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Medical and allied health students' self-regulated learning: The interplay between motivational beliefs and learning strategies

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ABSTRACT

Objective: Research on academic self-regulation suggests that students' self-efficacy, intrinsic goal orientation, deep approach to learning, and organized studying improve students' academic performance. The primary goal of the study was to investigate the extent to which students perceive their motivational beliefs and their self-regulated learning strategy use, and examine the relationship between the two constructs; motivational beliefs and self-regulated learning strategies.

Methods: A sample of 205 first year students (121 males and 84 females) from the College of Medicine in Malawi responded to a five-point Likert-type scale questionnaire assessing their self-efficacy, intrinsic goal orientation, and learning strategies. Data were analyzed using IBM® SPSS® Statistics, version 20.

Results: Compared with learning strategies, students reported higher levels of motivational beliefs; self-efficacy [M = 4.37, standard deviation (SD) = 0.64]; and intrinsic goal orientation (M = 4.09, SD = 0.68). Male students had higher levels of intrinsic goal orientation than their female counterparts ($p < 0.05$), and the first-generation students had higher levels of deep strategy than non-first-generation students ($p < 0.05$). Linear regression results indicate that both self-efficacy and intrinsic goal orientation positively predicted deep learning strategies (self-efficacy: β = 0.21; intrinsic: β = 0.41), meta-cognitive strategies (self-efficacy: β = 0.30; intrinsic: β = 0.38), and resource management (self-efficacy: β = 0.25; intrinsic: β = 0.26).

Conclusion: The results suggest that the first year medical and allied health students possess intrinsically strong motivational beliefs and that these beliefs have an important impact on their deep learning approach and organized studying. Possible implications of the results and recommendations for future research are discussed.

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Self-efficacy; intrinsic goal orientation; cognitive learning strategy; resource management; deep learning approach

Introduction

In higher education, especially medical schooling, educating students to become life-long learners who can effectively apply theoretical concepts to their professional contexts is an important aspect. Due to the nature of their profession, it is essential that students in medical institutions need to be more independent of their teachers in extending and updating their knowledge base. To achieve this educational responsibility, a number of medical institutions have shifted their teaching approach from the traditional teacher-centered to student-centered where the use of interactive and problem-based learning is mostly preferred [1–3]. University of Malawi (UNIMA), through the College of Medicine (CoM), is also trying to incorporate the problem-based learning (PBL) approach, especially in the clinical years [4]. Barrows and Tamblyn [5] define PBL as "the learning that results from the process of working towards the understanding of a resolution of a problem" (p. 1). Students in PBL are first presented with a problem by their tutor; then they engage in an independent study on their learning issues outside the tutorial to come back later for discussions on a given problem. According to Van den Hurk [6], students in PBL need to be encouraged to take responsibility for their own

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learning process (self-regulated learning) so that they actively contribute to their own learning.

Boekaerts [7] argues that many researchers support the view that one of the major goals of formal education is to equip students with self-regulatory skills. These skills are viewed as very important to guide one's own learning during formal schooling. Self-regulatory skills also help in updating one's knowledge after leaving school. Pintrich [8] defines self-regulated learning (SRL) as, "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (p. 453). Students can be described as self-regulated learners if they effectively use cognitive, meta-cognitive, resource management, and motivational skills during their learning process [9]. This notion suggests that essentials to SRL are the motivational beliefs and the learning strategies or mental processes that learners deliberately employ to help themselves learn and understand something new. From the definition and a brief description of what SRL is, it is clear that in PBL, where SRL is encouraged, students should be motivated enough to take up the responsibility of monitoring their own learning, and it is vital that medical and allied health students become prepared for this new teaching approach as early as the first year.

Motivational beliefs

By definition, "motivation is an internal process that activates, guides, and maintains behavior over time" [10]. In education, the willingness to put effort into learning is as a result of several factors ranging from the student's personality and abilities to characteristics of particular learning tasks, incentives, setting, and teacher behavior. Pintrich et al. [11] summarized all these motivational aspects into three general constructs. The first category is that of expectancy. It refers to students' beliefs that they can accomplish a task and its components include self-efficacy and control beliefs for learning, which are students' beliefs that outcomes are dependent on one's own effort. The second general category is value, which focuses on the reasons students involve in academic tasks. Its components include value beliefs: intrinsic goal orientation (a focus on learning and mastery); extrinsic goal orientation (a focus on grades and approval from others); and task value beliefs (judgments of how useful, interesting the course material is to the student). The third general motivational construct is affect, which focuses on test anxiety. Due to their effect on self-regulated learning strategies, in this study, motivational beliefs of self-efficacy [12] and intrinsic goal orientation [13] represented expectancy and value, respectively.

