

Flipped Learning for 21st Century Competence Development:

The Systematic Literature Review

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Abstract—This paper aims to analyses the flipped learning researches using the Systematic Literature Review (SLR) to finds its correlation to 21st century competence development according to twenty articles which reported about flipped learning from 2015 to 2018. The SLR was applied to examine the impacts of the application of flipped learning toward the mastery of 21st century competencies and the advancement of flipped learning researches both in Indonesia and abroad. The result of review was presented descriptively. The result shows that flipped learning researches have been done on various school subjects and various methodologies. Quasi-experimental design has been the most chosen method. The most used technological media among the various tools is the use of video. The most common keyword is flipped classroom. The impact analysis shows that flipped learning brings positive impacts to the mastery of 21st century competence which are creativity and innovation, critical thinking and problem solving, communication, and collaboration. The application of flipped learning in Indonesia and abroad shows comparable results. The results of the analysis show that flipped learning is very suitable to be applied in the classroom and becomes an implication for the government or policy makers to recommend flipped learning to be implemented in learning activities.

Keywords—learning, area of study, the slr, 21st century competence

I. INTRODUCTION

At present the learning process changes are important because the development of industry in the world has reached the 4th wave of industrial revolution (4IR) or "industry 4.0". Industry 4.0 is characterized by the presence of new technologies that merge the physical, digital and biological world, which are manifested in the form of robots, mobile computer devices, artificial intelligence, driverless vehicles, genetic editing, digitalization of public services, and so on. In industry 4.0 equipment, machinery, sensors, and humans are designed to be able to communicate with each other using internet technology known as "internet of things" [1].

Education in schools is no longer effective to prepare the younger generation to enter the industrial ecosystem 4.0 which prioritizes the development of 21st century competencies namely (1) creativity and innovation, (2) critical thinking and problem solving, (3) communication and (4) collaboration. Education must be implemented by referring to the new paradigm of education characterized by students as connectors, creators, and constructivists in the context of the production and application of knowledge and innovation [2].

One of the innovative learning strategies that educators can use so that students are active in the learning process and utilize ICT technology with the aim of supporting learning materials that can be accessed wherever and whenever is flipped learning [3]. Therefore, it is very important to examine flipped learning and its impact on developing 21st century competencies.

II. RELATED LITERATURE REVIEW AND THEORETICAL FRAMEWORK

At present, the concept of education has changed from teacher-centred learning to learner-centred learning. Teachers play a role not only as knowledge providers, but also promoters of learning that encourage students to actively build knowledge.

Flipped learning is one of the most emphasized and innovative learning strategies in recent years. This strategy changes the learning process in the classroom to focus on students to apply knowledge and achieve learning objectives at a higher level. Milman states that Flipped learning is with the teacher's limited time to introduce concepts, teachers can make video lectures, screencasts, or podcasts that teach concepts, so that more time is available for activities that are more interesting (often collaborative) and usually facilitated by the teacher [4].

Bergmann and Sams define flipped learning as learning where direct instruction is delivered at home through videos made by teachers or taken from other sources, as well as

activities that were previously done as homework done in the classroom [5].

The Association of Flipped Learning Network formally proposes the definition of flipped learning is a pedagogical approach in which direct instruction is transferred from group learning spaces to individual learning spaces, and the resulting group space transforms into a dynamic and interactive learning environment in which educators guide students as they apply concepts and engage creatively in subject matter and into learning practices [6].

Stone in Hwang et al. mentioning flipped learning is the teacher recording activities in the classroom to convey learning, students watch videos before class and use class time to complete complex concepts, answer questions, and students are encouraged to actively learn and associate them with daily life [7].

Subramaniam and Muniandy state that in a flipped learning model, work is usually done in class and work that is usually done as homework is reversed or diverted [8]. Before coming to class, students read material and see videos on topics assigned to then be involved in the classroom in active learning using games, simulations, discussions or experiments with the help of educators. In short, listening to lectures or watching videos is done at home and homework is done in class. Lo et al., [9] describes flipped learning like the following Figure. 1.

