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Original Research

The impact of self-efficacy beliefs on learning strategies: towards learning Human Anatomy at College of Medicine

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ABSTRACT

Objective: The study was designed first, to find out from the medical students if their perceived self-efficacy is related to their use of cognitive learning strategies; second, to asses if, in terms of gender and parent education, differences do exist in their levels of self-efficacy and their use of the cognitive strategies. **Method:** This was a cross section study which employed a pre-tested questionnaire, Motivated Strategies for Leaning Questionnaire (MSLQ), scored on a Likert Scale. The study population was made up of first year medical students after consenting to take part in the study. There was an 86% response rate. **Results:** Self-efficacy positively predicted both learning strategies of shallow [$\beta = 0.47$] and deep [$\beta = 0.42$]. There were no significant differences between male and female students on both shallow and deep learning strategies, and self-efficacy beliefs ($p < 0.05$). First generation students had higher levels of cognitive learning strategies in both shallow ($p < 0.05$) and deep ($p < 0.01$) learning strategies. **Conclusion:** Self efficacy is therefore important for adoption of study habits in medical students with respect to the learning of Anatomy. It is therefore imperative to employ methods that will yield high self-efficacy in students.

KEY WORDS: Medical education; Self-efficacy; Study strategies; Shallow learning strategies; Deep learning strategies.

INTRODUCTION

Background

In medical education, Human Anatomy has been and continues to be one of the core subjects in training health personnel, in particular medical doctors. Over the years, there have been several innovations and changes in medical education which has affected the teaching and learning of basic medical sciences subjects which includes, Human Anatomy. One of the changes has been the overall reduction of contact hours for basic medical science subjects, and for Human Anatomy, this reduction resulted in reduced content, dissection hours and anatomical knowledge assessment [1].

Human Anatomy is a very important subject to medical and other health professional students for their future clinical courses and practice. Comprehensive understanding of Human Anatomy is essential for comprehending the pathophysiology of diseases [2, 3], patient examination, and it also forms the basis for disease diagnosis, communication with fellow professionals and patients [4]. As such, Human Anatomy knowledge in medical students has to be of accepted satisfactory levels.

Lack of satisfactory Human Anatomy knowledge has been thought to contribute to some errors during medical practice. For instance, cases of patients' misadventure involving damage to adjacent structures have been reported in literature and the underlying factor being inadequate human anatomical knowledge, especially when new doctors are involved. A sound and comprehensive knowledge of Human Anatomy as argued by Monkhouse [5] should be a prerequisite to medical practice. It helps to accurately define and successfully treat what the patient is presenting and it is also essential for specialised training like surgery. In fact, Gogalniceanu et al. [1] states that Human Anatomy should remain a principal component of medical education with dissection of cadavers forming its core teaching method as recommended by the General Medical Council of UK. This emphasizes the fact that Human Anatomy is a vital subject to medicine and health personnel. It is from this background that medical educators and health professionals need to ensure that other factors that can potentially have a negative effect on the teaching and learning process of Human Anatomy be addressed. One such a factor is students' self-confidence which among others, is affected by perception towards a particular subject and in turn effecting learning strategies.

Evidence from research shows that students view Human Anatomy as a factual and heavily loaded subject, and in turn, they approach it thus, thereby affecting their studying habits towards the subject. Previous studies [6,7,8,9], found that students perceive Human Anatomy to be a difficult subject to understand and being the most overloaded subject among the basic medical science subjects. In part, this is due to the fact that students have to master many new concepts and complex terminologies. Furthermore, Human Anatomy as a subject has also been described as less attractive to students, resulting into them having low enthusiasm with low concentration levels. As a result, students are forced to use surface learning approaches i.e. memorization [5].

Despite the perceived level of difficulty, there is a general appreciation, amongst medical students, that a good knowledge of Human Anatomy is essential for sound medical practice [10]. In medical profession, competencies and outcome are important aspects for performance. An effective intellectual functioning for medical students not only requires the understanding of factual knowledge, but also the self-confidence to perform in a very stressful environment. This calls for medical students to be self-efficacious in their learning of Human Anatomy. According to Khan et al. [11], self-efficacy is postulated to have a positive relationship with cognitive processes of an individual. Therefore, the stronger the perceived self-efficacy, the higher the cognitive strategies used. Employing deeper cognitive strategies such as planning, monitoring and regulating cognitions help students effectively master the contents of what they learn.

