**Preparing for Vocational High School Learning in the Future: Lessons Learned from the COVID-19 Pandemic**

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**Abstract.** The COVID-19 pandemic had an impact on vocational high schools learning. Schools, teachers and students of vocational high school are forced to adapt with the changes of learning process that must be done online from home. Learning activities in vocational high schools cannot run optimally during this pandemic, especially in practical learning that cannot be done with online learning. On the other hand, there is no doubt that post-pandemic learning activities will change along with the development and adaptation processes that have been carried out. Therefore anticipatory efforts are needed so the learning activities after pandemic does not experience obstacles. The literature review method in this study aims to find out the changes that might occur in vocational high school learning after the end of the pandemic and to know what efforts are needed to prepare it. The results of this study are expected to help schools, teachers, and students of vocational high school to make a better preparation to deal with the changes that might occur after the end of COVID-19 pandemic, so that the learning constrains that may be encountered in post-pandemic learning can be minimized.

1. **Introduction**

The Coronavirus Disease 2019 (COVID-19) is an infection disease caused by coronavirus (SARS-CoV-2) that declared as a global pandemic by The World Health Organisation (WHO) on March 11, 2020 [1]. In Indonesia 2 confirmed cases of COVID-19 has reported on March 2, 2020 and it has increased to 10.842 cases in 34 provinces on May 2, 2020 [2]. The increase in the number of cases took place quite quickly and it has affected various sector in Indonesia. In the education sector, the impact of COVID-19 includes policies that require learning activities to be carried out from home through online learning [3]. This forces schools, teachers and students including vocational high school level to adapt the changes of learning situations during the pandemic.

 Vocational high school is one of the secondary education that prepares students to work in a certain fields [4]. As happened in other levels of education, teaching and learning activities in vocational high schools which consist of learning theory and practice did not run optimally during the pandemic, especially in practical learning that cannot be done with online learning. In addition, the number of vocational high schools in Indonesia is 14,064 schools that spread across 34 provinces, consisting of 142 different competencies and with different quality schools in each region. [5]. The varied conditions of vocational high schools result a difference adaptation process of vocational high schools when implementing learning process during the pandemic.

 On the other hand, the COVID-19 pandemic has changed the way students are educated around the world, this change provides an overview of how education can change for the better or worse in the long time [6]. Therefore, vocational high schools must also be prepared for post-pandemic conditions and adapt to the learning that must be done on post-pandemic. This study aims to determine the changes that might occur in vocational high schools learning process after the pandemic and the efforts that need to be made to anticipate them. To achieve these objectives, it is necessary to know in advance how vocational high school learning process before the pandemic, during the pandemic and the possibility of learning in the future of vocational high schools based on current development trends. The results of this study are expected to help schools, teachers, and students of vocational high school to make a better preparation to deal with the changes that might occur after the end of COVID-19 pandemic, so that the learning constrains that may be encountered in post-pandemic learning can be minimized.

1. **Method**

The approach for this study is literature review. The data were collected from several paper, paper in review are conference proceeding, journal articles, book chapter and copy of Indonesian government policy documents with years of range from 2011 until 2020. Categorizing the literature is based on the period Pre-COVID-19 pandemic, during the COVID-19 pandemic and Post-COVID-19 pandemic. The amount of literature reviewed in this study was 40 and the distribution of them according to the pandemic period is as follows:

Pre-COVID-19 Pandemic : 19 literatures

During the COVID-19 Pandemic : 9 literatures

Post-COVID-19 Pandemic : 12 literatures

1. **Result**

Vocational high schools learning process changes mainly due to the presence of a COVID-19 pandemic. Based on several of the literature reviews can be drawn finding that as following;

* 1. *Pre-COVID19 Vocational High School Learning (2011 – 2019)*

The purpose of vocational high schools learning is to improve work competency which includes aspects of knowledge, skills and attitudes. Before the COVID-19 pandemic took place, the organization of vocational high schools learning generally used work-based learning that was delivered face-to-face, such as production-based learning [7]. The learning implementation in Indonesian vocational high schools refers to the standards of the learning process that are part of the national standards of Indonesian education, according to these standards vocational high schools learning process is takes place at home, at school, and in the business or industrial world, using a variety of sources and held by utilizing information and communication technology [8].

