

# 21st Century Based E-Learning in Mechatronics Course

Puteri Ardista Nursisda Mawangi<sup>1</sup>  
Vocational Education Study Program  
Postgraduate State University of Malang  
Mechanical Engineering Education Study Program  
Faculty of Engineering  
Universitas Negeri Malang  
puteriardista95@gmail.com

Djoko Kustono<sup>2</sup>  
Mechanical Engineering  
Faculty of Engineering  
Universitas Negeri Malang

Widiyanti<sup>3</sup>  
Mechanical Engineering  
Faculty of Engineering  
Universitas Negeri Malang

**Abstract**— In the 21st century which everything is digitized, learning has also been using the internet. many colleges use the e-learning system to create their own portal, but it is not adequate and many features that are not active yet. The mechatronic lecture that is needed in the 21st century but still many who do not use e-learning. Along with learning the 21st century, mechatronics should be implemented with the e-learning system that reflects the 21st century learning. The use of free e-learning platform such as Edmodo as an alternative to achieve the 21st century learning in the course of mechatronic is noteworthy. Seeing the results of the use of Edmodo has a positive impact on improving learner learning outcomes.

**Keywords**— 21st century, e-learning, mechatronics

## I. INTRODUCTION

Nowadays communication has been conducted over the internet in a matter of seconds so that people can easily get connected to the rest of the world [1]. Not only in communication, but the learning process is also using the internet. Media are required to facilitate the learning process. Traditional media tends to need more time because it takes time for face to face meeting when the courses hour are limited. Modern media based on information technology (internet) save times, because learning can be done anywhere and anytime [2]. Media which used in the learning process is selected based on their expediency (effectiveness and efficiency), novelty and learners interest toward the media. Currently, learners are more interested in finding information/knowledge through the Internet. So the use of the internet as a learning media is an effective and efficient option.

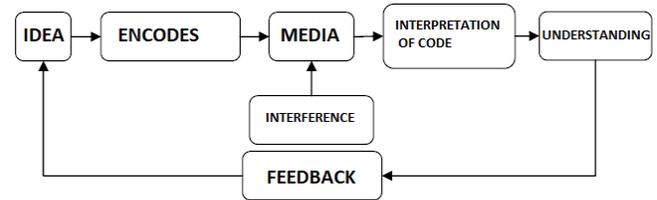


Figure 1. Position media in the learning process [3]

Based on Indonesian Internet Service Provider Association, 2017, internet usage in the area of education as much as 88.24% at the level of S2 / S3 and 79.23% at the level of Diploma / S1 [4]. In some universities and vocational colleges, the Internet has been a medium of learning, although not in an e-learning system, 21st century learning models presenting the latest instructional innovation [5]. Entering the 21st century, technological advances have been demanding educators and learners have learning abilities in the all-digital age [6]. Development occurs not only in the realm of education, but in the world of the industry also has undergone changes. In the 21st century many industries who use robots. The needs of the robotics science as the lives of the industrial revolution 4.0 cannot be separated from the mechatronics science.

Some universities already provide e-learning system, including lectures in mechatronics. However, the observations show there are many e-learning systems that are no active and incomplete. There are still no offering of mechatronics course in the e-learning system which is provided in some universities, see figure 1 and 2. This indicates that the course of mechatronic still ongoing with face to face meetings this institution.

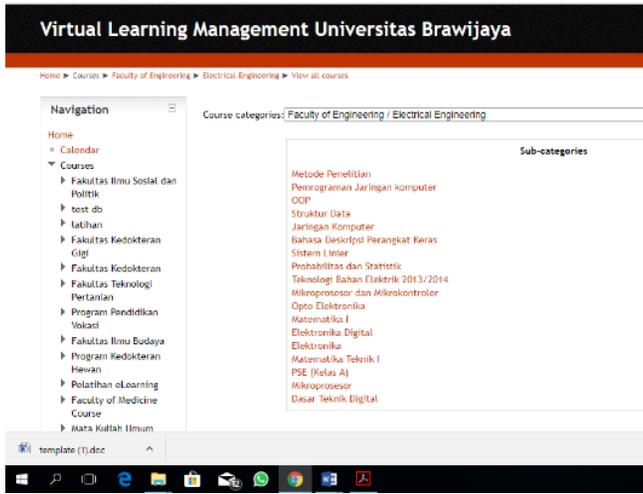


Figure 2. E-learning UB [7]

