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Implementation of Flipped Classroom Model in Vocational High School: A Systematic Literature Review

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Abstract

This research aims to provide a comprehensive overview of flipped classroom implementation in Indonesian Vocational High School (VHS). This is a systematic review studies using the PRISMA (Preferred Reporting Items for Systematic reviews dan Meta-Analyses) method. The results revealed that 1) flipped classroom in Indonesian VHS impacts students' interests and motivation also students' learning outcome in varied aspect, 2) the model consists of in-class time and out-of-class time, 3) teacher's primary roles are to design the instruction, select appropriate media, and facilitate the student in learning with ensuring and measuring the extent of students' understanding, 4) there are varied activities and media can be integrated into flipped classroom. The benefit, challenges, and recommendations for further research are also provided.

Keywords: Flipped Classroom, Vocational High School, Systematic Literature Review

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INTRODUCTION

Technology has developed rapidly and affected many aspects, including the education sector, over the last few decades. Consequently, traditional approaches need to be transformed into student-centred learning. Students must engage in meaningful inquiry-based learning that has genuine value and relevance for them personally and their communities (Scott, 2015).

The skills needed to face the challenges in the future have already changed. A type of vocational education, Vocational High School (VHS) has to prepare graduates to have the competencies needed in work, business, and industry. Moreover, adjusted to the industry 4.0 era, VHS becomes a level at which the students are directed to be skilled in specific fields of work and be ready for a career. In particular, VHS is expected to reduce unemployment by equipping the graduates so they can compete with the provision of hard skills and soft skills (Tandirerung & Vitalocca, 2017).

However, Kurniawan et al. (2021) found that the level of absorption of SMK graduates was low because of their poor attitudes. It also found that their soft and hard skill is not following the qualifications of the industrial work. These results are similar to those reported by Nuryanto & Eryandi (2020), who disclose the importance of mastering attitude, knowledge, and skill. In addition, it is also emphasized to master the 21st-century skill. In summary, there is a need to align

the competencies of graduates with the demand of industries that can be measured through their learning outcomes.

Implementing a suitable learning model can improve the learning process and affect students' competencies or learning outcomes (Prasetya et al., 2018). Generally, learning models contain activities such as delivering material by the teacher, followed by doing assignments or practicing during class time. However, it is commonly found that in traditional teacher-centered learning, students have to continue their learning activities at home because there is not enough time (Cobena et al., 2019). Other findings, studies by Hidayat (2018) and Sanuaka et al. (2017) also reported that students find it hard to develop their skills caused of inappropriate learning strategies or limited time.

According to Agustini et al. (2021), flipped learning is a very suitable model and is recommended to be implemented in learning. In flipped classroom model, students first learn the material during the out-of-class time, and then other learning activities such as discussions and practices are carried out during the class time. This flipped classroom model framework ensures that students receive personalized education tailored to their individual needs (Bergmann & Sams, 2012). Students are facilitated to learn without any limitations of space and time, and it is possible to learn at their own pace of learning. Students can choose the most appropriate time and place to learn and the most convenient learning style. It is identical to video, as learning media made by the teacher. Along with its development, each student had the opportunity to choose the most suitable media for them, so videos were not the only media that could be used. Many students learn from teacher-made videos, and others learn from textbooks or find information via the internet.

It is critical to understand the current practices for future implementations. Research in flipped classrooms increased significantly (Jwaifell et al., 2018). Both Agustini et al. (2021;) and Yulianti & Wulandari (2021) claimed flipped classroom affects the increase of students'21st century skill and competence. It transformed teacher-centered learning into student-centered learning. Tutal & Yazar (2021), one recent research, found flipped classroom given their promising results in improving teaching practice and providing better student learning outcomes in various subjects. It also showed significance in all educational levels, which the elementary school and high school having the highest effect size. However, the characteristic of student in each education level is different and previous research does not analyse how the model works at each level.

There are many studies examining flipped classroom, but only a single study exists that observes the implementation of flipped classroom in vocational high schools. The study has explained the definition, the role, and the step of flipped classroom in vocational high school also the factors inhibiting the implementation of flipped classroom (Basori, 2018). Because flipped classroom appears to be well suited in learning, teachers, instructors, and instructional designers need to become familiar with this model and its application in vocational high school. Moreover, it would be more beneficial for teachers, instructors, and instructional designer, if it explained the implementation of flipped classroom in vocational high schools.