Self-efficacy beliefs

Apart from the mere understanding of factual knowledge, medical and allied health students also need to be self-efficacious in life-long skills, such as problem-solving and critical thinking, and in applying the theoretical concepts to their professional contexts. Self-efficacy is viewed as a significant source of students' inspiration to work, and it is postulated to influence people's choices, level of effort, and persistence [14,15]. Therefore, students who identify themselves as efficacious apply greater effort on a difficult task and are more likely to persist than those with less certainty of their capabilities than those who are less efficacious. Shih [16] further links self-efficacy with attribution and control-value theories of learning. On one hand, he argues that students who are less efficacious attribute their successes/failures to such factors as luck or easy task (factors which they have little or no control); hence; they feel they cannot succeed on their own. Consequently, they resort into setting themselves easy objectives. On the other hand, efficacious students attribute their successes/failures to factors like ability and effort (which are controllable factors) and eventually they become motivated to work productively. Due to their attribution and control beliefs, students with high self-efficacy are more likely to continue persisting in their coping efforts when they face obstacles and therefore are more likely to succeed [14,15]. Literature also indicates that self-efficacious students aim at mastering the concept, especially for future performance [17], as opposed to simply getting the concept right for the sake of performance.

Intrinsic goal orientation

In education, goal orientation is defined as a set of behavioral intentions that determine how students approach and participate in learning activities [13]. These behavioral intentions are learners' beliefs regarding their own academic goals that explain why attaining a particular goal is necessary for them. The expectancy-value model of self-regulated learning postulates that the principal goals students possess

for participating in an activity are either intrinsically or extrinsically motivated [8,18]. According to the model, learners who adopt an intrinsic goal orientation to learning mostly focus on internal factors such as understanding and mastering the materials they study [19]. Conversely, students who adopt an extrinsic goal orientation approach focus on external factors such as grades, rewards, and approval from others [8,19]. Compared with extrinsic goal orientation where students' characteristics are not affiliated with academic success [13], a number of studies have confirmed the importance of intrinsic goal orientation on mastery learning approach; it is associated with high-quality learning outcomes. Students who are intrinsically oriented, and who emphasize on the mastery of concepts tend to place high intrinsic value on learning, are inclined to use deep information processing strategies, are self-efficacious and self-regulated, and attribute their success or failure to effort and strategy use [13,20].

Self-regulated learning strategies

Self-regulated learning strategies can be described as approaches that students use to develop study habits, regulate, and monitor their learning process. There are three main approaches to students' learning which can be categorized as surface, deep, and organized (strategic) studying approaches [21,22]. Briggs and Tang [23] define surface learning as an approach whereby a student learns only enough to pass assessment; students use superficial cognitive strategies such as repetition, highlighting, and memorization [11]. The second approach, deep learning, is defined as an approach whereby students meaningfully engage with the course content and treat it as something worthy time spending and understanding [23]. Consequently, students who adopt a deep learning approach use deep and metacognitive learning strategies such as critical thinking, planning, and monitoring to construct meaning in the study material [11]. The third approach, organized studying (previously referred to as strategic approach [21]), refers to the student's ability to seek help from either peers or teachers and manage study time and effort [22] and Pintrich et al. [11] refer to this approach as resource management. For the purpose of this study, two approaches were measured: deep and organized approaches. Surface approach was not included in the study because it reflects shallow information processing which was not the focus of the study.

