Tuijin Jishu /Journal of Propulsion Technology
ISSN:1001-4055
Vol. 44 No.04 (2023)

The Effect of Using ICT, Discussion, Explanation, and Discovery Methods in Instructional Process on Students' Learning Motivation

Sucipto[1], Bambang Budi Wiyono[2]*, Ali Imron[3], Desi Eri Kusumaningrum[4], Rohaida Binti Mohd. Saat[5]

[1]Nonformal Education Department, Faculty of Education, Universitas Negeri Malang, Indonesia.
[2]*Educational Management Study Program, Faculty of Education, Universitas Negeri Malang, Indonesia.
[3]Educational Management Study Program, Faculty of Education, Universitas Negeri Malang, Indonesia.
[4]Educational Administration Department, Faculty of Education, Universitas Negeri Malang, Indonesia.
[5]Department of Mathematics and Science, EducationFaculty of Education, University of Malaya,

Abstract
Students' learning motivation influences students' learning outcomes. The higher the student's learning motivation, the higher the student's learning outcomes. If studied further, it is estimated that there is a relationship between the use ofinstructional methods and the ICTof teachers and student learning motivation. This research aims to test the effect of using discussion, explanation, and discovery methods and the use of Information and Communication Technology (ICT) on students' learning motivation. Through random sampling, 156 students were taken as research samples. Data collection techniques used questionnaires and documentation. Data analysis techniques used descriptive statistics, analysis of variance, correlation, and regression analysis. The results of zero-order correlation analysis showed that there was a significant positive correlation between the use of discussion, explanation, and discovery methods and student learning motivation. There were differences in the frequency of using discussion, explanation, and discovery methods in the teaching-learning process. Simultaneously, there was a significant positive influence of the use of these three teaching methods on student learning motivation. Partially, only the use of the discovery method had a significant effect on student learning motivation. There was a significant effect of the use of teaching methods and ICT in the teaching-learning process on students' learning motivation. The use of ICT in learning showed a stronger effect on student learning motivation than the use of teaching methods.
Keywords*: Discussion method, explanation method, discovery method, ICT, learning motivation, student*

1. Introduction

Quality education is a priority scale for educational development. Quality education will contribute to the progress of a nation. The primary indicator of educational quality is student learning outcomes. High student learning outcomes characterize quality education.

Many factors, both internal and external, influence student learning outcomes. Internal factors are factors that come from inside, while external factors are factors that come from outside. Intelligence, motivation, interests, and talents are examples of factors that come from inside the student. Meanwhile, family background, parents' socio-economic conditions, learning facilities, and teacher's teaching are factors that come from outside the student[1][2][3]. Of these external factors, a teacher's teaching is one of the factors that really determines student learning outcomes[4]

One of the factors that really determine student learning outcomes is student learning motivation [5][6]. Learning motivation is one type of motivation that exists in individuals, namely motivation in teaching and learning activities. Motivation comes from the term "motive," which means an effort that encourages someone to do something. Motivation is a motive that has become active. Motivation is a hidden force within humans that enables them to act uniquely. Motivation can provide direction and intensity to a person's behavior. Someone who has high motivation will be able to achieve high results[7].

Learning motivation is the overall psychological activator force within students that gives them the desire to learn. Students who have high motivation have a lot of energy to carry out learning activities. On the other hand, students who do not have the motivation to learn will not carry out learning activities optimally. Therefore, to improve student learning outcomes, it is necessary to increase their learning motivation. Learning motivation is the main determining factor in student learning outcomes.

Learning motivation can be divided into two, namely intrinsic and extrinsic motivation. Intrinsic motivation is motivation from the inside, namely active motivation and functioning from within, without external stimulation. Meanwhile, extrinsic motivation is active motivation that is active due to external stimuli. The position of intrinsic motivation is more important than extrinsic motivation. There is a sequential effect between extrinsic and intrinsic motivation[8]. A teacher needs to increase student learning motivation. By increasing learning motivation, it will have an impact on increasing student learning outcomes [9][10]. One way to improve student learning motivation is to carry out an effective teaching process[11][12]. Teacher teaching is a system in which some components are interdependent and interact. These components such as learning objectives, learning materials, learning strategies and models, learning methods, learning media, and learning evaluation. Teaching methods are one component of a teacher's teaching system that has a strong influence on student learning processes and outcomes[13].

Teaching methods are the methods used by teachers in delivering lesson material. In a teaching-learning system, the teaching method has a parallel function to the other components but is more specific than the other components. Teaching methods are tools used by teachers to convey lesson material to students. Teaching methods facilitate students to gain learning experience. Through teaching methods, various types of student learning activities can be created. Through these learning activities, students will gain meaningful learning experiences.

Several teaching methods can be applied by the teachers. Each teaching method has specific characteristics. A particular teaching strategy requires a particular teaching method. The same teaching method is not necessarily appropriate for all learning. Several factors that need to be considered in choosing a method are students, goals, situations, facilities, and instructors. Some teaching methods that are widely used are lectures or explanations, discussions, assignments, discoveries, simulations, demonstrations, question and answer, resistance, review, units, and drills. Among the several teaching methods, those that are often used are explanation, discussion, and discovery methods.

The explanation method is a way of delivering subject matter by providing information or explanation and oral narrative to a group of students in a teaching and learning interaction. The discussion method is a way of delivering lesson material through the process of involving two or more students who interact verbally and face each other regarding a specific goal by exchanging, defending opinions, or solving problems. The discovery method is a way of delivering lesson material by facilitating students to find the information they need for themselves. These three teaching methods are often used by teachers or explanations in the learning process, but their influence on student learning motivation has not been studied much. The magnitude of the influence of these three teaching methods on student learning motivation also still needs to be studied. Through the use of effective teaching methods, students' learning motivation will be able to increase, and by increasing students' learning motivation, they can achieve good learning achievements.