The mastery of Human Anatomy contents for future practice is very vital for medical students as compared to just knowing the contents for the sake of passing examinations. Students who are self-efficacious aim for mastery goals, which focus on learning, mastering the task according to self-set standards, as opposed to performance goals which are only directly connected to an outcome. Consequently, the self-efficacious students become motivated to use effective learning strategies [12]. In contrast, those who are inefficacious go for performance goals and sometimes even performance avoidance, thereby resorting in employing shallow learning strategies. For instance, they can commit whatever they learn into rote memory simply to pass the exams.

Recently, many medical colleges, especially those under Medical Education Partnership Initiative (MEPI), have been encouraged to teach its students using Problem-Based Learning (PBL) approach [13]. In PBL, students are encouraged to take responsibility for their own self-regulated learning process [14]; they become active participants in their own learning. As a member of MEPI, University of Malawi – College of Medicine (UMCOM) is also moving towards incorporating PBL teaching approaches especially in clinical courses. It is paramount that medical students become prepared for this new teaching approach as early as first year. Consequently, in today's medical education, students are required to become self-directed, self-efficacious and critical thinkers. It was therefore necessary to assess the students' self-efficacy with respect to learning strategies students employ to Human Anatomy subject at UMCOM.

Theoretical Framework

The current study focused on two self-regulated learning processes: self-efficacy and cognitive learning strategies. According to Pintrich [15] 'self-regulated learning is an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behaviour' (p. 453). This implies that students should be motivated enough to take up the responsibility of monitoring their own learning. Thus, the theory has two major constructs: the motivational and strategies components where self-efficacy and the cognitive strategy are parts of the constructs respectively. These self-regulatory skills are viewed as very important to guide one's own learning during formal schooling.

Self-efficacy

Academic self-efficacy is one of the motivational construct, within the self-regulatory learning theory. It refers to students' personal judgement of their own capabilities to organise and perform study related courses of action to attain designated goals [16]. Self-efficacy is considered an important source of students' motivation and it is hypothesised to influence key indices of academic motivation as people's choices, level of effort and persistence. This entails that students who perceive themselves as less efficacious for learning may choose easy tasks, regarding demanding tasks as threats other than challenges. They may also avoid some tasks; failing to persist longer on some difficult tasks. On the contrary, those who perceive themselves as efficacious expend greater effort on a difficult task and are more likely to persist than those with less certainty of their capabilities.

According to Shih [17], self-efficacy is linked to attribution and control-value theories of learning. He argues that efficacious students attribute their successes / failures to factors like ability and effort which are controllable and eventually are motivated to work productively. They aim at mastering the concept, as opposed to memorizing the concept for mere performance. In turn, students who master a challenging task may eventually increase their self-efficacy thereby bringing a reciprocal relationship between the two constructs [18]. Those 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.

Additionally, according to Zimmerman, [12] perceptions of efficacy depend on a mastery criterion of performance rather than that of normative. This means that efficacious students rate their certainty about a certain task's particular difficult level and not in comparison with others in class. This is the much needed attribute of medical college students since their training is much aimed at producing health personnel who are independent of their teachers in handling delicate real life cases of health.

Cognitive learning strategies

Self-regulated learning strategies are defined as measures that students use to develop study habits, monitor and regulate their learning process, and make adjustments to their own strategies based upon feedback [19]. There are three general categories of learning strategies that are important in understanding self-regulated learning [20]. The first category is referred to as cognitive. These strategies

are used to retrieve, encode, and organize new information and can further be divided into two; shallow and deep cognitive strategies. Using repetition, highlighting, and memorization, shallow cognitive strategies, sometimes referred to as rehearsal strategies; help encode new information into short-term memory. Deep cognitive strategies enable long-term memory through elaboration, organization, and critical thinking, leading to a higher level of cognitive engagement. This first category is the main focus of the current study.

