The Influence of Artificial Intelligence and Teacher Leadership on Science Major Students

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Abstract: This research will analyze the use of Artificial Intelligence (AI) and teacher leadership on student performance. Another variable analyzed was the use of books and demonstrations in the form of PowerPoint presentations. Apart from that, in this research two moderator variables will also be used, namely devices and illustrations in PowerPoint. The tools used by teachers are expected to be able to increase the influence of book use on student performance and also improve relationships between leadership. The illustrative moderator variable turned out to increase the effect of using PowerPoint on student performance. In this research it is proven that AI can improve the leadership of teachers, and teacher leadership will improve student performance. Leadership will also have a stronger influence on performance if teachers use the right devices, whether notebooks, tablets or cellphones. Apart from that, the use of presentations created with PowerPoint will also improve student performance. When accompanied by illustrations (especially transitions and animations). Therefore, teachers must be able to utilize AI and its supporting applications.

Keywords: Artificial Intelligence; Leadership; Power point; PLS; SEM

Introduction

The use of artificial intelligence (AI) has had a significant impact on student performance in educational contexts. One aspect that is affected is leadership ability. With AI, students can develop their leadership skills through various simulations and interactive games provided by this technology (Chan et al., 2023; Liu et al., 2023; Otto & Mănescu, 2023). Apart from that, the use of books in the learning process also benefits from AI. Students can easily access educational resources through online platforms that use AI technology to present learning materials in an interactive and personalized manner (Fontenot, 2024; Richter & Resch, 2020). Not only that, good use of Powerpoint is also an important factor in improving student performance as measured by the perception of success in getting good grades in the classes they take (Gans, 2023). With the help of AI, teachers can create interesting presentation material, especially if it is given a display that is equipped with transitions between pages or animations for each object on each page, it will make students more interested in the teacher's explanation, which in the end students can

achieved good results as they had hoped together (Abas & Imam, 2016; Ghazali, 2016; Tahira Jibeen & Khan, 2015).

With AI, teachers can carry out their role as a leader in the classroom in a style that is respected and liked by their students (Aslan et al., 2020; Bektaş et al., 2022; Liu et al., 2021; Schott et al., 2020). Military or dictatorial leadership styles are not liked by most students and are no longer suitable for current conditions (Avurakoghene & Oredein, 2023; Murtza & Murtza, 2023; Shick et al., 2023). Leadership that students like will cause students to feel comfortable in following lessons in class. They can freely develop their reasoning power which can ultimately improve their performance (Bellibaş et al., 2021; Gunawan & Adha, 2021; Meidelina et al., 2023; Shengnan & Hallinger, 2021). Doing assignments, doing practice questions, or making presentations can be done with full concentration, so that you end up getting good grades as previously expected (Kilag & Sasan, 2023; Meyer et al., 2022).

Gladin (2023) explains that in teaching and learning activities a reference book is needed, especially so that students can repeat the teacher's explanation in class,

because usually the teacher will not be able to explain all topics in one class session. With books, students can see whether the material contained in the Syllabus has been completely discussed or not (Gunawan & Adha, 2021; Lipscombe et al., 2023; Mandang, 2023; Nguyen et al., 2020; Nursiwan & Hanri, 2023; Talumewo et al., 2023; Utami et al., 2023). If not, then students can read the material in the book. The devices used by teachers in preparing supporting equipment or to explain material to students can also influence students' use of books and at the same time increase the influence of the teacher's leadership style on student performance (Fanni & Giancotti, 2023; Gladilin, 2023; Tarisayi, 2023; Tozzi, 2023). If teachers can use their devices (such as notebooks or tablets) to deliver material or make presentations, they will be able to strengthen the influence of teacher leadership in class control (Karacabey et al., 2022; Kilag & Sasan, 2023; Li & Liu, 2022; Printy & Liu, 2021). Apart from that, it will also encourage students to read the textbooks that were mentioned by the teacher at the beginning of the lecture.

In terms of using PowerPoint, teachers are also required to innovate and be creative so that students do not get bored with the ordinary appearance of PPt (Aslan et al., 2020; Cynthia et al., 2022; Wijaya et al., 2021). In PowerPoint there are transitions and animations. Transition is a variation of page movement, while animation is the process of displaying illustrations and writing on a page, so that one page can contain several animations at once (Annisa Destrina & Muttaqiin, 2023; Ghazali, 2016; Kismiantini et al., 2021; Syauqi et al., 2020). By utilizing transitions and animations, the presentation will not feel monotonous, so students will feel interested and will follow the teacher's presentation for a longer duration (Gunawan & Adha, 2021; Lipscombe et al., 2023; Mandang, 2023).