The interplay between motivational beliefs and learning strategies

Self-efficacy and intrinsic goal orientation are the two motivational beliefs that are closely related to SRL. According to Zimmerman and Cleary [24], a key determinant of whether learners employ self-regulated learning strategies or not rest on self-efficacy, the beliefs they hold about their capabilities to achieve certain tasks. Self-efficacy is postulated to have a positive relationship with the cognitive processes of an individual; the stronger the perceived self-efficacy, the higher the cognitive strategies used [12]. Likewise, research on goal orientation indicates that intrinsic goal orientation is associated with deep information processing strategies, while extrinsic goal orientation is associated with shallow information processing strategies [13,20]. Students who are intrinsically oriented are self-efficacious and self-regulated; they tend to pursue challenging tasks, spend a great deal of time on the tasks given, and attribute their success or failure to effort and strategy use [13,20]. Although a growing body of literature exists on the relationship between motivational beliefs and self-regulated learning strategies, empirical evidence of their relationship in medical education is scanty [25,26].

The major focus of this study, therefore, was twofolds. First, we aimed to investigate the extent to which medical and allied health students perceive their motivational beliefs of self-efficacy and intrinsic goal orientation and self-regulated learning strategies. Second, we aimed to examine the relationship between the two constructs; the motivational beliefs (self-efficacy and intrinsic goal orientation) and self-regulated learning strategies (deep approach—deep and meta-cognitive strategies and organized approach—resource management). Specifically, there were three research questions that guided the study.

1. To what extent do students adopt motivational beliefs of self-efficacy and intrinsic goal orientation during their studies?
2. To what extent do students demonstrate levels of self-regulated learning strategies during their studies?
3. Is there any relationship between students' motivational beliefs and self-regulated learning strategies?

Methods

Study design

This was a cross-sectional survey design which used quantitative methods of data collection and analysis. The study's main purpose was to investigate students' motivational beliefs and their self-regulated learning strategies and establish the role motivational beliefs play on self-regulated learning. Part of a predesigned and pre-tested survey was used to collect the data. No personal information that would identify individual participants was collected. Data were collected from college students during the second semester of their first professional year.

Sample population

A total of 222 undergraduate students from the CoM, a constituent college of the UNIMA, were recruited for the study. These were medical and allied health students aged between 18 and 22, who were enrolled in their 2016–2017 first year at the college. Students at this college have diverse economic, cultural, and social backgrounds; the college enrolls students from almost every district of the country. Each year, the college enrolls students into a 1-year foundation program (foundation year), as preparatory training for their medical career. After a year, the students are then enrolled into their first professional year as medical and allied health students (second-year at college), split into four different programs: Bachelor of Medicine Bachelor of Surgery (MBBS), Bachelor of Pharmacy (PHARM), Bachelor of Physiotherapy (PHYSIO), and Bachelor of Medical Laboratory Sciences (MLS). Students choose their preferred programs of study when applying for the place, that is, before they are enrolled into the college; the college just selects them into their own preferred programs as indicated in their application forms. For the purpose of this study, all enrolled first-year students (second-year at college) were invited to participate in the study; there were no exclusion criteria.

Procedure

Before conducting the survey, the study had to follow some ethical principles to protect the privacy and confidentiality of participants. First, an institutional review board, CoM Research Ethics Committee, approved the research protocol. Second, the study was done anonymously, meaning that no personal information that would identify individual participants was collected, and finally, informed written consents were obtained from the participants themselves. Prior to data collection, the instrument was pre-tested on a small sample (n = 30). This was to ensure that a careful cross-cultural adaptation was done. Adapted surveys assessing students' self-efficacy, intrinsic goal orientation, deep and meta-cognitive strategies, and resource management with respect to their respective major courses were given to the participants in their classrooms. Participants were reminded of the study's anonymity and confidentiality. They responded to the questionnaires at their own free time and completed questionnaires were put in a sealed box, which was put at the Dean of students' secretary's office before the end of the next business day.

Instrumentation

Motivated strategies for learning questionnaire

The Pintrich et al.'s [11] motivated strategies for learning questionnaire (MSLQ) was used to measure student's motivational beliefs and learning strategies in their respective major courses. Three separate sub-scales of the MSLQ were used to assess students' motivational beliefs and the learning strategies. Participants responded to eight items assessing their self-efficacy (α = 0.93) and four items assessing their intrinsic goal orientation (α = 0.74). Deep learning approach was measured by two dimensions of the cognitive and metacognitive sub-scale: deep learning strategies and meta-cognitive learning strategies. Participants responded to a total of 15 items assessing their deep learning strategies: six items for elaboration (α = 0.76), four items for organization (α = 0.64), and five for critical thinking (α = 0.80); and 12 items assessing their meta-cognitive learning strategies (α = 0.79). Finally, organized learning approach was measured by 19 items of resource management sub-scale: four items for time and study management (α = 0.52), three items for effort regulation (α = 0.76), four items for peer learning (α = 0.69), and eight items for help-seeking (α = 0.76).