However, the study does not explain the implementation adequately and does not attempt to review all the relevant literature systematically.

Based on the explanation above, this study aims to provide the best evidence on how flipped classroom is implemented at the VHS in Indonesia by selecting relevant articles from the last five years and reviewing them systematically using PRISMA method. The following research questions were addressed in this article.

RQ1: How is the implementation of flipped classroom in vocational high schools?
RQ2: What are the positive impacts of flipped classroom implementation?
RQ3: What are the challenges encountered in flipped classroom implementation?

While providing the answer to be considered for teachers, instructors, and instructional designers, this study proposes further recommendations for future research.

METHODS

A systematic review, also known as research synthesis, is a method to provide a comprehensive, unbiased synthesis of many relevant studies in a single document. It attempts to uncover "all" of the evidence relevant to a question and focus on research that reports data rather than concepts or theory. A systematic review is conducted by following these steps:

1. articulated the objectives and questions clearly,
2. determine the inclusion and exclusion criteria
3. search comprehensively to identify all relevant studies, both published and unpublished
4. appraise the quality of included studies, assess the validity of their results, and report any exclusions based on quality
5. analyze the data
6. presentation and synthesis of the findings extracted
7. report the methodology and methods used to conduct the review transparently

In this research, it was conducted by using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) method introduced by Liberati et al. (2009) and developed specifically for scoping reviews by Tricco et al. (2018). PRISMA can be used as the foundation for reporting a systematic review (Moher et al., 2009).

At the stage of the eligibility criteria, a specification is made to determine what is included (Inclusion Criteria / IC) and not included in the criteria (Exclusion Criteria / EC) (Table 1). Furthermore, specify all databases and other sources searched and the date when each source was last searched.

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Published from 2017 till July 2021	Published before 2017
Type of publication: Journal (research article)	Type of publication: Conference proceeding, systematic review articles, book series, chapter in book and books

Written in Indonesian or English	Written in a language other than Indonesian or English
Conducted in Indonesian VHS	Conducted in other level education than VHS
Articles could be accessed	Articles couldn't be accessed
Flipped Classroom is the model of the instruction	Not Flipped Classroom Model
Indexed nationally by Sinta or international by Scopus	was not indexed by Sinta or International by Scopus

The following step is searching and collecting a number of articles published in the period from 2017 to July 2021 by using the keywords "FLIPPED CLASSROOM" AND ("SMK" OR "VOCATIONAL SCHOOL") in a searchable database of scholarly literature, Google Scholar. It is an academic citation search engine (Haddaway et al., 2015). Even though 1200 data was detected, Google Scholar only allowed access to up to 49 pages where each page contains 20 data so that the records could be accessed are 961. The records are presumably duplicated, so the metadata such as the author, publisher, and year of publication are screened, ensuring that each record was identic. After the duplicates were removed, the articles were completely identified to ensure whether the article met the criteria whether not. The author used the Endnote App to identify and organize each article. Page et al. (2021)) have compiled two flow diagrams for the study of databases and from other methods such as from websites, organizations, and citation searches. The author used flow diagram using citation search because the articles were sourced from Google Scholar. The result obtained 29 articles as study material in this research (Figure 1).