Besides the use of teaching methods, an essential variable is the use of information and communication technology (ICT) in learning. Related to technological developments, the use of ICT in education is vital. The use of ICT covers two aspects, namely information technology and communication technology. Information technology covers everything related to the process, use as a tool, manipulation, and information management. In the world of education, technology, in general, has a purpose so that students understand, recognize, and use the tools of information technology. It can be applied for communication, such as Google Meet, Skype, or Zoom, sharing information, such as WhatsApp, email, or websites, and recording tools, such as video and audio recording [14]. In addition, it can also be used to present material, store, or process data, such as a personal computer or laptop. Based on the theory, the use of ICT in the teaching-learning process will be able to improve student learning processes and outcomes. However, there needs to be an integration of the use of ICT and the

teaching methods applied. There needs to be integration between content, methods, and the use of technology in the teaching-learning process. Not all teaching methods are suitable for using ICT. There needs to be integration between the use of ICT and the teaching methods used.

The use of ICT in the teaching-learning process can be as an instructional medium to clarify the description or explanations, as a learning resource, namely as a source of information and searching for information, and as a learning system component. The use of ICT in learning can increase learning interactions between teachers and students and between students and students. The use of ICT can also improve the quality of the teaching process and the quality of student learning outcomes. However, how it affects students' learning motivation has not yet been widely studied, and the comparative influence of the use of teaching methods and ICT on student learning motivation has not been studied in depth as well.

In several studies during COVID-19, the use of ICT in learning has not shown effective results [15][16][17]. There was a negative relationship between ICT use for learning at school and students' outcomes, especially for students from developing countries [18]. There was a negative relationship between educational ICT resources and student academic performance, and there was a positive correlation with cognitive-motivational. The educational ICT resources indicated strong associations with cognitive-motivational engagement, and student engagement mediates the relationship between educational ICT resources and academic performance[19]. The use of ICT outside of school does not affect student learning outcomes[20. In other studies, there was a strong positive link between ICT literacy and academic achievement [21]. There were effects of the use of technology on students' motivation [22]. There was a relationship between the use of ICT and the enjoyment of science learning [23]. The use of ICT can increase students' test scores and cognitive and noncognitive abilities [24]. Therefore, this needs to be studied more deeply. Based on the background, this research was conducted.

Purpose

This research aimed to determine the effect of using discussion, explanation, and discovery methods on student learning motivation and compare its coefficient. It is to test the impact of using ICT in the teaching-learning process on students' learning motivation. In addition, the study also finds the effect of the use of teaching methods and ICT on the students' learning motivation simultaneously and partially. The formulation of the research hypothesis is that there is a significant effect of the use of explanation, discussion, and discovery methods on student learning motivation. There is a significant effect of the use of ICT in the teaching-learning process on student learning motivation. There is a different effect of using discussion, explanation, and discovery methods on students' learning motivation. There is a significant effect of the use of teaching methods and ICT on the students' learning motivation, simultaneously and partially.

2. Methods

This research aims to find the relationship coefficient and the influence of applying discussion, explanation, and discovery methods on student learning motivation. In addition, the research also tests the effect of using teaching methods and ICT on the student's learning motivation. For this reason, the research design is a descriptive correlational research design. Research steps include formulating research problems and objectives, reviewing theories and previous research results, formulating research hypotheses, developing and validating research instruments, collecting data, analyzing and interpreting data, formulating research findings, and writing research reports.

Participants. The research sample was taken from 156 students from Universitas Negeri Malang by random sampling techniques. The samples consisted of 40 male students and 116 female students, covering the third semester, fifth semester, and seventh semester. Related to the parents' occupations, they consist of 29 civil servants and 127 private employees, and the education level consisted of 32 elementary schools and 22 junior high schools. 62 senior high school, 34 bachelor's degrees, five master's degrees, and one doctorate degree. This is representative of the population targeted for this research. All elements are represented and do not show significantly different learning facilities. The results of data collection regarding the facilities of students also showed the same conditions, and all are represented, namely in terms of learning facilities: 3 (1.9%) were poor, 27 (17.3%) were adequate, 98 (62.8%) were good, and 28 (17.9%) were excellent. Regarding ICT facilities, 2

(1.3%) were very poor, 5 (3.2%) were poor, 10 (6.4%) were adequate, 87 (55.8%) were good, and 57 (33.3%)) were excellent. Thus, it can be concluded that the research samples are representative.

Data sources and data collection process. The study used questionnaires and documentation as data collection techniques. The research instruments used in this research were developed based on research variables. The type of instrument is a summated rating (Likert Scale) type questionnaire. Each instrument item is provided with five alternative answers, namely strongly agree = 5, agree = 4, neutral = 3, disagree = 2, and strongly disagree = 1.

The steps that were conducted in developing the instrument are reviewing the basic theory of research variables, establishing a conceptual definition, translating it into an operational definition, describing the indicators, constructing statements, assembling the instrument, and compiling the completeness of the instrument. To obtain the validity of the instrument, trials, and analysis of the instrument were carried out based on empirical data in the field. The trial was conducted on the same population, which was not taken as a sample of 140 respondents. The level of validity of the instrument was tested using item analysis, while the level of reliability of the instrument was estimated using Cronbach's Alpha formula[25].

Based on the results of the instrument analysis, each item shows a good discriminatory index. There is a significant positive correlation between the items and the total score, with the coefficient > 0.3. It can be concluded that all instrument items have good item validity. The results of Cronbach's Alpha reliability analysis also show good results. The reliability value obtained is 0.701. The above value is above 0.7, so it shows a good level of reliability[26][27].