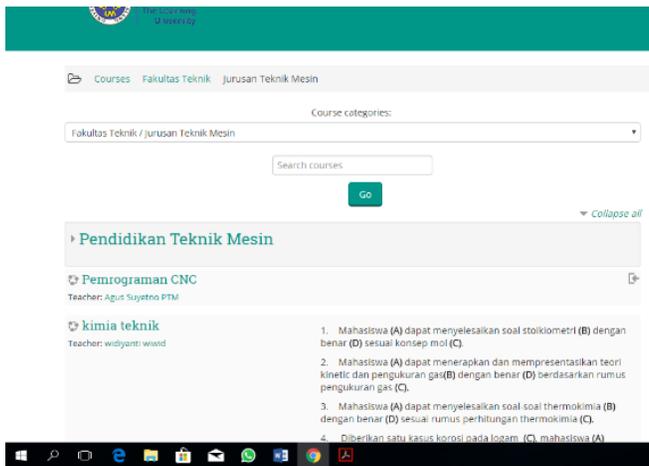


Figure 3. E-learning UM [8]

What is interesting to examine is how the dynamics of this school became one of the main contributors to the progress of the *Wathiqubillah* Dynasty (a title for the Kingdom of Sambas).

## II. DISCUSSION AND ANALYSIS

### A. The urgency of Mechatronics courset

Mechatronics is a course that consists of practical learning and theoretical learning, see Table 1. Mechatronics is a course required in the development of technology in the 21st century, because it is the science of the design process that includes a combination of techniques (machinery engineering, electrical engineering, telecommunications engineering, control engineering, and computer engineering) [10]. Mechatronics is a system consisting of mechanical and electronic parts. Mechatronics science is closely related to robotics technology development. Mechatronics is accepted as a new discipline in Europe in March 1986 when the Advisory Committee for Industrial Development and Research of the European

Communities has acknowledged that mechatronics is a major requirement in the European research and education program [11].

Table 1. Description competence mechatronics course [9]

Description of competence	the type of grain
Describe the concepts and mechatronic applications.	theory
Identify the main device robotic and functions.	theory
Explain the working principle, characteristics, and application of various types of sensors (linear and rotation, acceleration, force, torque, flow, temperature, distance, light, vision, integrated microsensor).	theory
Demonstrating the working principles, characteristics, and application of various types of sensors (linear and rotation, acceleration, force, torque, flow, temperature, distance, light, vision, integrated microsensor).	practice
Explaining the functions and working principle of actuators (electric motors, hydraulic, pneumatic, electromechanical).	theory
Demonstrating the working principles, characteristics, and application of various types of sensors (linear and rotation, acceleration, force, torque, flow, temperature, distance, light, vision, integrated microsensor).	practice
Conditioning the signal on mechatronics.	practice
Designing mechatronic systems.	practice
Applying a mechatronics system	practice

### B. 21st Century Learning

Jennifer Nichols describes four specific characteristics of the 21st century learning as follows: (1) instruction should be learner-centered, learners are placed as the subject of active learning develop interests and potentials; (2) education should be collaborative, learners must be taught to collaborate with others. Collaborate with different people in different cultures and values ; (3) learning should have a context, learning will not mean much if it does not have an impact on learner life outside of school. Therefore, the subject matter needs to be associated with the daily life of learners; and (4) schools should be integrated with society, as an effort to prepare learners to become responsible citizens, educational institutions should be able to facilitate learners to get involved in their social environment. For example, hold community service activities [12].

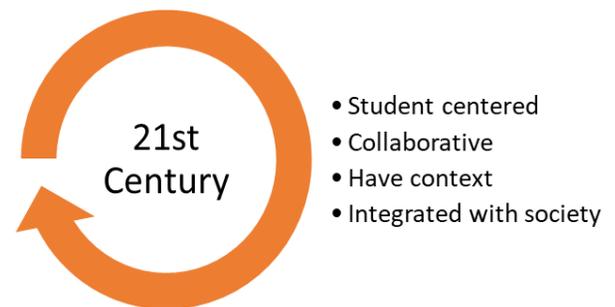


Figure 4. 4 distinctive characteristics of the 21st century learning

### C. E-Learning

E-learning is a learning activity that utilizes a computer network (internet, LAN, WAN) as a method of delivery, interaction, and is facilitated and supported by various other

forms of learning services [13]. There is at least three functions of e-learning to the learning activities in the classroom, as an optional, complementary or substitute [14]. Learners and educators can continue to communicate anytime and anywhere by accessing the e-learning system. the e-learning system will not only increase the knowledge of all learners but also will help ease the burden of educators in the teaching-learning process because in this system some educators function could be taken over by a computer program. The results of the learning process can be stored in the form of learner's database that can be used anytime and anywhere. System e-learning organization supported by the government through the Ministry of National Education No. 107 / U / 2001 [15]. Here are the benefits of e-learning in education, among others: (1) increase the motivation of learners, (2) effective and efficient digital portfolio, (3) broaden the perspective and the thinking horizon, (4) foster a cooperative spirit, (5) it can be a measuring instrument of the learning concept that we do compare with schools from other countries [16].