The questionnaire, therefore, consisted of a total of 50 items, scored on a five-point Likert-type scale ranging from 1 (not at all true of me) to 5 (very true of me). Sample items include motivational beliefs: (a) self-efficacy, *I'm certain I can master the skills being taught in this class* and (b) intrinsic goal orientation, *In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn*; and learning strategies: (a) deep learning approach,

Table 1. Descriptive statistics and Pearson correlation analysis (n = 203).

Variable		Mean	SD	1	2	3	4	5
Motivational beliefs	1. Self-efficacy	4.37	0.64	-				
	2. Intrinsic goal	4.09	0.68	0.539**	-			
Deep approach	3. Deep strategy	3.64	0.78	0.434**	0.528**	-		
	4. Meta-cognitive	3.69	0.74	0.507**	0.546**	0.804**	-	
Org. approach	5. Res. management	3.50	0.61	0.393**	0.395**	0.694**	0.706**	-

**p < 0.001.
Org. approach = organized approach; Res. management = resource management.

I ask myself questions to make sure I understand the material I have been studying in this class and (b) organized learning approach, *I try to work with other students from this class to complete the course assignments.*

Data analysis

Statistical data analyses were done using IBM® SPSS® statistics version 20. Prior to the data analysis, the collected data were screened for accuracy and missing value. Each item was later checked for normality and reliability analyses were also done to check for the instrument's consistency. Following the screening and reliability tests, Pearson correlations were calculated to establish the association between variables assessed in the study. Descriptive statistics for all the tested variables were realized and tabulated from raw data. To test if there were disparities in motivational beliefs and learning strategies (1) between male and female participants, and between first-generation college (FGC) and non-first-generation college (NFGC) students, independent samples t-test was used (p < 0.05); (2) among four study programs of MBBS, PHARM, MLS, and PHYSIO, a one-way analysis of variance (ANOVA) was used (p < 0.05). Finally, to find out if students' self-efficacy and intrinsic goal orientation predicted their learning strategies, a simple linear regression (p < 0.05) was used.

Results

Of the targeted 222 students, a total number of 203 students (91.4%) participated in the study and completed the survey. According to their programs of study, 65 students (38 males and 27 females) came from MBBS, 51 students (31 males and 20 females) from PHARM, 47 students (27 males and 20 females) from PHYSIO, and 40 students (24 males and 16 females) from MLS. In total, the male-to-female ratio of the participants was 120–83, representing a 59%–41% ratio in terms of percentages. On students' family education history, 105 were FGC students (those who have no previous college graduates in their family) and 100 were NFGC students (those who at least have one or more college graduates in their family). The reliabilities of the subscales from this survey were also computed; Cronbach alpha for self-efficacy was 0.87; for intrinsic goal orientation, it was 0.69; for deep learning strategies, it was 0.88; for meta-cognitive learning strategies, it was 0.78; and finally for resource management, it was 0.76.

Descriptive and Pearson correlation statistics

Table 1 presents descriptive and the Pearson correlation analysis results for all of the study variables. Correlation results show that there were significant positive relationships among the variables tested. A rather strong correlation can be observed between self-regulated learning variables: deep strategy/meta-cognitive strategies and meta-cognitive/resource management strategies. The strong relationship suggests shared variability between these concepts, and it proves the fact that they are all measuring one construct: learning approaches. However, mild relationships can be observed between learning approaches and motivational beliefs: for instance, deep strategy/self-efficacy and resource management/intrinsic goal orientation. This suggests that the constructs are distinct.