*Data analysis.*Regarding the research objectives and existing data types, the data analysis techniques used in this research are descriptive statistics, Pearson product-moment correlation, and regression analysis. Descriptive statistics was used to describe data, namely the average use of explanation, discussion, and discovery methods, as well as student learning motivation. Analysis of variance was used to test differences in the intensity of using discussion, explanation, and discovery methods in learning. Correlation and regression analysis techniques were used to examine the relationship and influence of discussion, explanation, discovery methods, and use of ICT on student learning motivation.

3. Results

The Use of Discussion, Explanation, and Discovery Methods and ICT in Learning

Before testing the hypothesis, the first step is describing the data, both intensity data using the discussion method, explanation method, and discovery method in learning and student learning motivation. From the results of the analysis, it is known that the average score for using the discussion method in teaching was 4.22, with a standard deviation of 0.524. These results are clarified by the results of the frequency distribution analysis, which are generally presented in Figure 1.

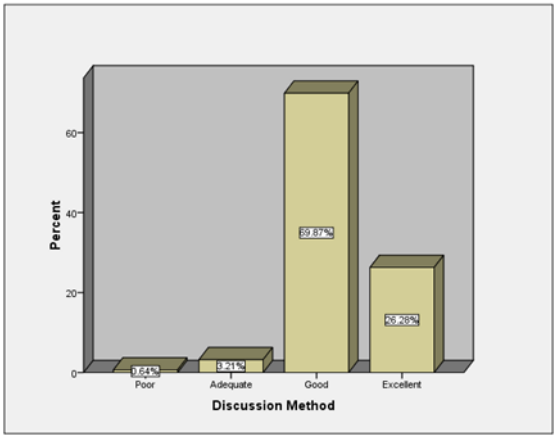

Figure 1: Intensity of Using Discussion Methods in Learning

Based on Figure 1, it appears that the majority of lecturers use discussion methods in the good category. Some are excellent, and a few are in the adequate and inadequate categories. This shows that the majority of lecturers have implemented discussion methods in learning.

The results of the second analysis showed that the average score for using the explanation method in teaching was 4.13, with a standard deviation of 0.613. These results are clarified by the results of the frequency distribution analysis, which are presented in Figure 2.

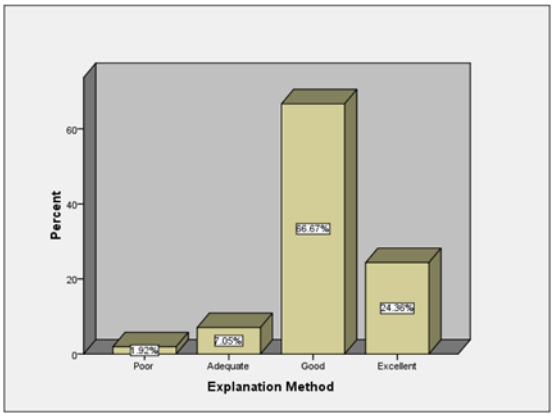

Figure 2: Intensity of Using Explanation Methods in Learning

Based on Figure 2, it appears that the majority of lecturers use the explanation method in the good category. Some are excellent, and a few of them are in the adequate and inadequate categories. This shows that the majority of lecturers have applied the explanation method in learning.

The results of the third analysis showed that the average score for using discovery methods in teaching was 3.83, with a standard deviation of 0.761. These results are clarified by the results of the frequency distribution analysis, which are presented in outline in Figure 3.

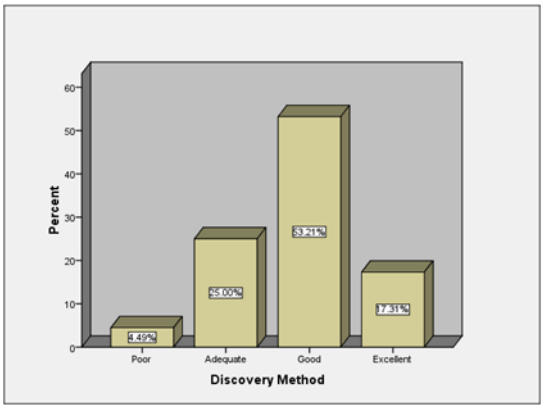

Figure 3: Intensity of Using Discovery Methods in Learning

Based on Figure 3, it appears that the majority of lecturers using discovery methods are in the good category. Some are excellent, and a few are in the adequate and inadequate categories. This shows that the majority of lecturers have applied the explanation method in learning.

Even though the use of these three methods shows that they have the same category, namely in the good category, if we look at the average score, the lowest is the discovery method. Lecturers use discussion and explanation methods more than discovery methods. This is confirmed by analysis of the differences in the use of discussion, explanation, and discovery methods, obtaining an F value of 15.595, with a p-value < 0.05. Thus, it can be concluded that there are differences in the use of discussion, explanation, and discovery methods applied

by lecturers in learning. The results of further analysis show that what is different from the three teaching methods is the discovery method. Lecturers use it less than the explanation and discussion methods. These results are shown in Figure 4.

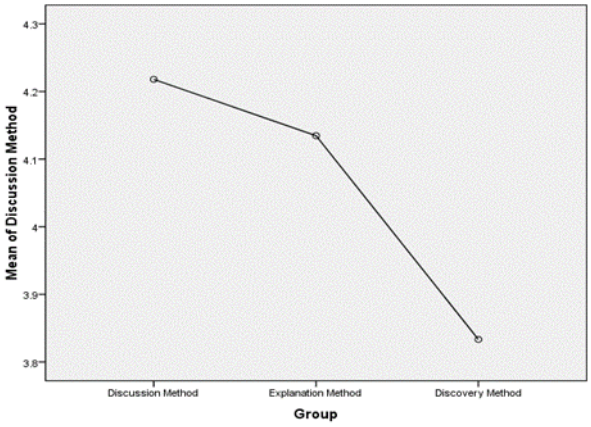

Figure 4. Differences in the Use of Discussion, Explanation, and Discovery Methods in Learning

The results of the fifth analysis showed that the average score for using Information and Communication Technology in teaching was 4.24, with a standard deviation of 0.513. These results are clarified by the results of the frequency distribution analysis, which are generally presented in Figure 5.

