A Novel Examination of Learning Approaches and Their Influence on Student Performance in Higher Education

Mohammad [1*] Zainab Nazir Chaudry [2] Asif Raheem Khan [3] Muhammad Ibrahim Chaudhary [4]

[1] PhD Candidate, Department of Global Value Chains and Trade, Lincoln University, Canterbury, New Zealand.
Email: mohammadbinzarar@gmail.com
[2] EdTech Educator, Aga Khan Education Service, Pakistan.
Email: zainabnazir.chaudry@akesp.org
[3] MS Student, Department of Accounting & Finance, Bahria University, Islamabad, Pakistan.
Email: asifrahemkhan@gmail.com
[3] MS Student, Department of Business Administration, Air University, Islamabad, Pakistan.
Email: m.ibrahim.ch223@gmail.com

ABSTRACT: The learning method has a significant impact on the acquisition, retention and application of knowledge and clinical skills by various students. A secondary data analysis was conducted in which responses to 20 questions were obtained from medical students of a major city of Pakistan, and which learning approaches, namely deep, surface and strategic learning relating to better academic performance were identified in this quantitative study. The analysis of the data was undertaken using secondary data analyzed by SmartPLS, in which correlation analysis and regression analysis were used to determine the power of the learning approach that can be predicted. The results reveal that all three methods are primarily related to academic performance, with deep learning being the strongest predictor of academic success, followed by the strategic learning approach. The findings point to a meaningful understanding and organized study behaviours as key drivers of excellence in medical education, even though surface learning is indicated with a positive, though comparatively weaker link. The insights gained reveal the importance of cultivating learning dispositions and attitudes that are deep and strategic, and encourage professors to create learning environments that foster curiosity, critical thinking, and self-regulated learning. The integration of evidence-based learning strategies with teaching will make it more effective to train students to be confident and competent in their professional practice in medical institutions.

KEYWORDS: Deep Learning, Surface Learning, Strategic Learning, Academic Performance

Pages: 330 – 343
Volume: 5
Issue: 5 (May 2026)

Corresponding Author
Mohammad
✉ mohammadbinzarar@gmail.com

Cite this Article: Mohammad, Chaudry, Z. N., Khan, A. R. & Chaudhry, M. I. (2026). A Novel Examination of Learning Approaches and Their Influence on Student Performance in Higher Education. *The Regional Tribune, 5*(5), 330-343. https://doi.org/10.55737/trt/v-v.305

Introduction

Medical education requires consistent effort, discipline, and the skills to adapt to complex learning environments because they are in continuous learning mode. Every student adopts a specific learning approach that influences how efficiently they learn and apply knowledge (Otto et al, 2024). Learning approaches are commonly categorized into three parts, i.e., deep, surface, and strategic (Zilundu et al, 2022). Deep learning includes understanding ideas in

depth, linking concepts, and reflecting critically. Surface learning focuses on memorization and repetition without true comprehension. Strategic learning reflects students' desire for high academic achievement through organized planning and continuous self-evaluation.

For understanding, these approaches are vital because students' academic success often depends on the method they adopt for their learning and how efficiently they use them. Literature suggests that students who combine deep and strategic learning approaches achieve stronger academic outcomes than those who rely mainly on surface learning (Roehe et al, 2024). Additionally, the pressure and workload in medical education have been found to have an impact on learning, with some students resorting to superficial learning due to time pressure (AlOmar et al, 2022). Mindfulness, social support, and effective time management are coping strategies that can help to support deeper learning and better performance (Ashraf et al, 2024).

Secondary data were retrieved from the final-year medical students of a major city in Pakistan to draw conclusions through this study, which was a quantitative research design. These factors have also been studied by international researchers, but few studies have analyzed them in the scope of medical education in Pakistan in recent years. Hence, this study adds to the literature by giving fresh understandings of the connection between learning approaches and achievement of students in a developing country context.

The study tackles the following questions:

1. What are some of the varied ways in which successful students learn?
2. What is the effect of deep learning, surface learning, and meaningful learning on academic performance?
3. What is the best way for students to learn that predicts academic achievement?

It aims to discover the learning styles employed by successful medical students and examine the correlation of these with academic achievement, and which of these learning styles best accounts for student achievement. The insights gained from this research can help inform the learning environments of educators and curriculum designers to foster good study habits and enhance student performance.

The study is confined to the medical students from a hospital-based institute in a big city of Pakistan. Data collected from final-year students used for the study are secondary data collected earlier and only involve the relationship between learning approaches and performance outcomes. The aim of the analysis is not to discuss institutional or demographic differences in detail, but to analyze the general learning behaviour patterns in the medical context.