Descriptively, the mean score comparisons among study variables indicate that largely, students reported higher levels of motivational beliefs than the learning strategies. To test if there were significant differences among the variables, one-way repeated measures of ANOVA was used, and the results show that the data violated the assumption of Mauchly's test of sphericity. Since the data did not satisfy the assumption of sphericity, Greenhouse-Geisser correction was used to measure the differences and the results show that the mean scores were significantly different [$F_{(3.210,\ 654.800)}$ = 124.461, p < 0.001]. A pair-wise comparison analysis using Bonferroni correction reveals that there were significant differences on almost all paired variables (p < 0.05) except for one pair; deep and meta-cognitive

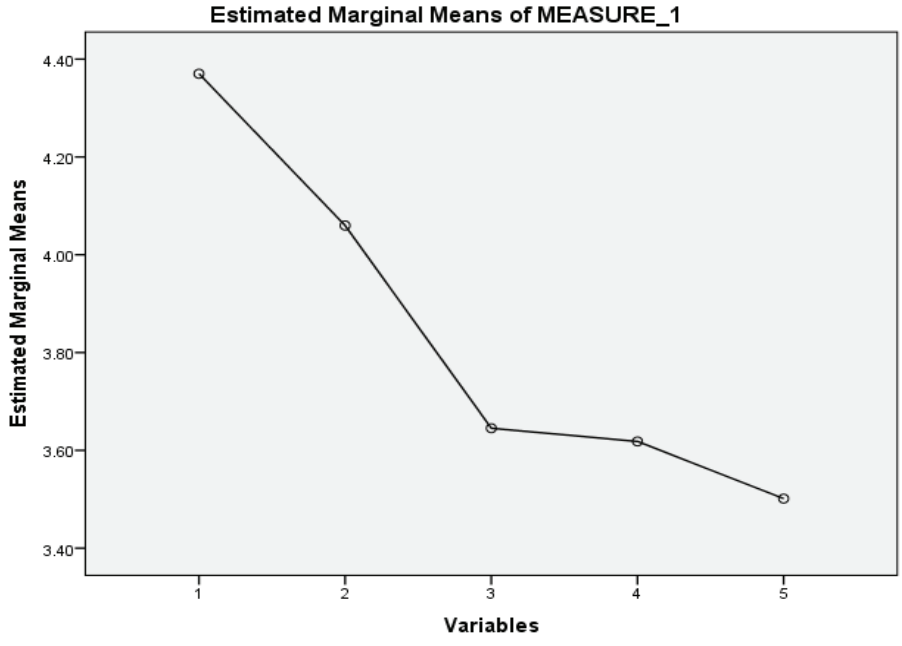

Figure 1. The extent to which students adopted motivational beliefs and learning strategies. 1 = self-efficacy, 2 = intrinsic goal orientation, 3 = deep strategy, 4 = meta-cognitive strategy, and 5 = resource management.

strategies (p = 1.000). Figure 1 illustrates the mean differences between the tested variables. From the graph's **mean inspection,** therefore, we can conclude that students reported higher levels of motivational beliefs of self-efficacy and intrinsic goal orientation than the learning strategies.

Disparities of intrinsic goal orientation and deep learning approach

Independent samples t-tests were used to find out variable differences between male and female students; and between FGC students and NFGC students. Concerning gender differences, the t-test results reveal that there was a significant difference on intrinsic goal orientation: male students had higher scores than female counterparts; male [M = 4.14, standard deviation (SD) = 0.75]; female (M = 3.92, SD = 0.73); $t_{(201)}$ = 2.076, p < 0.05. No significant differences were observed on self-efficacy, deep and meta-cognitive learning strategies, and resource management. On family members' education, FGC students reported higher levels of deep cognitive learning strategy use than NFGC students; FGC (M = 3.75, SD = 0.75); NFGC (M = 3.52, SD = 0.78); $t_{(201)}$ = 2.115, p < 0.05. However, on self-efficacy, intrinsic goal orientation, meta-cognitive learning strategies, and resource management, no differences were observed between the two generation statuses.

To determine the differences based on students' affiliation to a particular program (MBBS, PHARM, MLS, and PHYSIO), a one-way ANOVA was conducted. Results reveal that there were no statistically significant differences among the four group means on all the three constructs tested in this study (p < 0.05). The main effects of the dimensions were not significant: self-efficacy [$F_{(3,199)}$ = 0.18, p = 0.910]; intrinsic goal orientation [$F_{(3,199)}$ = 1.58, p = 0.196]; deep strategies [$F_{(3,199)}$ = 0.38, p = 0.769]; meta-cognitive strategies [$F_{(3,199)}$ = 1.72, p = 0.543]; and resource management [$F_{(3,199)}$ = 1.96, p = 0.121].

