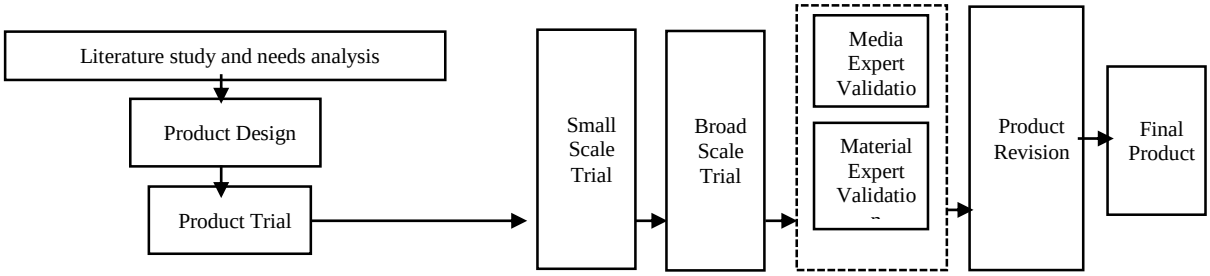

Figure 1. Research stages

In Figure 1, there is an expert validation process. The experts used are material experts and media experts. The two experts were chosen based on the level of competence needed to validate the product being developed. The material expert analyzes the suitability of the material and the level of effectiveness. Media experts analyze MOOC products that are developed from the user and admin aspects.

3. Results and discussion

In this study produced several results or findings. The findings include the need for aspects of learning, aspects of action, and aspects of conditions. Furthermore, the results of the percentage of each aspect are shown in Figure 2.

In Figure 2, it is shown that there are four key needs indicators in the learning aspect. These indicators include awareness, knowledge, attitudes, and special skills. In detail, it is shown that the awareness indicator has a percentage of 78%, the knowledge indicator has a percentage of 85%, the attitudes indicator has a percentage of 97%, and the special skill indicator has a percentage of 82%. Of the four

indicators in this aspect of learning, the attitudes indicator has the highest percentage value. Next, the percentage in the action aspect is shown in Figure 3.

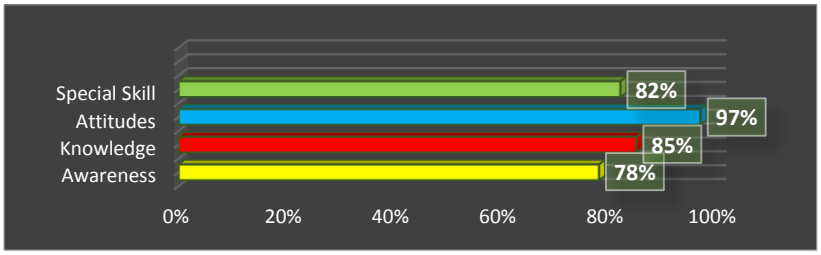

Figure 2. Percentage of needs in the learning aspect

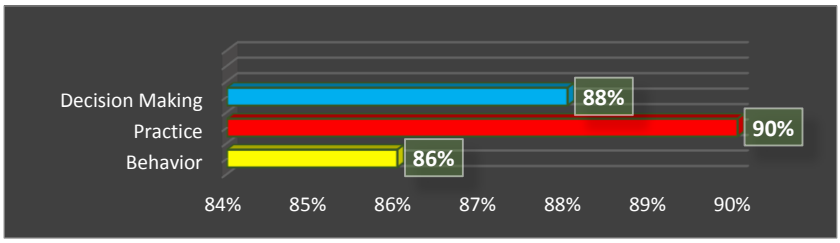

Figure 3. Percentage of requirements in the action aspect

In Figure 3, it can be explained that there are three main indicators in the aspect of the action. The percentage of each indicator includes the indicator behavior has a percentage of 86%, the practice indicator has a percentage of 90%, and the decision-making indicator has a percentage of 88%. Among these three things, the practice indicator has the biggest percentage. Next, the percentage in terms of conditions is presented in Figure 4.

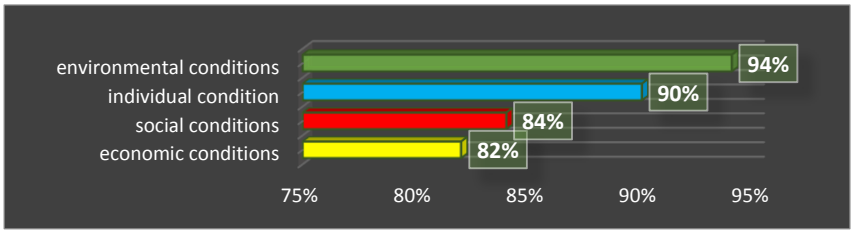

Figure 4. Percentage of requirements in the condition's aspect

In Figure 4, it can be seen that in the onditions aspect there are four main indicators. The percentage of each indicator includes economic conditions has a percentage of 82%, social conditions have a percentage of 84%, individual conditions has a percentage of 90%, and environmental conditions has a percentage of 94%. Of the four things, environmental conditions have the biggest percentage of 94%. Furthermore, the results of the validation of material experts (vocational fields) are shown in Table 1.