The value of this study lies in the fact that it identifies the importance of knowing students' preferred learning styles to enhance the effectiveness of teaching and learning. Deep and strategic approaches lead to increased involvement with the content of the course, knowledge retention, and better performance in clinical practice among medical students (Avraam et al, 2025). These various strategies can help teachers create interventions that support self-regulated learning and stress management (McGee et al., 2024). The findings of this research can help medical schools design better academic support structures, integrate assessments with meaningful learning, and drive a culture of improvement in medical education.

Literature

Definitions and Key Constructs

This article adopts a framework that clearly shows learning strategy, and it is defined as how an individual organizes and uses cognitive, meta-cognitive, and resource management skills to learn more efficiently (Cipra et al, 2019). In this study, successful students are those whose academic records reflect consistent superior performance, attributed

in part to effective learning strategies. Deep learning discusses a method where students seek to understand meaning, connect ideas, question assumptions, and think critically and evaluate rather than memorizing facts (Alsayed et al, 2021). For deep strategies, students engage in reflection, integrate prior knowledge, monitor their comprehension, and then apply concepts to new scenarios. Strategic learning describes the behavior of learners who deliberately plan, monitor, and regulate their study activities with the goal of achieving high performance. They allocate study time according to perceived importance, align their efforts with assessments, and adjust tactics when necessary. Surface learning is characterized by a focus on rote memorization, minimal engagement with underlying conceptual structure, and completing course requirements (Roehe et al, 2024). In educational research, student performance typically represents objective outcomes such as exam scores or grade point average, representing the student's success in mastering the academic content.

Study Habits, Motivation, and Academic Environment

Most effective study habits form an initial step which enable students to execute their learning strategies. For example, it includes regular lecture attendance, note-taking, immediate review of lectures, and using external resources. In a Pakistani context, a medical student who maintained planned study routines, engaged in practice, and used online resources showed significantly higher exam performance (Osama et al, 2024). Good study habits enable sustained engagement, reduce postponement and support deeper understanding of concepts. Empirical work from medical contexts shows a significant positive correlation between structured study routines, active recall practices and academic achievement (Aljaffer et al, 2024).

Motivation interacts intimately with both strategies and habits. Positive feedback from assessments can reinforce a student's willingness to maintain effective approaches, whereas repeated poor outcomes may reduce self-efficacy and push learners toward less effortful strategies. Studies in higher education emphasize this feedback loop (Harvey et al, 2025). In blended or online settings, motivation can be affected and may vary due to uncontrolled reasons but remains central in driving strategy use. Motivation influences which learning approaches students adopt and how persistently they use them.

Finally, the academic environment curriculum design, assessment methods, faculty feedback, and institutional support shapes which learning strategies are feasible or rewarded. Innovative and learner-centered programs encourage deeper approaches, whereas assessment and test routines are more focused on factual recall and may also promote surface learning (Uppal, 2020). (Roehe et al, 2024) shows that programs emphasizing critical thinking, integrated assessments, and formative feedback tend to foster deeper learning preferences. Otherwise, surroundings where there is a high focus on memorization often push students toward surface strategies.

Learning Approaches and Academic Performance

The usual consensus in medical education is that deep and strategic approaches align more consistently with better academic outcomes than surface approaches because they require more practical and understandable knowledge than just memorization (Gross et al, 2025). For instance, profiling research by Otto et al. (2024) revealed that students categorized as active or planned learners (profiles associated with deep and strategic features) achieved higher grades than passive learners. (AlOmar et al., 2022) found that the strategic approach dominated and correlated positively with self-rated academic progress. As the deep and surface approaches did not show significant correlations in some measures, this may reflect assessment styles (Ashraf et al, 2024). In Pakistan demonstrated that strategic and self-regulated learning mediated performance improvements in a blended learning environment.

Additionally, the recent teaching methods of academic tutoring in medical schools improved students' time management, self-efficacy, and strategy usage, which in turn enhanced learning outcomes (Harvey et al, 2025). These results suggest that strategy training and feedback can strengthen the link between learning approach and performance. However, not all studies uniformly favor deep over strategic or dismiss surface completely. In some contexts, surface learning still shows weak positive relationships under heavy content load. As a result, these gains are usually smaller and less stable (McGee et al, 2024). The interaction among approaches (students combining deep and strategic behaviors) is emerging as an important predictor in recent studies.

