ORIGINAL RESEARCH

A Phenomenological Exploration of Experiences Related to Learning Styles Among Undergraduate Medical Students in a Barbadian Medical School

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Introduction: Learning style (LS) frameworks have been implemented by educators to promote participatory learning in order to strengthen learner engagement and to enhance learning outcomes. Self-efficacy has been shown to have an association with learning style and is a predictor of clinical performance and other qualities in medical students. This study examined the perspectives of second and final year medical students in a Caribbean-based medical school, relative to their learning approaches, teaching exposures and preparation for assessments.

Methods: An interpretivist qualitative approach was used to analyze data from two focus groups, conducted as part of a sequential mixed-methods study (November 2018-February 2019) with medical students in the second and final year of study. Discussions were audio-recorded, transcribed verbatim, and inductively coded with in-depth thematic analysis assisted by NVivo software.

Results: Six Year 2 (Female: Male = 5:1) and seven Year 5 (Female: Male = 5:2) participants, ranging between 18 and 34 years and with a range of LS were recruited into the study. Analysis and data reduction produced three organizing themes: "Dynamics of information delivery and acquisition", "Pivoting", and "LS identification, awareness and mutability", and the global construct "Individual and environmental factors modulate the influence of LS preference in triggering self-efficacy". In managing information received in class, students used textbooks, YouTube videos, and collaborative learning to augment perceived gaps in lectures and their personal notes. Learning style self-awareness is useful for facilitating self-efficacy throughout medical school, especially at points of transition within the programme of study.

Conclusion: LS theory and testing appear to be useful for student and teacher awareness. In practice, honing students' adaptability to varying learning settings may be more relevant in helping students achieve self-efficacy.

Keywords: self-efficacy, VARK questionnaire, focus group discussion, pre-clinical and clinical education, Caribbean

Introduction

Learning is a multifaceted process influenced by many factors, including the educational environment, the curriculum, the educator, and the student.[1] Over the years, medical education has seen a gradual transition from passive learning, facilitated by an educator-centred approach, to a more active-based, learner-centred approach.[2,3] As many students are expected to retain, recall and apply a large volume of information while developing skills during their training, one way to enhance the learning environment is for educators to be cognizant of the differing learning styles and adapt teaching styles accordingly.[2] Consequently, learning style frameworks have been implemented by educators to promote participatory learning in order to strengthen learner engagement and enhance learning outcomes.

The term "learning styles" (LS) refers to the innate and unique way in which individuals preferentially acquire knowledge, process, recall and apply new information and skills in the context of learning.[4] A person's LS is typically

acquired over time, and may vary based on previous experiences, educational background, and learning environment characteristics.[5] Many studies have extensively researched the concept of aligning instructional strategies with individual LS needs to enhance student learning – the so-called *meshing hypothesis*[4] and have reported mixed findings. While some studies have recommended modification of teaching strategies to fit students' LS and thus achieve optimal learning outcomes,[6–8] other studies are not in agreement.[9–11] Therefore, while LS might be important, self-efficacy which refers to "an individual's belief in his or her own ability to organize and implement action to produce the desired achievements and results" is a modulating factor of the learning process.[12] It is well established that self-efficacy plays an important role in student motivation and learning and is a positive predictor of academic progress.[13–15] Self-efficacy can also determine goal setting, commitment to learning, resilience, achievements, and readiness to confront challenges.[16] Academic self-efficacy confers an adaptive advantage, especially in programmes where students have to transition from didactic to observation and kinetic skills-based learning. Thus, it is important for educators to implement instructional strategies that promote academic self-efficacy, and to develop knowledge and skills.[17]

