Teachers' Competency in Managing e-learning Media: A Perspective and Challenges in Facing the Industry 4.0

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In facing the challenges of the Industrial Revolution 4.0, information and communication technology (ICT) plays an important role in the process of empowering technology into teaching and learning activities. E-learning refers to a teaching method which utilises electronic media as a component of ICT and offers a solution to add value to teaching and learning by enhancing the effectiveness of learning. This study aims to identify teachers' competence in designing and utilising electronic learning (e-learning) media in schools. The study employed an explanatory descriptive approach. The quantitative research was conducted through the research subjects, comprised of 20 teachers of two senior vocational schools in the Gorontalo Province, Indonesia. This research relied on data obtained from a questionnaire, observation, interviews, and documentation to determine the profile teachers' competency in managing e-learning media to enhance teaching practices in the classroom.

Keywords: *Teachers' competence, Learning media, E-learning, Industrial Revolution 4.0.*

Introduction

In the current era of the Industrial Revolution 4.0, technology has become an inseparable feature accessed by human beings due to its rapid development. Aside from its significant impact upon people's lifestyle, communication modes, and social interaction, the development of technology has brought fruitful innovations in making things easier and time efficient (Alcácer & Cruz-Machado, 2019; Slusarczyk, 2018; Deloitte, 2015). In addition to its impact in aspects of life, the incorporation of technology in the education field has led to a significant shift within the education system in schools. Previously used only by select

groups, the Internet has gradually become essential in the present age. The Internet allows the mass sharing of digital content, including e-learning materials, to a wide range of users simultaneously, any where and any time. That being said, the use of e-learning materials in education is now a must-have program (Kinshuk & Cheng, 2016; Ikere et al., 2012; Bhuasiri et al., 2012).

Conceptually, e-learning is a learning model that involves the Internet and an IT network. It enables teachers to conduct an online-based learning process, as well as monitor and evaluate without having to be in the same place with the students (Hwang, 2014). Moreover, e-learning media provides different perspectives to the teacher in regard to integrating between the learning materials, and specific topics. By virtue of technology, teachers can visualise seemingly unreachable fields, including the exploration of the vast world unseen-before or microscopic objects, such as bacteria. E-learning is also easy to apply and provides an effective learning experience, allowing the students to be more engaged and motivated in responding to the learning content (Demiray & İşman, 2001; Price, 2015). Aside from that, e-learning shifts the focus from the passive teacher-centred learning activities to the students, offering flexibility to the students to choose the learning materials based on their preference, in order to accommodate their learning needs.

Due to the growing demands for e-learning media, a workshop on e-learning media management has previously been conducted for senior vocational school teachers within the Province Gorontalo, Indonesia. The program serves as the actualisation of the three principles of higher education; education, research, and community service. The program aimed to develop teachers' competence in utilising e-learning media, as a means to support the implementation of the learning process.

Based on a preliminary observation in the sub-district, teachers are not familiar with e-learning media, despite the fact that the region is connected to the Internet. A training program based on e-learning media management is essential to increase the teachers' skills to achieve an optimal learning process. This present research is carried out during the training of e-learning media management conducted by university students at two senior vocational schools within the Province Gorontalo, Indonesia. The students were under the supervision of lecturers and experts in the ICT field and in the training process of the vocational teachers' schools. The participants included teachers from the senior vocational schools, SMK Taruna Bahari, and SMK 4 in the North Gorontalo District, Gorontalo, Indonesia. The teachers' competence, such as skills, knowledge, and attitude, is essential in e-learning media utilisation in the teaching and learning process. The training is expected to improve teachers' competence in the previously mentioned subject, as teachers are required to adjust to the Industrial Revolution 4.0 era. Concerning this issue, this study delves upon elaborating the teachers' competence of e-learning media management.

Literature Review

The teachers' competence, conceptually, is an intellectual potential that is actualised in performing their professional duties. Teachers' competence also involves their ability to guide, nurture, and provide advice to the students to achieve optimal results. Professional teachers view their job as a symbol of dedication, rather than from merely a money-based outlook (Kumar, 2013, p.17).

