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A Rasch analysis: Comparing students' learning activity on online learning and blended learning

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Abstract

This study purposes to compare student learning activities in fully online learning and blended learning. This study uses the mixed methods approach (explanatory sequential model). 42 junior high school teachers were comprised as the sample. Learning activity questionnaire (LAQ) and interview procedures were used as a data collection tool. The data obtained were analysed using Rasch analysis. Rasch analysis is a statistical technique for defining the measure of human performances, attitudes and insights. The results showed that almost all respondents agreed with all statements on the questionnaire. The percentage of respondents' approval of statements using blended learning is higher than respondents who use fully online learning. Thus, it can be determined that fully online learning and blended learning can develop student learning activities. The researcher recommends that in the strategic plan for managing learning services, online learning should provide additional computing infrastructure to run the two learning methods.

Keywords: Blended learning, comparing, learning activity, online learning, Rasch model

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1. Introduction

Technology has opened a vast horizon of communication and the digital domain. Educational institutions are today in a more puzzling situation to admit this revolutionary change, so they are equipping students through the new trials of the digital domain (Mbale, 2014; Pozdniakov & Freiman, 2021; Soomro et al., 2018). Online learning is single of the wildest rising tendencies in the instructive use of technology. Subsequently 2000, online learning, generally recognized as 'e-learning', 'web-based instruction' or 'remoteness learning', has frolicked an accumulative part in higher education through the advancement of the Internet and the World Wide Web (Yam & Rossini, 2011). Online learning has developed prevalent because of its probable for as long as additional flexible admittance toward content and training at any time, starting any place (Bazelais & Doleck, 2018; Cheng & Lai, 2020). Online learning is the use of the Internet to admission learning material; interrelate through content, teachers and other students; become provision throughout the learning process; improvement knowledge; shape personal sense; and produce from learning involvements (Brieger et al., 2020). Recurrently, the enthusiasm for online learning programmes involves (a) cumulative the accessibility of learning involvements for students who cannot or select not to appear in old-style face-to-face contributions; (b) collecting and distributing instructional gratified additional cost-efficiently; and/or (c) provided that admission to capable teachers and learners in spaces where such teachers are not obtainable (McGraw et al., 2007; Means et al., 2013; Mpungose, 2020; Newhouse, 2017; Sit & Brudzinski, 2017).

According to Foulger et al. (2018), online learning was initially only an alternative model of conventional learning. This is carried out because conventional learning is considered to have many shortcomings and weaknesses. But in its journey, this learning model turned out to cause many changes in educational units due to the fact that it emerged as a new modern paradigm in the world of education (Yacob et al., 2012), and thus the conventional learning concept can slowly be replaced.

In certain cases, online learning has a very crucial role in overcoming problems in the world of learning, including things that are extraordinary and urgent. Online learning is very suitable to be applied to extraordinary cases in the world of education, such as natural disasters that prevent students from going to school or outbreaks or pandemics. The same thing was also expressed by Jamaludin et al. (2020), who argued that during a pandemic, as is currently happening, namely the coronavirus disease (COVID-19) pandemic, the school or the teachers certainly cannot provide a justification for stopping the learning–teaching process because basically the process of educating can be carried out in various ways. The most effective solution in the midst of calls for social distancing and physical distancing as it is today is by carrying out online learning.

Another significant tendency in current centuries is the appearance of 'blended' or 'hybrid' methods that use two or more unrelated learning approaches or a mixture of methods, such as linking face-to-face learning through online learning; linking online learning through access to teachers or faculty affiliates; or linking simulation with organized learning (Bonk & Graham, 2012; McGrath, 2013; Walsh, 2005). It delivers leads of equally e-learning and face-to-face learning (Soomro et al., 2018). Blended learning is a mixture of diverse drill media (technology, actions and types of events) to generate an ideal drill programme for an exact spectators. The term 'mixed' means that drill led by traditional instructors is added through other electronic arrangements (Bersin, 2004). Blended learning is equally simple and complex (Bliuc et al., 2007; Goh & Yang, 2021; Kundu et al., 2021; Morton et al., 2016; Wang et al., 2015). At its simplest, blended learning is a wise supplement to face-to-face lessons in the classroom with online learning opportunities. There is a substantial instinctive demand to the idea of mixing the assets of synchronous (face-to-face) and asynchronous learning events. At the similar time, there is

substantial difficulty in its employment through the trial of virtually boundless design potentials and applicability to so numerous contexts.