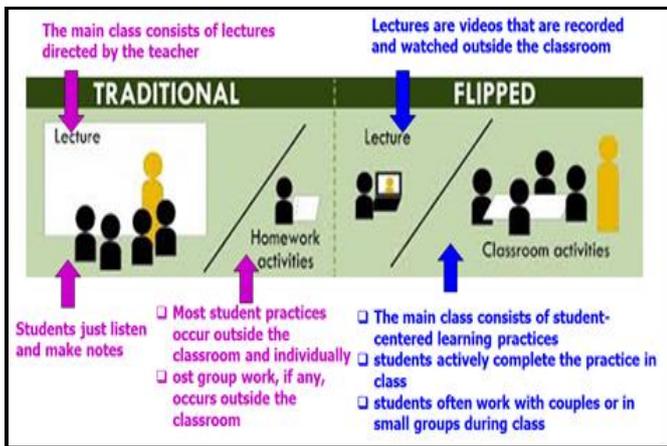


Fig. 1. Flipped Learning Schema (Source: <https://www.sciencedirect.com/science/article/pii/S1747938X17300295>).

According to the Flipped Learning Network there are four aspects that must be met by educators when implementing flipped learning in class namely F-L-I-P (Flexible Environment, Learning Culture, Intentional Content, Professional Educator) [6].

There are several principles that teachers must understand to develop flipped learning as follows [7]. First, flipped learning involves students in self-study at home. Teachers need to give students teaching materials, such as instructional videos, before class time. Instructional content in videos is

primarily designed for students to gain knowledge at the remembering and understanding levels.

Secondly, teachers in flipped learning must design learning activities in the field to encourage students to apply what they have learned to real-world problems and gather information from the experience of everyday life. The Learning tasks in the field primarily focus on learning in application levels, analysis, and synthesis.

Third, designing learning activities in class to engage students in high-level thinking based on what they have learned from teaching videos and what they have observed or gathered from field visits or experiences their daily lives. Classroom learning activities may focus on application, analysis, evaluation, or even level creation, depending on the purpose of the learning unit.

Fourth, encouraging peer-to-peer and peer-to-teacher interactions across all study spaces, namely, homes, schools, and other real-world spaces.

Fifth, mobile and wireless communication technology is used to connect home-independent learning, exploration, and application in the field, high-level thinking assignments in the classroom, and the interaction between friends and friends to teachers throughout this learning room (table 1).

TABLE I. TIME OF LEARNING IN FLIPPED LEARNING CLASSES COMPARED TO TRADITIONAL CLASSES

Traditional classes		Flipped learning Classes	
Activity	Time	Activity	Time
Introductory activity	5 min	Introductory activity	5 min
Discussing homework done the night before	20 min	Questions and answers about the learning videos that learners have watched at night Previous	10 min
Teaching new content/material	45 min	Doing self-duty and or conducting activities in the laboratory by being guided by educators	110 min
Doing self-duty and or conducting activities in the laboratory by being guided by educators	55 min		
Closing activities Conclusion and Assessment	10 min	Closing activities Conclusion and Assessment	10 min

(Adapted from: Bergmann, et al. [10]).

In flipped learning, what the students do before the learning process in the classroom is at the lowest cognitive levels, those are remembering and understanding aspect. The instructions from the video are used for expressing the basic contents from the target knowledge that will be achieved. The learning in the classroom is aim at achieving the higher cognitive levels, such as applying, analyzing and evaluating. In order to achieve that goal, the role of the teacher in the classroom has changed, from

an instructor to be a facilitator and counselor of problem solving. In the classroom, discussion, collaborative learning activities, individual coach, and other strategies are being held to find out and improve students' self-reflection ability and to help them to achieve the higher level of cognitive learning behavior. The goals are presented in Figure 2 below.

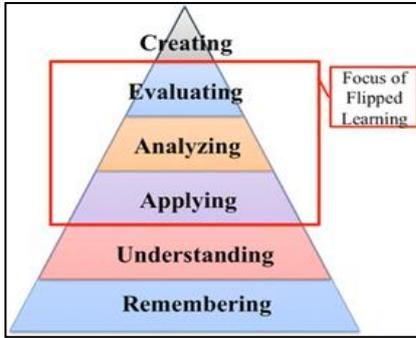


Fig. 2. The goals of Education from the classroom Activities for Flipped Learning (Source: <https://link.springer.com/article/10.1007/s40692-015-0043>).

