Impact of Using Big Data Analisys in Increasing Personalization of Learning

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Article Information:	ABSTRACT
	In today's digital era, big data analytics has become a very relevant topic to improve learning personalisation as it can collect and analyse very large and complex data. Big data analytics can lead to a more efficient learning system by collecting and analysing huge and complex data. In education, big data analytics can be used to understand students' learning behaviour, their needs and preferences, so that learning and learning outcomes can be improved. This research is conducted with the aim of using big data analytics to improve learning personalisation. It also aims to find out the challenges of using big data analytics to improve learning personalisation. The method used in this research is quantitative method. This method is a way of collecting numerical data that can be tested. Data is collected through the distribution of questionnaires addressed to students. Furthermore, the data that has been collected from the distribution of the questionnaire, will be accessible in Excel format which can then be processed with SPSS. From the research results, it can be seen that the big data analysis has shown that the use of more detailed and accurate data can help teachers find students' special needs and improve learning effectiveness. As a result, teachers can create learning strategies that are better suited to students' needs and improve their learning outcomes. From this study, we can conclude that the use of big data analytics in improving personalisation allows teachers to understand better the individual needs and preferences of students, so that more suitable learning plans can be developed and student engagement can be improved. **Keywords**: *Big Data, Learning, Personalisation*

INTRODUCTION

Big data analytics is the process of processing very large data to obtain useful information for the decision-making process (Palatinus et al., 2019). Relationship analysis, data mining and text mining, machine learning, and statistics are some of the data analysis techniques used in big data analysis (Li et al., 2022). Big data analytics can help identify patterns in data, test hypotheses, verify or reject theories, and help better the decision-making process (Taloba et al., 2023). Big data analytics is essential in several industries, such as media and communications, banking and securities, healthcare, education, and manufacturing, to improve operational efficiency, enhance service quality, and spot opportunities and risks.

Big data analysis requires specialised skills in data analysis and lucrative career prospects in data fields such as data analyst and data scientist (Mannering et al., 2020). Businesses and organisations are greatly impacted by the application of big data analytics. One of the most significant impacts is the improvement of operational efficiency; big data analytics helps organisations understand the patterns and trends occurring in the data, so they can make better and more effective decisions (Weersink et al., 2018). In addition, big data analytics helps organisations understand customer preferences and market behaviour, so they can respond quickly to market changes and improve their performance (Corp et al., 2020). Therefore, companies can reduce uncertainty and improve operational efficiency.

Personalisation is a way to create unique and engaging user experiences, such as precise suggestions, moving content, and exclusive offers (Aheleroff et al., 2021). Personalisation helps businesses improve business performance, service quality and operational efficiency (Asaithambi et al., 2021). Big data analytics is essential for creating sound personalisation strategies in fields such as banking, e-commerce, and marketing (Barry & Charpentier, 2020). Website personalisation can be done by knowing the user's behaviour, demographics, and interests (FitzGerald et al., 2018). The types of data that can be used for personalisation include traffic source, browser type, location, landing page, user history and more.

Personalisation of online ads is expected to reduce frustration from ads and help customers find products that suit their needs (Davico et al., 2020). Personalisation can improve business performance and increase customer engagement and interaction (Gaber et al., 2019). By being mindful of privacy, using accurate data, and focusing on message quality, personalisation can lead to better customer experiences and better outcomes (Soffer, 2021). Big data analytics can improve personalisation, especially in terms of operational efficiency, service quality and business performance (Troussas et al., 2020). Organisations can better understand user behaviour, preferences and market trends so they can make better decisions and interact with customers better.

Big data analytics is used in the healthcare industry to predict market demand, price fluctuations, and predict patient medical records, medical sensor data, and genetic information (Chen et al., 2020). In some industries, such as e-commerce, it helps increase sales conversions and customer loyalty by providing more personalised product recommendations to shoppers. Big data analytics is also used in other instances, such as traffic monitoring applications, to provide real-time traffic information to users, discover traffic patterns, congestion, and provide route recommendations (Arunachalam et al., 2018). Big data analytics is used in the financial industry to conduct risk analysis and fraud detection, as well as provide more personalised financial services by understanding user behaviour and preferences (Ghofrani et al., 2018).