Nevertheless, to create it expressive, blended learning should be the result of a considered combination of face-to-face learning and online learning (Deng et al., 2021; Garrison & Kanuka, 2004). The idea of blended learning has developed rapidly in established countries and through the fast and advanced blended learning system in educational establishments it is tender with new frontiers, bringing progress to knowledge explorers. Consequently, it is imperative to differentiate blended learning from online support learning and online learning (see Figure 1).

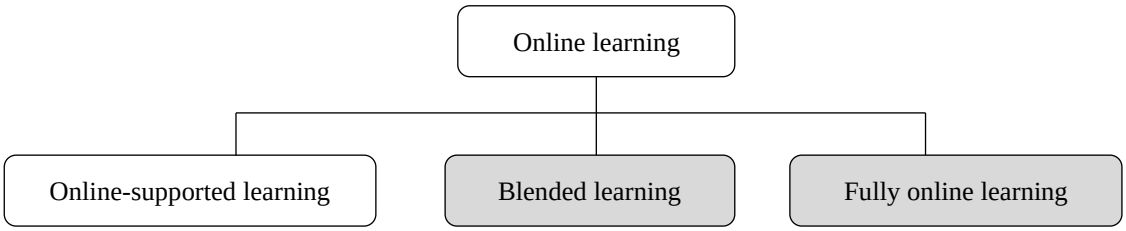


Figure 1. A scale of online learning (adopted from Garrison & Kanuka, 2004)

This blended learning approach has formed modernisation, flexibility, activeness and association in the teaching and learning progression. In addition, through blended learning, learners can use online stages anytime and anyplace. Blended learning generates an original model for peer-to-peer contact. Blended learning is achieved in an educational and learning environment that effectively combines different dissemination approaches, educational models, and learning styles. This is the result of embracing a planned and systematic way to leverage technology groups in the largest face-to-face manner (Krause, 2008). In other words, blended learning is the actual mixture of online technology and face-to-face teaching in a learning programme such that we are not just accumulation one against the prevailing medium expediently (Bock et al., 2021; Garrison & Kanuka, 2004; Ibrahim et al., 2022).

Studies have shown that 'using a mixed learning approach increases student achievement scores equated to other approaches and has an enhancing consequence on students' attitudes concerning mathematics' (Lin et al., 2017; Quinn & Aarão, 2020). This is encouraging but also need not be surprising. When students have better attitudes towards, their study grades are likely to go up as a result. Blended learning creates a diverse responsibility for the teacher in the classroom. The teachers converted less of an instructor and more of a facilitator (Eryilmaz, 2015; Mese & Dursun, 2019; Sharma et al., 2020; Wai & Seng, 2015).

Furthermore, for both blended and fully online learning, policymakers and experts essential research-based data roughly the circumstances of the comparison between student learning activities with blended learning and fully online learning. Student learning activities are overall one of the components of a teacher's assessment (Clark, 2012; Zeng et al., 2018). Realising student ability in the teaching and learning progression is a measure of learning success. In online learning throughout the COVID-19 era, learning activities are a measurement that must be restrained and measured appropriately and systematically (Setiawan et al., 2021). Student learning activities have become a indicator of amenities provided through educational institutions or school. Students' learning activity is the activity that will build students' knowledge. If the student learning activity does not work well, then knowledge cannot be effortlessly in accordance with the learning objects that have been set (Sailer et al., 2021; Sakir & Kim, 2020).

Therefore, to compare student learning activities in blended learning and fully online learning, Rasch analysis can be used. Rasch analysis can currently be used to assess the process of developing a test and is a powerful psychometric tool (Franchignoni et al., 2010; Fratiwi et al., 2020; Nurdini et al., 2020; Yu, 2020). The Rasch analysis, published by Georg Rasch in 1960, is a statistical technique for defining the measure of human performances, attitudes and insights (Rasch, 1960; Samsudin et al., 2020). Rasch measurements have aided with a variety of activities in pedagogy, school psychology and many other ranges.

1.1. Purpose of the research

The contemporary article reports a study that compared online learning in general, i.e., between fully online and blended versions of online learning, in certain, for a diversity of learners and through a variety of dissimilar contexts and applies using Rasch analysis. Therefore, the aim of this study was to compare student learning activities in fully online learning and blended learning through Rasch analysis.

