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To cite this article: B Lastariwati *et al* 2021 *J. Phys.: Conf. Ser.* **1833** 012069

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# Exploration of the determining factors of successful online learning in the industrial revolution 4.0 era

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**Abstract.** This study explores factors that determine the success of online learning in the aspects of (1) students; (2) lecturers/teachers, (3) learning methods; (4) learning content; and (5) educational institutions. This study was a meta-analysis study. The data sources were obtained from online journal articles published from 2018 to 2020. This study was conducted by selecting relevant articles, and re-synthesizing the research results qualitatively and quantitatively. The data were collected by reading, coding, analyzing in-depth, and interpreting the results of the analysis according to the research objectives. Data credibility was controlled by involving a second reader (inter-reader and inter-coder) The results showed the determinants of successful online learning are: (1) the students' motivation and self-efficacy because the students must be able to overcome their obstacles (2) successful online learning methods require individual intervention from lecturers; (3) lecturers with technology literacy are more successful and able support other lecturers, (4) successful online learning content uses various sources and is actively involved in forums and (5) institutions facilitate Learning Management Systems and other online learning tools.

## 1. Introduction

The society in the industrial revolution era 4.0 use digital or internet technology to work, interact, and communicate in daily lives. Education has also shifted from traditional face-to-face learning to online learning. Higher education is a pioneer of change in the field of internet-based education [1]. Various online learning models currently widely used include: e-learning, distance learning, blended learning, flipped classroom learning, MUVES (Multi-User Virtual Environments), and MOOCs (Massive Open Online Courses).

Online learning allows students to learn from a distance, not limited by space and time, thus it is ideal for learning during the unfolding COVID 19 pandemic. Online learning systems have advantages and disadvantages. This study examines the characteristics of successful and effective online learning for the users. It was conducted through a meta-analysis study of the research results on the online learning implementation. The results are expected to serve as constructive feedback to develop better online learning programs in the future.

Eryilmaz [2] proves that online learning packaged in a combination of e-learning and face-to-face (blended learning) provides more effective results than learning environments that only use one of the two methods, online or face-to-face learning. Participants have a positive opinion on internet-supported applications and consider blended learning to be more useful [2]. Ayçiçek & Yelken [3] claimed that the flipped classroom model positively affects the level of students' involvement in the classroom since the students still receive teachers' guidance while carrying out activities in the class and teachers provide direct feedback.



E-learning programs that are not combined with face-to-face in MOOCs still experience many obstacles. Tiejun [1] suggested that only 38.46% of students show interest in MOOCs. Learning using MOOCs is still unstable for several reasons, namely: there are no special requirements and legal graduates' recognition for MOOCs participants. During the learning process, there is no time limit for completing mandatory /non-compulsory tasks. Students' motivation to learn is inconsistent, when students face difficulties, they easily give up and leave the course. Unrestricted study time causes some students to delay learning activities. Most students study only in their spare time. Students need cheap internet at home and a quiet learning environment to concentrate on virtual online courses. Similar results were also found by Gamage et al. [4] that MOOCs still face many challenges such as very low completion rates, students complain of isolation, low learning motivation to continue the course because the course itself is also less qualified. Several studies have shown that online learning can be successful if it is applied to an appropriate learning environment and is supported by various adequate facilities. However, the existing studies concerning the topic are still limited, thus the factors that support successful online learning are explored in more depth in this study. The factors analysis was assessed from the characteristics of students and lecturers. The objectives of this study were: to explore the factors that determine successful online learning from the characteristics of (1) students; (2) lecturers/teachers, (3) learning methods; (4) learning content; and (5) educational institutions.