Table 1. Results of material expert validation (vocational education)

No	Indicator Points	Score	%
1	The material is presented according to the objectives and learning objectives	3.33	83.33
2	The material displayed systematically and in the sequence of indicators	3.80	95.00
3	The material is equipped with pictures, graphics, and videos	4.00	100.00
4	The material is equipped with minimal C4 analysis questions	4.00	100.00
5	The material is presented according to the latest information developments	3.33	83.33

In Table 1, it is explained that there are five main indicators used by material expert validators to analyze the products being developed. Then the results of the media expert validation are shown in Table 2.

Table 2. Results of media expert validation

No	Indicator Points	Score	%
1	Appropriate design, color, text, icon and menu selection	3.50	87.50
2	Easy understanding of navigation menus	3.80	95.00
3	Ease of reading content by users	3.33	83.33
4	Accuracy in using the display every page	3.50	87.50
5	Attractive design and conformity to the user's target	4.00	100.00

Based on the above results, in this study produced two important discussions and findings. The discussion includes: (1) the need to increase the outcome of prospective vocational teachers; and (2) the potential for innovative MOOCs to improve the outcome of prospective vocational teachers.

3.1. Need for increased outcomes of prospective vocational teachers in the educational era 4.0

In this study, it was revealed that there are three main aspects of need in improving the quality of prospective vocational teacher's outcomes in the educational era 4.0. The first aspect is the learning aspect. Learning aspects include awareness needs, knowledge needs, attitudes, and special skills. In principle, the outcome is the impact, benefits, and expectations of change from a stage or activity [15]–[17]. In this realm, the ability to do self-awareness is very much needed. The awareness in question is a sense of understanding the environment and being able to read the opportunities from the analysis. Not only that, in the process of reading opportunities, every prospective vocational teacher must have complex knowledge. Academic and social and cultural knowledge. Some experts claim that one of the keys to improving the quality of graduate outcomes is the significant level of complex knowledge in accordance with industry needs [8], [18], [19]. The industrial world, especially the industry of educational institutions (schools), has the priority of hiring teachers who have special skills. This was done because now someone who has special skills will be able to master the latest technology quickly.

In addition to the learning aspect, improving the quality of prospective vocational teacher's outcomes in the era of education 4.0 is also determined by the action aspect [20], [21]. Some experts claim that the ability in terms of student graduate practice is relatively a major point in determining acceptance when applying for work [7], [12], [19]. A certain job will require special professional skills. Not only that, prospective vocational teachers are required to have a high-level mindset. It was implemented through speed and accuracy in making a decision. Of course, it starts with positive habits while working. In this study, it was revealed that the ability of prospective vocational teachers to practice has the highest percentage in the aspect of the action. This is consistent with vocational education experts who state that the key to the success of a technical job, is determined by professional work experience.

Furthermore, improving the quality of prospective vocational teacher's outcomes in the era of education 4.0 is influenced by aspects of conditions. In this aspect, there are four main indicators. The indicators include economic conditions, social conditions, individual conditions, and environmental conditions. Some experts claim that the quality of outcomes is greatly influenced by social conditions and economic conditions. When examined in more depth, the two conditions are related to the discipline and activity of individuals in the workplace. In this realm, the prospective vocational teacher's quality outcomes will improve if the four conditions are harmonious and ideal [8], [22].

3.2. Potential innovation of MOOCs to increase outcome of prospective vocational teachers in the era of education 4.0

In this study, MOOCs innovation was developed as an alternative technology to improve the prospective outcomes of vocational teachers in the era of education 4.0. The results of the average validation assessment by material experts and media experts stated that the product developed was feasible and good. The assessment aspects are quite complex with the main criteria in each domain of validation. In

the material expert validation process, the focus of the validation indicator is on the suitability of the product against the competency goals, learning objectives, and activity achievements. Furthermore, other indicators are the quality of material displayed systematically and supporting content such as images, graphics, videos, and other supporting content. In this research, it was also validated related to the analysis of the material and the questions presented were at least in C4 criteria. From these indicators, the product developed has an average of above 80%. This is in accordance with the statements of some experts that, learning media in the form of MOOCs at least contain analytical materials with minimal criteria applied/applicable.

