Edu Cendikia: Jurnal Ilmiah Kependidikan
Volume: 5 | Nomor 01 | April 2025 |
DOI: 10.47709/educendikia.v5i01.5725

Analysis of the Effect of Learning Models, Cognitive Abilities, and Facilities on Students' Academic Achievements

Author:
Mohzana[1]
Firman Aziz[2]
Muhammad Ridhwan[3]
Susatyo Adhi Pramono[4]
Iwan Henri Kusnadi[5]
Bayu Purbha Sakti[6]

Affiliation:
Universitas Hamzanwadi[1]
Universitas Pendidikan Indonesia[2]
Universitas Serambi Mekkah[3]
Universitas Wijayakusuma Purwokerto[4]
STISIP Bina Putera Banjar[5]
Universitas Widya Dharma Klaten[6]

Corresponding email
mohzana@hamzanwadi.ac.id[1]

Histori Naskah:
Submit: 2025-03-26
Accepted: 2025-04-08
Published: 2025-04-09

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Abstract:
This study analyses the influence of learning models, cognitive abilities, and facilities on students' academic achievement. Improving student learning outcomes heavily depends on the learning model used in the teaching and learning process. Both internal and external factors influence academic achievement. Internal aspects include students' cognitive capacity, while external factors include the availability of facilities. Students' cognitive capacities contribute to their understanding and application of the concepts taught, and selecting an appropriate learning model can enhance the efficacy of the learning process. Conversely, a better learning environment is supported by sufficient facilities. This study used a quantitative methodology based on survey research. Questionnaires distributed in senior high schools were used to gather data. In particular, the study found that student's academic achievement improved when they were more actively involved in and understood the content through technology-based learning models that were interactive and centred around technology. Compared to pupils with lower cognitive abilities, those with higher cognitive abilities tend to do better in school. Comfortable classrooms, access to technology, and sufficient teaching materials are all examples of full and high-quality learning facilities that positively affect student learning results. Using multiple linear regression analysis, we find that all three factors, the learning model in particular, contribute significantly to students' performance in the classroom. These results show that to raise the bar for education, we must enhance learning strategies, help students hone their cognitive capacities, and build better classrooms.

Keywords: Academic Achievement, Cognitive Ability, Facilities, Learning Model

Introduction

One of the most important factors in a country's progress is its educational system since it is the primary means by which its citizens can acquire the knowledge and skills necessary to become productive members of society. Several elements impact educational success by determining how well lessons are taught and how students can retain information. Important aspects that directly influence academic accomplishment include the learning model, students' cognitive capacity, and the available facilities (Jumiati et al., 2024). Improving the quality of education requires a holistic strategy since students' academic accomplishment is

the primary metric for evaluating the efficacy of the education system in place (Widodo & Masnawati, 2024). If each variable is optimally treated, education can better produce people with academic knowledge, critical thinking abilities, and the capacity to adjust to changing circumstances.

Teachers' pedagogical stances significantly impact the knowledge and skills their students acquire. Students can be more engaged and gain a deeper grasp of the material through creative and interactive learning techniques. Students can become more engaged and better retain material when taught through technology-based methods, group discussions, or project-based approaches (Hidayatullah et al., 2023). On the flip side, pupils may struggle to retain information and develop an interest in learning when presented with learning models that are too static and uninteresting (Kamaruddin et al., 2023). Consequently, one factor that needs to be considered in education is selecting a learning model corresponding to pupils' demands and material features. To ensure that every student reaches their full potential, teachers also need the flexibility to adapt the lesson plan based on the student's preferred learning method. The quality of education can rise due to the enhanced efficiency of the learning process.

