The Impact of Learning Strategies on Academic Success of the Preclinical Medical Students in Bangladesh

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Abstract

Background: Learning strategies are systematic steps that students use to achieve specific learning objectives. Use of effective learning strategies enables the students to efficiently manage large amount of information pertaining to preclinical subjects in medical schooland ensures better academic outcome. This study aims to explore the relationship between learning strategy and academic scores of preclinical medical students in Bangladesh.

Materials and methods: This was a cross sectional study conducted during the period from January to December 2024. Data were collected from 192 1st and 2nd year students of two medical colleges through a questionnaire. The 50 items of the questionnaire were divided in nine subscales. SPSS was used for analysis.Unpaired t-test and ANOVA were used to compare means. Pearson's correlation coefficients were calculated between each subscale score and academic performance.

Results: Female students, students who study for longer hours and those living in hostel displayed significantly higher scores. In terms of correlation, critical thinking showed moderate but significant correlation ($r=0.42$, $p=0.00$) while metacognitive self regulation ($r=0.22$, $p=0.03$) time and study management ($r=0.31$, $p=0.00$) revealed small though significant correlations with the academic score.

Conclusion: The results of the study will enable the educators to guide the students on efficient learning practices to ensure better academic outcome.

Key words: Academic success; Learning strategy; Student.

Introduction

Learning strategies are a series of systematic and organized steps that is carefully devised and employed by a student to achieve a specific learning objective. These strategies vary depending upon the students' perceived ability, motivation and belief in the effectiveness of a specific learning strategy.[1] The students' conception of what learning entails also influences their choice of learning approaches. A student who views learning as memorization and reproduction of facts will adopt different learning strategies compared to a student who views learning as a process of transforming information and ideas to expand and deepen their existing knowledge.[2] Simply adopting a specific learning strategy is not sufficient, the students need to be motivated enough to organize and regulate their cognitive process to sustain and implement any learning strategy.[3]

The shift from higher secondary education to medical school is frequently challenging for many preclinical medical students.[4] The challenge arises from the need to become autonomous and self-regulated learners who are expected to plan and monitor their learning with less guidance compared to higher secondary education.[5] The rising academic pressures necessitate the development of effective learning skills to cope with these demands. The students who fail to understand and adopt appropriate learning strategies often crumble under academic pressure resulting in poor academic performance.[6]

Preclinical medical education requires students to grasp a large and complex body of knowledge, such as anatomy, physiology and biochemistry. Self-regulated learning helps students set individual goals, manage their time efficiently and use effective study techniques to navigate this complexity.[7]Therefore, the focus on Self-Regulated Learning (SRL) is increasing where the students will proactively set goals and adjust their learning strategy to achieve that goal.[8] Self-regulated learning is associated with academic success and life-long learning.[9]

Highly motivated, self-regulated students tend to exhibit a higher degree of autonomy in their choice of learning strategies. Appropriate learning strategy is instrumental in development of learners' cognitive, affective and psychomotor dimensions which in turn ensures better

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professional and academic performance.[10] The students utilize different cognitive, metacognitive and resource management strategies for learning such as rehearsal, elaboration, critical thinking, self-regulation, time and effort regulation etc. Metacognition is the awareness, knowledge and control of cognition.[9] Learning strategy is proven to be one of the key factors for success in medical students.[10,11]

Depending on the usage of effective learning strategy, dedicating sufficient time and effort, students can efficiently manage large amounts of information and translates their knowledge into practical application and academic success.[12] Despite the influence of learning strategy on academic success of the students, there is an evident lack of researches exploring the relationship between learning strategy and academic success of the preclinical medical students in Bangladesh. This study aims to evaluate the learning strategies of the preclinicalmedical students in Bangladesh and find out the correlations between their learning strategy and academic success.