Utilization of MOOCs is focused on the material presented which has a direct impact on changes in behavior and knowledge. MOOC products should be able to provide short-term and long-term effects [14], [23], [24]. The effect on increasing the competence and capability of users, in this case, prospective vocational teachers. Furthermore, in the validation process of e-learning media experts, the evaluation criteria include 1) the accuracy of the design, color, text, icon, and menu selection; 2) ease of understanding the navigation menu; 3) ease of reading content by users; 4) the accuracy of the use of each page display; and 5) the attractiveness of the design and its suitability to the user's target. The results of the five aspects of the validation of media experts have an average of above 80%. So, the product developed is very interesting. Some experts claim that media in the form of MOOCs are required to have an attractive and up-to-date appearance [14], [25], [26]. That's because psychologically, users will be more comfortable and excited to see an attractive appearance and in accordance with the latest technological developments. In its function, MOOCs play a role in presenting virtual courses by expert experts. So, the MOOCs products that are developed need to be designed systematically through the selection of relevant content. Menu displays, background, and other supporting effects need to be adjusted to each page display on MOOCs-based learning media.

4. Conclusion

The results of the discussion in the previous section can then be mapped into three conclusions. The conclusions include: 1) aspects of the need to improve the prospective vocational teacher outcomes namely learning aspects (awareness has a percentage of 78%, knowledge has a percentage of 85%, attitudes has a percentage of 97%, and special skills have a percentage of 82%.), The aspect of acion (behavior has a percentage of 86%, practice has a percentage of 90%, and decision making has a percentage of 88%), and aspects of conditions (economic conditions have a percentage of 82%, social conditions have a percentage of 84%, individual conditions have a percentage of 90%, and environmental conditions have a percentage of 94 %); 2) MOOC products developed are feasible and interesting (average score 92%); and 3) media/product innovation MOOCs that are developed can be used as a reference for the development of technologies that have deeper content and content complexity.

5. References

[1] C. S. Chai, J. H. L. Koh, and Y. H. Teo, “Enhancing and Modeling Teachers ’ Design Beliefs and Efficacy of Technological Pedagogical Content Knowledge for 21st Century Quality Learning,” *J. Educ. Comput. Res.*, vol. 57, no. 2, pp. 360–384, 2019.

[2] E. Henritius, E. Löfström, and M. S. Hannula, “University student’s emotions in virtual learning: A review of empirical research in the 21st century,” *Br. J. Educ. Technol.*, vol. 50, no. 1, pp. 80–100, 2019.

[3] J. Hu, J. Hu, H. Liu, Y. Chen, and J. Qin, “Strategic planning and the stratification of Chinese higher education institutions International Journal of Educational Development Strategic planning and the strati fi cation of Chinese higher education institutions,” *Int. J. Educ. Dev.*, no. May, 2018.

[4] A. B. N. R. Putra, A. Mukhadis, E. E. Poerwanto, W. Irdianto, and A. I. Sembiring, “LMS Technology by Using Makerspace Approach on Unique Experiments-Based through MOOCs in Improving the Professional Competence of Vocational Students Paper,” in *3rd International Conference on Sustainable Information Engineering and Technology, SIET 2018 - Proceedings*,