The use of big data analytics in improving the personalisation of learning has several significant impacts (Yang et al., 2019). In some sectors, such as education, big data analytics is used to improve the personalisation of learning by better understanding user behaviour, preferences and market trends (Luechtefeld et al., 2018). As such, organisations can improve operational efficiency, enhance service quality, and improve business performance in a more effective and efficient manner (Hidayah et al., 2020). In some ways, big data analytics helps improve personalised learning by understanding customer data, predicting behaviour and providing more tailored recommendations (Salas-Olmedo et al., 2018). As such, organisations can improve operational efficiency, enhance service quality, and improve business performance in a more effective and efficient manner.

The type of method used in this research is quantitative method. This method is used so that the final results of data processing can be known clearly and precisely about the impact of using big data analysis in improving learning personalisation. The data collection process is obtained by researchers from the results of respondents' answers that researchers have done. Researchers made a questionnaire of 20 questions, then distributed it through goggle from. After the data is collected, the data will be calculated into percentages and presented in the form of tables. In processing research data, researchers use SPSS software which aims to make it easier for researchers to process data, and the data results are more relevant.

From the results of the explanation above, the researcher assumes that there is an impact of using big data analysis in improving learning personalisation. This study also aims to find out the advantages of the impact of using big data analysis in increasing the personalisation used in the learning process so that the learning process is not too monotonous in learning. In this study, researchers also used quantitative methods, whose data came from the results of the questionnaire that the researchers had submitted. Furthermore, the researcher really hopes that the next researcher will examine and study more deeply the impact of using big data analysis in improving learning personalisation.

RESEARCH METHODOLOGY

This study used a quantitative research design, which uses statistical processes to present data in the form of numbers. The researcher created twenty questions to collect information about the study to find out the results. The researcher will ask respondents to answer the questions asked, which will be presented in the form of tables and percentages. The purpose of processing this data with the SPSS application is to compare the results of the respondents' answers. After this comparison, the researcher can provide solutions for any information they get about the impact of using big data analysis in improving learning personalisation.

In this study, the researcher investigates the impact of using big data analytics in improving learning personalisation. The purpose of the researcher is to investigate this so that the researcher can collect, analyse, and provide an understanding of the data that has been collected. In creating the questions, the researcher used language that is good and easy for students to understand. This is so that students who give their responses to the questions asked by the researcher can be answered quickly. That way, researchers will find it easier to test the data being investigated regarding the impact of using big data analysis in improving learning personalisation.

In examining the impact of using big data analytics in improving learning personalisation, the researcher must determine the subject for his research. In this study, the subjects in this study were students from various educational institutions. As for before the distribution of the questionnaire was carried out by the researcher, the researcher asked for the availability of the respondents in advance to be able to take the time to fill out the questionnaire that the researcher would distribute. The questionnaire contains 10 questions each about the impact of using big data analysis in improving learning personalisation.

After the researcher conducted several stages as previously described, in conducting research, the researcher also paid close attention to ethics and manners in researching. Researchers think that ethics need to be considered whenever and wherever they are, including in the research conducted. This aims to gain the trust and readiness of the respondents or the objects in this study. Furthermore, in this study, the researcher also explained information related to the research, one of which was information on filling out the questionnaire. The information was explained by the researcher so that the respondents were ready and willing to voluntarily provide responses and answers to the questions asked by the researcher.

The data collected by the researcher in examining the impact of using big data analysis in improving learning personalisation will be processed into the SPSS application. Then the data that has been obtained will be presented in the form of tables

and diagrams. The purpose of presenting it in the form of tables and diagrams is to be able to see the comparison of the results of the research that has been conducted by researchers regarding the impact of using big data analysis in improving learning personalisation. Furthermore, the acquisition of data results is made into a percentage form or into an average form. Then the results of the data will be tested again using the T-test.