The second category is what is called meta-cognitive strategies, used for controlling and executing one's own learning process. The third category is the resource management. It is argued that besides self-regulation of cognition, students must also be able to control learning resources such as managing and regulating one's study time, environment, and effort; peer learning, and help-seeking (focusing on the use of others in learning) [20]. Considerable research indicates that the use of self-regulated learning strategies is highly related to quality of learning, performance, and positive academic outcomes [21, 22, 23, 24].

The role of self-efficacy on learning strategies

Self-efficacy and SRL strategies are closely related to each other. According to Zimmerman and Cleary [25], a key determinant of whether learners employ self-regulatory strategies or not rests on self-efficacy, the beliefs they hold about their capabilities to achieve certain tasks. Hence students must possess such beliefs in order to employ effective learning strategies. It is important to study the co-existence of these two constructs in education since it has been ascertained that students' academic performance is, among other factors, much influenced by students' self-efficacy [11,26,27] and self-regulated learning strategies [21,22,23,24]

Previous studies on self-efficacy have emphasized its central role in self-regulated learning, in this case, predicting cognitive processes [12, 28]. Among other effects, perceived self-efficacy in students influences their behaviour, choice in activities, effort and persistence on a task [11, 16, 18]. In line with Bandura's (1997) propositions, Pintrich, Roser and De Groot, quoted in Shil [17], also found that higher sense of efficacy in students was positively associated with the use of their cognitive learning strategies. As such, in response to the difficulty of regulating their learning, students with high levels of self-efficacy tend to use more cognitive strategies than their fellow counterparts. Consequently, efficacious students develop effective learning strategies, making them more likely to progress and achieve better knowledge. On the contrary, less efficacious students avoid failure and damage their self-esteem by seeking easy tasks, and might even be subjected to employing shallow strategies for the mere sake of performing well disregarding the notion of mastering concepts learnt.

Extensive research in education psychology has revealed that self-efficacy is a major factor that influences students' behaviour and choice of activities in learning. Various studies have demonstrated the positive link between self-efficacy and learning strategies. To some extent, education researchers in fields outside medicine have acknowledged the role of self-efficacy on students learning. Prior studies in medicine have evaluated students' self-efficacy in a general context [29]. However, self-efficacy has not been extensively assessed in the context of medical students' cognitive learning strategies. Understanding students' self-efficacy and learning strategies in anatomical studies would, therefore, be a very important concept to study. Firstly, this would offer an opportunity of improving the learning environment for students as a way of promoting even higher levels of self-efficacy. It would also serve as reference point in reviewing the curricula for medical and allied health programs, to have a well-informed review process. This has a direct effect on the nature of medical and allied health graduates.

Given the findings of research on self-efficacy and self-regulated learning strategies, it was of great interest therefore to investigate the links between these two constructs in medical context, towards the learning of Human Anatomy. Specifically, the study was designed to (1) examine whether medical students' perceived self-efficacy is related to their use of cognitive learning strategies, (2) find out if differences exist between male and female students on their perceived self-efficacy and learning strategies, (3) assess differences in self-efficacy and learning strategies used between first-generation college (FGC) students and non-first-generation (NFGC) students. Researchers of the current study took a keen interest to investigate differences in gender and generation status of students. In gender, male and female college students in medical education might perceive and experience self-efficacy and learning strategies differently. The same applies with generation status. FGC students (those who have no previous college graduates in their family) might have college experiences which are different from NFGC students (those who at least have one or more college graduates in their family).

METHODS AND MATERIALS

Study design

This cross-sectional study aimed at investigating the role of students' self-efficacy on their learning. A predesigned and pre-tested questionnaire was used to collect data. No information that would identify the individual was collected. The respondents were asked to complete the questionnaire in their free time at the end of their first professional year. They were asked questions pertaining to self-efficacy and self-regulated learning with reflect to Anatomy as a subject.

Sample population

The sample population consisted of the 2014 undergraduate Bachelor of Medicine Bachelor of Surgery (MBBS) year one students from University of Malawi, College of Medicine

(UMCOM), in their second semester of Anatomy studies just before their end of semester 2 examinations. The total number of students for MBBS 1 was 84 and those that responded were 72 representing an 86% response rate. Other demographic descriptions are indicated in table 1.