Materials and methods

This was a cross sectional study conducted during the period from January to December 2024. In this cross sectional study, all 1st and 2nd year medical students of two consecutive sessions from Marine City Medial College, Chattogram and Rangamati Medical College, Rangamati were invited to participate over the course of two academic years. Among 207 students, 192 students participated. The researchers explained the objectives and gave assurance of anonymity. The ethical permission was taken from Institutional review Board of Marine City Medical College. The MSLQ (Motivated Strategy for Learning Questionnaire) was distributed at the beginning of a lecture class on different occasions. The students filled it on the spot and returned the questionnaire within 30 minutes. The percentages of marks obtained in term final examinations were calculated. SPSS was used to compute mean and standard deviation of all subscales and composite scoreof learning strategy. Means were compared using unpaired t-test and ANOVA with Turkey's post hoc test for two and more groups, respectively. Pearson's correlation coefficients were calculated to determine the relationship between learning strategy and percentage of scores obtained in term final examination.

Instrument: The 50 item learning strategy section of the questionnaire were utilized in the present study. These items are divided into nine subscales. Rehearsal (4 items) involves reciting lessons to memorize. Elaboration (6 items) integrates new information with prior knowledge.Organization (4 items) involves selecting and connecting appropriate information.Critical thinking (5 items) is applying prior knowledge to new situation for problem-solving. Metacognitive self-regulation (12 items) involves adjustment of cognitive activities to improve performance. Time and study environment (8 items) effort regulation (4 items-effort to complete goals despite difficulties) peer learning (3 items) and help seeking (4 items) are the remaining four subscales.Each item is scored on a five point Likert scale where '1' means 'not at all true of me' and '7' means 'very true of me'.

Results

Table I showed the the mean scores of all the subscales and composite score of learning strategy in the preclinical medical students. The mean scores of all subscales and composite scorewere found to be moderate and satisfactory. No categories presented with low mean score (Score < 3).

Table I Descriptive statistics for subscales of learning strategy (n=192) in preclinicalmedical students

Learning Strategies	Mean	SD	SEM
Reherasal	5.36	±1.04	0.11
Elaboration	5.19	±1.14	0.12
Organization	5.09	±1.22	0.13
Critical thinking	4.79	±1.04	0.11
Metacognitive self regulation	4.89	±0.86	0.09
Time and study environment	4.55	±1.04	0.11
Effort regulation	4.33	±1.23	0.13
Peer learning	4.99	±1.32	0.14
Help seeking	5	±0.96	0.1
Composite score (Average of subscale means)	4.91	±0.79	0.08

● SEM: Standard Error of Measurement, SD: Standard Deviation.

Table II depicted the comparison of student characterisctics in relation to their composite scores for learning strategy. The female students (p=0.01) and the students livining in hostel

(p=0.049) showed significantly higher composite scores than male students and students living with family. The number of hours students spent studying also showed significant difference. The students who studied less than 4 hours had significantly lower score than those studying 4-6 hours (p=0.00) and >6 hours (p=0.00). There was no significant difference in thescores of non-government and government medical students (p=0.07).

Table II Comparison between the composite score of learning strategy according to the characteristics of the preclinical medical students

Characteristics of the students		n (192)	Mean	SD	p value	Post hoc test
Gender	Male	60	4.78	±1.80	0.01*	-
	Female	132	4.93	±1.87		
Type of medical college	Non-government	100	4.93	±1.82	0.07 ns	-
	Government	92	4.84	±1.88		
Accomodation	In hostel	102	4.94	±1.85	0.049*	-
	With family	90	4.83	±1.83		
Hour spent for study	< 4 hours (x_1)	62	4.42	±2.03	0.00**	x_1 vs. x_2=0.00**
	4-6 hours (x_2)	98	5.0	±1.68		x_1 vs. x_3=0.00**
	> 6 hours (x_3)	32	5.44	±1.75		x_2 vs. x_3=0.07ns·

● n: number of sample, SD: Standard Deviation, p<0.05*, p<0.01**, ns: not significant.

Table III presented the relationship between mean scores for nine subscales of learning strategy with academic score of the students. The critical thinking categoty were found to have moderate but significant correlation (r=0.42, p=0.00) while metacognitive self regulation (r=0.22, p=0.03), time and study management categoties (r=0.31, p=0.00) revealed small though significant correlations with the academic score.