1.2. Importance of the research

This study presents a comparison of student learning activities in online learning and blended learning. Therefore, this research is expected to be a reference for researchers who use online learning and blended learning for student learning activities.

2. Methods

2.1. Research design

This case study implemented a sequential explanatory mixed methods design (Creswell, 2014). This research is a combination of two research methods: quantitative and qualitative research. A combination of both quantitative and qualitative data analysis was performed throughout the study process to support the data collected from both streams of the data collection used in this study (Jerry & Yunus, 2021). The quantitative method in the primary stage generated the objective statistical findings. According to Creswell (2015), this model comprises of initial gathering quantitative data and then accumulating qualitative data to assistance elucidate or intricate on the quantitative outcomes that afford a common portrait of the research difficult, followed by a qualitative analysis to get the interpretation of the data analysis.

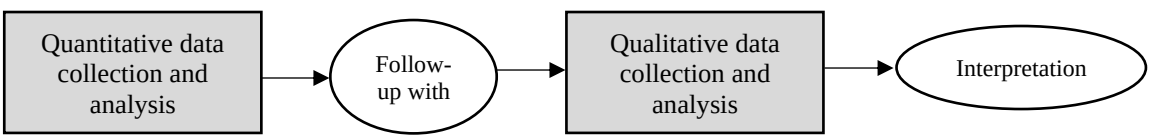


Figure 2. Explanatory sequential design (adopted from Creswell, 2015)

Quantitative data in this study were collected based on questionnaires from student learning activities. Then, a detailed interview was conducted to investigate each of the variables and indicators provided in the questionnaire.

2.2. Participants

This study was fragment of a partnership project that aimed to augment teacher knowledge of fully online learning and blended learning. In the project, the teachers and schools used fully online learning and blended learning as the core instructional approach. The participants of this study (N = 42; 27 female

and 15 male; their average age was 27–51 years) were teachers in one of the junior high schools in Bandung, West Java, Indonesia. Participants were separated into two clusters based on the learning activities carried out, including teachers who implemented fully online learning (N = 23) and teachers who applied blended learning (N = 19). The selection of teachers was carried out through random sampling technique. The participants were randomly selected from the two gender of (i.e., male and female) teachers. There are many ways and alternatives that can be used by teachers in running online learning programmes. In accordance with its nature, online learning can be carried out in a two-way (synchronous), one-way (asynchronous) or self-directed model. In this study, the results of the identification of various learning media or platforms used by teachers in each school in conducting online learning are evaluated.

2.3. Instruments

Two research tools were used to accumulate data for this research: a questionnaire and interview. The learning activity questionnaire (LAQ) was developed by the researchers for junior high school teachers. LAQ aims to collect data from respondents in the form of experience, personal feedback or information about the respondent's research topic so that the researchers can obtain an overview of the research topic. In the initial steps of producing the LAQ, there were seven statements. Nevertheless, subsequently analysing its validity and reliability, there are two invalid statements.

In this study, a blend questionnaire was used, namely an open and closed combination questionnaire. We used a questionnaire to find out what factors influence student learning activities. There are five statements in LAQ that are used as the focus of the research. These statements are related to student learning activeness, as shown in Table 1.

Table 1. The list of statements in the questionnaire

List of statements	Code of statement
Students like to respond to teacher's questions and instructions	S1
Students record teaching materials completely and neatly	S2
Students have the ability to socialise and work well together	S3
Students can present their work well	S4
Students take classes seriously from the beginning to the end of the meeting	S5

The LAQ was distributed to each junior high school data source in the form of a Google Form. The Google Form has seven statements related to student learning activities when using online learning. The LAQ cover sheet informs the participants about the purpose of the questionnaire and the confidentiality of the answers. A 5-point Likert scale was used for the quantitative questionnaire preliminary from strongly agree to strongly disagree, where 1 = strongly disagree (SD), 2 = disagree (DA), 3 = undecided (UD), 4 = agree (A) and 5 = strongly agree (SA) (Soomro et al., 2018).