One of the goals of flipped learning is to popularize the independent learning. With the assistance of cellular and wireless communication technology, flipped learning is an approach that is more student-centered that can grow their independent learning [11]. This shows that flipped learning can be a better alternative to achieve the competitions of 21st century, those are creativity and innovation, critical thinking and problem solving, communication and collaboration.

III. PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

The flipped learning approach is commonly studied and used in various educational institutions worldwide. Therefore, we intend in this paper to provide more contribution on essential aspects to be considered when implementing the flipped learning approach in educational settings.

This review intends to identify flipped learning links with 21st century competency development and advances in flipped learning research in Indonesia and abroad through content analysis from 20 articles from 2015 to 2018. We also hope that this research will encourage future researchers or policy makers to research and implement flipped learning. Thus, the analysis of this study addresses the following research questions:

- What area of study have implemented flipped learning?
- What methodology has been used in flipped learning?
- What media technology has been used to implement flipped learning?
- What are the most commonly used keywords in flipped learning?

- Does the application of flipped learning have an impact on increasing 21st Century competence?
- What is the flipped learning research in Indonesia and abroad?

IV. METHODOLOGY

This research was conducted through content analysis to analyse 20 articles published from 2015 to 2018 about flipped learning to find a connection with the development of 21st century competency. Content analysis is a research technique that collects and analyses the contents of a text. Content analysis is a research method that does not use humans as the object of research. Content analysis uses symbols or text in certain media, then the symbols or text are processed and analysed [12].

The research findings were interpreted using descriptive analysis and analysis of social networks. The findings and discussion in this study can be the basis for potential future research from the flipped learning approach and 21st century competency development.

According to Kohlbacher [13], content analysis refers to analysing material in a step-by-step process. The steps that must be followed are as follows: first, formulate the research problem. Second, choosing twenty articles from various area of study that influence or impact on flipped learning published in 2015, 2016, 2017 and 2018. Third, analyse the area of study, methodology, media technology, keywords, the impact of implementing flipped learning on 21st century competency development, and the development of flipped learning in Indonesia and abroad. The results of the analysis are interpreted using descriptive analysis, percentage and frequency to interpret the findings so that the results of the study are obtained. Fourth, the data are analysed and reported systematically starting from the area of study, the most frequently used methodology, technology media, the most frequently used keywords, the impact of implementing flipped learning on 21st century competency development, the development of flipped learning in Indonesia and abroad. Then, the researchers concluded and suggested flipped learning research for its application in the future.

V. SAMPLE

The present study investigated 20 peer-reviewed scholarly articles published from 2015–2018. The 20 journals were retrieved and analysed using the following rationales:

- A specific focus on flipped learning research
- Derived from a trusted source or journal with an ISBN or ISSN
- Publication from 2015-2018
- Contains various area of study

- The 20 journals are accessed and found through electronic databases

The 20 articles were selected from professional journals, namely: Journal of Educators Online, The IAFOR Journal of Education, Journal Manajemen Pendidikan, Journal of Hospitality, Leisure, Sport and Tourism Education, Journal Computers in Human Behaviour, International Journal of Information and Education Technology, Journal Educational Technology and Society, International Journal of Software Engineering and Its Applications, Journal of Information Technology Education: Innovations in Practice, International Journal of Instruction, Journal of English Teaching, Literature, and Applied Linguistics, Jurnal Pendidikan Ekonomi, Advances in Social Science, Education and Humanities Research (ASSEHR), Jurnal bioeducation, Jurnal Matematika, Jurnal Teknodik.

There are two journals published in 2015, six journals published in 2016, seven journals in 2017, and five journals in 2018.

VI. FINDINGS AND DISCUSSION

In this study, 20 journals were examined during the four years of publication (2015–2018). The descriptive analysis in the form of percentage, frequency and linkages was used in analysing the data. Discussions were carried out based on the percentage reported systematically starting from the study of the area of study, methodology, media technology, keywords, the impact of implementing flipped learning on 21st century competency development, and the development of flipped learning in Indonesia and abroad. This is described as follows.