Table 1. A summary of the demographic attributes of respondents (n = 72).

Variable	Number	Percentage
Gender		
Male	40	55.6
Female	32	44.4
Parents' Education		
FGC students	34	47.2
NFGC students	38	52.8

Procedure

Before conducting the survey, some ethical principles to protect the life, health, privacy and confidentiality of participants were followed. Firstly, College of Medicine Research Ethics Committee (COMREC) approved the research protocol. Secondly, the survey was made anonymous, and finally, to ensure voluntary participation from the participants, informed written consents were obtained from the participants themselves.

Surveys assessing students' experiences of both self-efficacy and cognitive strategies with respect to Human Anatomy as a subject were given to the participants in their classroom. They were reminded of anonymity and confidentiality. Participants completed the surveys in their own free time and were told to return filled questionnaires to the secretary's office before the end of business the following day.

Instrumentation

Motivated Strategies for Learning Questionnaire (MSLQ)

Students' self-efficacy beliefs and cognitive learning strategies were measured using an adapted version of the *Motivated Strategies for Learning Questionnaire* [20]. The alpha coefficient for self-efficacy was 0.93 and for the cognitive strategies, it ranged from 0.64 to 0.80; that is, for rehearsal, it was 0.69, for elaboration, 0.76, for organization, 0.64 and finally for critical thinking, it was 0.80. Participants responded to eight questions assessing their self-efficacy. On their cognitive strategies, participants responded to four questions assessing their shallow strategies, 15 items assessing their deep strategies: six items for elaboration, four items for organization and five for critical thinking. The questionnaire therefore, consisted of a total of 27 items, scored on a 5-point Likert-type scale, from 1 (not at all true of me) to 5 (very true of me). Sample items include: self-efficacy, "I am confident I can understand the basic concepts taught in this course"; shallow strategies, "When I study for this class, I practice saying the material to myself over and over"; deep strategies: elaboration, "When reading for this class, I try to relate the material to what I already know"; organization, "I make simple charts, diagrams or tables to help me organise course material"; critical thinking, "I often find myself questioning things I hear or read in this course to decide if I find them convincing". The reliabilities of the subscales from this survey were also acceptable, Cronbach alpha ranging from 0.72 to 0.91

Data Analysis

Data was analysed using IBM® SPSS® statistics version 20. Before the actual analysis, each survey item was checked for normality and then data was screened for accuracy and missing values. Following data screening, reliability analyses were done to check for the instrument's reliability. Pearson correlations were also calculated to determine the relationship between variables tested in the study. Descriptive statistics for all the tested variables were also calculated.

A simple linear regression ($p < 0.05$) was used to find out if students' perceived self-efficacy beliefs predicted the two categories of cognitive learning strategies (shallow and deep). To test if there were significant differences in self-efficacy, shallow and deep learning strategies between male and female students, independent samples t-test was used ($p < 0.05$). Also, to compare self-efficacy, shallow and deep learning strategies between FGC students and NFGC students, independent samples t-test was used ($p < 0.05$).

RESULTS

Descriptive and Pearson correlational statistics

Scores were based on a Likert scale where 1 was the lowest score and 5 was the highest score. The mean score comparisons on the study variables show that students used shallow learning strategies (M = 3.44, SD = 0.98) and deep learning strategies (M = 3.58, SD = 0.78) in almost the same way, higher than the average mean score. They also showed a higher level of self-efficacy beliefs (M = 4.31, SD = 0.66). Pearson product moment correlations among the study variables reveal that there were positive correlations between shallow learning strategies, deep learning strategies and self-efficacy ($p < 0.01$).