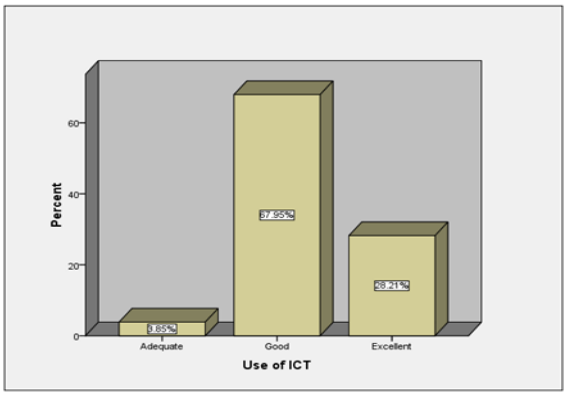

Figure 5: Intensity of Using ICT in Learning

The Effect of Using Discussion, Explanation, and Discovery Methods and ICT on Students' Learning Motivation

After describing data, testing was carried out on the influence of discussion, explanation, and discovery methods on student learning motivation. The results of the zero-order correlation analysis are presented in Table 1.

Table 1. Zero Order Correlation of the Use of Discussion, Explanation,

Discovery Methods, and the Student Learning Motivation

Independent Variables	Student Learning Motivation		
	r	*p*	Conclusion
Use of Discussion Methods	0.227	0.002*	Significant
Use of Explanation Methods	0.239	0.001*	Significant
Use of Discovery Methods	0.268	0.000*	Significant

Based on Table 1, it can be seen that the results of zero-order correlation analysis show a significant positive correlation between the use of discussion, explanation, and discovery methods and student learning motivation. The correlation between the use of the discussion method and student learning motivation obtained an r-value of 0.227 with a p-value < 0.05, the correlation between the use of the explanation method and student learning

motivation obtained an r-value of 0.239 with a p-value < 0.05, and the correlation between the use of the discovery method and student learning motivation got an r-value of 0.268 with a p-value < 0.05. The three correlations show a p-value < 0.05. Thus, it can be concluded that the null hypothesis is rejected, and the alternative hypothesis is accepted. There is a significant positive correlation between the use of discussion, explanation, and discovery methods and student learning motivation.

Then, a regression analysis was carried out to find the effect of using discussion, explanation, and discovery methods on student learning motivation, both simultaneously and partially. The results of the regression analysis show that the R-value obtained is 0.306, and the F-value is 5.246, with a p-value < 0.05. Thus, it can be concluded that simultaneously, there is a variable influence of the use of discussion, explanation, and discovery methods on student learning motivation. Meanwhile, the partial effect of each variable is presented in Table 2.

Table 2. Partial Correlation of the Use of Discussion, Explanation,

Discovery Methods, and Student Learning Motivation

Variables	*Beta*	*t*	r partial	*p*
Use of Discussion Methods	0.093	0.925	0.075	0.356
Use of Explanation Methods	0.093	0.888	0.072	0.376
Use of Discovery Methods	0.188	2.134	0.171	0.034*

Based on Table 2, it can be concluded that the results of the partial correlation analysis show that the significant variable is the use of the discovery method, with a correlation coefficient value of 0.171 and a predictive power of 0.188. Thus, of the three teaching methods, namely discussion, explanation, and discovery methods, the teaching method that has the dominant influence is the discovery method.

Then, testing was conducted to test the effect of using ICT in the instructional process on the student's learning motivation, and the results are presented in Table 3.

Table 3. The Effect of Using ICT on The Students' Learning Motivation

Variables	*Beta*	*t*	*r*	*p*
The use of ICT	0.311	4.063	0.311	0.000*

The research results show that there is a significant effect of using ICT in the instructional process on students' learning motivation, with a predictor value of 0.311 and p < 0.05.

Then, testing was carried out to test the effect of using teaching methods and ICT in learning on students' learning motivation. When tested separately, the use of teaching methods and the use of ICT in the teaching process did not show a significant influence on student learning motivation. Only the use of ICT shows a significant influence on learning motivation. However, when combined, the use of the three teaching methods and ICT shows a significant influence. The results are generally presented in Table 4.

Table 4. The Effect of Using Teaching Methods and ICT on The Students' Learning Motivation

Variables	*Beta*	*t*	*r* partial	*p*
Use of Teaching Methods	0.185	1.978	0.158	0.050*
The use of ICT	0.203	2.183	0.172	0.032*

The results of the regression analysis obtained an R-value of 0.345, with an F value of 10.358, with p < 0.05. Thus, it can be concluded that there is a significant positive influence of the use of teaching methods and ICT on student learning motivation. The results of the partial correlation analysis also show that both the use of teaching methods and ICT in learning have a significant effect on student learning motivation. However, if you look at

the value, the influence of the use of ICT is higher than the use of teaching methods.

4. Discussion

The results of data analysis show that there is a significant positive correlation between the use of discussion, explanation, and discovery methods and student learning motivation. The higher the application of these three teaching methods, the higher the student's learning motivation. The research findings confirm several previous studies that teaching methods have a strong influence on student motivation and learning outcomes [28][29][30]. The other research results show that teacher credibility is a primary predictor variable of student academic motivation. The quality of a teacher's teaching methods is the main component that indicates a teacher's credibility [31]. In line with this research, the other study results indicate that a teacher's teaching behavior is a predictor variable for students' autonomous motivation[32][33].