Table 1. Category Impact of using big data analytics to improve learning personalisation

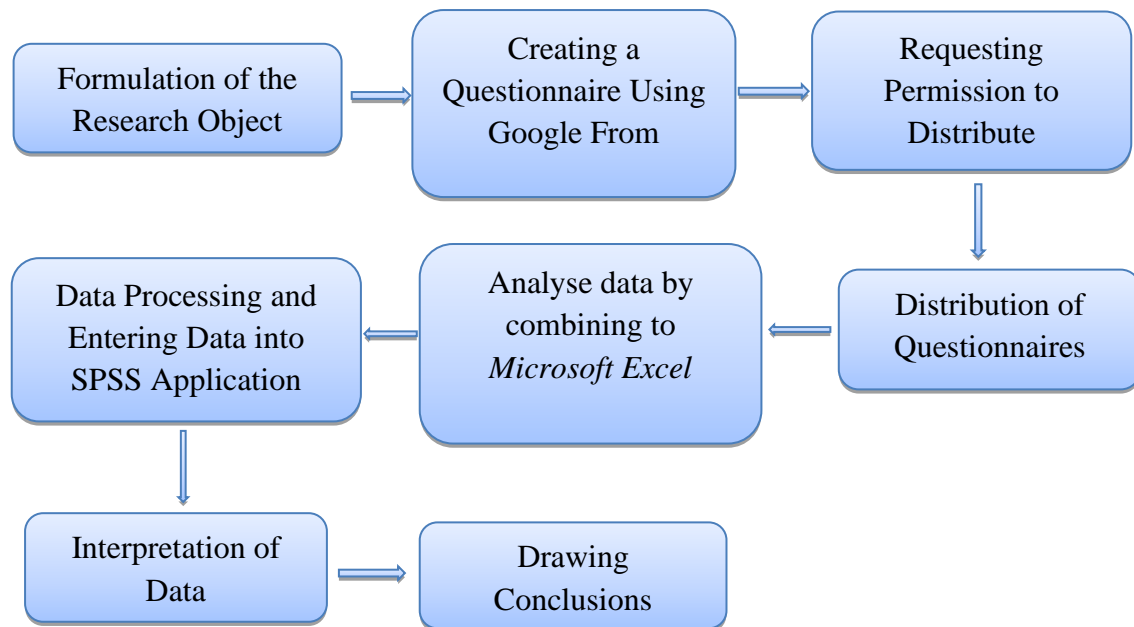| No	Acquisition Category	Level of Education	The percentage (%)
1	Strongly Agree	Students	>90%
2	Agree	Students	45-89%
3	Disagree	Students	16-45%
4	Not Agree	Students	5-15%

Figure 1. Flow of Data Collection and Analysis

Figure 1 above shows how researchers collect and analyse research data. The results of data acquisition come from respondents' answers to researchers' questions. Furthermore, in quantitative research methods, researchers will also test again using the

T-test which will be used to enter research data into the SPPS application. The number of questions asked by the researcher totalled 20 questions, where each question was divided into ten questions with different questions. Only after the questionnaire is distributed, the researcher can formulate and draw conclusions from the research of the research object.

RESULT AND DISCUSSION
The Impact of Using Big Data Analytics

Big data analytics can help increase the personalisation of learning and improve the efficiency and quality of education. Educational institutions can use big data technology to collect and analyse vast and complex data covering student behaviour, needs and preferences, so that students can receive more relevant and appropriate content. Improving teachers' ability to identify students' unique needs, increasing students' ability to get more relevant information, and improving the overall quality of education are additional impacts. Big data analytics can also help school management, such as lowering costs, improving data management, and making better decisions.