D. 21st Century Learning Based on E-Learning in Mechatronics Course

Department of Educational of Yogyakarta has realized the 21st Century Skills Learning based on e-learning with the launch of the jogjabelajar portal which has features as shown in Figure 5.

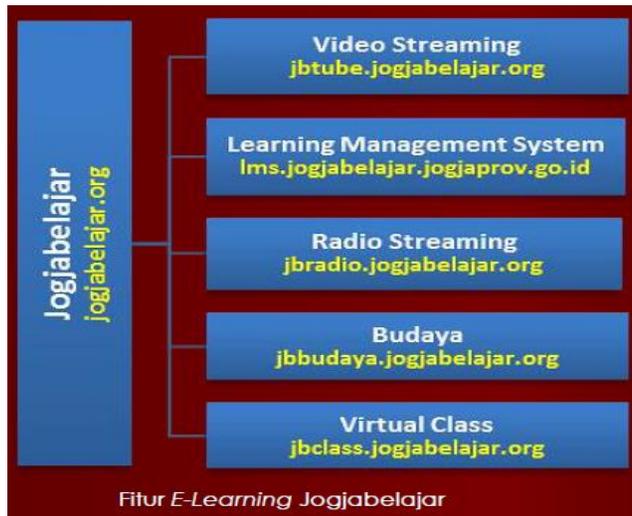


Figure 5. Features Jogjabelajar e-learning [17]

21st century learning based on e-learning features the Learning Management System and virtual classes that do not necessarily exist in general e-learning. If we can't create a portal, we can take advantage of the social networking-based learning platform for free that can help create the 21st century learning. For example, by using "Edmodo" or "Google classroom". These have e-learning features which more complete than the other platform, see asterisks in Figures 6 and 7. The learning models of mechatronic using Edmodo platform as a compliment or Substitution can be shown in figure 6 and 7.

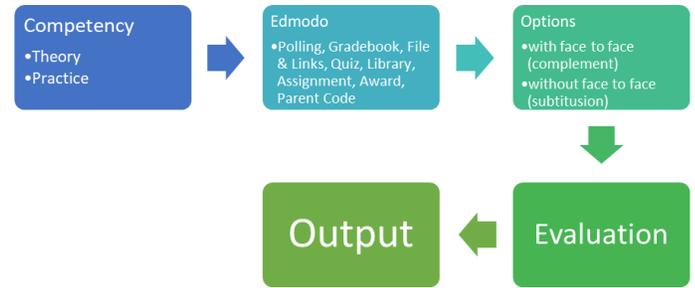


Figure 6. Mechatronic Learning Model with Edmodo

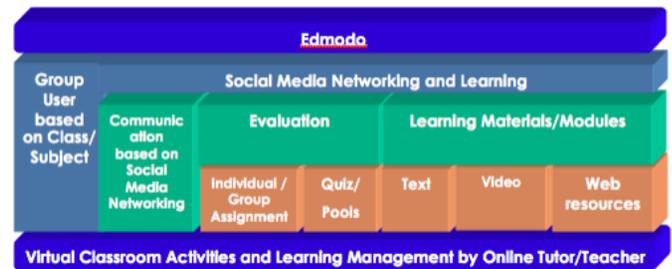


Figure 7. Framework Edmodo

In the implementation of mechatronic's practical learning, the supervision of learners is needed. Therefore, there are 2 choices of supervision model. First, if using face to face meeting then supervision will be done directly by the educator. Secondly, if without face to face meeting the educator must use the tools to create a video with a camera and then uploaded to Edmodo. In fact, Edmodo is often used as a complement to learning theory, but for the future, it is not possible to use as a learning substitution in practice. According to the research by Perkasa, the effectiveness of using Edmodo platform as a complement, conclude that the results of learners who use Edmodo in e-learning there is an increase of learning outcomes if compared with the results of learners who aren't using Edmodo and the use of Edmodo is included in the category of effective [18].

III. CONCLUSION

A. Conclusion

In Indonesia, the e-learning system provided for mechatronics course is still inadequate. Though mechatronics is a science that is needed in the industry of the 21st century. 21st century learning models presenting the latest instructional innovation requires knowledge deployment wherever and whenever. Therefore, educators and learners should have the capability of learning in the 21st century. Edmodo platform as an alternative to the use of e-learning system that reflects the 21st century learning is a choice that must be taken into account, in fact the result of Edmodo as e-learning platform is effective and can be used to improve learning outcomes.