The results of the second study showed that there were differences in the influence of the use of discussion, explanation, and discovery methods on student learning motivation. The use of the discovery method has a more substantial effect on student learning motivation than the discussion and explanation method. The findings of this research are related to the results of previous research[34][35]. The results of the experimental study also show that students' motivation and achievement are higher when taught with a new teaching method approach compared to classical teaching methods. The new teaching method is based on constructivism, and the classical teaching method approach is based on behaviorism [36]. The discovery method emphasizes activities in the learning process and is based on constructivism. Students try to build their knowledge based on their learning experiences. The learning process is student-centered. Through active learning, it has a stronger impact on student motivation and learning outcomes.

The results of the third study showed that there is a significant influence of the use of ICT in learning on student learning motivation. The higher the use of ICT in learning, the higher the student's learning motivation. The findings of this research are related to several previous research results [37][38][39]. There is a significant relationship between the use of ICT in teaching and student learning motivation [23]. The use of ICT in learning has a direct effect on student learning motivation [40]. In addition, there is a significant relationship between the use of various ICT in teaching and student performance and satisfaction [41]. The use of ICT in learning makes the learning process more effective and enjoyable. It is easier for students to understand learning material, so their learning motivation increases. The more the lecturer uses ICT in the teaching-learning process, the higher the student's learning motivation. The use of ICT enhanced enjoyment and interest in the topic presented, decreased feedback time, allowed the opportunity for the students to choose and control their learning pace, and increased self-esteem [42]. The use of information and communication technology helps teachers through interactive methods to interact with students

The results of the fourth research showed that the use of teaching methods and the use of ICT in learning influence students' learning motivation. When it was compared to these two variables, the use of ICT has a higher coefficient than the use of teaching methods. The results of this study are in line with several previous studies that the use of ICT has a more decisive influence than the use of teaching methods [43]. The teacher's supervision process also shows the same results, that the use of ICT in the development process has a stronger effect on the quality of teacher teaching than the use of supervision techniques [44]. This is acceptable because by using ICT, teaching becomes more exciting and enjoyable. The use of teaching methods will be more interesting if supported by the use of ICT-based learning media. Therefore, the use of ICT in learning has a more decisive influence on student learning motivation. The use of learning media will increase students' learning motivation [45].

The use of ICT in the teaching-learning process varies. Most lecturers use WhatsApp, Email, Sipejar-Assignment, Google Meet, Google Search, Google Classroom, Zoom, and Quizizz in the teaching-learning process. Most students use WhatsApp, Google Search, and Email in learning [16][17][46]. Most teachers like using WhatsApp, YouTube, Instagram, email, Facebook, and Twitter to build relationships with students[15]. Their use in the learning process also varies; for example, WhatsApp, Google Search, and email were widely used for communication media and sharing assignments. Google Meet and Zoom were widely used for the discussion process. Google Classroom and Sipejar were widely used for learning processes, discussions, and

assignments. Google Scholar, ScienceDirect, and Microsoft Academic were most used to obtain learning resources[14]. Quizizz was widely used in learning process and assignment [16]. Thus, the use of ICT in the instructional process varies according to learning needs.

If examined further, the use of ICT in learning needs to be integrated with the learning process. Several research results showed that the use of ICT cannot have a significant impact on student learning processes and outcomes because the application is inappropriate[47]. For this reason, it needs to be adapted to the content, model, or teaching method used and supported by appropriate theory [48][49]. The proper use of ICTs can catalyze the paradigmatic shift in both content and pedagogy [50]. The use of ICT must be integrated with mastery of pedagogy and content so that it can be implemented effectively. Therefore, in addition to ICT, teachers must master content and pedagogy. Teachers' technological pedagogical content knowledge impacts the use of ICT in pedagogy[51]. The obstacle is that many teachers have not mastered ICT well, so they do not utilize ICT in learning. The availability of ICT, as well as access to use, for example, the availability of the internet, is still not optimal, so there is less intensive use of ICT in the teaching-learning process [52][46]. Teachers think of ICT as an emerging tool for teaching-learning but have faced many challenges in using it in the classroom [53]. Therefore, it is necessary to continually improve teachers' abilities in using ICT integrated with content and pedagogy. Teacher competency using ICT combined with pedagogy and content needs to be continuously improved through education, development, or instructional supervision [54]. Instructional supervision is a process to improve and increase the quality of the teacher's teaching process in order to improve student learning outcomes [55].

5. Limitations

This research was carried out using a non-experimental design, so it didn't control all variables that influence students' learning motivation. Therefore, for future research, it is recommended to conduct the experimental research so that full control can be carried out in order to obtain generalizations.

6. Conclusion

Based on the results of the analysis and discussion, several main conclusions can be stated in this research. First, there is a significant influence of the use of discussion, explanation, and discovery methods on student learning motivation, both simultaneously and partially. On average, lecturers have used these three teaching methods in the good category. Based on the score, it is known that lecturers more often use discussion and explanation methods than discovery methods.

Reviewing the correlation and regression coefficients obtained, of the three teaching methods studied, the one that has the strongest influence is the discovery method. Even the results of partial correlation analysis show that only the discovery method has a significant positive effect. This indicates that the discovery method is the most effective method for increasing student learning motivation.

There is a significant positive influence of the use of ICT in learning on student learning motivation. The higher the lecturer uses ICT in the learning process, the higher thestudent's learning motivation. Even looking at the correlation and regression coefficients obtained, the use of ICT in learning has a stronger influence than the use of teaching methods. This shows that using ICT in the teaching-learning process can improve student learning experiences and make the learning process enjoyable.