Information and communication technology (ICT) used in vocational high schools learning is developing along with the presence of technology revolution. Utilization of ICT in vocational high school learning includes multimedia learning and e-learning. Multimedia learning that used include power point and computer-based interactive multimedia which are generally used in face-to-face learning in classroom [9]. The use of computer-based learning media encourages students to be more active in understanding the learning material presented and helps students gain higher knowledge and longer memory [10].

The use of interactive multimedia in learning results better learning achievement [11], [12] compared to power point media [9]. However, based on the average competency of students, in students with low academic ability, the use of computer-based media has the same effect as the use of power point media [13]. The success of learning with interactive multimedia is influenced by the ability of teachers to use ICT [14] and the availability of adequate facilities [15], [16]. In using multimedia learning, teachers need to find points of integration with traditional teaching methods, and learn from the strengths and weaknesses of each other so that better teaching results can be achieved [17]. The application of multimedia learning in vocational schools requires efforts to improve the ability of teachers through training activities and policy support from the school and other relevant parties [14], [18].

Along with easy access to technology, in order to achieve better learning outcomes, several vocational high schools in Indonesia have begun implementing electronic learning (e-learning). The use of e-learning in vocational high school has a positive impact on student learning progress. Students who use YouTube integrated Google Classroom based e-learning media have significantly greater learning outcomes. By utilizing the e-learning media, students were encouraged to use academic and reliable resources from their teachers in their tasks and homework [19].

However, the increased integration of technology in learning has led to several changes in teacher responsibility, including the change in the role of teachers who are no longer as a source of information [20]. E-learning is not only transferring a curriculum form paper to the internet, it takes more effort and time to do a needs analysis and planning [21]. Teachers need skills for operating and planning e learning as an instructional media, so the instructional design for e learning should be well prepared by the teacher. The teacher is required to know the model of instructional design which is suitable for e learning to be carried out and the indicators that are needed in implementing instructional design for e learning [22].

 Not all applications of e-learning in vocational high schools run optimally. According to the study, there are some things that need to be revised in the strategy of implementing e-learning systems in vocational high schools from the perspective of the social environment and facilitation conditions. Technical support including technology and domain pedagogy should be given more attention. Schools must provide an atmosphere of social environment conducive towards the implementation of e-learning. The implementation of e-learning should not only be considered as voluntary advice, but it needs support from the principal which is manifested in regulations [23].

 In addition, the diversity of school quality causes the use of ICT in learning is not practiced by all vocational high schools in Indonesia. The availability of facilities and the ability of teachers are two things that need support from various related parties. These two things also become obstacles in the implementation of online learning that was carried out during the COVID-19 pandemic.

* 1. *Vocational High School Learning During the COVID19 Pandemic (2020)*

During the COVID-19 pandemic, the role of technology became important in people's lives. In the education sector, technology is used for learning and as a media for teachers and students to stay connected [24]. Online classes at universities and online education for students are now becoming common, these changes may have relatively longer socio-psychological and behavioural implications [25]. Through innovations that continue to be made every day, this period becomes an opportunity to decide how and what we should change in the new era of education.[26].

 In Indonesia, digital platforms are used to facilitate the learning process from home [1]. The Ministry of Education and Culture also facilitates online learning policies by providing a *portal rumah belajar* which can be accessed through the website address belajar.kemdikbud.go.id. The main features of the *portal rumah belajar* are learning resources, digital classes, exercises and virtual laboratories. Besides that, there are supporting features such as electronic books and features of sustainable professional development. This website can be accessed by students and teachers at all levels of schools including vocational high schools level. All content in the *Portal Rumah Belajar* can be accessed and utilized free of charge [27].

 As long as online learning implementation, the teacher only acts as a mentor, students will succeed if the teacher gives them an appropriate learning strategy for students' online learning [28]. Communication between students and teachers has a basic effect on shaping students’ perceptions and approach to online learning [29]. Teachers' teaching skills in online learning and student's self-directed learning awareness are needed to support the success of online learning.

 On the other hand, although virtual learning platforms have the potential to play an important and useful role in online learning [30], not all students and teachers can access the platform. Access to distance learning through digital technology is identical with inequality especially for marginalized communities [31]. Therefore, various lessons learned from the organization of online learning during the COVID-19 pandemic should be taken as an evaluation material for improving the implementation of post-pandemic learning and the future of vocational high school learning.