Hypotheses Development

Deep Learning Approach

Deep learning applies to intentions to transcend from simple facts to using new knowledge to build on existing structures. Learners engage in reflection on questions and bring coherence across topics. The same is true in the health professions, where the education is complex and where deeper approaches have more relationships with long-term retention, clinical thinking, and the transfer of education across contexts, as are required in these professions. For instance, in a study of medical students, while strategic approaches are much more preferred, students employing deep strategies still showed better self-rated academic progress when contextual factors were favorable (Burton et al, 2024). Furthermore, it is recognized in the literature that deep learning plays a critical role, particularly with respect to medical applications where understanding of pathophysiology, diagnostics, and integration of knowledge from different disciplines are crucial. This deeper level of engagement could be supported through the use of programs that include case-based teaching, reflection, and problem solving (Gross et al, 2025). That said, there are some studies that indicate that in some environments, with exams that are purely factual, the relationships between some studies and deep learning are not well established. Students might slip back into surface tactics when it comes to preparing for an exam (Aljaffer et al, 2024).

Deep learning requires a steady commitment to understanding meaning; linking ideas; and transferring concepts to new settings. It's a measure of intrinsic motivation and cognitive involvement that's more than just recall. In deep learning, students process information in a meaningful way, relate it to what they already know, and develop their critical thinking skills, which leads to better performance in learning (Rohani et al, 2024). In medical education, knowledge needs to be used in actual clinical issues, and deep learning consistently has been linked to better academic and professional results (Alsayed et al, 2021). Research studies have revealed that deep approach learners have greater long-term retention, better examination results, and better problem-solving skills than those using surface learning who memorize the material (Avraam et al, 2025). A comprehensive meta-analysis by Roehe et al. (2024) revealed that students who were trained in elaboration and conceptual integration techniques demonstrated significantly higher differences in STEM and health sciences classes. Therefore, this body of evidence can be used to support the following hypothesis: The use of a deep learning approach has a positive and significant impact on student performance.

H1: Deep learning approach positively and significantly predicts academic performance.

Strategic Learning Approach

Strategic Learners are able to adjust efforts, manage time, and plan study priorities to match assessment demands. They show progress, they adapt to them as necessary, and they frequently use both deep and surface tactics in an adaptive way. It is mentioned in the literature that a strategic approach was more prevalent among the final-year medical students and positively related to academic achievement (Osama et al, 2024). In merged learning

environments in Pakistan, strategic behaviors (planning, matching with exam patterns) have an intermediate effect on performance with institutional support and feedback loops (Ashraf et al., 2024). This advocates that strategic learning, when encouraged, serves as a bridge between students' essential motives and the structural demands of medical training. Furthermore, pedagogical studies indicate that curricula that focus on repeated assessment, feedback, and curriculum-based learning outcomes will reinforce student strategic planning and adjustment (Gul et al, 2018). However, care must be taken since there are times when an overly strategic learner might fail to acquire depth of understanding, opting instead to adopt test-taking strategies when assessment is not well defined.

Strategic learning emphasizes a goal-directed and self-regulated approach. Pupils who take this approach are making clear academic goals, making plans, monitoring their own progress, and adapting their approach as needed. This adaptive flexibility enhances the efficiency of learning and enables students to efficiently respond to assessment requirements (Ashraf et al, 2024). Motivation and metacognition are both essential elements of strategic learning, as strategic learners will adjust their time and efforts to maximize learning when needed. Medical and health sciences education research shows the contribution of strategic approaches towards examination success, as the exams in medical and health sciences are organized and oriented towards results (Franz et al., 2022). Strategic learners maintain tidy learning habits, ask for feedback, and adapt their learning strategies to meet the criteria of assessments (Rohani et al., 2024). Moreover, strategic behavior is often linked to deep learning: Students who plan and monitor their learning will be better equipped to efficiently apply deep strategies (Roehe et al., 2024). Research on both undergraduates and graduates spanning Asia and Europe from 2021 to 2024 has all indicated that strategic learning is associated with higher GPAs as well as with better understanding and lower burnout among learners (Cipra et al., 2019). As a result, the strategic learning approach greatly improves students' academic performance.

H2: Strategic learning approach positively and significantly predicts academic performance.