Different frameworks and models for assessing LS have been described in the literature.[18] One such model, the Visual, Aural, Read/Write, Kinesthetic (VARK) model, is a useful tool for educators to elicit learning style preferences from students to design teaching and assessment strategies that align with different learning profiles to bolster student learning.[19,20] The validated questionnaire[21] was developed by N. Fleming (http://vark-learn.com)[22] and categorises individual learning styles into the four sensory modalities which individuals preferentially use to assimilate new knowledge and information.[22] These are: Visual (V): learners who learn best by seeing; Auditory (A): learners who learn best by hearing; Read/Write (R): learners who prefer printed material; and Kinesthetic (K): learners who prefer having a physical or practical experience. The VARK instrument has been used in many tertiary institutions worldwide to determine the learning style preferences among medical, dental and other health sciences students.[5,9,19,23–32] Self-efficacy, which has also been shown to have an association with LS,[33,34] can be assessed through standardized self-report instruments and has been validated for use among medical and other health sciences students.[13,33,35–38] Studies have reported self-efficacy as being a predictor of various qualities in medical students including mental health and well-being,[39,40] self-esteem;[41] confidence,[42] and patient-centered communication skills to improve clinical outcomes.[43] The link between low self-efficacy and increased feeling of burnout has been reported among medical students.[39,44] Academic self-efficacy, proactive personality and psychological safety were also demonstrated to be important for critical thinking.[45] These studies thus highlight the need for educators to also cultivate students' self-efficacy in medical schools.

In the Caribbean, few studies have been conducted to explore LS preferences of students at the tertiary level[46–52] and fewer still on student LS with reference to VARK in the Caribbean context.[20] There is also a paucity of published data on self-efficacy in the context of medical education in the Caribbean setting.[13,53,54] A recent study in a Barbadian medical school evaluated medical student satisfaction and self-efficacy as they participated in a novel online clinical clerkship curriculum which was delivered during the COVID-19 pandemic. The authors reported that although students' general acceptance of the online curriculum was low, they reported relatively higher levels of satisfaction and perceived self-efficacy.[13] A longitudinal study in Jamaica assessed the effects of the COVID-19 caseload on burnout by resident physicians and found that self-efficacy was correlated with reduced burnout.[53]

This paper reports on the qualitative elements of a sequential mixed methods study of learning experience through the lens of students themselves. We sought to document students' description of their learning activities and processes and their experiences navigating the learning environment at two discrete points in the Bachelor of Medicine and Bachelor of Surgery (MBBS) programme. In this context, we sought to examine the perceptions and experiences of second (pre-clinical) and fifth year (clinical) medical students with different learning styles as relates to their learning approaches, teaching exposures, and preparation for formative and summative assessments within the setting of a Caribbean-based landed medical school.

Methodology

The work presented in this paper was nested within a sequential mixed-methods study conducted between November 2018 and February 2019 at a Caribbean-based medical school. An interpretivist qualitative approach was used to analyze data from two focus groups with medical students in Years 2 and 5 of the MBBS programme who had previously completed the VARK Learning styles inventory administered through official emails, the preceding semester. The focus group guide explored students' perspectives regarding how they take in and manage data and information; prepare for examinations; and aspects of

their individual LS preference. The study was approved by the Institutional Review Board, The University of the West Indies (UWI), Cave Hill, Barbados (IRB No.180304-B), and followed the principles of the 2013 Helsinki Declaration.

Setting
Barbados, a small island developing state in the Eastern Caribbean, is home to one of the five campuses of the University of the West Indies (UWI) - The Cave Hill campus. The Faculty of Medical Sciences offers a full pre-clinical and clinical curriculum leading to the award of the MBBS degree (Box 1).[55]

Approach to Sampling and Data Collection
Participants were purposively selected, aiming for maximal variation of LS within the focus groups in order to capture a wide range of perspectives. A flyer posted online, invitation emails, and a gatekeeper faculty member who was not a member of the study team but was familiar with the study aims, facilitated recruitment into the study. Participation in the study was voluntary, and no incentives were given. Participants had previously completed the VARK questionnaire in the quantitative arm of this study.

The informed consent from the participants incorporated permission to publish their anonymized responses. After receiving informed consent, data was collected using a semi-structured interview guide developed by a multi-disciplinary team of researchers. The guide contained 27 open-ended questions exploring four domains: "Intake of information"; "Studying"; "Taking tests/exams"; and "Changing Learning Styles". The interviewer was a female with relevant training in qualitative interviewing, who was not a member of faculty and had no prior personal knowledge of the students. A non-participant observer faculty member, who was familiar with the study and VARK inventory but was not currently teaching the participating students, attended the focus group discussions (FGDs) as a non-participant observer. The discussions averaged 75 minutes and were audio-recorded.