A. Area of Studies in the Flipped Classroom

Articles that apply flipped learning have survived the last four years of analysis to answer researchers' questions "What area of study have implemented flipped learning?". Various area of study that have applied flipped learning as in the following table 2.

TABLE II. AREA OF STUDY THAT APPLIES FLIPPED LEARNING

Author(s) and Year	Level	Area of Study	Ref
Clark (2015)	Elementary school	Mathematics	[14]
Danker (2015)	College	Performing Arts	[15]
Damayanti and Sutama (2017)	Vocational School	Mathematics	[16]
Cronin and Lowes (2016)	College	Physical education	[17]
Hao (2016)	College	education department	[18]
Yoshida (2016)	College	Education technology	[19]
Bhagat et al. (2016)	High school	Mathematics	[20]
Heo dan Chun (2016)	College	Mathematics	[21]
Aidinopoulou dan Sampson (2017)	Elementary school	Sejarah	[22]

Kostaris et al. (2017)	SMP	Communication Technology	[23]
Song et al (2017)	College	Mathematics	[24]
Yang (2017)	High school	English	[25]
Unal dan Unal (2017)	All levels	All subjects	[26]
Vitanofa and Anwar (2017)	High school	English	[27]
Agustiningrum and Haryono (2017)	High school	Economy	[28]
Ilahi et al. (2018)	High school	Mathematics	[29]
Hairida (2018)	College	Chemistry	[30]
Wulansari and Sutrisna (2018)	College	Nursing	[31]
Saputra and Mujib (2018)	High school	Mathematics	[32]
Basyah (2018)	Vocational School	Entrepreneurship	[33]

The results of the analysis indicate that flipped learning has been carried out in various area of study at all levels of education, with the mathematics as the field of study that most applies flipped learning. This is in accordance with the writings of Bergmann and Sams [5] which also shows that flipped learning is not only applied in chemistry and mathematics classes, but also in all area of study.

B. Research Methodology Used in Flipped Learning Research

The methodology used in flipped learning research was examined from 20 journals to answer the researcher's question "What methodology has been used in flipped learning research?" The results of the analysis are presented in the following figure 3.

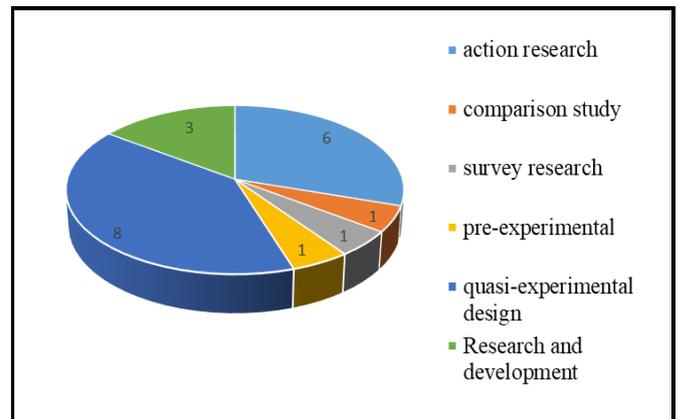


Fig. 3. Research methods.

The analysis found that the methodology most often used in flipped learning research was quasi-experimental design. Apart from quasi-experimental design, which is often used is action research.

The analysis also found the sample size and approach used. The result is that flipped classroom is the most widely used approach but there are also studies that compare it to mobile learning, lesson study and guided inquiry. Complete results are presented in the following table.

C. Research Methodology Used in Flipped Learning Research

Various media technologies have also been used in flipped learning research. Therefore, this section will answer the research question "What media technology has been used to implement flipped learning?". Schramm and Porter [34] states that media is a messenger technology that can be used for learning purposes. The following are presented media that are used in 20 articles that apply flipped learning.

The results of the analysis show that various media technologies are used in flipped learning. The most used media is video. Besides using video, many researchers also use the learning management system (LMS) (table 3).