Academic success heavily depends on the learning paradigm and students' cognitive capacities. The ability to think critically, solve problems, grasp abstract ideas, and retain information are all examples of cognitive talents (Peng et al., 2021). Students scoring higher on the cognitive ability test tend to have an easier time grasping difficult concepts and applying what they learn in new contexts. Conversely, cognitively struggling children typically have trouble grasping the material and necessitate a more personalised approach to learning and extra assistance. Thus, promoting students' academic performance by working to enhance their cognitive talents is crucial. This can be achieved by stimulating their intellect, providing suitable academic challenges, and encouraging critical thinking (Mohzana et al., 2023). Additionally, to meet the demands of students in the modern digital age, educators can enhance cognitive abilities by using learning strategies that incorporate the solution of real-world problems, the exploration of novel concepts, and the integration of technology into the learning process.

The quality of the school's physical space also has an important role in how well students learn. The presence of sufficient teaching materials, easy access to technology, and comfortable classrooms all contribute to an ideal setting for learning (Ntahomvukiye & Sikubwabo, 2024). For instance, students can learn more rapidly and easily with modern instruments like computers, projectors, and internet connections (Wulandari et al., 2021). Additionally, students are more likely to pay attention when the classroom is well-lit, has comfortable seating, and is clean. Students can reach their full academic potential with access to well-maintained studying spaces that promote comfort. Efforts to enhance the quality of learning and student academic achievement should prioritise providing and upgrading high-quality educational infrastructure (Sakti, 2020). Therefore, there should be no disparity in the quality of education that kids from different socioeconomic backgrounds get, and the government and schools should collaborate to ensure that all students have equitable access to sufficient facilities.

Literature Review

Student Academic Achievement

Academic achievement results from a student's efforts to study and is typically evaluated in various ways, including test scores, assignments, and extracurricular activities. This success shows how well the students have grasped the material and how well the teaching approaches work in the classroom. Multiple studies have found that both internal and external influences have an impact on students' academic performance. Intrinsic variables include the intrinsic drive to learn, IQ, and the cognitive abilities necessary for efficient information processing. At the same time, students' academic achievements are heavily influenced by

circumstances outside their control, such as the classroom setting, the level of parental involvement, and the strategies employed by teachers (Zen & Ariani, 2022; Wulandari et al., 2021). Student engagement can be enhanced by creating a supportive learning atmosphere and using creative pedagogical strategies catering to individual student needs. So, there are a lot of things that can be done to raise academic performance. One is to use technology in learning to make more learning resources available to students. Another is giving them constructive criticism to determine where they excel and need improvement. Lastly, a problem-based learning approach can help students develop their analytical and critical thinking abilities (Mohzana et al., 2023; Sutiani, 2021). Using a well-rounded set of tactics, we can help students reach their full academic potential, ensuring they are well-equipped to tackle future obstacles.

Learning Model

Educators employ learning models, tactics, or approaches to provide information to students more effectively and engagingly. With the correct model, students can become more invested in their learning, have a deeper understanding of course material, and practice important life skills like critical thinking and problem-solving (Acim et al., 2024). Learning models commonly used in the classroom include inquiry-based learning, which promotes students to seek answers through investigation actively; project-based learning, which emphasises students working together to solve problems; and collaborative learning, which involves students practising their application skills through practice-based tasks. The methods influence students' interests, motivations, and learning results, so choosing the correct learning model to improve education is crucial. Traditional, teacher-centred learning models are considered ineffective in enhancing student knowledge compared to technology-based, interactive learning approaches like e-learning or multimedia-based learning. Technology in the classroom enhances student readiness for real-world difficulties because it increases students' access to knowledge, promotes independent learning, and provides a more engaging and comprehensive learning experience.

Cognitive Abilities

Students' cognitive abilities play a significant role in determining how well they comprehend, analyse, and apply the knowledge they gain from their coursework. This competency encompasses a range of abilities that contribute to students' capacity to understand and implement course material, including reasoning, remembering, analysis, and problem-solving (Kamaruddin et al., 2023; Peng et al., 2021). A student's comprehension, capacity to apply new knowledge, and performance on standardised tests positively correlate with their cognitive ability. A student's social milieu, the quality of their parenting, and the knowledge and skills they acquire in and out of the classroom are all elements that can impact their cognitive development. Consequently, for students to build stronger intellectual abilities and be prepared to confront future challenges, it is necessary to implement the correct educational strategy to maximise students' cognitive development. This includes teaching methods that promote exploration, discussion, and critical thinking exercises (Sutiani, 2021).