Table 2. Recap of Percentage Results from Respondents' Answers

No	Questions	Strongly Agree	Agree	Disagree	Not Agree
1	Big data analytics enables the collection and processing of data from multiple sources to deeply understand students' learning needs and preferences	26%	20%	40%	14%
2	With big data analysis, teachers can understand students' individual learning preferences and styles	30%	45%	15%	10%
3	Personalised learning shaped by big data analytics increases student engagement	30%	25%	45%	0%
4	Analysed data allows for teaching tailored to each student's skill level	50%	30%	20%	0%

5	Personalisation of learning through big data analysis helps address learning gaps between students	15%	45%	31%	9%
6	The use of big data analysis enables adaptation of the curriculum according to individual needs	60%	12%	14%	14%
7	The data collected can provide insight into the progress and challenges of individual students	20%	50%	22%	8%
8	Data-driven personalisation of learning helps identify students who need extra help	40%	50%	10%	0%
9	With big data analysis, teachers can provide more specific feedback to each student	10%	20%	50%	20%
10	Personalised learning increases student motivation as the material is more relevant	80%	10%	10%	0%

Table 2 above shows the distribution of questionnaires that have been conducted by researchers. This questionnaire contains ten questions about the impact of using big data analytics in improving learning personalisation. In addition, during the distribution of the questionnaire, the researcher has percentageed each response result from the respondents. Therefore, respondents can choose to answer the researcher's questions by providing options such as strongly agree, agree, disagree, or disagree. And it can also be seen from the first question asked by the researcher regarding big data analysis allows collecting and processing data from various sources to understand students' learning needs and preferences in depth, getting the highest score of 40% disagree option.

The second question about With big data analysis, teachers can understand students' individual learning preferences and styles, scored 45% agree. The third question about Personalisation of learning shaped by big data analysis increases student engagement, scored 45% disagree. The fourth question, analysed data enables teaching tailored to each student's skill level, scored 50% strongly agree. The fifth question Personalisation of learning through big data analysis helps overcome learning gaps between students, scored 45% in the agree option. Furthermore, the sixth question, the

use of big data analysis enables curriculum adaptation according to individual needs, 60% strongly agreed.

The seventh question that the data collected can provide insights into each student's progress and challenges, got a percentage result of 50% agree option choice. In the eighth question about Personalisation of data-driven learning helps to identify students who need additional help, there is also a choice of 50% agree option. The ninth question about With big data analysis, teachers can provide more specific feedback to each student, got a percentage result of 50% who disagreed. For the last question about Personalised learning increases student motivation because the material is more relevant, get a percentage of 80% in the option choice strongly agree.

Table 3. Recap of Percentage Results from Respondents' Answers

No.	Questions	Strongly Agree	Agree	Disagree	Not Agree
1	Big data analysis helps measure the effectiveness of learning strategies for each student	33%	59%	3%	5 %
2	With the analysed data, teachers can adjust learning materials according to students' interests	88%	12%	0%	0%
3	Data-driven personalisation of learning improves overall student academic outcomes	23%	15%	50%	12%
4	With big data analysis, teachers can identify and address individualised learning barriers	60%	20%	18%	2%
5	Personalisation of learning allows for a more engaging and meaningful learning experience for each student	25%	35%	30%	20%
6	The data collected helps create learning pathways that are customised to student needs	50%	22%	13%	15%

7	With big data analysis, teachers can design assignments and evaluations that match students' abilities	20%	41%	29%	10%
8	Personalisation of learning helps accelerate student progress by adjusting the pace of learning	49%	39%	6%	6%
9	Big data analysis allows for more accurate measurement of student learning success	20%	45%	10%	25%
10	Data-driven personalisation of learning helps create a learning environment that is inclusive and responsive to student needs	80%	20%	0%	0%

In the table 3 statement above, the researcher has also made ten questions. Which can be seen from the first question Big data analysis helps measure the effectiveness of learning strategies for each student, getting a percentage result of 59% agree option. Next question number two With the analysed data, teachers can adjust learning materials according to student interests, getting a percentage score of 88% in the option choice strongly agree. The third question, Personalisation of data-driven learning improves students' overall academic results, received a percentage score of 50% disagree.

The fourth question about With big data analysis, teachers can identify and address individual learning barriers, received a 60% percentage score on the strongly agree option. The fifth question about Personalisation of learning allows for a more engaging and meaningful learning experience for each student, received a 35% agree option. The sixth question on Data collected helps to create learning pathways that are tailored to student needs, also received the same percentage of 50% in the strongly agree and agree options.