TABLE III. MEDIA IN FLIPPED LEARNING

Author(S) and Year	Media	Ref
Clark (2015)	Online and offline videos (flash drives and DVDs)	[14]
Danker (2015)	Study online with LMS	[15]
Damayanti and Sutarna (2017)	Video	[16]
Cronin and Lowes (2016)	Study online with LMS	[17]
Hao (2016)	Online video, YouTube, listen to audio recorded on the Moodle platform, online resources on the internet	[18]
Yoshida (2016)	Instructional video	[19]
Bhagat, et al. (2016)	Video, drop box	[20]
Heo dan Chun (2016)	Video, mobile	[21]
Aidinopoulou and Sampson (2017)	Simulation, forums, wikis, blogs, documentary film making, social media, whiteboard, web search, and digital voting	[22]
Kostaris et al. (2017)	Video, LMS Moodle	[23]
Song et al. (2017)	Video	[24]
Yang (2017)	online video	[25]
Unal and Unal (2017)	Video	[26]
Vitanofa and Anwar (2017)	Video	[27]
Agustiningrum and Haryono (2017)	Video	[28]
Ilahi et al. (2018)	Video	[29]
Hairida (2018)	Video	[30]
Wulansari and Sutrisna (2018)	PPT slides, learning videos	[31]
Saputra and Mujib (2018)	Video	[32]
Basyah (2018)	Video with chunking technique	[33]

D. Keywords

In addition to the titles and abstracts the keywords are indicated to play an important role in journal publications.

Keywords have a big impact on user search or basic information on internet search engines [35]. Researchers need to choose suitable keywords for their journal articles for indexing purposes. Well-chosen keywords allow articles to be quickly identified and quoted by others. If you don't use relevant keywords, readers won't be able to find or quote their articles.

Analysis of 20 flipped learning articles was conducted to answer the question "What are the most commonly used keywords in flipped learning research?" The results of the analysis found a total of 85 keywords from the analysis of 20 selected articles. The three most frequently used keywords are flipped classroom used in 15 articles, flipped learning is used in 4 articles, and learning outcomes are used in 3 articles. The most commonly used keywords are presented in the following figure 4.

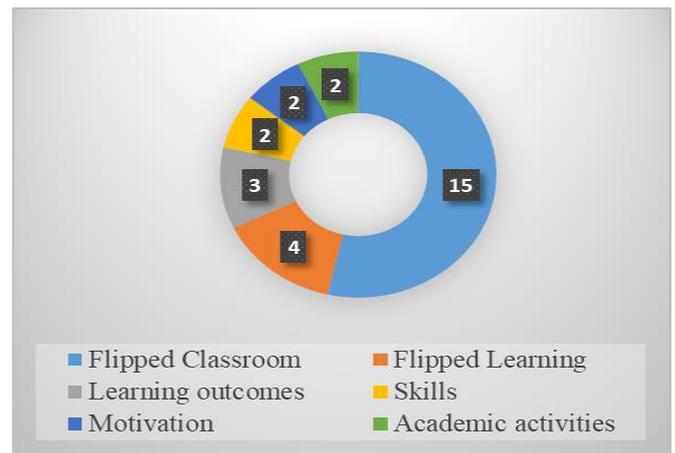


Fig. 4. Keywords that are used.

E. The Impact of Flipped Learning on Increasing 21st Century Competence

Analysis was conducted to determine the impact of flipped learning implementation. The impact is analysed related to the development of competency 21st century, namely Creativity and innovation, Critical Thinking and problem Solving, Communication and Collaboration which is contained in the 2013 curriculum (K-13) in Indonesia. This was done to answer the question "Does the implementation of flipped learning impact the increased competence of the 21st century?" The results of the study were related to the mastery of 21st Century competence with the following considerations.

Creativity and innovation. In flipped learning, creativity and student innovation skills can be improved by engaging in creative projects, such as developing innovative websites or artwork by searching for relevant information on the Internet, performing observations on field, and participate in brainstorming in class or on their mobile devices [7]. If in the results of the research, there is such component means that the research has an impact on Creativity and innovation.