Selvi (2010, p.168–167) mentions several competences that a professional teacher must possess, as follows: field competence, research competence, curriculum competence, lifelong learning competence, socio-cultural competence, emotional competence, communication competence, ICT competence, and environmental competence.

On the other hand, Article 10 of Law 14/2002 on Teachers and Lecturers states that teachers' competence comprises pedagogical competence, characteristic competence, social competence, and professional competence, which is earned from a professional education. Nasrul (2012, p.37) argues that the previously mentioned competences are regarded as closely interrelated, and reciprocal, as well as underlying each other.

Omenge and Priscah (2016, p.1) posit that learning media involves all the substantial tools and resources available to be utilised by the teacher during the learning process, in an effort to accommodate the students in achieving the expected results. The learning media may comprise traditional variations, including a whiteboard, printed materials (handouts, books, and worksheet), a display board, chart, PowerPoint presentation slide, overhead projector, physical items, and recordings of videos or movies, as well as modern variations, such as computers, a display model or figure, DVDs, CD-ROMs, an interactive whiteboard, the Internet, and an interactive videoconference, among others. The previously mentioned variations of media provide flexibility to the teacher in designing the most effective medium to enhance the students' comprehension of the learning material (Li et al., 2015; Ikere et al., 2012).

The key objectives of learning media are to facilitate communication and the learning process (Rahadian & Budiningsih, 2017). On the other hand, Jamuna and Pankajam (2017) argue that learning media aims to stimulate meaningful comprehension of the learning process. Therefore, one needs to take into account each variation's strengths and weaknesses in designing an effective learning media. Echoing the notion, Adegbija and Fakomogbon (2012) assert that designing a process of learning media relies on aspects of the teaching approach employed. For example, individual instruction, group instruction, a combination between both or direct instruction. In teacher-centred direct instruction, the effectiveness of learning media is related to its utilisation in accordance with the learning objectives. This is supported

by Fajriah and Churiyah (2016), that designing a process of learning media needs to take into account the facilities available in schools; not every media is applicable in most of schools.

As cited in Davies (2015), the European Parliamentary Research Service states that the idea of the Industrial Revolution 4.0 was born based on the notion that the industrial revolution has occurred four times. The first revolution in 1784 occurred in United Kingdom (UK), marked by the invention of the steam machine, and mechanisation that replaced human workers. The second revolution, occurring in the end of nineteenth century, was triggered by the innovation of electric mass production machines. The computerisation approach of manufacture automation in the nineteen-seventies was highly regarded as the key marker of the third industrial revolution. In the present era, developments in technology creating sensors, interconnection, and data analysis, has given birth to the idea of integrating the various aspects of technology within the industry field. This concept is highly regarded as the next or fourth industrial revolution. The Industrial Revolution 4.0, compared to the previous revolutions, is considered somewhat phenomenal. It is regarded as a priori concept, since it is still an imagined concept and is yet to occur in the real world (Drath & Horch, 2014; Zeitoun, 2008).

Innovations in the IT field has led to the rise of artificial intelligence (AI), which adopts a human individual's capabilities inside an application for better production process automation. Bringing its significant impacts around the world, the Industrial Revolution 4.0 boasts the efficiency of automation in a wide range of activities that connects people all over the world, as well as being the foundation of an online-based trade transaction and transportation service (Hamdani, 2018).

One of the key distinctions of the Industrial Revolution 4.0 is that the industry is connected to almost every aspect of life, and in ways that the industry processes and commercialises the exchange of information between human beings, between human beings and things, as well as between the things themselves. The concept of the 'Internet of Things' (IoT) allows the efficient process of ordering, production, implementation, and delivery, without the need of a human individual within each process (Ślusarczyk, 2018). The Industrial Revolution 4.0 gave rise to groundbreaking changes in modern production by virtue of achievements in digitalisation, robotisation, AI and IoT, new variations of materials, and biotechnology. These changes have boosted people's welfare, as well as created new jobs in developed countries (Vasin et al., 2018).