Based on the results of this research, it is recommended that teachers and lecturers use the discovery method more intensively in learning compared to other methods and integrate it with the use of ICT in the learning process. In this way, it may be possible to increase student learning activity and motivation, which will ultimately improve student learning outcomes. Therefore, the pedagogical, content, and ICT competence of teachers and lecturers need to be continuously enhanced in order to implement an effective ICT-based teaching-learning process. Improving teacher competency can be implemented through instructional supervision.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of

this article.

Funding

The authors received financial support from the Institution of Research and Community Development for the research, authorship, and publication of this article.

ORCID iD

Wiyono, B.B. https://orcid.org/0000-0001-8351-5453

References

[1] Efriza, R.; Caska, C.; Makhdalena, M. Analysis of Factors Affecting Student Learning Achievement of Social Sciences Subjects in Muhammadiyah Middle School Rokan Hulu Regency. *Journal of Educational Sciences***2020**, *4* (3), 529–540. https://doi.org/10.31258/jes.4.3.p.529-540.
[2] Nguyen, C.; Griffin, P. Factors Influencing Student Achievement in Vietnam. *Procedia - Social and Behavioral Sciences***2010**, *2* (2), 1871–1877. https://doi.org/10.1016/j.sbspro.2010.03.1001.
[3] Riswanto, A.; Aryani, S. Learning Motivation and Student Achievement : Description Analysis and Relationships Both. *COUNS-EDU: The International Journal of Counseling and Education***2017**, *2*, 42. https://doi.org/10.23916/002017026010.
[4] Harith, S.; Ahmad, A.; Suhaini, M. Factors Influencing Student Achievement: A Systematic Review. *International Journal of Psychosocial Rehabilitation***2020**, *24*, 550–560. https://doi.org/10.37200/IJPR/V24I5/PR201720.
[5] Habók, A.; Magyar, A.; Németh, M. B.; Csapó, B. Motivation and Self-Related Beliefs as Predictors of Academic Achievement in Reading and Mathematics: Structural Equation Models of Longitudinal Data. *International Journal of Educational Research***2020**, *103*, 101634. https://doi.org/10.1016/j.ijer.2020.101634.
[6] Guo, W.; Bai, B.; Zang, F.; Wang, T.; Song, H. Influences of Motivation and Grit on Students' Self-Regulated Learning and English Learning Achievement: A Comparison between Male and Female Students. *System***2023**, *114*, 103018. https://doi.org/10.1016/j.system.2023.103018.
[7] Atma, B. A.; Azahra, F. F.; Mustadi, A.; Adina, C. A. Teaching Style, Learning Motivation, and Learning Achievement: Do They Have Significant and Positive Relationships? *Jurnal Prima Edukasia***2021**, *9* (1), 23–31. https://doi.org/10.21831/jpe.v9i1.33770.
[8] Lee, Y.; Lee, J.; Hwang, Y. Relating Motivation to Information and Communication Technology Acceptance: Self-Determination Theory Perspective. *Computers in Human Behavior***2015**, *51*, 418–428. https://doi.org/10.1016/j.chb.2015.05.021.
[9] Annisa, A. Pengaruh Motivasi Belajar Terhadap Prestasi Siswa Di Sekolah. *Al-Ittizaan: Jurnal Bimbingan Konseling Islam***2020**, *2*, 1. https://doi.org/10.24014/0.8710124.
[10] Jumarniati, J.; Anas, A. Pengaruh Motivasi Belajar Dan Aktivitas Belajar Terhadap Hasil Belajar Mahasiswa Program Studi PGSD. *Cokroaminoto Journal of Primary Education***2019**, *2* (2), 41–47. https://doi.org/10.30605/cjpe.222019.113.
[11] Firdaus, A. Factors Affecting Students Motivation to Learn in School: A Qualitative Study of School Management. *International Journal of Scientific & Engineering Research***2019**, *10*, 206–211. https://doi.org/10.14299/ijser.2019.12.01.
[12] Chan, S.; Maneewan, S.; Koul, R. Teacher Educators' Teaching Styles: Relation with Learning Motivation and Academic Engagement in Pre-Service Teachers. *Teaching in Higher Education***2021**, *0* (0), 1–22. https://doi.org/10.1080/13562517.2021.1947226.
[13] Bayrak, B. K.; Bayram, H. The Effect of Computer Aided Teaching Method on the Students' Academic Achievement in the Science and Technology Course. *Procedia - Social and Behavioral Sciences***2010**, *9*, 235–238. https://doi.org/10.1016/j.sbspro.2010.12.142.
[14] Wiyono, B. B.; Kulidtod, Z. D.; Bin Musa, K. The Effectiveness of Using Recording, Synchronous Communication, and Sharing Information Tools in Training to Improve the Teachers' Instructional Process and Outcome. In *2022 2nd International Conference on Information Technology and Education (ICIT&E)*; 2022; pp 398–402. https://doi.org/10.1109/ICITE54466.2022.9759549.
[15] Wiyono, B. B.; Wedi, A.; Kusumaningrum, D. E.; Ulfa, S. Comparison of The Effectiveness of Using Online and Offline Communication Techniques to Build Human Relations with Students in Learning at Schools. In *2021 9th International Conference on Information and Education Technology (ICIET)*; 2021; pp 115–120. https://doi.org/10.1109/ICIET51873.2021.9419660.
[16] Wiyono, B. B.; Wedi, A.; Wahyuni, S.; Valdez, A. V. Use of Online Communication Media as A Student Learning Tool in College and Its Effect on the Achievement of Students. In *2020 6th International Conference*