Furthermore, the seventh question about With big data analysis, teachers can design assignments and evaluations according to students' abilities, got a percentage score of 41% agree. The eighth question about Personalisation of learning helps accelerate student progress by adjusting the pace of learning, getting a percentage gain of 49% strongly agree. In question nine, big data analysis allows more accurate measurement of student learning success, also found the most agreed option of 45%. The last question about Personalisation of data-driven learning helps to create an inclusive learning environment that is responsive to student needs, received 80% strongly agree.
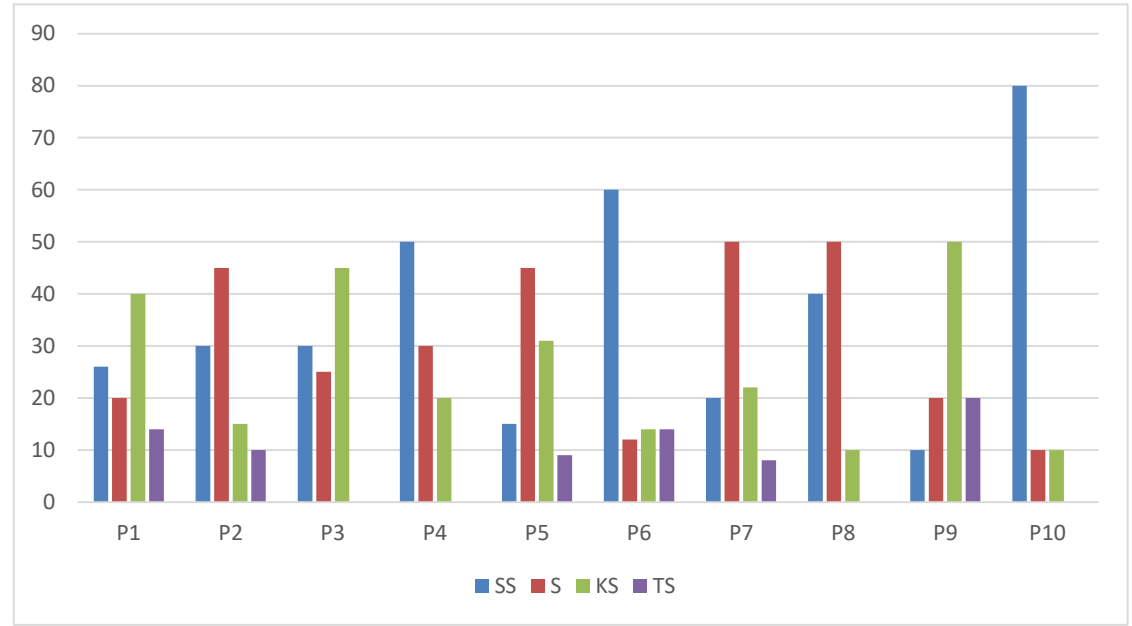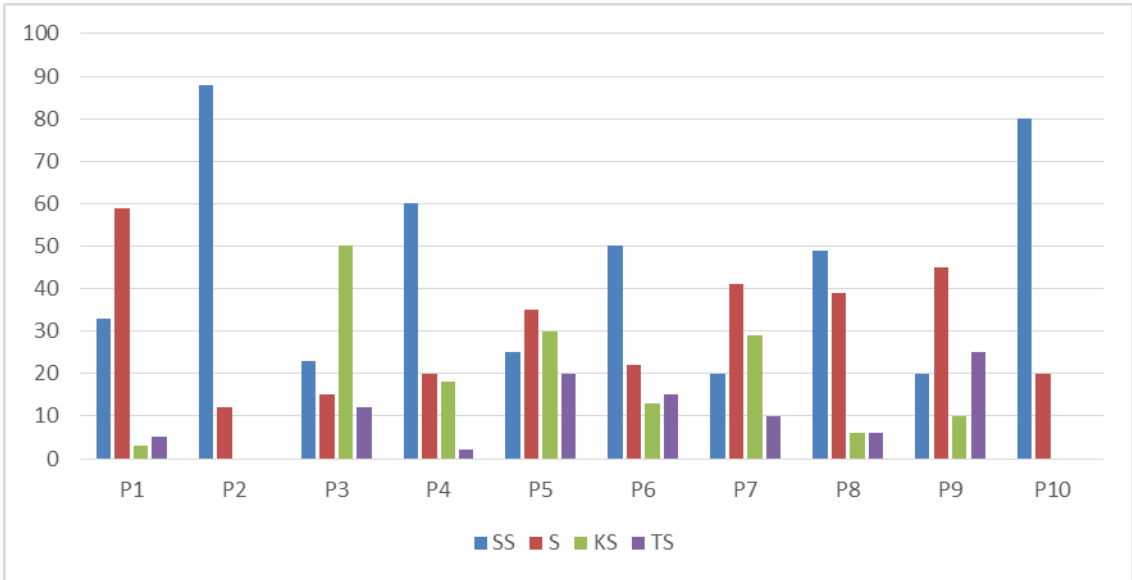
Diagram 1