## 2. Method

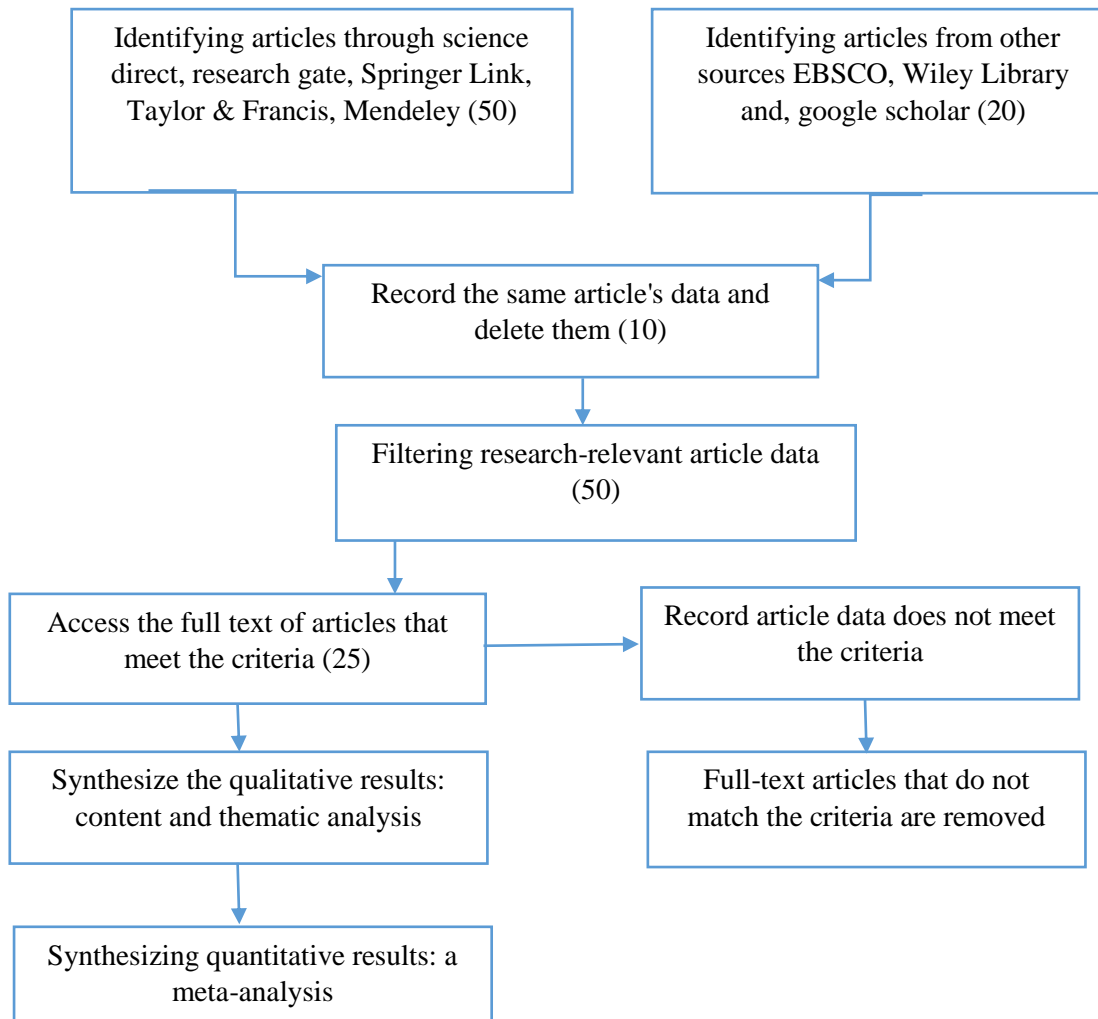
### 2.1. Types of research

This study is a meta-analysis study that started with a systematic review of the literature, then the results of the review are combined to obtain new findings. Konstantopoulos stated that obtaining research evidence generated from various studies is very important to draw more general conclusions [5].

### 2.2. Research procedure

This study was conducted with a meta-analysis procedure adopted from Mikolajewicz & Komarova [6] with several modifications. The population of this study consisted of scientific articles about online learning. The sample was limited to articles published from 2018 to 2020. The data collection process used bases data tracing from ScienceDirect, ResearchGate, Mendeley. Taylor & Francis and Springer Link. Articles from EBSCO, Wiley Online Library, Google Scholar, etc. were categorized as data from other sources. The keywords used the terms: distance learning, e-learning, blended learning, and flipped classroom.

Triangulation of multiple data sources aids in finding evidence that generates credibility. To maintain data credibility, this study involved 3 readers and a coder or inter-reader and intercoder. If there are differences in perceptions, a discussion is held between the researcher and the coder to reach an agreement to resolve it. The obtained data were then analyzed thematically. Meta-analysis was conducted for quantitative research findings. Figure 1 presents the data collection procedure.