The influence of motivational beliefs on self-regulated learning strategies

Students' self-efficacy and intrinsic goal orientation were used in a simple linear regression analysis to predict students' deep learning approach through deep learning strategies and meta-cognitive learning strategies and organized studying approach through resource management. The regression results show that both motivational beliefs of self-efficacy and intrinsic goal orientation positively predicted deep learning strategies (self-efficacy: β = 0.211; intrinsic: β = 0.414), meta-cognitive strategies (self-efficacy: β = 0.300; intrinsic: β = 0.384), and resource management (self-efficacy: β = 0.254; intrinsic: β = 0.258). Table 2 presents results from the simple linear regression analysis.

Table 2. Linear regression results for the study variables (n = 205).

Variable	Predictors	Unstandardized coefficients		$t_{(201)}$	p-value
		B	Standard error		
Deep strategy	1. Self-efficacy	0.256	0.084	2.411	<0.001
	2. Intrinsic goal orientation	0.428	0.072	5.964	<0.001
Meta-cognitive	1. Self-efficacy	0.329	0.073	4.493	<0.001
	2. Intrinsic goal orientation	0.359	0.062	5.760	<0.001
Res. management	1. Self-efficacy	0.244	0.071	3.411	0.001
	2. Intrinsic goal orientation	0.211	0.061	3.456	0.001

Discussion

The goal of this study was twofolds. First, it was designed to investigate the extent to which undergraduate medical and allied health students perceive their motivational beliefs and self-regulated learning strategies. Second, it was aimed to examine the relationship between the two constructs under study. With regard to the first focus, results indicate that students experienced motivational beliefs and learning strategies differently. A pairwise comparison of variable means reveals that students reported higher levels of motivational beliefs than the learning strategies. One best explanation towards students' higher motivational beliefs is that according to the UNIMA selection system, CoM (as opposed to other constituent colleges of UNIMA) selects students who indicate one of its programs as their first choice during the application process. It is therefore expected of learners to demonstrate high levels of motivational beliefs since what they learn is what they desired as their first choice. The current results are also in line with other previous studies conducted during students' initial years of their medical profession [27,28]. These studies found out that students had higher levels of motivational beliefs (value, goal, self-efficacy, and control) than cognitive and resource management strategies.

Similar to other previous studies [27–29], the current study found relatively low usage of cognitive strategies and resource management among first year college students. This suggests that in relation to their motivational beliefs, students did not effectively use their deep and meta-cognitive learning strategies and did not properly manage their resources in terms of time and study environment, peer learning, help-seeking, and effort regulation. As suggested by previous studies, this might be due to the lecture-based curriculum [29], which to some extent, is still used at the CoM, especially in the initial years of medical schooling. An alternative explanation to lack of deep and organized learning approaches by first year students would be that characteristics of the learning environment, such as the examination methods used, influence the degree to which the deep learning approaches are used [23,27]. For instance, first year examinations at the CoM, which are mostly characterized by recall answers, may reward the use of memorization rather than the use of deep learning. As argued by Woodhouse et al. [29], it might turn up that as the teaching approaches and examination methods change in upper classes, students change their learning approaches from shallow to deep processing strategy use.

Taking advantage of students' high levels of motivational beliefs, which entails high levels of confidence, effort, and mastery of new situations in their learning environment, educators need to provide students with conducive environments for their deep information processing strategies. While educators cannot influence the orientation to learning that students initially bring to their studies, they are able to manipulate the learning context, providing an opportunity to influence the approach students would adopt [30]. As research indicates, apart from individual factors, there are several factors in the learning environment that affect students' approaches to learning [1,2,23]. Depending on how the teaching and assessment activities award, either deep or surface learning approaches, students' orientation to studying may also change. According to Briggs and Tang [25], teaching factors such as teaching to bring out the underlying structure of the subject matter, teaching to get active rather than passive responses from students, engaging students in the lesson, assessing for understanding of underlying structure rather than facts only, creating a positive working atmosphere, and emphasizing the depth rather than the breadth of learning, would influence students towards a deep approach to learning. Organized studying and deep learning approaches help the learner to understand new information, relate them with prior knowledge, and apply the knowledge in their professional contexts [2,23,30,31].