Facility

Classrooms that are well-lit and air-conditioned, fully-stocked laboratories, libraries with sufficient volumes of instructional materials, and the availability of technological resources like computers and the Internet are all examples of educational facilities. A conducive learning atmosphere, high levels of student motivation, and active engagement in the learning process are all influenced by the availability of sufficient facilities (Ntahomvukiye & Sikubwabo, 2024; Wulandari et al., 2021). Schools that invest in physical spaces enable students to concentrate better on their studies, acquire more hands-on experience by utilising

labs and technology, and have greater access to high-quality educational materials (Jumiati et al., 2024). According to several studies, academic performance is higher in schools with fully equipped facilities than those with fewer resources. So that every student has an equal chance to succeed academically, the government and schools must keep working to enhance the accessibility and quality of educational resources to build a more efficient, fair, and inclusive education system (Lestariningrum et al., 2024).

Research Method

This study employed a quantitative survey approach to assess the impact of learning models, cognitive abilities, and facilities on students' academic achievement. Data were collected through questionnaires distributed to high school students. A simple random sampling technique was utilized to ensure representativeness, giving each student an equal chance of selection and minimizing selection bias. The sample size was determined based on Krejcie and Morgan's (1970) guidelines, which suggest that for a population of 1,000, a sample size of 278 is appropriate. In this study, out of a total student population of 800, a sample of 267 students was selected, aligning with these recommendations and ensuring a 95% confidence level with a 5% margin of error. The collected data were analyzed using multiple linear regression to explore the relationships between the independent and dependent variables, students' academic achievement. Statistical software was employed to process the data, ensuring analytical accuracy. The findings were then compared with those from previous studies to draw reliable conclusions.

Results

In particular, the study found that students' knowledge, critical thinking abilities, and learning motivation were significantly influenced by technology-based learning models that promoted active participation. Based on the multiple linear regression analysis results, project-based and collaborative learning models positively and significantly affected student academic achievement. On average, students who actively engaged in these learning models achieved 13% higher scores than those who followed traditional methods. Project-based learning enabled students to improve their problem-solving skills and apply theoretical concepts to practical situations. In contrast, collaborative learning encouraged peer interaction, contributing to better communication and a stronger sense of responsibility in completing group tasks. Furthermore, 79% of students agreed that using digital media, e-learning platforms, and interactive simulations increased their understanding of the material and helped them stay motivated. These findings support the conclusion that implementing a dynamic and technology-driven learning approach has a statistically proven impact on improving academic outcomes among high school students

Students with greater cognitive levels have an advantage in understanding, processing, and applying learning concepts compared to those with lower levels, suggesting a favourable association between cognitive capacity and academic accomplishment. Students who think critically, remember information and analyse it can take in more material and connect it to what they already know. The capacity to organise thoughts, conduct thorough analyses, and approach problems methodically are all signs that a learner has high cognitive capabilities and will likely have successful learning strategies. On the flip side, children who aren't as bright may struggle to grasp abstract ideas; in such cases, an adaptive learning strategy and supplementary aid may be necessary for these students to reach their full academic potential. Intellectual stimulation, exploration-based learning, and problem-solving exercises are all ways to help pupils improve their cognitive talents, which in turn leads to improved academic accomplishment.

In addition, students' academic performance is enhanced when schools provide sufficient facilities, including computers, labs, libraries, and a pleasant place to study. Students can learn more efficiently, obtain more in-depth practical experience, and access a range of pertinent information sources to bolster

their subject matter understanding when sufficient facilities are available. Students are more likely to focus, be motivated, and actively participate in their learning in a well-maintained school with adequate facilities. Enhanced learning methods, digital skill development for students, and faster access to a wider range of knowledge and teaching materials are all significant outcomes of educational technology, which includes computers, the internet, and interactive media. So that all students have an equal chance to attain their full academic potential, it is crucial to improve and equalise educational facilities as a first step in building a more inclusive and effective learning system.