2019, pp. 312–316.
[5] N. Primasatya and Jatmiko, "Implementation of Geometry Multimedia Based on Van Hiele ' s Thinking Theory for Enhancing Critical Thinking Ability for Grade V Students," *Int. J. Trends Math. Educ. Res.*, vol. 1, no. 2, pp. 56–59, 2018.
[6] L. Woessmann, "Facing the life-cycle trade-off between vocational and general education in apprenticeship systems: An economics-of-education perspective," *J. Educ. Res. Online*, vol. 11, no. 1, pp. 31–46, 2019.
[7] M. Lin, "Challenges and Opportunities for Technical and Vocational Education and Training in the local communities : Education and Labour Market for Young People," *Int. J. Soc. Sci. Stud.*, vol. 7, no. 3, pp. 1–15, 2019.
[8] D. Newton, A. Day, M. Giles, J. Wodak, J. Graffam, and E. Baldry, "The Impact of Vocational Education and Training Programs on Recidivism : A Systematic Review of Current Experimental Evidence," *Int. J. Offender Ther. Comp. Criminol.*, vol. 62, no. 1, pp. 187–207, 2018.
[9] A. B. N. R. Putra, A. Mukhadis, E. E. Poerwanto, W. Irdianto, and A. I. Sembiring, "Edmodo-Based Makerspace as E-Learning Technology to Improve the Management Project of Vocational Students in the Disruptive Technology Era," *3rd Int. Conf. Sustain. Inf. Eng. Technol. SIET 2018 - Proc.*, pp. 302–307, 2019.
[10] R. S. Chidiac and L. Ajaka, "Writing Through the 4Cs in the Content Areas – Integrating Creativity , Critical Thinking , Collaboration and Communication," *Eur. Sci. J. August*, vol. 7881, pp. 95–102, 2018.
[11] S. Hashim, M. H. A. Rahman, D. Nincarean, N. F. Jumaat, and P. Utami, "Knowledge Construction Process in Open Learning System among Technical and Vocational Education and Training (TVET) Practitioners," *J. Tech. Educ. Train.*, vol. 11, no. 1, pp. 73–80, 2019.
[12] I. Placklé, K. D. Könings, W. Jacquet, A. Libotton, J. J. G. Van Merriënboer, and N. Engels, "Students embracing change towards more powerful learning environments in vocational education," *Educ. Stud.*, pp. 1–18, 2018.
[13] A. Cohen, U. Shimony, R. Nachmias, and T. Soffer, "Active learner's characterization in MOOC forums and their generated knowledge," *Br. J. Educ. Technol.*, vol. 50, no. 1, pp. 177–198, 2019.
[14] Z. Li, Y. Ren, and W. Wang, "Teaching Reform of Computer Basis Course based on MOOC," in *Advances in Social Science, Education and Humanities Research*, 2018, vol. 294, no. Ieesasm 2018, pp. 381–385.
[15] E. S. Andersen and K. V. Grude, "Our tribute to Rodney – And the importance of Goal Directed Project Management," *Int. J. Proj. Manag.*, vol. 36, no. 1, pp. 227–230, 2018.
[16] B. K. Omeno and P. Sang, "Project Management and Performance of Public Sector Construction Projects : A Case of Constituency Development Funds Projects in Migori East ," *Int. J. Curr. Asp. Proj. Manag.*, vol. I, no. I, pp. 13–26, 2018.
[17] J. Xu, B. Li, and S. Luo, "Practice and Exploration on Teaching Reform of Engineering Project Management Course in Universities Based on BIM Simulation Technology Practical Application of BIM Technology in Today ' s Educational Reform," *EURASIA J. Math. Sci. Technol. Educ.*, vol. 14, no. 5, pp. 1827–1835, 2018.
[18] D. P. Thunqvist, A. H. Tønder, and K. Reegård, "A tale of two reforms : Institutional change in vocational education and training in Norway and Sweden in the 1990s," *Eur. Educ. Res. J. 1*, pp. 1–15, 2019.
[19] H. Jossberger, S. Brand-gruwel, M. W. J. van de Wiel, and H. Boshuizen, "Learning in Workplace Simulations in Vocational Education : a Student Perspective," *Vocat. Learn.*, vol. 11, pp. 179–204, 2018.
[20] A. B. R. N. Putra, M. Ihwanudin, E. K. Mindarta, P. Puspitasari, and M. A. Pratama, "Occupational Health And Safety (OHS) management for employees on the risk of diseases due to the intensity of computer use in the workplace/industry," in *MATEC Web of Conferences*, 2018, vol. 01016, pp. 1–6.

[21] A. Mukhadis, A. B. N. R. Putra, A. M. Nidhom, A. Dardiri, and H. Suswanto, "The Relevance of Vocational High School Program With Regional Potency Priority in Indonesia," *J. Phys. Conf. Ser.*, vol. 1028, pp. 1–8, 2018.
[22] C. Lang *et al.*, "Teaching Stress Management in Physical Education: A Quasi-Experimental Study with Vocational Students," *Scand. J. Educ. Res.*, pp. 1–13, 2017.
[23] L. Ma and C. S. Lee, "Investigating the adoption of MOOCs : A technology – user – environment perspective," *J. Comput. Assist. Learn.*, vol. 35, pp. 89–98, 2019.
[24] A. Zancanaro, C. Nunes, and M. Domingues, "Evaluation of Free Platforms for Delivery of Massive Open Online Courses (MOOCS).," *Turkish Online J. Distance Educ.*, vol. 18, no. 1, pp. 166–181, 2017.
[25] N. Spyropoulou, C. Pierrakeas, and A. Kameas, "Experience Gained From Applying a TeamBased Approach for Experience Gained From Applying a Team- Based Approach for MOOC Development," *Int. J. Web-Based Learn. Teach. Technol.*, vol. 14, no. 2, pp. 14–30, 2019.
[26] D. Verstegen, A. Dailey-hebert, H. Fonteijn, G. Clarebout, and A. Spruijt, "How do Virtual Teams Collaborate in Online Learning Tasks in a MOOC ?," *Int. Rev. Res. Open Distrib. Learn.*, vol. 19, no. 4, pp. 38–55, 2019.