Table III Correlations between nine subscales of learning strategy and academic scores of preclinicalmedical students

Learning Strategies	r	p value
Reherasal	0.16	0.1 ns
Elaboration	0.14	0.18 ns
Organization	0.11	0.3 ns
Critical thinking	0.42	0.00**
Metacognitive self regulation	0.22	0.03*
Time and study environment	0.31	0.00**
Effort regulation	0.19	0.06 ns
Peer learning	0.12	0.24 ns
Help seeking	0.07	0.48 ns
Composite score	0.21	0.04*·

● r: Pearson's correlation coefficient, p<0.05*, p<0.01**, ns: not significant.

Figure 1 showed the moderate positive correlation between critical thinking subscale and academic score.
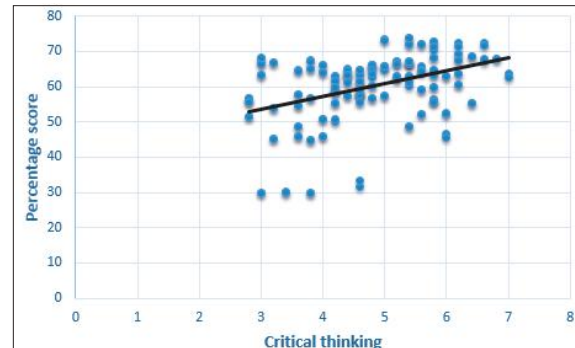
Figure 1 Scatter plot showing the correlation between critical thinking and academic score

Discussion

Efficient learning strategies are known to boost confidence, increase motivation and maximize the academic success of the students.[13] Therefore, this study determined the mean scores of each subscales of learning strategy. The mean scores for each subscale (Table I) and composite score for learning strategy were satisfactory which were indicative of the preclinicalmedical students employing efficient learning strategy. The findings of the present study were aligned with the results of Hamid & Singaram who reported similar findings in most subscales of learning strategy except for peer learning and help seeking.[14] They reported lower scores for these two categories compared to the present study.

Statistically significant differences were found between the composite scores of female and male students (Table II). The female students scored significantly higher (p=0.01). Other studies also found that female students are generally more engaged in learning activities and as a result achieve greater academic success compared to their male counterparts.[14,15] The teachers may focus on instruct the male students on the efficient learning strategies for better academic outcome. The students living in hostel had significantly higher scores (p=0.049) than those living at home (Table II). Living on-campus influences students' personal development and learning engagement. Consequently their cognitive and critical thinking skills increases leading to better academic performance.[16] This might be the reason for higher scores in students living in hostel.The

students living off-campus may be benefitted from attending peer learning sessions, which can enhance their cognitive and metacognitive skills. No significant difference was found in the scores of non-government and government medical students (p=0.07) indicating an similar level of motivation and engagement in learning activities among the students of both institutions.

The students who studied less than 4 hours had significantly lower score than those studying 4-6 hours (p=0.00) and >6 hours (p=0.00, Table II). According to Wilkinson et al. medical students who spent more time studying often use deep processing strategies, which involve connecting various topics through multiple sources and peer learning.[17] This suggests a positive correlation between study time and effective learning strategies. This might explain the findings in the present study indicating the students who invest more time in self-study use more efficient learning strategies.

The academic success of students is a top priority for educators. Students' academic performance is influenced by many external and internal factors. External factors include parent's education, income etc. while learning strategy is one of the key internal factors affecting students' academic success.[18] So, present study also explored the relationship of different subscales of learning strategy with academic scores of the preclinical medical students.

The critical thinking categoty were found to have moderate but significant correlation (r=0.42, p=0.00) with academic performance (Table III). Ohran et al. also found moderate correlation (r=0.428) between critical thinking and academic success of the students.[19] Hamid and Singaram found weak correlation (r=0.16) between the two variables which is contrary to present study.[14] The finding of present study is indicative of the students adopting deep learning strategies rather than surface strategies like rehearsal and memorization. Critical thinking is a way of thinking in a evedence based, logical and reasonabale manner. Critical thinking or creative thinking boosts the problem solving skills which in turn increase the academic success of the students.[20] It also makes students more equipped to become self-regulated learners where they can take active responsibilities for learning and

monitoring of their progress.[21] Therefore, critical thinking is one of the key skills to achieve for academic success.