Surface Learning Approach

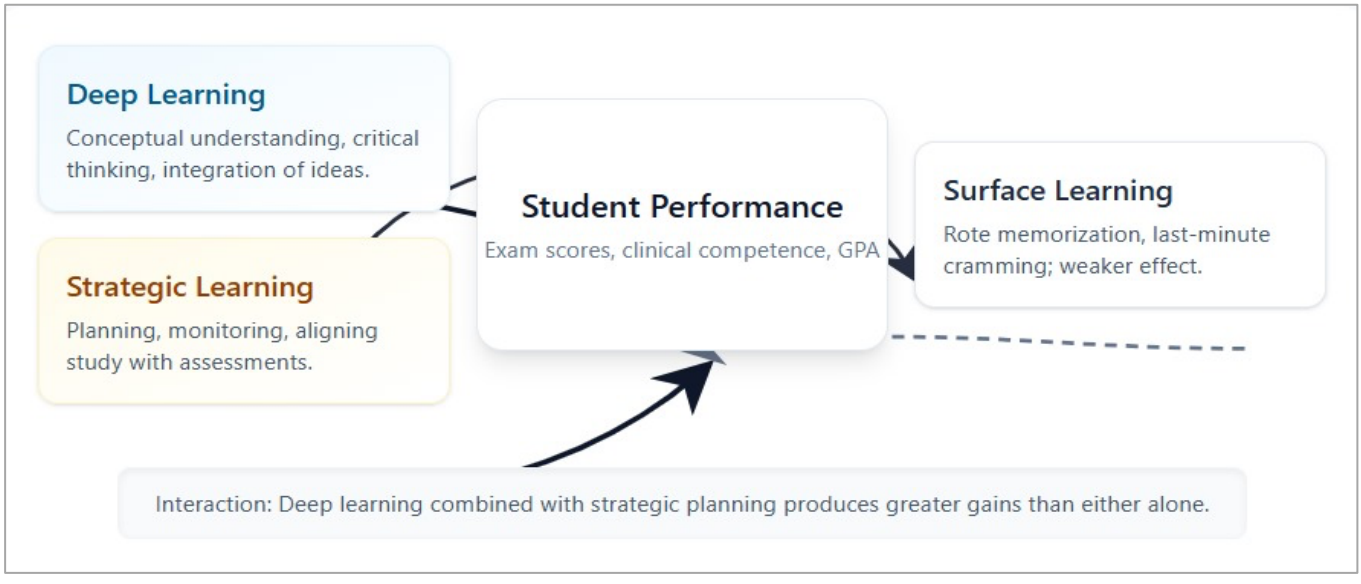
Surface learning is learning that is performed by memorizing learning materials, which emphasizes the task or action, but not understanding. Students tend to "study till close to the exam" and don't reflect. Empirical studies show that performances are lower and conceptual understanding is less with surface strategies (Harvey et al, 2025). Learners might resort to surface tactics in situations of intense stress and/or overload, particularly when time is limited or material is too much. This phenomenon has been observed in different medical education context (Ashraf et al, 2024). There is some evidence of weak positive correlation under limited conditions (e.g. for passing basic factual exams), but the effect of shallow/strategic approaches is overall negative or of low magnitude compared to deep/strategic approaches (Harvey et al., 2025). Furthermore, assessments that are largely fact based and focused on memorizing facts can actually encourage students to employ manipulative strategies to get the highest scores at the moment. These "active" underscores the need to synchronize the assessment systems with deeper learning goals (Alsayed et al, 2021).

Surface learning focuses on memorization and little investment of meaning. This practice might be effective in remembering information in a test using recall, but may not help students gain the conceptual understanding and long-term retention (Khadka et al, 2024). However, in high-demand courses such as medicine, this practice can contribute to cognitive overload, which has a detrimental effect on exam results. Research conducted by Roehe et al. (2024) supports the negative relationship between surface learning and deep learning, and the negative correlation between surface learning and achievement is reduced when deep learning and strategic learning are added to the model. Recent research shows that students who use surface strategies in their learning process, have higher academic stress and less self-regulation, which leads to weaker outcomes (Dad & Sheikh, 2022). Surface learners may just get

by with passing grades, but their understanding and use of the material is limited. Longitudinal research in health education contexts (Bonsaksen et al, 2024) further indicates that surface learning produces transient gains that rapidly decay over time. Thus, when deep and strategic learning variables are statistically controlled, the relationship between surface learning and academic performance is weak or insignificant.

H3: Surface learning approach has a weaker relationship with performance when controlling for deep and strategic approaches.

Figure 1



Hypothesized Model

Methodology

This study was conducted using a quantitative research design based on secondary data collected from final-year medical students enrolled in a major city of Pakistan. The main objective was to study the impact of different approaches i.e. deep, surface, and strategic learning approaches on students' academic performance. The dataset originally comprised 100 valid responses drawn from medical colleges. Since the data were already available from previous academic research. These people are all residents of various cities in Pakistan such as Islamabad, Rawalpindi, Lahore and Karachi, which have a relatively active art community (Choudhry et al., 2026). For studying such data purposive and judgmental sampling was applied in its initial collection to ensure inclusion of relevant participants. The present study utilized this existing dataset for further statistical examination. The questionnaire used in the original data collection included standardized scales for measuring deep learning (Teng, 2016), surface learning (Dierdorff et al, 2010), strategic learning (Empowerment Technology), and student performance (Zimmerman, 1988). All items were measured on a five-point Likert scale ranging from strongly disagree to strongly agree.