The Industrial Revolution 4.0 is well-known for its massive disruption on high competition in fields such as politics, economy, education, social, and religious beliefs. Setiawan et al. (2018) contends this disruption is caused by technological advancements, the millennial generation, the speed of microprocessors, disruptive leaders, a shift in how to win, and the

IoT. Liao et al. (2018) assert that the focus of the Industrial Revolution 4.0 is in the fields of research and development, employment, education and training, the modernisation of infrastructure, and chemical and transportation tools manufacturing.

E-learning is a learning model that utilises the Internet as one of the advancements in ICT (Mahmun, 2012). Either conducted remotely or face-to-face, e-learning is technology-mediated learning that uses computers. This online-based classroom arrangement is a shift from the traditional approaches of education and training to a collaboration-based learning that is personalised, flexible, individual, independent, and collaborative, and which is based upon a community of students, teachers, facilitators, and experts (Jethro et al., 2012; Jung & Jung, 2013).

E-learning involves the use of digital technology tools for teaching and learning any time and any where. This involves training, the delivery of knowledge by motivating students to interact with each other, and exchanging and respecting differences of opinion to facilitate communication and enhance the relationships that support the learning process. Its significant impact upon education has increased access to information, and provided a rich environment for collaboration among students (Arkorful & Abaidoo, 2014). E-learning has shown increased levels of retention, and enhanced utilisation of content, resulting in an improved attainment of knowledge, skills, and attitudes. Multimedia e-learning also offers students the flexibility to choose from a large menu of media choices to accommodate their diverse learning styles (Jethro et al., 2012; Music, 2013).

E-learning provides the advantage of 24-hour access, 365 days a year, compared to the use of instructor-led training (ILT), which requires scheduling of one learning duration. Compared to ILT, e-learning is suitable for students who have scheduling conflicts between education and other essential needs. In addition, e-learning is cost effective because the developed course content is easily modifiable for further improvements, whereas ILT is expensive because there are some associated costs, including the cost of content development, good teaching professionals, handout copy multiplication, infrastructure, electricity, training material, stationery, travel, food, lodging, and parking fees, among others. It is undeniable that ILT's advantage is the physical presence of an instructor in the class, whom can solve students' questions instantly. However, e-learning allows students to learn at their own pace compared to ILT, which demands student discipline through courses in a specific learning timeframe. In e-learning, students can focus only on learning what is important and ignore unnecessary information, unlike ILT, which teaches all the information and at the same level as the whole class. Therefore, e-learning is a learning model that is far better, cheaper, and student-friendly compared to ILT, which is considered to be old-fashioned (Goyal, 2012; Ehlers & Conole, 2010).

Hakimi et al. (2016) states that e-learning is a model that should be considered in designing the learning process due to its significant impact on learning. The overall benefits of e-learning include the promotion of learning; independence and individual satisfaction; flexible learning any time and any where; participants come from diverse backgrounds; learning without the same prerequisite obligations; processes that adjust to the speed, and needs of individuals; cooperative learning; time efficiency, cost, and environmental burdens; the opportunity to be a peer to others; fast and optimal results; and varied and interactive learning utilising multimedia (Oliver, 2016; Arkorful & Abaidoo, 2014).

Furthermore, Towhidi (2010) states that a successful online teacher possesses the following characteristics: they are visible, as students need to feel that the instructor is present for them, even in remote learning; they are organised, including are well prepared and has a well-established assessment strategy and activities; allows students to communicate directly; are analytical, including being actively involved in ongoing discussions about the learning content and concepts; and are a model teacher, being a model of best practice in teaching.

Research Method

This descriptive quantitative research employed an explanatory method to explain the object under study through research data, and make general conclusions. Descriptive research is conducted to describe one or more variables without making comparisons or relating them to other variables.

The study involved the research subjects, who were 20 teachers who participated in e-learning media management training conducted by KKS program students under the direct monitoring of supervisors and experts in ICT.

The data was collected via a close-ended questionnaire using a five-level Likert scale based on frequency, as well as through direct observation, interviews to acquire data on the respondents' feedback regarding their competence in e-learning management, and documentation to compile notes and documents regarding the teachers' competence.