## B. Sugestion

Educators are expected to be more familiar with e-learning and learning of the 21st century. Moreover universities in Indonesia would be better if it can create an e-learning platform that reflects the 21st century learning.

### REFERENCES

- [1] U. Budiarmo, Pembelajaran Abad XXI dan Kurikulum 2013 (21st Century Learning and Curriculum 2013), (online), (<http://upomobudiarmo.gurusiana.id/article/pembelajaran-abad-21-dan-kurikulum-2013-4465-56-11-16>) accessed on July 15, 2018 (2018)
- [2] B. D. Puspitasari, thesis: Pengembangan E-Learning pada Mata Pelajaran Simulasi Digital Paket Keahlian Teknik Mekatronika di SMK. (Development of E-Learning in the Digital Simulation Package Subjects Mechatronics in Vocational Skills. Yogyakarta: Yogyakarta State University, not printed (2015)
- [3] Daryanto, Media Pembelajaran (Learning Media). Yogyakarta: Gava Media (2010)
- [4] F. K. Bohang, Internet Berapa Jumlah Pengguna Internet Indonesia? (Internet Users How many Internet Indonesia?), (online), (<https://tekno.kompas.com/read/2018/02/22/16453177/berapa-jumlah-pengguna-internet-indonesia>) accessed on 15 July 2018 (2018)
- [5] A. Rohim, R. Milky A. and S. G. Julian, paper: Belajar dan Pembelajaran di Abad XXI (Teaching and Learning in the 21st Century). Yogyakarta: Yogyakarta State University, not printed (2016)
- [6] Rusman, D. Kurniawan, and C. Riyana, Pembelajaran Berbasis Teknologi Informasi dan Komunikasi (Based Learning Information and Communication Technology). Jakarta: Grafindo Persada (2012)
- [7] Universitas Brawijaya, Virtual Learning Management Universitas Brawijaya (Brawijaya University Virtual Learning Management) (online), (<http://vlm.ub.ac.id/course/category.php?id=9&perpage=20&page=1>) accessed on July 15, 2018 (2018)
- [8] Universitas Negeri Malang, Pembelajaran Online Universitas Negeri Malang State University of Malang Online Learning, (online), (<http://e-learning.um.ac.id/>) Accessed on July 15, 2018 (2018)
- [9] Universitas Negeri Malang, Kurikulum Teknik Mesin Edisi 2014 Fakultas Teknik Universitas Negeri Malang (Curriculum 2014 edition of Mechanical Engineering, Faculty of Engineering, State University of Malang). Malang: UM Press (2014)
- [10] A. Gullu, O. AKI, and H. KUŞÇU. J. Proc. Soc and Beh Sci, 176, 1050- 1055 (2015)
- [11] D. Liliana and P. S. Florina. J. Proc. Soc and Beh Sci, 203, 205- 209 (2015)
- [12] J. R. Nichols, 4 Essential Rules of 21st Century Learning, (online), (<https://www.teachthought.com/learning/4-essential-rules-of-21st-century-learning/>) accessed on July 15, 2018 (2017)
- [13] R. Adawi. J. Unimed, 69 (2008)
- [14] S. Siahaan, E-Learning (Pembelajaran Elektronik) Sebagai Salah Satu Alternatif Kegiatan Pembelajaran (E-Learning (Electronic Learning) As One Of Alternative Learning Activities), (online), (<http://www.Depdiknas.go.id>) accessed on July 16, 2018 (2002)
- [15] E. Kusumaputri. J. UIN. Sun. Kali. Hum, 8, 62-75 (2011)
- [16] O. H. Hanggi, Pentingnya E-Learning dalam Pendidikan (The Importance of E-Learning in Education), (online), (<https://www.kompasiana.com/olive.hanggi/54f35b88745513902b6c7229/pentingnya-elearning-dalam-pendidikan>) accessed on July 18, 2018 (2015)
- [17] K. B. Aji. Pembelajaran Berbasis Keterampilan Abad XXI (21st Century Skills-Based Learning). KMP Ed.Res. Con (2017)
- [18] Y. S. Perkasa, thesis: : Efektivitas Penggunaan E-Learning Edmodo pada Mata Pelajaran Simulasi Digital Mahasiswa Kelas X SMK Muhammadiyah 1 Bantul (Effectiveness of E-Learning Subjects Edmodo on Digital Simulation Learner Class X SMK Muhammadiyah 1 Bantul). Yogyakarta: Yogyakarta State University, not printed (2015)