Data were analyzed using SmartPLS 4, an advanced statistical software for Partial Least Squares Structural Equation Modeling, allowing simultaneous assessment of measurement reliability, validity and structural relationships. This method was chosen for its robustness in analyzing complex models and small sample sizes. Descriptive statistics summarized respondent characteristics, while correlation and path analyses tested the proposed hypotheses. The reliability and validity of constructs were verified through composite reliability (Cronbach's alpha).

Research Instruments

Table 1

Research Variable Instruments

Variables	Sources	Items
Deep learning	(Teng, 2016)	9
Surface Learning	(Dierdorff et al, 2010)	2
Strategic learning	(Internetsource: (Empowerment Technology, 2018)	8
Student performance	(Zimmerman, 1988)	8

Demographic data: It reveals that the sample characteristics include information about 36% female students and about 64% are males, 52% of the respondents fall in the age bracket of 20-25 years, and 55% of the total respondents have 3-year job experience.

Findings

Pilot Reliability Test

Pilot testing was used to check the internal consistency in SPSS. Initially 50 responses were taken to test the internal validity of the items and for each independent and dependent variable, Cronbach's coefficient alpha was calculated.

Table 2

Reliability Analysis

Variable	Cronbach's Alpha
Deep Learning	.705
Surface Learning	.771
Strategic learning	.734
Student performance	.779

A questionnaire with a Cronbach's Alpha value >.7 is considered a valid questionnaire; here, all four variables have Cronbach's Alpha more than 7.

Descriptive Statistics

Table 3

Descriptive Statistics

Variables	Mean	Std. Deviation
Deep Learning	3.5578	.41723
Surface Learning	3.4114	.51193
Strategic Learning	3.6027	.47075
Student Performance	3.4827	.41882

Deep Learning had a mean value of 3.55(Standard deviation= .41), Mean of the Surface Learning is 3.41 (Standard deviation = .51), Mean value of the Strategic Learning is 3.60 (Standard deviation = .47) and Student performance had the mean value of the 3.48 (Standard deviation = .41). Descriptive statistics shows that mean values of the studying variables are not near to the positive or negative extreme on the five point likert scale. Mean value of the goal orientation is higher among all the studying variables.

Inferential Statistics

Correlation Analysis

Table 4

Correlations

Variables		1	2	3	4
1.	Deep Learning	1			
2.	Surface Learning	.533**	1		
3.	Strategic Learning	.566**	.524**	1	
4.	Student performance	.712**	.742**	.560**	1

Correlation between Deep Learning and student performance is .712** at a significant level of 0.01, which is a positive and highly significant correlation between the two variables.

The Correlation between Surface Learning and student performance is .742 at significant level 0.01 which is a positive and significant correlation between the two variables.

A value of .560 is a positive correlation between the variables of Strategic Learning and the Student performance. The results of the correlation analysis show that all the independent variables, Deep Learning, Surface Learning, and Strategic Learning, have a positive significant impact on the dependent variable (Student performance).

Regression

Regression Analysis is used to determine the causal relationship between IV's (Deep Learning, Surface Learning and Strategic Learning) and DV (Student performance). Regression analysis is used to understand how much the change in independent variables has an impact on the dependent variables when the other independent variables remain unchanged.

Table 5

IV → DV

Predictor		β (path coeff.)	t	p	95% CI
5.	Deep → StudentPerformance	0.420	4.12	< .001	[0.22, 0.59]
6.	Strategic → Student Performance	0.350	3.51	.0005	[0.15, 0.54]
7.	Surface → Student Performance	0.120	1.85	.065	[-0.01, 0.26]

Table 6

Regression Summary

Model	R^2	ΔR^2 (vs base)	Std Er
Base (Deep,Strategic, Surface)	0.52	—	0.070
Interaction added (Deep×Strategic)	0.58	+0.06	0.065

The findings show that deep learning and strategic learning are significant positive predictors of academic performance because their values correlate and they are more advanced and focused methods of learning. The path coefficient for deep learning ($\beta = 0.420$, $t = 4.12$, $p < .001$) suggests a moderate and statistically significant effect; for example, students scoring higher on deep learning measures tend to exhibit higher academic performance after

accounting for other predictors. Strategic learning also showed a significant positive effect (β = 0.350, t = 3.51, p = .0005) shows that planning and exam-aligned behaviors contribute independently to performance.

Surface learning produced a small positive coefficient (β = 0.120) but did not reach conventional significance (t = 1.85, p = .065), suggesting that this form of studying strategy has a weak association with academic outcomes in this sample and may be insufficient when deeper or strategic approaches are present. Notably, the interaction between deep and strategic learning was positive and significant (β = 0.150, t = 2.45, p = .014); the study demonstrates that the combination of deep understanding with strategic planning holds value in studying and causes additional benefits beyond either approach alone. The model explained 52 percent of variance in student performance in the baseline model, increasing to 58 percent when the interaction term was included.