The collected data was classified and processed to gain an overview of the teachers' competence. The study involved conducting a frequency table descriptive analysis upon the questionnaire data by using the following formula (Sugiyono, 2012, p.107):

$$Score\ percentage = \frac{Total\ Amount}{Total\ score}_{(\%)} x\ 100\%$$

The score percentage for each indicator describes the level of teachers' competence. The data was further classified by referring to the criteria, as designed by Thoha (2003):

Table 1: Interpretation guidelines on the teachers' competence

Percentage	Interpretation
91–100	Very Good
81–90	Good
71–80	Moderate
61–70	Low
≤60	Very Low

Findings and Discussion

Designing instructional media is very important because it is central to the success of its objectives. Learning media require analysis by paying close attention to various aspects, including the students' goals, needs, and conditions; learning material content; and the development of learning success measurement tools. Furthermore, learning media based on e-learning needs to be prepared in the form of a media planning script, which is to be tested and improved.

As the Ministry of Education (Kemendikbud, 2017) stipulates, the steps of designing learning media are: (1) analysing the needs and characteristics of students, (2) formulating goals, (3) determining the structure of media content and type, (4) determining the treatment and participation of students, (5) creating a sketch and/or story board, (6) determining the materials and/or tools to be used, (7) implementation of media making and testing, and (8) carrying out activities and evaluating. The results of the teachers' competence in designing e-learning media is shown in the following table.

Table 2: Teachers' competence in designing e-learning media

Aspect	Percentage	Criteria
Analysing the students' needs and characteristics	80.25	Good
Formulating goals	79.50	Moderate
Formulating items of learning materials in detail	79.25	Moderate
Developing learning success measurement	84.50	Good
Writing a learning media transcript	82.25	Good
Conducting a test and revision of the media	81.75	Good
Average	81.25	Good

This study finds out that teachers were competent in the steps of analysing the students' needs and characteristics, developing measurement tools, writing scripts, and making improvements to learning media based on e-learning. Moreover, the developed measurement tools were appropriate and in accordance with the materials and learning objectives. The content was

designed in a good manner and was initially analysed prior to delivery. Furthermore, the teachers were able to identify and adjust the learning media with the expected goals and to conduct revision on the aspects that required improvements. However, the teachers found it difficult to adjust the learning objectives with the content of e-learning media. The teachers also faced difficulty in presenting detailed material in simpler content forms, as well as in complicated ones.

After the design stage, the next crucial stage was media utilisation. This stage began with a preparation process in selecting and determining the e-learning media to be used. Furthermore, teachers prepare students' capabailities, so that they can use e-learning media optimally. The next stage is the implementation of e-learning media. This stage requires the teacher's expertise in using e-learning media. The last stage is the evaluation of learning to determine the extent to which the teaching objectives are achieved, and to assess the extent of the influence of learning media to support the success of the learning process.

Anwar (2011) elaborates that learning media utilisation requires taking into account the four steps of preparation, presentation, implementation, and evaluation. In line with this, Ramli (2012) mentions aspects that are central to the utilisation of the media, namely: (1) teacher preparation, including preparing media, preparation for media use skills, consideration of the advantages and disadvantages of using media, and preparation of materials that students may not be able to grasp clearly; (2) preparing the class, including students' mental readiness to accept lessons using media, and the class atmosphere prior to the application of media; (3) media presentation, including media content must be appropriate and supportive of the learning material, the media used is easy to obtain and is in accordance with the level of student intelligence, the media can facilitate all students, the message is not disturbed by other elements, and the media should be able to stimulate students to focus on the material; and (4) evaluation, including measurement of the extent to which the success of learning using media can achieve minimal competence (Fields, 2015). The teachers' competence in utilising media is displayed in following Table 3.