This paper will analyze the influence of books, the influence of AI on leadership, the influence of leadership, and PowerPoint on student performance in a semester. The novelty of this study is to find out whether leadership mediates the relationship between AI and student performance. So far, leadership is considered an innate characteristic of a person so that it cannot be imitated by others. But with AI, people can learn many things so they can adjust. It also wants to know whether the use of gadgets (such as laptops, tablets, or mobile phones) can moderate the influence of book use and teacher leadership on student performance.

The integration of AI technology and PowerPoint presentations has revolutionized the landscape of science education. By harnessing the power of AI, educators can enhance their teaching methods and improve students' performance significantly (Astuti et al., 2023; Cynthia et al., 2022; Rissa Khairinaa et al., 2023).

AI plays a pivotal role in personalizing learning experiences, allowing educators to tailor their teaching strategies to meet individual student needs (Annisa Destrina & Muttaqiin, 2023; Astuti et al., 2023). Through advanced algorithms and data analytics, AI can analyze student performance data to identify areas for improvement and provide targeted support.

PowerPoint presentations serve as an effective visual aid in science education, enabling teachers to present complex concepts in a clear and engaging manner (Cholis Sa'dijah et al., 2021; Nursiwan & Hanri, 2023; Wijaya et al., 2021). By incorporating multimedia elements such as images, videos, and animations, educators can create interactive learning experiences that captivate students' attention and facilitate better understanding of scientific principles.

Effective leadership style in teaching is crucial for leveraging the potential of AI and PowerPoint in science education (Kismiantini et al., 2021; Meidelina et al., 2023). Educators who embrace technology as a tool to enhance their teaching practices demonstrate adaptability and innovation in their approach (Wijaya et al., 2021). By fostering a collaborative learning environment that encourages exploration and critical thinking (Ma & Marion, 2021; Shengnan & Hallinger, 2021), teachers can empower students to become active participants in their own learning journey (Mandang, 2023).

The strategic utilization of AI technology and PowerPoint presentations has the potential to transform science education by making it more interactive, engaging, and effective (Karacabey et al., 2022; Liu et al., 2021; Printy & Liu, 2021). By embracing these tools with an innovative leadership style, educators can unlock new possibilities for enhancing students' learning experiences and driving academic success (Bellibaş et al., 2022; Gunawan & Adha, 2021; Lipscombe et al., 2023; Trigueros et al., 2020).

Research Framework

When depicted, the research framework will look like in Figure 1.
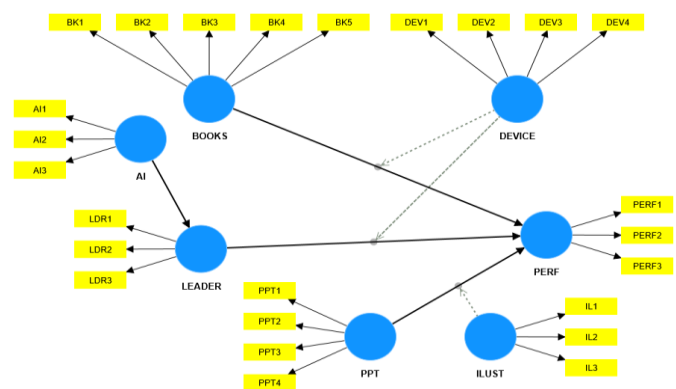
Figure 1. Research Framework

Method

Research respondents were selected using purposive sampling using a questionnaire on Google Form which was distributed via WhatsApp groups. The teachers who are respondents are not limited to which school or region, because with Google Form they can be distributed throughout Indonesia, except that only teachers who teach classes related to science are expected to fill the form. The data collected was 121 respondents, but 6 respondents were excluded because they do not teach science class, so only 115 data could be used. The analysis used is Partial Least Squares (PLS) with SmartPLS software version 4.0.9 (Hair et al., 2021; Ringle et al., 2023), which is the latest version when used to analyze data in this research. All necessary tests, for example validity, reliability and homogeneity tests have been carried out and the results are good, so they can proceed to the next analysis. Research step is shown in Figure 2.

Even though the number of samples are limited, but in SmartPLS, it can be bootstrapped upto 5000 samples, and the results shew very similar results, so that researcher can proceed to the analysis phase (Winarno, 2017).
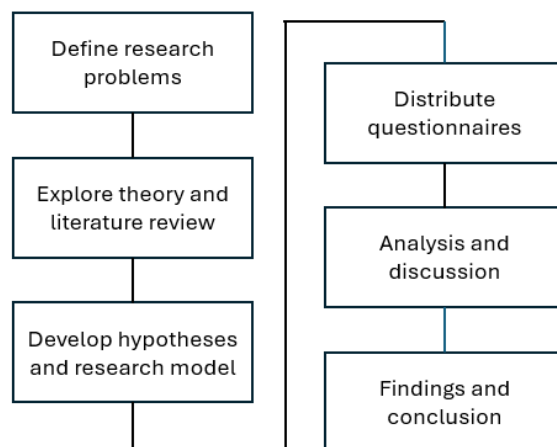

Figure 2. Research steps.