on Education and Technology (ICET); 2020; pp 186–191. https://doi.org/10.1109/ICET51153.2020.9276562.
[17] Wiyono, B. B.; Indreswari, H.; Prestiadi, D. The Use of Technology-Based Communication Media in The Teaching-Learning Interaction of Educational Study Programs in The Pandemic of Covid 19. In *2021 IEEE 11th International Conference on Electronics Information and Emergency Communication (ICEIEC)2021 IEEE 11th International Conference on Electronics Information and Emergency Communication (ICEIEC)*; 2021; pp 1–5. https://doi.org/10.1109/ICEIEC51955.2021.9463846.
[18] Vargas-Montoya, L.; Gimenez, G.; Fernández-Gutiérrez, M. ICT Use for Learning and Students' Outcomes: Does the Country's Development Level Matter? *Socio-Economic Planning Sciences***2023**, *87*, 101550. https://doi.org/10.1016/j.seps.2023.101550.
[19] Wang, Y.; Wang, Y. Exploring the Relationship between Educational ICT Resources, Student Engagement, and Academic Performance: A Multilevel Structural Equation Analysis Based on PISA 2018 Data. *Studies in Educational Evaluation***2023**, *79*, 101308. https://doi.org/10.1016/j.stueduc.2023.101308.
[20] Sanfo, J.-B. M. B. Examining Student ICT Use and Learning Outcomes: Evidence from Japanese PISA Data. *Computers and Education Open***2023**, *4*, 100141. https://doi.org/10.1016/j.caeo.2023.100141.
[21] Lei, H.; Xiong, Y.; Chiu, M. M.; Zhang, J.; Cai, Z. The Relationship between ICT Literacy and Academic Achievement among Students: A Meta-Analysis. *Children and Youth Services Review***2021**, *127*, 106123. https://doi.org/10.1016/j.childyouth.2021.106123.
[22] Ayari, M.; Ayari, S.; Ayari, M. A. Effects of Use of Technology on Students' Motivation. *Journal of Teaching and Education***2012**, *1*, 2165–6266407.
[23] Huang, S.; Jiang, Y.; Yin, H.; Jong, M. S. Does ICT Use Matter? The Relationships between Students' ICT Use, Motivation, and Science Achievement in East Asia. *Learning and Individual Differences***2021**, *86*, 101957. https://doi.org/10.1016/j.lindif.2020.101957.
[24] Zhao, C.; Chen, B. ICT in Education Can Improve Students' Achievements in Rural China: The Role of Parents, Educators and Authorities. *Journal of Policy Modeling***2023**, *45* (2), 320–344. https://doi.org/10.1016/j.jpolmod.2023.02.007.
[25] Mertens, D. M. *Research and Evaluation in Education and Psychology: Integrating Diversity With Quantitative, Qualitative, and Mixed Methods*; SAGE Publications, 2014.
[26] Johnson, R. B.; Christensen, L. *Educational Research: Quantitative, Qualitative, and Mixed Approaches*; SAGE Publications, 2016.
[27] Gall, M.; Gall, J.; Borg, W. *Educational Research: An Introduction*, 8th edition.; Pearson: Boston, 2006.
[28] Sasongko, D. Pengaruh Metode Pembelajaran Dan Motivasi Belajar Terhadap Hasil Belajar Sosiologi. **2021**, *2*, 66–78. https://doi.org/10.30998/herodotus.v2i1.5833.
[29] Kartiani, B. S. Pengaruh Metode Pembelajaran dan Motivasi Belajar Terhadap Hasil Belajar Siswa pada Mata Pelajaran IPS Kelas V Kabupaten Lombok Barat NTB. *jpd***2015**, *6* (2), 212. https://doi.org/10.21009/JPD.062.03.
[30] Tristiantari, N. K. D. An Effect of Sociodrama Method Implementation in Students Language Skill at Fourth Grade. *Journal of Education Technology***2017**, *1* (1), 45–50. https://doi.org/10.23887/jet.v1i1.10083.
[31] Froment, F.; de-Besa Gutiérrez, M. The Prediction of Teacher Credibility on Student Motivation: Academic Engagement and Satisfaction as Mediating Variables. *Revista de Psicodidáctica (English ed.)***2022**, *27* (2), 149–157. https://doi.org/10.1016/j.psicoe.2022.05.001.
[32] Maulana, R.; Helms-Lorenz, M.; van de Grift, W. Pupils' Perceptions of Teaching Behaviour: Evaluation of an Instrument and Importance for Academic Motivation in Indonesian Secondary Education. *International Journal of Educational Research***2015**, *69*, 98–112. https://doi.org/10.1016/j.ijer.2014.11.002.
[33] Abazaoğlu, İ.; Aztekin, S. The Role of Teacher Morale and Motivation on Students' Science and Math Achievement: Findings from Singapore, Japan, Finland and Turkey. *Universal Journal of Educational Research***2016**, *4* (11), 2606–2617. https://doi.org/10.13189/ujer.2016.041114.
[34] Putra, I. G. D.; Sujana, I. W. Hasil Belajar IPS Menggunakan Kolaborasi Model Discovery Learning Berbasis Media Animasi. *Journal of Education Technology***2020**, *4* (2), 103–109. https://doi.org/10.23887/jet.v4i2.25099.
[35] Laksana, D. N. L. The Effectiveness of Inquiry-Based Learning for Natural Science Learning in Elementary School. *Journal of Education Technology***2017**, *1* (1), 1–5. https://doi.org/10.23887/jet.v1i1.10077.
[36] Ardhaoui, K.; Lemos, M. S.; Silva, S. Effects of New Teaching Approaches on Motivation and Achievement in Higher Education Applied Chemistry Courses: A Case Study in Tunisia. *Education for Chemical Engineers***2021**, *36*, 160–170. https://doi.org/10.1016/j.ece.2021.05.004.
[37] el Janous, Y.; El-Hassouny, E.; Laafou, M.; Madrane, M. Effect of ICT on Students Achievements and Motivation in Life and Earth Sciences Subject. *Pegem Eğitim ve Öğretim Dergisi***2022**, *12*, 103–112. https://doi.org/10.47750/pegegog.12.04.11.
[38] Amponsah, B. K.; Stonier, F. Effects of ICT on Teaching and Learning: A Review of Related Literature. *International Journal Of Scientific Advances***2020**, *1* (2). https://doi.org/10.51542/ijscia.v1i2.9.
[39] Zf, H.; Ma, D.; A, S. Role of Information and Communication Technology in Motivating, University