Furthermore, after receiving the data from the LAQ, the researchers conducted an interview with the data source to integrate the results and obtain qualitative data. The instrument used for qualitative data is interviews and interpretation of the results of the variable map (Wright) in the Rasch analysis. In this study, the interview process was carried out in various ways, including informal interviews, i.e.,

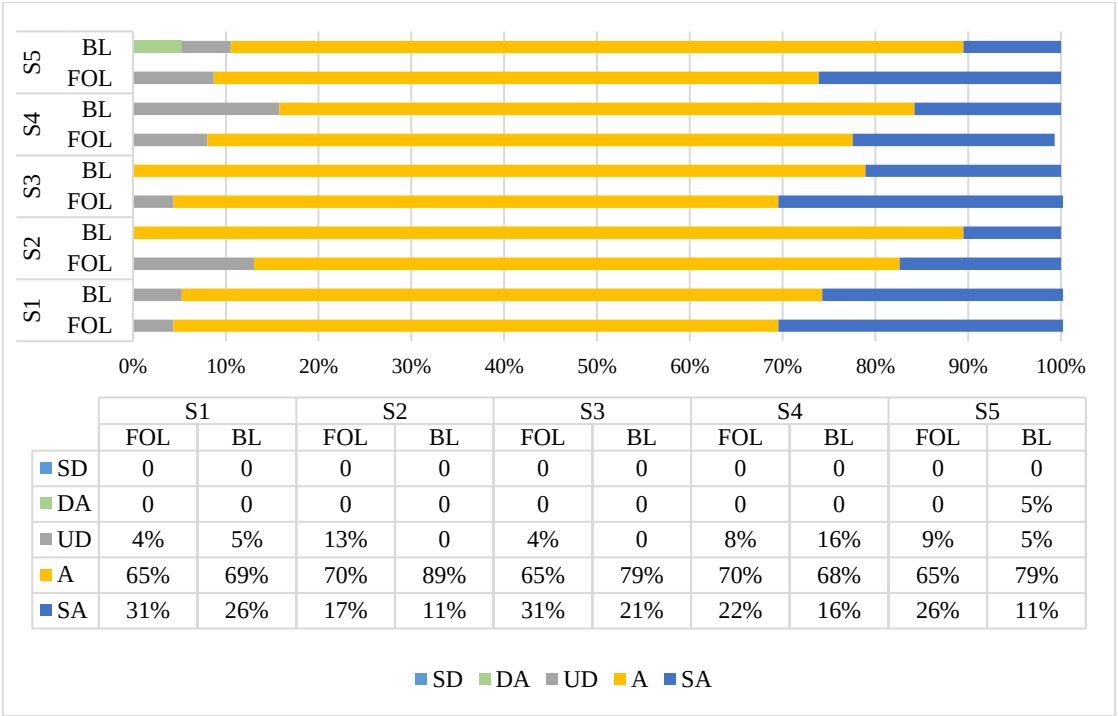
interviews that were not fixed on interview guidelines, and formal interviews, i.e., interviews that referred to interview guidelines.

2.4. Data analysis

Quantitative and qualitative data were examined unconnectedly. For quantitative data, descriptive data analysis was accomplished using the Excel programme. Then, for qualitative data in this study, the Rasch analysis model to analyse the research data was used. Data on a Likert scale of 1–5 obtained from the LAQ results were entered into the Microsoft Excel programme and then processed using Ministep: Evaluation/Student Winsteps version 5.2.2.0. Furthermore, the ordinal data obtained from the questionnaire results can be converted into interval data known as logit. The choice of analysis used is known as a variable map (Wright). The variable map shows the distribution of statements and data sources so that they can be interpreted based on their distribution.

3. Results and discussion

The dimensions of student learning activity in this study include activeness in asking and answering questions, problem-solving skills and questions and listening and following the learning process until it is finished. Based on the results of qualitative data processing on student learning activeness, the percentage of each respondent's statement in fully online learning and blended learning is shown in Figure 3.



	S1		S2		S3		S4		S5	
	FOL	BL	FOL	BL	FOL	BL	FOL	BL	FOL	BL
SD	0	0	0	0	0	0	0	0	0	0
DA	0	0	0	0	0	0	0	0	0	5%
UD	4%	5%	13%	0	4%	0	8%	16%	9%	5%
A	65%	69%	70%	89%	65%	79%	70%	68%	65%	79%
SA	31%	26%	17%	11%	31%	21%	22%	16%	26%	11%

Figure 3. Percentage of each respondent's statement in fully online learning and blended learning

Based on the results shown in Figure 3, it is known that each respondent gave varied statements on learning using fully online and blended learning. For the majority of statements from S1 to S5, respondents who use both fully online learning and blended learning, agree with each statement given, which is around 65%–79% statements strongly agree about 11%–31%, neutral statements are around 0%–13% and the majority no one answered disagree except for the S5 statement, and no one stated strongly disagreed with any given statement.