**Figure 1.** Data Collection Procedure

### 3. Results and Discussion

#### 3.1. Characteristics of Students

Online learning uses a constructivist approach, where students find or construct their knowledge based on the learning experiences they have acquired. The approach used in e-learning is student-centered. The results showed that motivation and self-efficacy were the main variables affecting students' performance in online learning [7], [8].

The results of the article review obtained 5 categories of challenges that students must face in the online learning process. They are challenges of self-regulation, technological literacy, and competence, students' isolation, technological adequacy, and complexity. Of the five categories, the most crucial challenges in the online learning process are self-regulation, technological literacy, and competency. In that context, students must be able to overcome barriers to their feelings, thoughts, and actions planned to achieve learning goals. Students' abilities and competencies in using technology are very effective in achieving learning goals [9].

Hien showed that students in soft disciplines score higher than those in hard disciplines [10]. Disciplinary differences must be considered to design the most effective online learning courses. Clear

objectives and expectations, quality of material, and collaborative learning significantly predicted students' performance after controlling for the influence of gender and previous learning achievement.

### *3.2. Teachers' Characteristics*

Professional educators demonstrate learning practices that enable learners to succeed in achieving learning goals. According to Wynne (1995) in [11] in the online learning process, professional educators are obliged to review and update learning practices regularly. Adapted from Khoe Yao Tung [12], characteristics of online learning, including 1) Teaching materials are presented in the form of text, graphics, and various multimedia elements, 2) Communication is carried out simultaneously such as video conferencing, chats rooms, or discussion forums, 3) Learning is at virtual times and places, 4) It uses various elements of CD-ROM-based learning, to improve learning communication, 5) Teaching materials are relatively easy to update, 6) Increasing interaction between students and facilitators, 7) Allowing formal and informal forms of learning communication, 8) It uses a variety of sources extensive learning on the internet [12]. The characteristics of successful teachers in online learning are (1) technology literacy; (2) able to operate instructional/educational technology; (3) able to create, upload and share high-quality video content with students [9]. Lecturers who have no experience using LMS (learning management system) technology experience anxiety when using LMS, but when they are supported by colleagues in using LMS, their anxiety is decreasing [13].

### *3.3. Learning strategies*

Moskal et al. [14], quoted by Minh Hien Vo states that "there is no best-blended learning model unless the instructor succeeds in aligning all the factors that contribute to learning success and eliminating the factors that hinder students' learning outcomes. The teachers should support the students and provide feedback. The task behind the task is very well done even though it is not statistically proven [10]. This statement is supported by Zhang [8] who found that students who received the individual intervention showed higher levels of learning motivation, learning attitudes, and self-efficacy.

### *3.4. Characteristics of learning content*

Content Quality Testing, Process, and Evaluation of Flipped Learning-Educational research methodology by Mulyatiningsih found that despite the quality of the learning content was good and complete (mean score of 4.06 from an ideal score of 5) but only 80% of students actively participated and were disciplined in completing the assignments. After a negative case analysis was carried out, symptoms were found. A complete online content does not guarantee that students enjoyed the learning because students do not like monotone reading and are overloaded with other tasks. The e-learning trial in the Statistics course, which only contained simple modules, videos, and assignments, showed a better participation rate that was close to 100%.

The research results by Minh Hien et al. [10] stated that in online learning, the objectives and expectations of courses should be communicated to students. The provision of high-quality learning materials and efforts to improve collaborative learning are things that contribute significantly to achievement student learning.

### *3.5. Educational institutions*

Educational institutions contribute to the success of online learning. The main task of educational institutions is to facilitate LMS services for lecturers and students. Graham [15] states that institutions are obliged to develop the competence of instructors who will teach online and face-to-face learning. The institution provides a computer laboratory to improve the technological readiness level therefore when delivering teaching content students feel comfortable and easy and respond positively [15].

#### 4. Conclusion

The determinants of successful online learning are: (1) the students' motivation and self-efficacy because the students must be able to overcome their obstacles (2) successful online learning methods require individual intervention from lecturers; (3) lecturers with technology literacy are more successful and able support other lecturers, (4) successful online learning content uses various sources and is actively involved in forums and (5) institutions facilitate Learning Management Systems and other online learning tools.

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