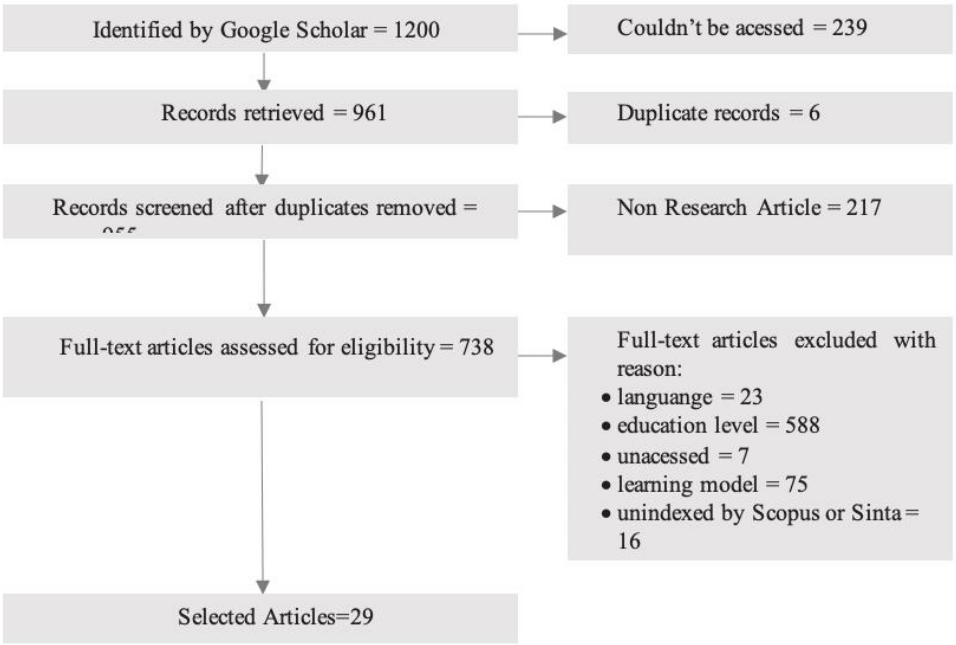

Figure 1. Flow diagram of PRISMA

RESULTS & DISCUSSION

As can be seen from the flow diagram above, 29 research articles fulfilled the requirements. An overview of flipped classroom research in VHS can be seen in Table 2 below.

Table 2. Summary of Selected Articles

No	Authors (Publication Year)	Subject	Research Area	Research Method
1	(Sucipto, et al., 2017)	Operating System	Affective, Cognitive, and Psychomotor domain	Quasi-experiment
2	(Handayani et al., 2018)	Basic Programming	The effectiveness of e-learning to conceptual understanding	R & D
3	(Basyah, 2018)	Project Work	Entrepreneurial interest	Classroom Action Research
4	(Sukayanti et al., 2018)	Art Culture	Validity and effectiveness of developed FC model	R & D
5	(Krishna et al., 2018)	Digital Simulation	Validity and effectiveness of developed FC model	R & D
6	(Widyastuti and Sujadi, 2018)	Math	Creativity and Learning Outcome	Classroom Action Research
7	(Mas'ud and Surjono, 2018)	Simulation and Digital communication	High Order Thinking Skill (HOTS)	Quasi-experiment
8	(Bariah et al., 2019)	Computer System	Learning Outcome Validity and effectiveness of developed FC model and media	Mixed Method
9	(Hamid and Effendi, 2019)	Basic Electrical and Electronics	Psychomotor domain and Student's Interest	Quasi-experiment
10	(Ruswana, 2019)	Math	Problem Solving Skill	Quasi-experiment
11	(Usmadi and Ergusni, 2019)	Math	Cognitive domain Student's motivation	Quasi-experiment
12	(Zamnah, 2019)	-	Self-efficacy	Quasi-experiment
13	(Nugroho et al., 2020)	Digital Simulation	Critical Thinking	Quasi-experiment
14	(Wirasatriya et al., 2020)	Computer and Basic Networks	The effectiveness of e-learning	R & D
15	(Sakti, et al., 2020)	Computer and Basic Networks	Need analysis and learning design	R & D
16	(Rusnawati, 2020)	Database Administration	Motivation, Learning Outcome, and Student's Perception	Quasi-experiment
17	(Laksana, 2020)	-	FC models to improve student's literacy	R & D

18	(Sumardi et al., 2020)	English	Communication skill	Case Study
19	(Darmawan et al., 2020)	Craft	Cognitive and Psychomotor domain	Quasi-experiment
20	(Fahmi et al., 2020)	English	Reading comprehension	Case Study
21	(Lalian et al., 2020)	Chassis Maintenance and Light Vehicle Power Transfer	The validity of FC models and media	R & D
22	(Sakti and Sukardi, 2021)	Computer and Basic Networks	Affective, Cognitive, and Psychomotor domain	Quasi-experiment
23	(Murni, et al., 2021)	Math	Resilience	Descriptive
24	(Supriadi, et al., 2021)	Math	Reasoning	Quasi-experiment
25	(Pudjianto, et al., 2021)	Digital Simulation	Motivation and Learning Outcomes	Class Action Research
26	(Meilantari, 2021)	Japanese	Student's Perception	Descriptive
27	(Oktarina, et al., 2021)	Operating System	The effectiveness of media in FC model to Improve HOTS	Quasi-experiment
28	(Faridah et al., 2021)	Biology	Motivation and Problem Solving Skill	Quasi-experiment
29	(Mudiarta et al., 2021)	School Program	Quality of Program	Evaluation

The subjects studied represent the three types of subjects in VHS, listed as follows: productive, adaptive, and normative subjects. This finding asserts that flipped classroom has been developed and implemented across the subject in vocational high school. In terms of the aspects studied, it has been revealed flipped classroom influenced students' interest and motivation, affective, cognitive, and psychomotor competencies, as well as self-efficacy, critical thinking, reasoning, problem-solving, communication, and resilience. Furthermore, most studies have only been conducted in several major studies in technology. It would be more relevant if the study also investigated flipped classroom in other majors, for an example, health, art, maritime, and tourism.