For clarity, the results and discussion of the research are described based on each statement and each lesson used by the respondent. In S1 statement related to student learning activities in response to teacher statements and instructions, the majority of the respondents who used blended learning (69%) and fully online learning (65%) agreed that students liked to respond to teacher statements and instructions. Then, as many as 89% of the respondents who use blended learning agree that students are able to record teaching materials completely and neatly and 70% of the respondents who use fully online learning also state the same thing. Furthermore, in terms of the ability to socialise and work together in both lessons, respondents stated that students can socialise and work well together with a larger percentage obtained in respondents who use blended learning (79%) compared to respondents who use fully online learning. On the other hand, in the S4 statement regarding students' ability to present their work well, the percentage of respondents with fully online learning stated that they agreed more than the percentage of respondents with blended learning. Finally, the percentage of respondents to the S5 statement related to student participation and seriousness from the beginning to the end of the meeting in fully online and blended learning activities is the same as the percentage shown in the S1 statement, namely agreeing to the statement by 65% for fully online learning and 69% for blended learning.

Overall, both learning, namely learning with fully online and blended learning, received a positive response to student learning activities, in terms of student activity, especially based on the statements examined in this study. However, when viewed from the percentage in this study, learning using blended learning tends to have a higher percentage than fully online learning. Furthermore, regarding the distribution of respondents' responses to the statements in the questionnaire for each lesson, Figure 4 shows respondents who use fully online learning and Figure 5 shows respondents who use blended learning.