The effect of self-efficacy on learning strategies

Students' self-efficacy beliefs were used in a simple linear regression analysis to predict students' cognitive learning strategies. To predict shallow learning strategies, the model was statistically significant (F (1, 70) = 20.181, $p < 0.001$) and accounted for approximately 22% (R^2 = 0. 224) of the variance of shallow strategies. Self-efficacy, therefore, positively predicted shallow learning strategies [β = 0.47, t = 4.492, $p < 0.001$]. Furthermore, to predict deep learning strategies, a significant regression equation was found (F (1, 70) = 14.548, $p < 0.001$), with an R^2 of 0. 172. Deep cognitive learning strategies, therefore, was positively predicted by self-efficacy [β = 0.42, t = 3.814, p

< 0.001]. This suggests that students who had the belief in their capabilities to organise and perform well in class had the motivation to use their cognitive learning strategies.

Self-efficacy and learning strategies on gender and parents' education

Independent samples *t*-test was used to measure differences in gender and parents' education regarding the learning strategies and self-efficacy. As Table 2 illustrates, independent samples *t*-test shows no significant differences between male and female students on both shallow and deep learning strategies and on self-efficacy beliefs ($p > 0.05$). On parents' education, the results show that first generation students had higher levels of cognitive learning strategies in both shallow ($p < 0.05$) and deep ($p < 0.01$) learning strategies. However, in self-efficacy beliefs, the results show no differences between first generation and non-first generation students.

DISCUSSION

The major purpose of this study was to investigate the influence of undergraduate medical students' self-efficacy on their cognitive learning strategies towards the learning of Human Anatomy. As was expected, high self-efficacy beliefs significantly predicted cognitive learning strategies. The results reflect a high prediction on both, shallow and deep cognitive strategies. These current findings support earlier studies in education that self-efficacy is positively linked to strategy use [12, 16, 28]. The present study expands on earlier research especially in medical education [11, 29, 30, 31] and in this case, towards the learning of Human Anatomy. When students believe in their capabilities to master and perform a task well, they become more motivated to employ a variety of learning strategies towards their task mastery. They become determined to persist in their studies leading to a better performance. These findings further reveal that students who are less self-efficacious are more likely to be less motivated to apply different learning strategies and eventually become less persistent in their studies.

Although this current data cannot address causality, basing on Bandura's [32] varied causal tests and other previous studies [12,25,28], it appears that students who have high self-efficacy choose a wide range of the learning strategies to influence their study environment. Since a wide choice of learning strategies are positively linked to high academic performance [21,22,23,24], enhancing students' self-efficacy beliefs would lead to an improved academic performance, thereby achieving medical institutions' goal: to train medical personnel who are fit for the practice and more independent of their teachers,. In Malawi, there still exist a shortage of qualified physicians, thus medical students with low self-efficacy beliefs should not just be left unattended; they should be encouraged to use the various learning methods to influence their study environment. There are a number of ways such students could be encouraged to do, some of them include help seeking and effort management.

The study found no significant gender differences in self-efficacy and cognitive learning strategies. This means that female students were as self-efficacious as their male counterparts. They also used shallow and deep cognitive learning strategies in the same way as their male counterparts. The results on gender only seem sensible looking at the trend that the higher the self-efficacy on students, the higher the strategy use. Since there had been no significant difference on self-efficacy between male and female students, it is not strange to see the two genders being the same on both cognitive learning strategies. The findings support a study conducted by Witt-Rose [33] who also found no differences between male and female students in the learning of Anatomy. The insignificant results, however, are rather surprising because significant differences were expected based upon other research findings in sciences [16,34]. In medical education, especially in Anatomy, literature [11,30] report that male students are more self-efficacious and therefore become more motivated to study and are more likely to use a variety of cognitive strategies than female students. Even in Malawi, this gender gap in sciences exists as early as primary school, grade 8 where boys' performance outweighs that of girls and as a result, girls think they are not good at

Table 2. Self-efficacy and learning strategies on gender and parents' education

Gender	**Male**		**Female**			
Variable	**M**	**SD**	**M**	**SD**	**t(71)**	**p**
Shallow strategy	3.50	1.03	3.38	0.93	0.533	0.596
Deep strategy	3.65	0.80	3.49	0.76	0.894	0.375
Self-efficacy	4.43	0.57	4.18	0.75	1.624	0.109
Parents' education	**FGC students**		**NFGC students**			
Variable	**M**	**SD**	**M**	**SD**	**t(71)**	**p**
Shallow strategy	3.74	0.90	3.18	0.99	2.457*	0.017
Deep strategy	3.88	0.75	3.31	0.73	3.253**	0.002
Self-efficacy	4.24	0.80	4.38	0.52	-0.887	0.378

** = $p < 0.01$, * = $p < 0.05$

sciences even if they really are [35]. On the other hand, boys become self-confident in their science learning, which is an essential component of self-efficacy.