Discussion

These results show that using the right learning models is critical for better student learning outcomes. This is because the approaches can influence students' comprehension, interest, and drive to study. Studies have demonstrated that active learning models like project-based learning, group discussions, or interactive simulations are more effective than passive methods like lectures and one-way content delivery in fostering student engagement and knowledge acquisition. This is supported by Acim et al. (2024) and Kamaruddin et al. (2023), who found that project-based learning significantly improves student performance by encouraging active involvement and deeper content exploration. More active exploration of ideas, development of critical thinking abilities, and application of information in real-world contexts are outcomes of approaches that promote student engagement. Learners' confidence, comprehension, and memorization can all benefit from more interactive learning experiences. Consequently, teachers should keep improving their methods and developing new interactive learning tactics based on students' requirements to make learning more effective and meaningful.

Children must cultivate their cognitive ability early on using engaging and difficult learning methodologies to comprehend better, analyze, and apply information. Research by Mohzana et al. (2023) and Kamaruddin et al. (2023) has shown that learning models involving inquiry and problem-solving tasks contribute positively to cognitive growth and students' ability to think critically and creatively. Students' cognitive development and the training of their critical and creative thinking abilities can be enhanced by challenging learning activities such as problem-solving, case studies, or in-depth exploration of subjects. Interactive media, group discussions, and direct experiments are all examples of engaging learning tactics that help students retain more information and develop a deeper comprehension of the material. Students will be more engaged and motivated to investigate and discover answers to difficulties if the intellectual challenges are tailored to their developmental level. Therefore, for children to have the best possible start regarding cognitive development, teachers must find ways to teach that do more than just relay information; they must also inspire pupils to think critically and creatively.

A well-designed classroom can do wonders for students' comfort, motivation, and retention of course material, so it is no surprise that school buildings play a significant role in facilitating kids' academic success. According to Jumiati et al. (2024) and Ntahomvukiye & Sikubwabo (2024), facilities such as comfortable classrooms, access to digital media, and other educational resources are essential in enhancing student learning outcomes. Learning environments that are both comfortable and technologically advanced allow students to go more deeply into the course material and find real-world applications for what they have learned. Teachers can implement a wide range of new pedagogical practices, including digital media, scientific experiments, and more interactive project-based learning when accessing high-quality educational infrastructure. Students are more likely to be engaged, focused, and motivated to do well when the school has sufficient facilities to support their needs. Therefore, investing in educational facility development and equalization is crucial as a strategic measure to guarantee that all children can access high-quality education and have the best possible learning experience.

Conclusion

Interactive learning models, strong cognitive talents, and sufficient facilities can enhance students' academic performance. Active learning approaches encouraging student participation, like group discussions and project-based learning, have enhanced students' comprehension and engagement with the learning process. Conversely, individuals with strong cognitive capacities can better take in, analyse, and apply knowledge, leading to better academic performance. Students can reach their full academic potential when schools provide sufficient facilities, including well-appointed classrooms, modern technology, and comprehensive course materials. Therefore, efforts to enhance education quality must centre on these three aspects. So that every student has an equal chance to do better in school, efforts to improve education must persist in creating new ways of teaching and expanding access to educational resources. Education policy priorities should include enhancing teachers' quality, ensuring sufficient facilities and infrastructure, and promoting the use of technology in the classroom. Students' socioeconomic status, family dynamics, and intrinsic motivation to learn are a few other variables that could impact their academic performance. Therefore, additional study is required to investigate factors influencing students' academic performance. Educational practices can be better adapted to improve learning quality and overall academic accomplishment if we better grasp the many aspects that impact learning outcomes.

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