Diagram 2

Table 3. T-Test on the Impact of Using Big Data Analytics in Improving Learning Personalisation

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PRE TEST	40.4500	20	23.24351	5.19741
	POST TEST	30.7500	20	15.03286	3.36145

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PRE TEST & POST TEST	20	-.543	.013

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	
Pair 1	PRE TEST - POST TEST	9.70000	33.85278	7.56971	-6.14359	25.54359	1.281	19	.215

Based on the results of table 3 above, it is a T-test using the SPSS application. From the results of the study, researchers can conclude that the T-test test in the first output section explains Mean as an average. In the Pre Test, the resulting average amount is 40.4500, while in the Post Test it is 30.7500. Based on these results it can be formulated that there is a difference from the results of the respondents' answers. Furthermore, in the Paired Samples Correlations section, obtaining Correlations of -.543, as well as a large sig acquisition of .013. Furthermore, in the Paired Samples Test section, the results obtained were 33.85278 in the Std. Deviation section, while in the Std. Error Mean section obtained a result of 7.56971. Based on these results, the impact of using big data analysis in improving learning personalisation.

Table 4. T-Test on the impact of using big data analytics to improve learning personalisation

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PRE TEST	20.8000	20	15.92284	3.56046

POST TEST	8.5000	20	7.78325	1.74039

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PRE TEST & POST TEST	20	.360	.119

Paired Samples Test

	Paired Differences								
				95% Confidence Interval of the Difference					
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
PRE TEST - POST TEST	12.30000	14.99860	3.35379	5.28044	19.31956	3.667	19	.002

Furthermore, in table 4, it is also the result of research using the T-test. It can be seen in the first output section from the acquisition of the Pre Test results of 20.8000, and the Post Test of 8.5000. In the Paired Samples Correlations section, obtaining Correlations of .360, with the acquisition of Sig results of .119. While in the Paired Samples Test section, obtained results of 14.99860 in the Std. Diviation, and Std. Error Meanya as much as 3.35379 Based on the results of this study, it can be seen between each question asked by researchers regarding the Impact of Using Big Data Analysis in Improving Learning Personalisation.

Big data analytics in education has changed the way we view and manage education systems. Educational institutions can use technologies that enable large-scale data collection, storage and analysis to gain comprehensive insights into students' learning patterns, trends in academic success and the factors that affect their performance (Grau-Fuentes et al., 2023). Analysing big data allows for a more targeted and effective approach to improving the student learning experience (Complexity, 2024). In addition, teachers can use predictive models and algorithms to make personalised suggestions and appropriate interventions to help each student reach their full potential (Zeng et al., 2023). However, it is important to remember that the use of big data in education raises ethical questions regarding student privacy and possible bias that may occur due to data analysis.