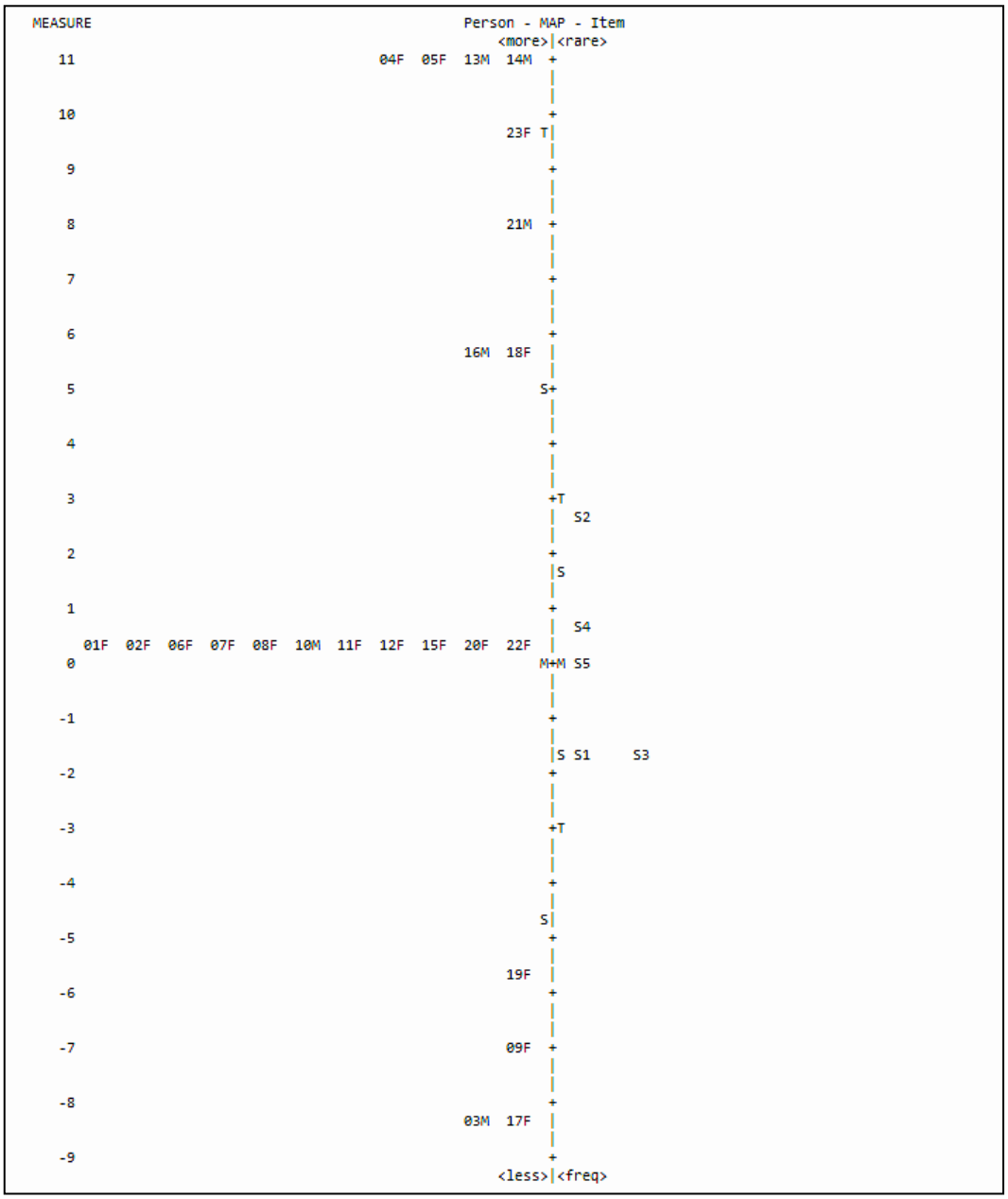


Figure 4. Distribution of respondents' responses to statements in fully online learning

Based on Figure 4, which shows the distribution of respondents' responses to statements in fully online learning, it can be seen that the right side is the distribution of statements (S1–S5), while the left side is the distribution of respondents from the 1st respondent to the 23rd respondent with M/F as gender (male/female). Of the 23 respondents who used fully online learning, 8 respondents (04F, 05F, 13M, 14M, 23 F, 21M, 16M and 18F) agreed with all the statements given, while there were 4 respondents who disagreed with the 5 statements given, namely respondents with codes 19F, 09F, 03M and 17F. The other 11 respondents agreed with the three statements (S1, S3 and S4), except for statements S2 and S4. Furthermore, when viewed in terms of the distribution of the statements in

Figure 4, the S2 statement is the most difficult statement to agree with, which is related to students being able to record teaching materials completely and neatly, while the S1 and S3 statements are the easiest statements for respondents to agree with, which is related to students being able to respond teacher statements and instructions, as well as students' ability to socialise and cooperate well in the fully online learning.