Concerning disparities of motivational beliefs, organized studying, and deep learning approach experiences among students, the study revealed that there was a gender significant difference on intrinsic goal orientation; male students reported higher levels of intrinsic goal orientation than their female counterparts. This suggests that male students are more likely to be intrinsically motivated than female students. This study outcome is in line with other research findings in sciences, especially in medical education, which indicate that male students become more motivated to study medical courses [8,12,32]. As Ngwira et al. [33] argue, this gender difference in intrinsic goal orientation suggests that there are some factors that enhance male students' motivation or harm female students' motivation when it comes to learning sciences. This could be due to the gender-linked stereotypes and lack of female role models in sciences. In Malawi, this gender gap toward learning science exists as early as in primary school [34]. Boys' performance outweighs that of girls' in science subjects like Mathematics and consequently, girls believe they are not smart in sciences, even if they are, and this lowers their motivation to learn. Furthermore, according to recent research [33], compared with girls, boys enjoy learning medical subjects and this enjoyment enhances their intrinsic motivation. Educators in the medical field need to foster and stimulate the development of intrinsic goal orientation in female students. Intrinsic goal orientation would enhance their deep approach learning which bolsters effective learning.

On family members' education disparities, the study found significant differences in deep cognitive learning strategies; FGC students perceived using deep cognitive learning strategies more than NFGC students. Studies comparing cognitive learning strategies between FGC students and NFGC students are rather limited. However, the current results are in consistent with Naumann et al. [35] who reported that the FGC students' self-regulated learning strategies were better predictors of their success. This means that their academic success came out of their self-regulation, and cognitive learning strategy is an essential component of self-regulation. In a low-income country with an approximate population of 18 million, where over 50% of the population is estimated to live below the international poverty line of 1.25 USD per day [36], it is believed that education, especially at the tertiary level, is essential to eradicate poverty. It is, therefore, expected of learners, especially FGC students, to work extra hard, trying many ways of dealing with a task thereby employing different cognitive learning strategies such as critical thinking so that they break through in their studies.

Surprisingly, despite the differences on perceived intrinsic goal orientation between male and female students, and on deep cognitive strategy use between FGC and NFGC students, there were no significant differences on deep cognitive strategy use between the two genders and on goal orientation between the two generation statuses. Furthermore, there were no significant differences in any other measured concepts. The insignificant results, however, are not in line with the study's expectations which were based on previous research findings in sciences. First, according to literature, male students would have been more self-efficacious than female students [12,32] and it was also expected that students who were intrinsically motivated (in this case, male students) would have adopted deep learning approach more than their female counterparts [37]. Second, FGC students would have been more self-efficacious than NFGC students as previous research on self-efficacy and the college students' generation status indicates: early college success increases the confidence of FGC students although doubt still exists, especially each time they take on new challenges [38]. As Artino et al. [25] argue, the findings are typical of first year medical and allied health students who are trying many ways of dealing with the perceived difficult and overloaded basic medical courses. Differences might be clear as students reach their upper classes.

Interestingly, despite differences in some of the learning aspects, such as intrinsic goal orientation and deep learning strategies among students on gender and generation status, there were no significant differences on all the motivated learning strategies among all the four programs. According to the literature [39,40], it was expected that due to different learning environments, different subjects would induce different learning experiences among college students. A possible explanation to these insignificant results is that maybe it is because, in this year of study, subjects do not fully develop into specific courses reflecting their respective programs; all they learn are introductory subjects. It might turn up that as the subjects develop into unique concepts in upper classes, students change the way they approach learning and consequently, differences among them with respect to their program of study might appear. In addition, it can also be noted that before these students start their

professional career, they first become enrolled in a 1-year foundation program as preparatory training for their medical career. It is during this period that they learn analytical and communication skills for academic purposes, which include abilities in studying and resource management. These abilities are very vital for one's self-regulated learning. Therefore, it implies that skills learnt in their previous year (foundation year) are immediately and equally applied in this year (first year of their profession) regardless of their different programs of study.