Another possible explanation of the insignificant results on gender is that the first year students had just completed the premedical year which is a preparatory year for the MBBS program. Among the topics covered in their Language and Communication course is 'study skills'. Still fresh in their minds, both male and female students execute these study skills in their first year in the same way hence no significance differences. Another interpretation of the current results is that since both male and female students had high self-efficay levels, their learning strategy use would also be high without taking gender differences into consideration. The high levels of self-efficacy that translates into a variety of cognitive strategies' use could also be explained in the sense that currently, Malawi has one medical school and as such, due to high competition for the limited places, students who make it to college have greater confidence in themselves and they are looking at different ways on how they would survive academically.

On parents' education, the study found significant differences on cognitive learning strategies but not on self-efficacy. Data indicates that the first-generation college (FGC) students were able to employ more cognitive learning strategies, be it shallow or deep, than non-first-generation college (NFGC) students. Research comparing cognitive learning strategies between FGC students and NFGC students are rather limited. However, the current results are consistent with Naumann et al. [36] who stated 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 strategies is an essential component of self-regulation. Furthermore, Malawi is one of the poorest countries in Africa and has high levels of poverty and low literacy levels. It is believed that education especially at the tertiary level is essential to eradicate poverty despite limited access to higher education. It is therefore certain especially for the FGC students to work extra hard in order to break through in life with many prospects, hence the use of cognitive skills more than their fellow NFGC students.

Surprisingly, and consistent with Stallings [31], the study indicates that there were no differences in students self-efficacy beliefs despite differences in their cognitive behaviour. Previous research on self-efficacy and the college students' generation status shows that while early college success increases the confidence of FGC students, doubt still exists especially each time they take on new challenges [37]. Accordingly Orbe's [37] findings also agree with Ramos-Sanchez and Nichols' [38] findings. They found out that self-efficacy levels were higher with NFGC students as compared with FGC students. In this study however, no significant difference has been found between the two generation statuses.

In summary, the results provide vivid empirical indications that in self-regulation, cognitive learning strategies are closely tied to self-efficacy beliefs. The more one beliefs he/she is capable of organising, mastering and performing academic tasks, the more he/she engages himself/herself in a wider range of cognitive learning strategies. In Medical education, results from this study further implies that there is a significant role self-efficacy beliefs play on medical students' self-regulatory learning. Therefore, it is necessary to provide necessary learning environments for students to enhance their self-efficacy beliefs. Since Human Anatomy is a very important subject to medical and other health professional students for their future professional success and practice, low self-efficacious students should be given an environment which is conducive for their confidence enhancement in studying of Anatomy. Furthermore, every student should be encouraged to use a variety of cognitive learning strategies especially in their early medical career as they are being prepared for PBL teaching and learning approaches in their higher classes when students are encouraged to take responsibility for their own self-regulated learning process.

Limitation

Due to the large number of potential participants in the study population, vis-à-vis the time limit of the study, the current study only focused on first year students doing Human Anatomy. Since there was a unique sample (first year students) available for the study, results might not be generalized beyond the specific population from which the sample was drawn. This is because the antecedents, experiences and management of self-efficacy can be different at various levels and might be more adaptive in subsequent academic years. Accordingly, medical educators would do well to conduct empirical studies focusing on how different year groups, in different programs, experience self-efficacy and employ the learning strategies. Such studies could also look at how these self-efficacy beliefs relate to their learning strategies.

Finally, the study included the relationship between self-efficacy and learning strategies only without considering performance (achievement). This is a valid limitation especially when people look at performance to be the key indicator of learning. Future research should include an investigation of the relationship between self-efficacy and academic performance, and in addition, a further investigation into the relationship between the learning strategies and achievement is desired.

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