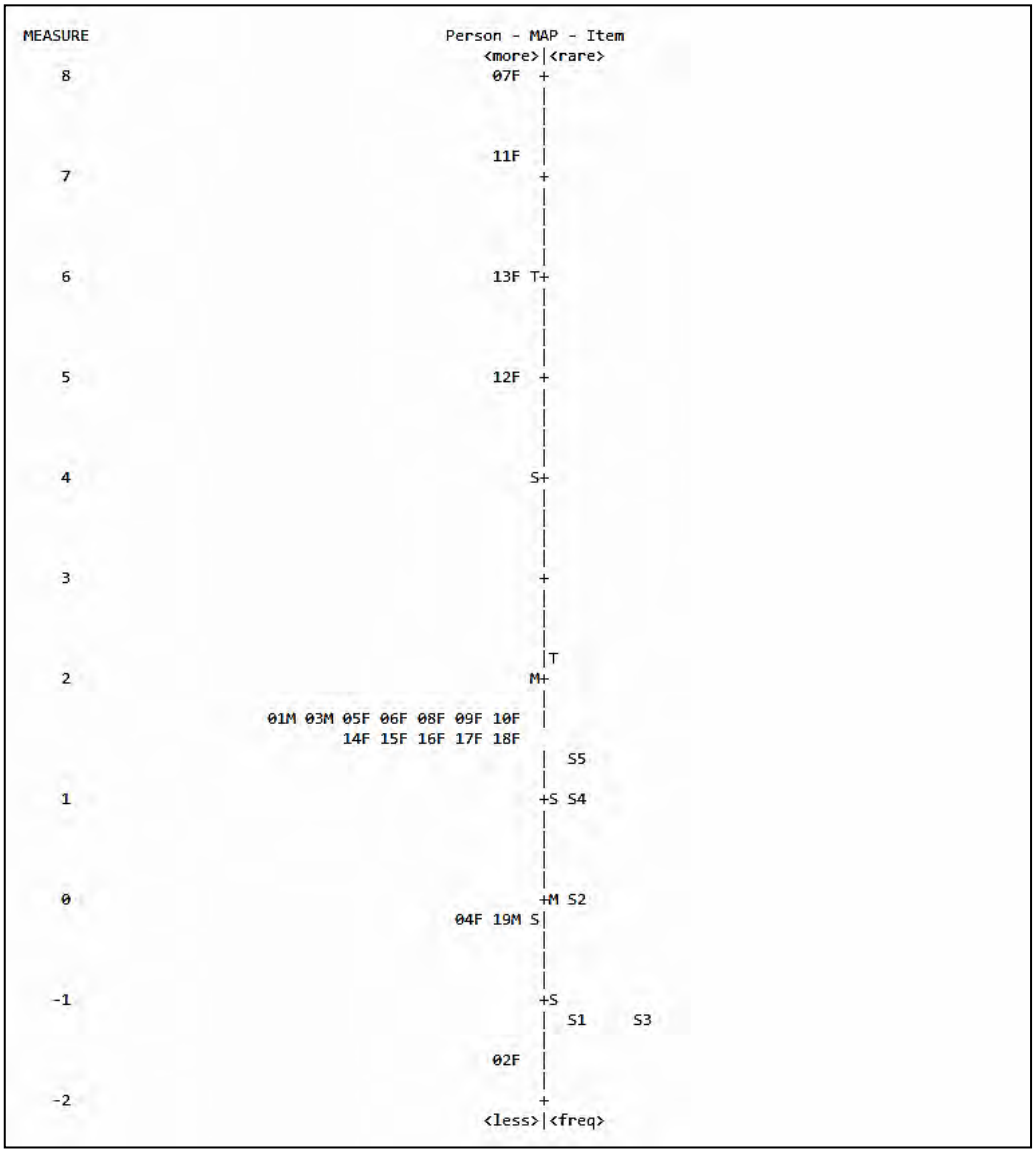


Figure 5. Distribution of respondents' responses to statements in blended learning

Furthermore, Figure 5 shows the circulation of respondents' responses to statements using blended learning. Figure 5 also shows that the majority of respondents agree with all the statements given. Of the 19 respondents, 3 respondents (04F, 19M and 02F) disagreed with statements S2, S4 and S5, and 1 respondent (02F) disagreed with all the statements given. Then, in terms of the distribution of statements, it can be seen that the S5 statement related to the participation and seriousness of students in participating in learning from the beginning to the end of the meeting is the most difficult statement to agree with by the respondents. While it is the same with respondents who use fully online learning,

respondents who use blended learning also agree that S1 and S3 statements are the easiest statements to approve.

Basically, the fundamental factor that influences success in learning is the activeness of student learning. Learning activity is an important element that must be possessed by students because it involves a combination of mental activities, namely thinking and physical activity or actions simultaneously. According to Baeten et al. (2013), an indicator of the success of a learning is when there is a synchronisation between the physical and psychological activities of the students simultaneously. Physical activities include the involvement of body parts in designing or creating something, playing or working, not just sitting still and listening. Meanwhile, psychological activities include students' thinking abilities that can function properly and is applied to the construction of critical thinking, building their own understanding and being able to solve problems they face during the learning process.

The majority of respondents stated that the active learning of students during the online learning process (fully online or blended learning) was very good. This is because the majority of students have high self-awareness that in learning that not only teachers should be active, but also students because the learning process is two-way. Another factor that causes student learning activity to be better is determined by the stimulus given by the teachers. For example, before starting lessons, teachers always remind students to be serious about following or doing the assignments given by the teacher.

Based on the results of the respondents' interviews, there are many ways and alternatives that can be used by teachers in running online learning programmes, both fully online learning and blended learning. By its nature, online learning can be carried out in a two-way (synchronous), one-way (asynchronous) or self-directed models. The results of the identification of media or learning platforms that are mostly used by teachers in learning are generally in synchronous learning using Google Meet, Zoom meetings, Skype and Microsoft Teams. When learning is asynchronous, WhatsApp, Google Classroom, Google Form and Edu Box are used. Furthermore, when self-directed, several media are used, such as the YouTube application, Quipper, Schoology etc.