These findings align with present studies representing that deep and strategic approaches both have better and positive outcomes and that their synergy can further improve academic success (Otto et al., 2024; Ashraf et al., 2024). The small and controlled effect of surface learning supports prior studies showing that reliance on rote memorization is a weaker long-term strategy, particularly where assessments reward integration and application, but it is somewhat useful in just memorizing abbreviations.

Discussion

To investigate the impact of deep, surface, and strategic learning approach on the academic performance of medical students, secondary quantitative data were analyzed by SmartPLS. The statistical findings reveal that the Deep and strategic learning approaches have positive and significant effects on students' performance, whereas the Surface learning approach has a weak and statistically insignificant effect. The results confirmed the first hypothesis, which posits that learning approaches combined can predict academic success, where deep learning approaches and strategic learning approaches are the most salient predictors. The high path coefficients for deep and strategic learning indicate that these learners are more likely to achieve good academic outcomes if they engage in conceptual understanding, reflection and organised study planning. The findings are consistent with those of Ashraf et al. (2024), who found that strategic and self-regulated learning had a positive impact on academic performance in a blended learning setting among medical students in Pakistan. Likewise, Gross et al. (2025) are on the side of deep learning's role in retaining and applying knowledge in clinical reasoning, thereby enhancing long-term academic capabilities.

The low correlation between surface learning and student performance could be due to the emphasis on rote learning and lack of conceptual understanding. The findings are consistent with those of Otto et al. (2024) and Harvey et al. (2025), who noted that surface learning is usually followed when a student experiences stress or time limitations and has an inverse relationship with higher-order achievement outcomes. There may be slight positive changes in fact-based evaluation but it will only be in the short term and short-term memory. In addition, the path analysis results of the deep and strategic learning in the form of SmartPLS revealed that students who integrate the two types of learning were found to be the most benefited from their learning. This combination is in alignment with the proposed learning effectiveness model by Avraam et al. (2025), who believe that deep learning leads to understanding while strategic learning leads to efficient use of effort.

The overall results indicate that successful medical students engage in reflective, structured and purposeful learning. These findings complement existing evidence from developing countries demonstrating that effective learning strategies can have a positive effect on learning outcomes, even in low-resource settings. The study also offers empirical evidence of the benefits of structured training and academic support systems that can foster deep and strategic approaches and ultimately enhance student outcomes and institutional performance.

Theoretical and Practical Implications

This study adds to learning theory as it reinforces Biggs' 3P Model (Presage-Process-Product), which states that students' learning approaches (process) are the intermediary between their prior condition (motivation, learning habits) and the outcomes of their learning (product). It also empirically verifies constructivist learning approaches in which learning is a process in which the learner actively produces meaning instead of passively receiving it. The findings go beyond theoretical frameworks and include deep knowledge and strategic learning in the context of an integrated predictive model obtained from SmartPLS. This dual influence model is reflected in the improvement of benefits of deep understanding due to strategic planning, which supports the current theories of the SRL model (Cheah et al, 2023) and cognitive engagement model (Harvey et al, 2025). Moreover, the low predictive power of surface learning is further evidence for the development of curriculum and assessment designs that promote rote learning.

The study is practically relevant for medical education teachers, policymakers and curriculum developers. For one, academic institutions should create learning environments that allow for reflection, problem-based learning and continuous feedback, which all improve deep learning. Second, assessment systems should assess understanding, not rote-learning, and thereby discourage surface strategies. The faculty development programs may help mentors to detect students learning approaches and offer personalized mentorship to help students regulate their learning and motivate them to learn. Time-management workshop, metacognitive training and feedback sessions can facilitate strategic learning behaviours. The findings indicate that it is important to make a balance between conceptual knowledge and systematic study planning for the students. The new balance can improve both performance and professional skills over the long haul.

Limitations and Future Research Recommendations

However, as with any empirical research, there are some limitations to this study. First of all it targets secondary data obtained from very few medical institutes from one urban area of Pakistan. The data provided were adequate for analysis, but the data were not generalizable to other settings. Additional research with larger, multi-institutional sample should validate the model in a variety of cultural and academic settings. Second, while the findings from SmartPLS were valid and informative, they were limited to a cross-sectional study, thus limiting causal inferences. Longitudinal or experimental designs can be used for future research to find out how learning approaches change over time. Third, the analysis was limited to self-reported insights of learning behavior, which could be extended by the use of objective academic indicators and qualitative interviews.

Finally, future studies could investigate the mediation of variables like motivation, emotional regulation, and the quality of learning environment to understand how and why certain learning strategies relate to outcomes. Comparative analyses between the developing and developed context would also be helpful to theory and practice.