Table 3: Teachers' competence in utilising media

| Aspect	Percentage	Criteria
Teacher preparation	82.00	Good
Class preparation	81.20	Good
Learning material presentation	82.50	Good
Learning evaluation	79.00	Moderate
Average	81.18	Good

This research found that the teachers showed a good performance in e-learning media utilization. Moreover, the teachers were able to conduct proper preparation prior to the

learning process. They were competent in identifying the strengths and weaknesses of e-learning media, in order to formulate strategies to cover the shortcomings. During the implementation of the learning activity, teachers were competent in preparing students to utilise e-learning media. The presentation of teachers regarding the learning material was also considered 'very good' in facilitating the students. It resulted in an overall good delivery of information and messages to the students. However, the teachers faced difficulty in measuring the effectiveness of e-learning based in accordance with the achievement of the learning objectives.

Based on the previous data, the percentage of teachers' competence in designing and utilising learning media is presented in the following histogram:

Figure 1. Teachers' competence in e-learning media management
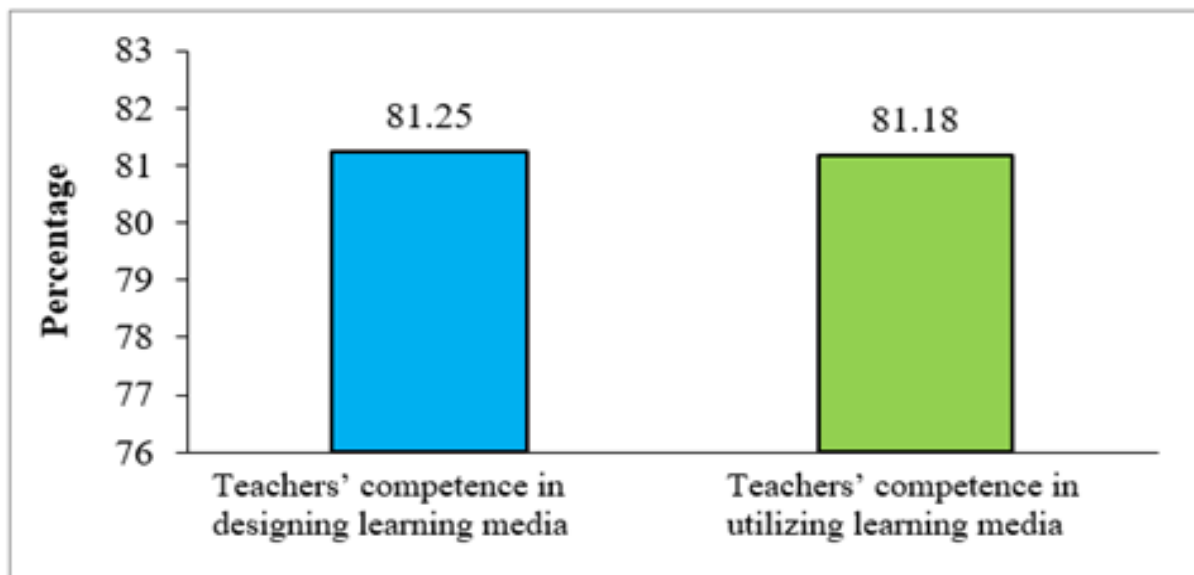
The analysis result indicates that the competence of teachers in designing e-learning media is at a level of 81.25 per cent, with interpretation of a 'good' criteria. Furthermore, the competence of teachers in utilising e-learning media reached a rate of 81.18 per cent, with a 'good' interpretation. Overall, the percentage of teacher competence in managing e-learning media reached 81.21 per cent, falling into the 'good' criteria.

Conclusion

The development of the Industrial Revolution 4.0, which is based upon the IoT and services, and follows mechanisation (Industry 1.0), mass production (Industry 2.0), and automation (Industry 3.0), has given birth to the concept of 'e-learning', as an advancement in education. E-learning involves the utilisation of the Internet to enhance students' comprehension, and

therefore, requires teachers' competence in aspects of design and utility. This study concludes that teachers' competence in designing and utilising e-learning media within the research site falls into a 'good' criteria. Henceforth, the teachers' overall competence in e-learning media management is considered 'good'. The result of this study has revealed that the profile of teachers' competency in the management of e-learning media within the teaching and learning activities indicates a positive expectation of being able to overcome the challenges of the Industry 4.0.

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