The absence of apposite infrastructure and admission to technology can cause some restraints for the successful integration of fully online learning and blended learning (Abbacan-Tuguic, 2021; Namyssova et al., 2019; Rasheed et al., 2020). Some of the obstacles faced by teachers in adopting fully online and blended learning include that there is no policy for the implementation of fully online or blended learning; no faculty provision and exercise to start progressions with fully online or blended learning formats; lack of specific skills needed to run courses in fully online or blended learning formats; and the lack of computer laboratories to run courses with fully online and blended learning formats (Abou Naaj et al., 2012; Soomro et al., 2018). In the identical vein, Smith and Hill (2019) identified a variety of disadvantages, such as the inevitability for pure goals and objectives of blended learning. Furthermore, Mirriahi et al. (2015) showed that an absence of institutional definition of blended learning reasons some challenges, as well as the absence of operate capacity to involve with blended learning gives rise to the possibility of misconstruing the blended learning values and practices to the accomplishment of blended learning. Additionally, as a result of their study, Smith and Hill (2019) hypothesise that additional teacher exercise should be conducted for the staff preceding to the application of blended instruction. This could be carried out through the suitable governance and deliberate leadership within an institution.

Based on the survey results in this study, it was also stated that the learning management was carried out independently by the teacher concerned, only a few received assistances from the school IT. From the respondent's perspective, it can be seen that the external factors mentioned above affect the

willingness of teachers and interfere with their motivation not to choose courses with online learning. Owing to the deficiency of school support, teachers demand a appropriate implementation scheme.

The results show that the percentage of respondents' approval of statements using blended learning is higher than respondents who use fully online learning. This is also consistent with the results of research conducted by Rozeboom (2017), which states that blended learning provides students with a optimistic learning involvement and consequences in higher student attainment. Several contemporary studies have showed exactly delineation in the implementation of the blended learning approach in different contexts, its advantages and disadvantages, including the assessment of blended learning and its design (Namyssova et al., 2019). Blended learning has proven to be more effective than face-to-face or full online classes in some situations (e.g., Brodersen & Melluso, 2017; Means et al., 2013; Serrano et al., 2019; Wright, 2017). With affection to the better effectiveness of blended learning, numerous researchers have revealed that students registered in blended learning progressions gained improved results compared to traditional fully online courses or face-to-face (Smith & Hill, 2019). Students experience the prospect to be equally self-determining and self-directed in their learning, charitable them the chance to study at their particular stride (Glazer, 2012; Hensley, 2012; Linder, 2017).

Research accompanied by Herodotou et al. (2020) shows that blended learning is more appropriate for student engagement and consummation. This chains the results of a investigation directed that the common of students favour blended learning. Research directed by Yam and Rossini (2011) expressions that learning that is carried out in blended learning is additional operative than learning that is only carried out online learning, because students have the advantage of a face-to-face learning experience and an online situation concurrently. Blended learning can take many procedures, but research apparently indicates that merging face-to-face teaching while utilising online learning incomes to supplement instruction has proven to be successful (Auster, 2015; Longo, 2016; Rozeboom, 2017).

4. Conclusion

The results of the study comparing fully online learning with blended learning on student learning activities show that those in the blended learning class performed higher than those in the fully online learning class. However, basically both of them produce a positive response to learning activities. The study also exposed that students in both lessons were able to utilise their incomes, collaborate with other students and take more ownership of their learning. Students are more involved with the material because they cannot avoid it. They were not given the option to relax in the back and ignore the teacher, but were requested formative questions as they carried out learning activities to assistance themselves measure their understanding. Students with higher needs benefit from online and blended learning classes, as well as they can work one-on-one or in small groups with the teacher allowing them to get the help they need and have their questions replied. Both learning, fully online learning and blended learning, provide all students through a positive learning experience and produce the desired student learning activities.

5. Suggestions

Based on the findings, the researchers recommend that online learning service management should provide additional computing infrastructure (e.g., servers, bandwidth and storage capacity) to route courses in both fully online and mixed learning. The researchers also recommend the need for a good definition and highlight the strategic plan of learning service management for fully online learning and blended learning.

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