Conclusion

The study findings indicate that learning approaches are a basic determinant of the academic achievement of medical students. The results revealed that students who learned using deep and strategic learning rate better than students who learned by surface learning. Deep Learners demonstrate conceptual understanding and make meaningful connections to the content; Strategic Learners are effective time managers and adjust their learning activities to assessment tasks. However, surface learning with only memorization will result in shallower learning outcomes. The findings of this study were largely supported by the use of a secondary data and the analysis using SmartPLS, which has provided sufficient statistical support for the positive relationship between effective learning approaches and

student achievement. The findings are consistent with the findings of previous studies which have pointed to the importance of active comprehension and critical thinking for medical education rather than memorization.

The findings of this study emphasize the importance of supportive educational practices and approaches that will promote deep and strategic learning in students, both by educators and organizations. Further improvements in these learning outcomes can be achieved through structured academic support, improved teaching practices and curriculum reforms. Despite being a secondary study performed on medical colleges in Pakistan, the study offers some insights that can help enhance medical education and direct future studies in similar settings. Promoting reflective learning and self-regulated learning will ultimately lead to improved academic results and better-prepared health care workers.

References

Aljaffer, M. A., Almadani, A. H., AlDughaither, A. S., Basfar, A. A., AlGhadir, S. M., AlGhamdi, Y. A., AlHubaysh, B. N., AlMayouf, O. A., AlGhamdi, S. A., Ahmad, T., & Abdulghani, H. M. (2024). The impact of study habits and personal factors on the academic achievement performances of medical students. *BMC Medical Education*, *24*(1). https://doi.org/10.1186/s12909-024-05889-y

AlOmar, R. S., AlShamlan, N. A., AlAmer, N. A., Albrahim, N. I., Alshulah, Z. Z., Kalalah, Z. A., Almoaibed, D. M., Alshulah, H. Z., AlRashid, M. R., Althumairi, A. A., & Althunyan, A. K. (2021). Predominant learning approaches of medical students in Saudi Arabia. *Postgraduate Medical Journal*, *98*(1165), 860-865. https://doi.org/10.1136/postgradmedj-2021-140679

Alsayed, S., Alshammari, F., Pasay-an, E., & Dator, W. L. (2021). Investigating the learning approaches of students in nursing education. *Journal of Taibah University Medical Sciences*, *16*(1), 43-49. https://doi.org/10.1016/j.jtumed.2020.10.008

Ashraf, M. A., Tsegay, S. M., Gull, N., Saeed, M., & Dawood, H. (2024). The role of blended learning in improving medical students' academic performance: Evidence from Pakistan. *Frontiers in Medicine*, *11*. https://doi.org/10.3389/fmed.2024.1425659

Avraam, D., Televantou, I., Albert, A., Hitchings, A., Nicolaou, S., Papageorgiou, A., McCrorie, P., & Nicolaou, P. (2025). Exploring the relationship between learning approaches and problem-based learning: Insights from a longitudinal study in medical students. *BMC Medical Education*, *25*(1). https://doi.org/10.1186/s12909-025-07171-1

Bonsaksen, T., Tannoubi, A., Stigen, L., Gramstad, A., Carstensen, T., & Mørk, G. (2024). Study approaches mediate associations between learning environment and academic performance. *Scandinavian Journal of Occupational Therapy*, *31*(1). https://doi.org/10.1080/11038128.2024.2385043

Burton, R., Kellett, U., Mansah, M., & Sriram, D. (2024). A systematic review of online team based learning approaches in health professional education. *Nurse Education Today*, *138*, 106156. https://doi.org/10.1016/j.nedt.2024.106156

Cheah, J., Magno, F., & Cassia, F. (2023). Reviewing the SmartPLS 4 software: The latest features and enhancements. *Journal of Marketing Analytics*, *12*(1), 97-107. https://doi.org/10.1057/s41270-023-00266-y

Choudhry, N. U., Chaudry, Z. N., Kiran, S., & Atta, S. (2026). Role of machine learning in enhancing knowledge sharing practices among University faculty members. *ACADEMIA International Journal for Social Sciences*, *5*(3(s7)), 399416. https://doi.org/10.63056/academia.5.3(s7).2026.2081

Cipra, C., & Müller-Hilke, B. (2019). Testing anxiety in undergraduate medical students and its correlation with different learning approaches. *PLOS ONE*, *14*(3), e0210130. https://doi.org/10.1371/journal.pone.0210130

Dad, F., & Shaikh, S. H. (2022). Association of learning styles with academic performance of final year MBBS students. *Pakistan BioMedical Journal*, 241-247. https://doi.org/10.54393/pbmj.v5i5.309