Result and Discussion

The results of the analysis can be shown in Table 1. From Table 1 it can be seen that there is one variable that is not significant at an alpha of 10%, namely the book variable. This means that the use of books does not cause student performance to increase.

Table 1. SEM PLS analysis results

	Orig smple	mean (M)	Stat dev	T statistics (|O/STDEV|)	P values
AI -> LEADER	0.460	0.478	0.069	6.716	0.000
BOOKS -> PERF	0.065	0.062	0.046	1.406	0.160
DEVICE -> PERF	0.001	0.004	0.041	0.019	0.985
ILUST -> PERF	-0.052	-0.041	0.040	1.297	0.195
LEADER -> PERF	-0.083	-0.085	0.042	1.974	0.048
PPT -> PERF	0.972	0.971	0.034	28.468	0.000
DEVICE x LEADER -> PERF	0.068	0.061	0.032	2.151	0.032
ILUST x PPT -> PERF	0.078	0.069	0.044	1.792	0.073
DEVICE x BOOKS -> PERF	-0.038	-0.031	0.045	0.841	0.400

The possibility is that currently books are not the only reference source used by students in studying teaching materials. Other sources that are considered more practical, for example, are Google and YouTube, which are relatively free and can be accessed at any time, as long as there is internet, similar to (Aslan et al., 2020; Meidelina et al., 2023; Shen et al., 2020). Even by learning via YouTube, students can listen to the presenter's explanation while doing other activities. In addition, when teachers use computer devices, it does not strengthen or weaken the influence of books on performance.

AI has been proven to influence leadership style. By utilizing AI, teachers can carry out their leadership functions in a good way too. Teachers can get the information or articles they are looking for easily, as in (Jarlis et al., 2023; Siswanto et al., 2023). If necessary, the teacher can ask AI to make explanations, examples, or even

practice questions for AI. Leadership is proven to influence student performance, similar results with (Ayaydin et al., 2023; Sheppard et al., 2021). With leadership that can be accepted by students, student performance will also increase. Likewise, when teachers can use their devices appropriately, whether laptops or tablet PCs, this will strengthen the influence of leadership on students' academic performance.

The use of interesting PowerPoint turns out to have a positive effect on student performance. The more attractive the PPt looks, the higher the student's performance, but this is not aligned with (DeMatthews et al., 2022; Saleem et al., 2020). If teachers utilize the transition and animation functions in PowerPoint, it turns out that it will also strengthen the effect of PPt exposure on student performance, at a confidence level of 90% (or

alpha=10%). Overall, the results of the research hypothesis can be seen in Figure 3.
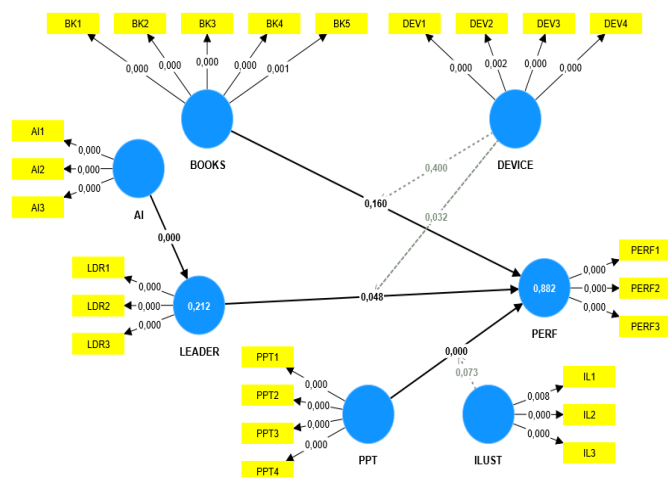

Figure 3. Results of research hypotheses

Conclusion

Based on the analysis carried out on data originating from 115 respondents, it can be concluded as follows: AI influences the leadership style of teachers in the science department. Teacher leadership style has a positive influence on student performance. This relationship is strengthened by the use of devices by teachers (DEVICE). Textbooks have no effect on student performance, perhaps due to the availability of other teaching resources that are easily accessible and relatively cheap. Likewise, the use of computer devices does not moderate the relationship between book use and respondent performance. The use of interesting PowerPoints has a positive influence on student performance. If teachers utilize the transition and animation features in PowerPoint, it turns out that it will strengthen the influence of using PowerPoint on student performance.

Conflicts of Interest
The authors declare no conflict of interest.

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