Metacognitive self-regulation was found to have a weak but significant relationshiip (r=0.22, p=0.03) with academic success (Table II).This finding is suggestive of the students ability to control their emotion and self efficacy, enabling them to adopt, regulate and monitor their learning process for better academic outcome. This also signifies their ability to adjust their learning strategy according to evolving academic challeges. Mustapha et al. did not find any significant relationship between these two variables which is dissimilar to present study.[22] The findings of Hayat et al. aligned with the present study who also found significant and positive correlation between metacognitive learning strategies and academic performance (r = 0.45, p≤0.01).[23] The students using metacognitive self-regulation skills tend to adopt deep learning approach, formulate better study plans, efficiently monitor learning and find solution of problems. These qualities in turn lead to academic success.[24]

Time and study management was another category which revealed a weak but significant (r=0.31, p=0.00) with academic achievement of the students (Table III). This finding is indicative of the importance of time and study management on academic success. Alyami et al. also found that students with higher GPA tend to preplan their study and efficiently manage the time.[25] The weak relationship in the present study indicates that the students were not making optimal use of their study time. Teachers can guide students on how to prioritize, divide and schedule their lessons effectively, as well as how to focus on their studies to achieve their learning goals within a limited timeframe.[26] The present study found very weak and insignificant correlations between other six subscales of learning strategy with the academic success of the students. The correlation between composite score of learning strategy was found to be small but significant (p=0.04, Table III). This finding was similar with Hamid & Singaram's findings for preclinical medical students.[14]

Though the overall scores in all subscales in regards to learning strategies of the preclinical medical students are satisfactory, repeated evaluation

throughout the academic year is required to establish the findings of present study. If students are skilled at selecting learning strategies that align with their preferences and goals, they are more likely to develop into self-regulated, lifelong learners. This independence reduces the necessity for teachers to provide constant guidance and supervision, allowing them to focus on adapting, monitoring and revising their teaching strategies.[27] It will ensure a good teacher-student communication as well as a better learning environment.[28]

Limitations
- The numbers of samples in different categories were unequal.
- The scores of learning strategy subscales were dependent on students' subjective perception.
- The scores of the subscales were compared only once with the scores of one examination.

Conclusion
The findings of the study revealed that the females students, students who study for longer hours and those living in hostel reported more positively on their adopted learning strategy. Three categories of learning strategy such as critical thinking, metacognitive self regulation, time and study management were found to have significant positive correlations with academic success. The results of the study should be useful for educators in identifying which learning strategies enhance students' performance and determining which groups to target for intervention, enabling them to guide students in adopting effective learning strategies.

Recommendations
- Future studies may take multiple measurements over the year to reduce the bias associated with self-reported scores and to confirm the findings of the present study.
- Further studies may include more medical colleges and a larger sample size.

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Contribution of authors
SB- Conception, acquisition of data, interpretation of data, drafting & final approval.

PPC-Design, acquisition of data, data analysis, critical revision & final approval.

Disclosure
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References
1. Pérez-Navío E, Gavín-Chocano Ó, Checa-Domene L, Prieto MG-V. Relationship between Learning Strategies and Motivation of University Students. Sustainability. 2023;15(4):3497.

2. Kirkwood A& Price L. Assessment and Student Learning : A fundamental relationship and the role of information and communication technologies. Open Learning: The Journal of Open, Distance and e-Learning, 2008;23(1):5–16.

3. Jong Y & Kim Y. Perceptions and Approaches of TOEIC Speaking Classes by University Students from Different Academic Disciplines. Res. Chin. Lang. Educ. 2019;31:1–20.

4. Chemers MM, Hu L & Garcia BF. Academic self-efficacy and first year college student performance and adjustment. Journal of Educational Psychology. 2001;93(1)55–64.

5. Biwer F, Egbrink MGA, Aalten P, Bruin ABH. Fostering Effective Learning Strategies in Higher Education – A Mixed-Methods Study.Journal of Applied Research in Memory and Cognition.2020;9(2):186-203.

6. Siddiqui IA, Abdulrahman KA & Alsultan MA. A learning skills course for the 1st year medical students: An experience at a Saudi medical school.Advances in Medical Education and Practice. 2015:6 205–210.