The implementation of flipped classroom

The result shows that flipped classroom learning model has been studied in various subjects and majors in VHS. The flipped classroom comprises two types of time in learning, in-class time (synchronous) and out-of-class time (asynchronous), which can be conducted offline and online. Before in-class time, teachers facilitate students with appropriate learning resources and tools. Concurrently with studying the material, students work on tasks. Teacher gives tasks closely related to the topic

that are making summaries and notes, answering questions, or playing quizzes using additional platforms. Furthermore, students are advised to take notes of things they do not understand. The list will be discussed later during in-class time. However, studies show that several teachers facilitated students to ask or discuss without waiting in-class time through personal communication media such as WhatsApp or classroom management platforms which are Google Classroom, Edmodo, Moodle.

Subsequently, teachers' primary role in-class time are ensuring and measuring the extent of students' understanding. Some in-class activities that can be carried out are discussions and reviews of materials considered difficult for students. Besides discussions, there are problem-solving activities (Usmadi and Ergusni, 2019), pair practice (Sumardi et al., 2020), doing exercises with a higher level of difficulty (Fahmi et al., 2020), making mind maps (Nugroho et al., 2020), and designing projects or making products to exhibitions (Basyah, 2018). Therefore, it can be concluded that the flipped classroom can be combined with other learning models with thorough preparation, both in designing in-class learning and out-of-class learning. However, the combination of the flipped classroom and other learning models has not been widely studied.

In connection with the above, Farida et al. (2019) identified that the flipped classroom encourages students to be more independent and confident because they have the opportunity to prepare themselves at home before in-class time. It is similar to Seemiller & Grace (2017), who found that generation Z prefers individual learning. For them, it does not mean that they cannot work together. They tend to accomplish independent learning activities before engaging in study groups.

The combination of technology-based learning media and appropriate learning models also significantly influence the learning process based on the 2013 Revised Edition curriculum, which requires students to be active and learn independently (Bariyah, 2019; Wirasatriya et al., 2020). Learning media usage in flipped classroom model is critical, mainly to deliver the material. In Bergmann & Sams (2012), initially, video was used as learning media. Videos facilitate students to study independently, adjusting to the time and place that is right for them (Bustanil et al., 2019). Although material and tutorial videos are still dominantly used as learning resources, the developments in media are increasingly varied.

It is textbooks (Basyah, 2018), electronic modules (Wirasatriya et al., 2020), interactive electronic books (containing text, audio, and video) (Oktarina et al., 2021), and Youtube (Pudjianto et al., 2021), which found effective for delivering materials. It is group discussion sheets (Usmadi and Ergusni, 2019), student worksheets (Wirasatriya et al., 2020), and practicum guidebooks (Basyah, 2018) that are used as learning tools. Moreover, in a way to facilitate student discussions and manage classes, there are WhatsApp (Fahmi et al., 2020; Wirasatriya et al., 2020), Google Classroom (Darmawan et al., 2020; Meilantari, 2021), Edmodo (Sucipto et al., 2017), Video conferences (Suryawan et al., 2021), and Moodle (Bariyah, 2019; Faridah et al., 2021; Hamid & Effendi, 2019; Murni et al., 2021; Rusnawati, 2020). This finding enrich to those reported by (Agustini et al., 2021) and proved that various media potentially harnessed to support flipped classroom models.

However, determining which media to use cannot be separated from considering the characteristics of students in learning and students' readiness to use learning media or tools. Oktarina et al. (2021) claimed that using material videos or other forms of material is not the most determining factor for learning success. Without a suitable instructional design, learning would not be optimal. In Widyastuti and Sujadi' (2018) case, teachers still use flash disks whereas distributing material videos to their students. Therefore, a teacher as a designer has a significant role in it. Likewise, Faridah (2019) found that social media is often integrated into flipped classrooms in universities. In addition, it is claimed that as learning media, social media has not been studied widely.