With regard to the second focus of this study, which was to examine the relationship between motivational beliefs and self-regulated learning strategies, findings clearly reveal that motivational beliefs of self-efficacy and intrinsic goal orientation positively predicted both the deep and organized learning approaches. The results, therefore, suggest that students who were self-efficacious and intrinsically motivated focused their attention on understanding the underlying meanings and the successful applications of the content learnt through an organized study. In other words, students who focused on internal factors such as mastering and understanding the materials were organized and used deep information processing strategies. This means that these students planned, organized, monitored, and evaluated their studies. According to previous work on self-efficacy [12,24,41] and goal orientation [1], students' motivational beliefs have been found to enhance deep learning approach among college students. In higher education, especially in medical schooling, educating students to become life-long learners who can effectively apply theoretical concepts to their professional contexts is an important aspect of formal education. Therefore, it is crucial for students to first become confident and intrinsically motivated in whatever they do for them to effectively use deep learning approach and effectively manage their studies.

Students' motivational beliefs and deep and organized approaches to learning are important factors to be taken into consideration, especially if educators aim at enhancing students' knowledge, attitude, and practical abilities. However, despite their higher levels of motivational beliefs, this study has revealed that these medical and allied health students have lower levels of deep and organized studying approaches to learning. As reported by a number of studies conducted in the medical field [33,39,40,42], students already perceive medical subjects, especially Anatomy as overloaded and difficult to understand. The perceived overload, coupled with the assessment methods commonly done in the medical field, makes students adopt rote learning as their principal learning strategy to cope with their loaded studies [43]. Since research indicate that students' orientation to studying and the context of learning within individual courses may influence students to adopt either deep or surface approaches in different situations [23,30], there is a great need for educators, therefore, to foster and stimulate the development of effective approaches to learning in students. As argued by Briggs and Tang [23], teachers need to refrain from teaching piecemeal content, assessing mainly for memorizing facts and providing insufficient time by overloading students. These teacher-related factors can influence students towards adopting a surface approach to learning, which is not effective for lifelong skills during their formal education.

The present study aimed at investigating the extent at which undergraduate medical and allied health students perceive their motivational beliefs and self-regulated learning strategy, and examining the relationship between the two constructs; the motivational beliefs and self-regulated learning strategies. This is an essential field of research in higher education as previous studies have reported positive effects of these concepts [13,20]. Especially in the medical field, knowledge gained at school need to be applied effectively, as these professionals deal directly with the life of people. According to findings from other research studies, deep and organized learning approaches help learners understand new information, relate it with prior knowledge, and apply the knowledge in their professional contexts [2,23,30,31].

This paper makes three major contributions to the literature. First, from the students' experiences on the learning aspects under investigation in this survey, the study has acknowledged that medical and allied health students have high levels of self-efficacy and intrinsic goal orientation during the initial years of their medical profession. On the contrary, it has been discovered that like other studies during their initial years [27,29,43], students possess lower levels of deep information processing strategies. Second, based on the findings, the study has asserted the role motivational beliefs play on deep approach to learning and organized studying. The paper has highlighted the importance of each concept in medical education and the need to foster such orientations in medical and allied health students. Third, based on the different models, findings,

and recommendations derived from the motivational beliefs and learning approaches' research, the paper has provided possible suggestions on how educators, especially in the medical field, can foster and stimulate such approaches to learning. Educators can influence students' goal orientations and learning approaches through manipulation of the learning contexts, such as teaching methods, workloads, and assessments.

The findings are, however, subject to some limitations. First, this was a cross-sectional study and therefore, it has not given information on changes in self-efficacy and goal orientation, and as well as the learning approaches among students over time. The study's target population was first year students and as they proceed with their studies, their orientation towards motivational beliefs and learning approaches might change. Longitudinal studies, therefore, are needed to investigate changes in both constructs over a period of time, and also whether such changes would affect the relationship among the study variables. The other limitation of the study is that it only focused on first year students without considering other potential participants in the entire study population, medical education. Due to its sample uniqueness, results might not simply be generalized beyond this specific target population. This is because students' motivational beliefs and approaches to learning might not be the same at different levels, in different contexts, since these psychological concepts are bound to be affected by the learning environment as well. Therefore, medical researchers need to conduct systematic studies focusing on how students in different medical schools, different programs, and different year groups adopt motivational beliefs and learning strategies. Finally, the study did not take into consideration other aspects of motivational beliefs, such as task value and control beliefs, which are also important in enhancing effective learning among college students. Future research need to consider investigating these variables as well.

Declarations of Interest

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