* 1. *Post-COVID19: What Vocational High School Learning May Hold in The Future*

There is no doubt that in the future this world will be different. The presence of the technological revolution has quickly changed the way of human life. The COVID-19 pandemic is forcing us to accept these changes, technology has been used massively and become an important part of human efforts to survive during the COVID-19 pandemic. The COVID-19 pandemic has forced education to re-evaluate how organizations and systems are run [32]. Various forms of online learning and collaboration have become the focus of attention in efforts to ensure continued learning.

Various technological innovations have been developed to support teaching and learning activities. This technological developments and innovations will affect how post-pandemic COVID-19 learning takes place. Various 21st century digital learning applications such as mobile learning and virtual learning have a tendency to shift conventional learning [33]. However, the use of the internet and other information technologies should be used in order to increase quality in education instead of accelerating the education [34]. The use of technology in learning is about using the right tools at the right time for the right purpose in a given context, so it is important for teachers to be able to decide what and when a learning technology is used [35].

 Meanwhile, students today are the Z generation who are the first generation born and grew up when technology has developed and all physical aspects of the world have digital equivalents. [36]. With these characteristics, the student adaptation process to the use of technology in learning process during the COVID-19 pandemic is possible to occur more quickly. This is why in post-COVID-19 learning, teachers must prepare to adapt to new learning technologies while making adjustments to the students characteristics that change after the adaptation process.

In vocational high schools, face-to-face learning cannot be replaced by virtual learning, especially in the learning of vocational practices, but the use of technology is still needed to improve the quality of learning that is adapted to the characteristics of students and the development of technology. One of alternative learning in vocational high school is blended learning. Blended learning is a mix of physical and online activities and experiences. Blended learning fits with the modern and connecting lifestyle. Blended learning also provide specific benefits to students, teachers, and administration, such as increased access and convenience, improved learning and decrease (or more flexible) costs, these benefits can be obtained if blended learning is carried out according to standard [37].

Blended learning is a method which serves the best learning environment where self-autonomy is essential [38]. So as to achieve successful learning in blended learning, awareness of independent student learning is needed. Self-Directed Learning is defined as the process in which students take initiative, with or without the help of others, in diagnosing their needs, formulating learning goals, identifying human resources and materials for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes [39]. Therefore, the full use of educational technology, especially the internet, interactive multimedia materials, and other technology-based media, needs to be directed to improve the quality of learning programs, especially in promoting self- directed learning.

However, the success of learners who undertake independent learning through digital-based forms of education cannot be seen as a trend that can be generalized broadly and can be replicated. When some students are able to develop by being freed through independent learning, many other students don't [40]. In addition, although students today are the first generation to grow in ICT culture, digital gap is still found among those who regularly use ICT, so socio-cultural interventions are still needed to minimize the effects of inequality caused by the use of the technology [41]. On the other hand, the integration of technology in effective learning depends on important conditions such as adequate funding and current resources [42]. Thus, support from various related parties is needed so that the integration of technology in learning can be carried out effectively. Improved teacher professionalism is also expected to improve student’s academic performance [43].

1. **Discussion**

The challenges facing vocational high schools in the future demand learner-centred innovative and flexible approaches including a reoriented curriculum to take account of new subjects and issues such as technology and the environment [44]. In addition, the challenges of learning changes after the COVID-19 pandemic also had an impact on schools, teachers, students and other related parties. Based on the findings of the literature review, to anticipate the changes that occur in post COVID-19 learning in vocational high schools, some efforts are needed as follows:

1. Teachers need to improve their teaching skills and ICT skills through training activities, including online trainings held during the COVID-19 pandemic by various relevant parties
2. Students need to increase awareness of independent learning to achieve successful learning during and after the COVID-19 pandemic
3. Schools in coordination with the education office and other relevant parties need to prepare strategies for implementing post-pandemic learning, including the provision of facilities, training for teachers and supporting policies.
4. **Conclusions**

The use of technology in learning is the factor that most changes in the implementation of learning in vocational high schools. Efforts to prepare for vocational high school learning in the future are the responsibility of all parties, including schools and teachers. The lessons learned from learning process during the COVID-19 pandemic are expected to be an evaluation material for future learning.

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