In this section, it has been explained that 1) flipped classroom consist of in-class time and out-of-class time, 2) teacher's primary roles are to design the instruction, select appropriate media, and facilitate the student in learning with ensuring and measuring the extent of students' understanding, 3) there are varied activities and media can be integrated into flipped classroom.

Benefits of flipped classroom

One of the most commonly cited benefits of flipped classroom was the additional time. Facing a lack of time for study, flipped classroom model provides additional time to do other learning activities than listening to teachers convey their lectures in class. Listening to the material has been moved to out-of-class time and facilitated with exciting and motivating learning resources. Students facilitated to actively engage in the activities during the in-class time and get more time to interact with teachers and students. This finding relevant to Karabulut-Ilgu et al. (2018) and (Mupita et al., 2020).

Another benefit revealed in this synthesis is positive perception from students. Students' perception tends to be positive because students are facilitated to learn according to their learning style and pace through the variety of media used. Students are also trained to use the media for positive things (Sukayanti et al., 2018) and become independent learners (Bariyah, 2019; Wirasatriya et al., 2020). Student-centered learning can be carried out well with the flipped classroom model.

It also shows that flipped classrooms significantly improve students' interest, motivation, affective, cognitive, psychomotor competencies, self-efficacy, critical thinking, reasoning, problem-solving, communication, and resilience. Nevertheless, more development is needed to improve students' soft skills and 21st-century skills, in line with the findings of Nuryanto and Eryandi (2020) and Samsudi et al. (2019) that the weakness of graduates in vocational schools today are student's low level of soft skills and their 21st-century skills. In studies by Lalian et al. (2020) and Sukayanti et al. (2018) it is proved that develop the model based on the subject and learning objective is suggested.

Challenges in implementation flipped classroom

This research found that flipped classroom not only obtain benefits. A number of advantages are accompanied by challenges that must be faced. Firstly, teachers need to prepare their readiness more. Together with this, teacher needs to prepare instructional design, the learning resources, tools, and instruments thoroughly. In

this case, teachers can obtain learning resources and tools in several ways, particularly: 1) utilizing existing ones, 2) modifying existing ones, or 3) developing them independently. In designing the instruction, it should encourage students to actively learn so that students are interested and enjoy the activities. Learning design is critical to the success of learning.

Secondly, the teacher is challenged to encourage and ensure students learn out-of-class time. The methods that have been used are: 1) making notes or summaries, 2) writing down things that are not understood, 3) providing follow-up assignments, both written questions and quizzes, 4) utilizing students with the attendance feature in e-learning to train students' discipline in following pre-session. Although the concept where students are advised to study at home first was quite old, learning activities at home are tangible and more focused with the flipped classroom model. However, it is still an obstacle for students who are not familiar with the flipped classroom. Students need adjustments and motivation to learn independently and engage in collaborative activities (Kurbanoğlu & Akkoyunlu, 2017). In general, this means students feel the importance of guidance in implementing the flipped classroom (Fahmi et al., 2020).

Last, the challenge for schools and teachers is providing supporting facilities and infrastructure. It cannot be denied that the flipped classroom requires technological devices, so a number of studies have suggested providing appropriate facilities and infrastructure selected based not only on the available facilities and infrastructure but also on the students' characteristics and the learning objective.

CONCLUSION

This systematic review aims to analyze flipped classroom in vocational high schools. By reviewing the implementation, it is found that 1) the model consists of in-class time and out-of-class time, 2) teacher's primary roles are to design the instruction, select appropriate media, and facilitate the student in learning with ensuring and measuring the extent of students' understanding, 3) there are varied activities and media can be integrated into flipped classroom. These findings are suggested to be considered for further implementation

Flipped classroom has several benefits: providing additional time to do active learning, improving student learning outcomes in affective, cognitive, and psychomotor aspects, training students to harness media for learning, and receiving positive perceptions from students. Besides, the challenges in conducting flipped classroom model are that teachers need to make an extra effort in preparation and encourage and ensure students learn out-of-class time. The challenges for schools, teachers, and students are providing supporting facilities and infrastructure based on the students' characteristics and the learning objective.

Although numerous studies have been conducted, for further research, it is recommended to investigate the effectiveness of flipped classroom in other majors and other learning outcomes and the effectiveness of the flipped classroom integrated with other learning models or activities or other learning media such as social media.

CONFLICT OF INTEREST

Concerning the research, authorship, and publication of this paper, the author(s) reported no potential conflicts of interest.

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