Undergraduate Students towards a Learning Task in Public, Sector Universities of Rawalpindi City. *Sociology and Criminology-Open Access***2019**, *8* (2), 1–6. https://doi.org/10.35248/2375-4435.19.7.196.

[40] Mudiono, A.; Wiyono, B. B.; Maisyaroh; Supriyanto, A.; Wong, K. T. The Effects of the Communicative Approach and the Use of Information Technology on Students' Motivation and Achievement in Indonesian Language Learning. *Journal of Language Teaching and Research***2023**, *14* (3), 808–819. https://doi.org/10.17507/jltr.1403.29.

[41] Valentín, A.; Mateos, P. M.; González-Tablas, M. M.; Pérez, L.; López, E.; García, I. Motivation and Learning Strategies in the Use of ICTs among University Students. *Computers & Education***2013**, *61*, 52–58. https://doi.org/10.1016/j.compedu.2012.09.008.

[42] Sze, S., Kevin. Motivating Students to Learn through the Use of ICT : A Case Study; Pokfulam Road, Hong Kong SAR, 2005; pp 991013345089703414, b31598705. https://doi.org/10.5353/th_b3159870.

[43] Klimov, B. F. ICT Versus Traditional Approaches to Teaching. *Procedia - Social and Behavioral Sciences***2012**, *47*, 196–200. https://doi.org/10.1016/j.sbspro.2012.06.638.

[44] Wiyono, B. B.; Samsudin; Imron, A.; Arifin, I. The Effectiveness of Utilizing Information and Communication Technology in Instructional Supervision with Collegial Discussion Techniques for the Teacher's Instructional Process and the Student's Learning Outcomes. *Sustainability***2022**, *14* (9), 4865. https://doi.org/10.3390/su14094865.

[45] Mardhiyyah, S. A.; Latief, M. A.; Masduqi, H. Enhancing the Students' Learning Motivation by Using Instructional Media for Thailand's Municipal School. *Pedagogy : Journal of English Language Teaching***2021**, *9* (1), 76–91. https://doi.org/10.32332/joelt.v9i1.3131.

[46] Wiyono, B. B.; Hadi, S.; Imron, A.; Indreswari, H. Use of Information Technology in Online Learning Process Applied by the Lecturers Based on the Education and Rank Level. In *2021 10th International Conference on Educational and Information Technology (ICEIT)*; 2021; pp 144–149. https://doi.org/10.1109/ICEIT51700.2021.9375550.

[47] Teoh, S.; Ch'ng, C. K.; Zaibidi, N. ICT versus Conventional Teaching and Learning Approach in Education: An Overview of Advantages and Disadvantages; 2021.

[48] Rocha Fernandes, G. W.; Rodrigues, A. M.; Rosa Ferreira, C. A. Different Theoretical Approaches to the Use of ICT in Science Education. In *Using ICT in Inquiry-Based Science Education*; Rocha Fernandes, G. W., Rodrigues, A. M., Rosa Ferreira, C. A., Eds.; SpringerBriefs in Education; Springer International Publishing: Cham, 2019; pp 39–58. https://doi.org/10.1007/978-3-030-17895-6_2.

[49] Ghavifekr, S.; Rosdy, W. A. W. Teaching and Learning with Technology: Effectiveness of ICT Integration in Schools.

[50] Salahuddin Qazi, M. Using ICT in "Interactive Method of Teaching" to Make Teaching - Learning Effective: A Study. *Journal of the Royal Asiatic Society***2023**, *XCVI,No.8,2023*, 2023.

[51] Andyani, H.; Setyosari, P.; Wiyono, B. B.; Djatmika, E. T. Does Technological Pedagogical Content Knowledge Impact on the Use of ICT In Pedagogy? *Int. J. Emerg. Technol. Learn.***2020**, *15* (03), 126. https://doi.org/10.3991/ijet.v15i03.11690.

[52] Yadav, R. Teachers' Knowledge and Practice of Using ICT Tools in High School Science Teaching and Learning. *Education Quarterly***2023**, *4*, 59–74. https://doi.org/10.3126/jeqtu.v4i1.57246.

[53] Joshi, B. Teacher's Perception Regarding the Use and Challenges of ICT in Teaching-Learning. *Ganeshman Darpan***2023**, *8*, 44–56. https://doi.org/10.3126/gd.v8i1.57331.

[54] Setia, R.; Nasrudin, D. Teacher Supervision as an Improvement in the Quality of Education. *International Journal of Education and Social Science Research***2020**, *03*, 11–22. https://doi.org/10.37500/IJESSR.2020.3032.

[55] Maisyaroh, null; Budi Wiyono, B.; Hardika, null; Valdez, A. V.; Mangorsi, S. B.; Canapi, S. P. T. The Implementation of Instructional Supervision in Indonesia and the Philippines, and Its Effect on the Variation of Teacher Learning Models and Materials. *Cogent Education***2021**, *8* (1), 1962232. https://doi.org/10.1080/2331186X.2021.1962232.