7. Zimmerman BJ. Becoming a self-regulated learner: Thoughts on the role of goal-setting. Contemporary Educational Psychology. 2002;27(1):1-26.

8. Yu B. Self-regulated learning: A key factor in the effectiveness of online learning for second language learners. 2020. Front. Psychol. 13:1051349. doi: 10.3389/fpsyg.2022.1051349.

9. Pintrich PR, Smith DAF, García T, McKeachie WJ. A manual for the use of the motivated strategies for learning questionnaire (MSLQ). Ann Arbor, MI: University of Michigan. 1991.

10. Maree CM, van Rensburg GH. Reflective learning in higher education: Application to clinical nursing. Afr J Phys. 2020.

11. Edgar S, Carr SE, Connaughton J, Celenza A. Student motivation to learn: is self-belief the key to transition and first year perfor- mance in an undergraduate health professions program? BMC Med Educ. 2019; 19(1):111.

12. Donker AS, de Boer H, Kostons D, Dignath van Ewijk CC, van der Werf MPC. Effectiveness of learning strategy instruction on academic performance: A meta-analysis.Educational Research Review. 2014;11:1-26.

13. Khansir A,Dehkordi F & Mirzaei M. A Study on the Effectiveness of Learning Strategies in English. Indian Journal of Language and Linguistics. 2023;4:18-31.

14. Hamid S & Singaram V. Motivated strategies for learning and their association with academic performance of a diverse group of 1st-year medical students. AJHPE. 2016;8(1):104-107.

15. Sikhwari TD. A study of the relationship between motivation, self-concept and academic achievement of studentsat a university in Limpopo Province, South Africa. Int J EduSci 2014;6(1):19-25.

16. deAraujo P & Murray J. Estimating the Effects of Dormitory Living on Student Performance. 2010. http://dx.doi.org/10.2139/ssrn.1555892.

17. Wilkinson TJ, Wells JE & Bushnell JA. Medical student characteristics associated with time in study: is spending more time always a good thing? Medical Teacher. 2007;29:106–110.

18. Shah R, Rehman W&Abbas SG. An Analysis of Students Academic Performance: A Case Study of Sarhad University, Peshawar, Pakistan. Sarhad Journal of Management Sciences. 2015;1(1):33-45.

19. Orhan A. The relationship between critical thinking and Academic achievement: A meta-analysis study. Psycho-Educational Research Reviews. 2022; 11(1):283-299.

20. Halpern DF. Teaching critical thinking for transfer across domains: Dispositions, skills, structure training, and metacognitive monitoring. American Psychologist.1998; 53(4):449–455.

21. Moon J. Critical thinking: An exploration of theory and practice. Routledge.2008.

22. Mustapha A, Bello G & Alabi H. Influence of Meta-cognition, Self-efficacy, and Self-regulated Learning on Students' Achievement in Biology in Ibadan, Nigeria. Qeios. 2024.
doi 10.32388/EOUPGL.

23. Hayat AA, Shateri K, Amini M, Shokrpour N. Relationships between academic self- efficacy, learning related emotions and meta cognitive learning strategies with academic performance in medical students: A structural equation model. BMC Med Educ.2020;76.

24. Pintrich PR& De Groot EV. Motivational and self-regulated learning components of classroom academic performance. J Educ Psychol. 1990;82(1):33.

25. Alyami A,Abdulwahed A, Azhar A, Binsaddik A, Bafaraj SM. Impact of Time-Management on the Student's Academic Performance: A Cross-Sectional Study. Creative Education. 2021; 12(3):471-485.

26. Cyril AV. Time Management and Academic Achievement of Higher Secondary Students. i-manager's Journal on School Educational Technology, 2015;10(3l):38-43.

27. Peeters J, De Backer F, Reina VR, Kindekens A, Buffel T, Lombaerts K. The role of teachers' self-regulatory capacities in the implementation of self-regulated learning practices. Social and Behavioral Sciences. 2014;116: 1963 −1970.

28. Karani R. Enhancing the Medical School Learning Environment: A Complex Challenge. J Gen Intern Med. 2015 Sep;30(9):1235-1236.