Big data analytics can improve operational efficiency, quality of goods and services, and public awareness of the importance of data. Big data analytics helps education by making systems smarter and better able to adapt to changes ("Retracted," 2023). Therefore, Big Data analysis improves education, students' abilities, and

decision-making processes. Big data analytics also helps society become better prepared for the era of industrial development 4.0, which is characterised by the emergence of big data (Ruggiero, 2022). As a result, big data analytics has great potential to improve the quality of education as well as enhance people's ability to face global big data challenges (Xu et al., 2023).

The use of technology in education has enabled significant improvements in the ability to customise learning (Christopoulos & Sprangers, 2021). Educators can get more information about students' learning preferences, their strengths and weaknesses by using digital learning platforms and educational apps (Mohanty et al., 2016). Using this data, they can create learning experiences that are tailored to individual needs and allow students to learn at their own pace and on a path that suits their learning style (Gunasekaran et al., 2017). This personalisation method not only increases student motivation and engagement, but also helps to create an inclusive learning environment where every student feels valued and supported throughout his or her educational journey.

Big data analytics has helped improve the personalisation of learning in education. Using the data collected, teachers can better understand students' learning behaviour and predict their needs more accurately (Jacobs, 2009). Thus, teachers can create learning strategies that better suit students' needs, improve students' ability to follow lessons, and increase students' awareness of what they are learning. Big Data analysis also improves operational efficiency, product and service quality, and public awareness of the importance of data in education (Xiang et al., 2015). Thus, Big Data analysis has great potential to improve the quality of education and enhance students' ability to handle big data challenges around the world.

The use of big data analytics in education has increased the personalisation of learning. Educational institutions can identify students' learning patterns and preferences in greater depth by leveraging technology to collect and analyse data in a big way (Research Scholar- IT, Dept. of IT, DSB Campus, Kumaon University, Nainital, India. et al., 2019). Big data analysis allows educators to create learning experiences that are more tailored to individual needs, allowing each student to learn in a way and at a time that suits them (Allam & Dhunny, 2019). In addition, predictive models that can anticipate students' learning needs and progress more accurately, allow education providers to provide more timely and relevant recommendations (Altan & Hacıoğlu, 2020).

CONCLUSION

Based on the results of the research that has been conducted and presented in tables and T-Test tests, it can be concluded as follows: The majority of respondents agree that big data analysis enables the collection and processing of data from various

sources to understand students' learning needs and preferences. This is shown by 45% of respondents who agree that teachers can understand students' individual learning preferences and styles through big data analytics. Personalised learning shaped by big data analysis increases student engagement, although 45% of respondents disagree. However, personalised learning is proven to increase student motivation due to more relevant material, with 80% of respondents strongly agreeing.

A total of 60% of respondents strongly agreed that the use of big data analytics enables curriculum adaptation according to individual needs. In addition, 50% of respondents strongly agreed that the analysed data enables teaching tailored to each student's skill level. Data-driven personalisation of learning helps identify students who need extra help, with 50% of respondents agreeing. The data collected also provides insight into each student's progress and challenges, with 50% of respondents agreeing.

The T-test results show that there is a significant difference between the pre-test and post-test results. The mean on the pre-test was 40.4500 and on the post-test was 30.7500. The correlation between the pre-test and post-test was -.543 with a significance of .013. Despite the difference, this result shows that big data analysis has the potential to improve the personalisation of learning. The T-test results in table 4 also show a significant difference between the pre-test and post-test results. The mean in the pre-test is 20.8000 and in the post-test is 8.5000. The correlation between pre-test and post-test is .360 with a significance of .119. This shows that there is an improvement in learning outcomes after using big data analysis.

Big data analysis has a positive impact in improving the personalisation of learning. By using big data, teachers can better understand students' learning needs and preferences, which allows for more effective adaptation of curriculum and teaching. In addition, learning personalisation supported by big data analytics is proven to increase student motivation and engagement, and help identify and provide assistance to students in need. Nonetheless, some respondents still doubt its effectiveness in some aspects, indicating the need for further research and application to optimise the use of big data in education.

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