Critical Thinking and Problem Solving. In flipped learning, teachers can guide students to solve the problem after the process of using mobile technology. Activities undertaken for example, identify problems by watching instructional videos at home and gather relevant information in the field, present problems to peers and teachers in the classroom and choose strategies, implementing strategies in field, and evaluate the results in class [7]. If in the results of the research there are such components, the research has effect on the critical thinking and problem solving.

Communication. Engaging students in flipped learning encourages students to communicate with their peers and teachers in home learning, in class, and in the field. With the right design of learning, students' communication competencies will be improved by encouraging student participation in learning interactions. The interactions can be peer-to-peer and peer-to-teacher-based issues based on what they've learned from teaching videos and what they've gathered and observed on the ground [7]. If in the results of the research there is such component means that the research will affect the communication.

Collaboration. In flipped learning, teachers can use different strategies to foster students' collaborative skills development, such as project-based learning assignments that require students to learn the basic knowledge of teaching videos in House, collecting data from the field, and designing the artwork together in class [7]. If in the results of the research, there is such component means that the research has an impact on collaboration.

The results of the analysis on research findings and associated with the 21st century competence achieved by students are as follows.

F. Flipped Learning Research in Indonesia and Abroad

Analysis of 20 articles was conducted to answer the question "How is the research of flipped learning in Indonesia and abroad?". The analysis is done by looking at the amount of research conducted, the field of study studied, and the availability of research annually. The results of the analysis of the number of studies are presented in the following figure 5.

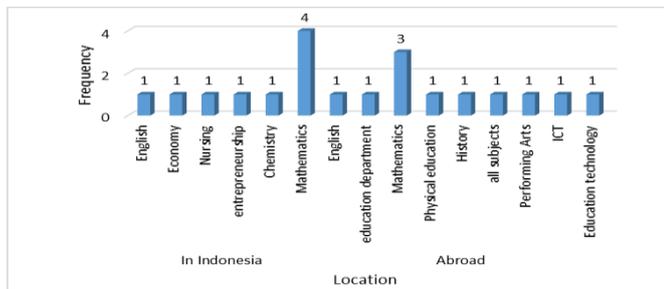


Fig. 5. Flipped learning research in Indonesia and abroad.

These results indicate that the application of flipped learning in Indonesia has been carried out at all levels, as well as abroad. Based on this, the implementation of flipped learning in Indonesia has been numerous and comparable to implementation abroad (figure 6).

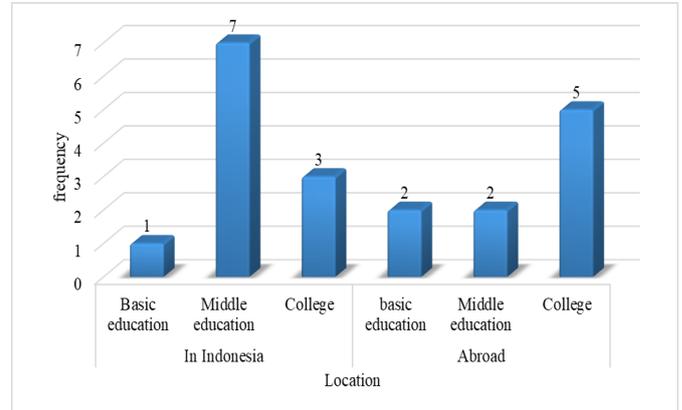


Fig. 6. Flipped learning research in accordance with education level.

VII. CONCLUSION

The study aims to analyze the adoption of flipped learning and its association with 21st century competency enhancement based on 20-article analysis that reported the implementation of flipped learning in 2015 to 2018. The results of SLR found that flipped learning research has been conducted in diverse areas of study with diverse methodologies. The most widely used methodology is quasi-experimental design. Media technology that used also the most dominant variety is using video. The most commonly used keywords are flipped classroom. Flipped learning affects the increase in the 21st century competence and application in Indonesia and abroad to show comparable results. This research has shown clearly that the adoption of flipped learning has transformed the learning culture of students from centered to teacher-centered students with more emphasis on student activity. The study implicates with limited time in class students has more opportunities to practice mastery with peers or under the guidance of teachers. The results of this study have also contributed to a better understanding of the use of technology in teaching and learning activities.

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