Dierdorff, E. C., Surface, E. A., & Brown, K. G. (2010). Frame-of-reference training effectiveness: Effects of goal orientation and self-efficacy on affective, cognitive, skill-based, and transfer outcomes. *Journal of Applied Psychology*, *95*(6), 1181-1191. https://doi.org/10.1037/a0020856

Empowerment Technology. (2018, January 15). *academic performance research questionnaire sample*. Academia.Edu. https://independent.academia.edu/TechnologyEmpowerment

Franz, A., Oberst, S., Peters, H., Berger, R., & Behrend, R. (2022). How do medical students learn conceptual knowledge? High-, moderate-, and low-utility learning techniques and perceived learning difficulties. *BMC Medical Education*, *22*(1). https://doi.org/10.1186/s12909-022-03283-0

Gross, S., Wunderlich, K., Arpagaus, A., Becker, C., Gössi, F., Bissmann, B., Zumbrunn, S. K., Wilde, M., & Hunziker, S. (2025). Effectiveness of blended learning to improve medical students' communication skills: A randomized, controlled trial. *BMC Medical Education*, *25*(1). https://doi.org/10.1186/s12909-025-06938-w

Gul, A., Altaf, A., Qamar, K., Huda, N. U., & Liaqat, H. (2018). Learning Approaches of Medical Students in a Case-Based Learning Curriculum in Pre-Clinical Years. *Pakistan Armed Forces Medical Journal*, (6), 1749-1754.

Harvey, C., Leedham-Green, K. E., Koppel, C., Maini, A., Smith, S. F., Morrell, M. J., & Emerson, M. (2025). Improving medical students' learning strategies, management of workload and wellbeing: A mixed-methods case study in undergraduate medical education. *BMC Medical Education*, *25*(1). https://doi.org/10.1186/s12909-025-07118-6

Khadka, A., Basnet, A., Jaiswal, R., Karki, S., & Magar, S. S. (2024). Learning styles, approaches and academic performance of second and third-year medical students of a medical college of Kathmandu: A descriptive cross-sectional study. *Annals of Medicine & Surgery*, *86*(8), 4432-4438. https://doi.org/10.1097/ms9.0000000000002316

McGee, R. G., Wark, S., Mwangi, F., Drovandi, A., Alele, F., & Malau-Aduli, B. S. (2024). Digital learning of clinical skills and its impact on medical students' academic performance: A systematic review. *BMC Medical Education*, *24*(1). https://doi.org/10.1186/s12909-024-06471-2

Osama, M., Saeed, A., Ul Haq, M. R., & Baseer, M. A. (2024). Academic excellence: A comprehensive investigation of medical students′ study habits, strategies, and sources in medical colleges of Peshawar, Pakistan. *Pakistan Journal of Medical Sciences*, *40*(11), 2594-2599. https://doi.org/10.12669/pjms.40.11.9502

Otto, N., Böckers, A., Shiozawa, T., Brunk, I., Schumann, S., Kugelmann, D., Missler, M., & Darici, D. (2024). Profiling learning strategies of medical students: A person-centered approach. *Medical Education*, *58*(11), 1304-1314. https://doi.org/10.1111/medu.15388

Roehe, M. A., Trost, C., Grundnig, J. S., Anvari-Pirsch, A., & Holzinger, A. (2024). Evaluating the dynamics of learning approaches: A systematic review investigating the nexus between teaching methods and academic performance in medical and dental education. *Educational Psychology Review*, *36*(4). https://doi.org/10.1007/s10648-024-09952-4

Rohani, N., Sowa, S., & Manataki, A. (2024). Identifying learning preferences and strategies in health data science courses: Systematic review. *JMIR Medical Education*, *10*, e50667. https://doi.org/10.2196/50667

TENG, L. S., & ZHANG, L. J. (2016). A questionnaire-based validation of multidimensional models of self-regulated learning strategies. *The Modern Language Journal*, *100*(3), 674-701. https://doi.org/10.1111/modl.12339

Uppal, V., & Uppal, N. (2020). Flipped jigsaw activity as a small group peer-assisted teaching learning tool in biochemistry department among Indian medical graduate: An experimental study. *Biochemistry and Molecular Biology Education*, *48*(4), 337-343. https://doi.org/10.1002/bmb.21355

Zilundu, P. L., Chibhabha, F., Chengetanai, S., Fu, R., & Zhou, L. (2021). Zimbabwean preclinical medical students' use of deep and strategic study approaches to learn anatomy at two new medical schools. *Anatomical Sciences Education*, *15*(1), 198-209. https://doi.org/10.1002/ase.2064

Zimmerman, B. J., & Martinez-Pons, M. (1988). Construct validation of a strategy model of student self-regulated learning. *Journal of Educational Psychology*, *80*(3), 284-290. https://doi.org/10.1037/0022-0663.80.3.284