Data Analysis
The audio-recordings were transcribed verbatim by a professional qualitative transcriptionist. Two medical educators (NG and HH), with graduate level training in qualitative methods, created and used a nine-point inductive coding frame (Table 1) for independent, in-depth coding of the transcripts. NVivo12 Pro software assisted with conceptual mapping, identification of co-occurrences and thematic clusters, and with discussion and resolution of differences related to the emerging themes.

Results
Six Year 2 participants (F:M = 5:1) and seven Year 5 participants (F:M = 5:2), ranging between the ages of 18 and 34 years and with a range of LS (Table 2) were recruited into the study.

The analysis and data reduction process produced three organizing themes (OTs) "Dynamics of information delivery and acquisition", "Pivoting (Leveraging multiple methods to optimize learning)", and "LS identification, awareness and mutability" which were condensed into the global construct "Individual and environmental factors modulate the influence of LS preference in triggering self-efficacy". This study, a nested case study across two groups, achieved saturation of themes across

Box 1 Description of the Macro Setting of the Study

The University of the West Indies (UWI) Faculty of Medical Sciences (FMS) was established in 1948, began clinical teaching in Barbados in 1967 and expanded to the full five-year undergraduate MBBS in 2008. Students typically matriculate into the UWI MBBS programme with any of the following qualifications: Four Caribbean Advanced Proficiency Examination (CAPE) or A-level certificates, or an Associate degree, or a Bachelor's degree in the pure and applied sciences.

The MBBS curriculum is comprised of two components. Phase 1 (pre-clinical) where there is introduction to basic biomedical sciences and broad social and behavioural constructs of health, wellbeing and illness. Phase 1 courses are scaffolded and are thus designed to promote integrated learning as students advance toward the Phase 2 (clinical) part of the programme. In the clinical years, students learn requisite medical skills through observation and practical interaction with real patients in hospital and ambulatory care settings, supplemented by use of models and simulated patients. The UWI MBBS programme is accredited by the Caribbean Accreditation Authority for Education in Medicine and Other Health Professions (CAAM-HP).

Note: Data from Faculty of Medical Sciences Undergraduate Handbook 2021–2022; 2023.[55]

Table 1 Data Reduction Matrix Showing the Inductive Coding Frame and Organizing Themes (OTs)

Code Name and Abbreviation	Description – Refers to All Descriptions/ Explanations by Participants Relating to	Condensed Organizing Theme
1. Info-in	Their explanation of how they (take in) information presented in class	**1. Dynamics of Information Delivery and Acquisition** Variable ways of taking in information, juxtaposed against stated preferences for receiving information. There were descriptions of a feedback dynamism between students' demand and lecturers' ability to supply mutually beneficial pedagogical strategies to optimise the teaching and learning experience across the pre-clinical and clinical years. The observed effects were manifested as flexible lecturing strategies in terms of delivery coupled with student's self-motivation to successfully transition through the MBBS programme.
2. Info-effect	The perceived effectiveness of the methods used by lecturers relative to their own learning style	
3. Inf-MetLec	The methods used by lecturers to share information/teach	
4. Dtmanagement[a]	Their explanation of how they manage information received in class.	
5. Dtmanagement[a]	Their explanation of how they manage information received in class	**2. Pivoting** Students' self-motivation to achieve a successful transition through the MBBS programme appeared to be linked to several strategies to manage the data in a way that allowed them to prepare optimally for assessments. Students supplemented information received in class sessions via several means including open access media. Self-directed learning (students taking responsibility for their own learning and seeking out additional resources and modalities to augment their understanding of the course material). Some aspects of augmentation were via peer support: individual students leveraged synergies arising from the perceived strengths of others to address unmet needs/gaps in their own knowledge base.
6. Ex- Prep	Their explanation of methods used and the perceived effectiveness of test preparation	
7. Ex-Stru	Explanation of the structure of, and the perceived types of assessments provided in class	
8. Ex-Tak	Their approach/techniques to answering the questions/ fulfilling the requirements of assessments	
9. Chan- Lstyl- stud	Anticipated or actual changes in learning style in relation to progressing from Years 2 to 5 of the MBBS	**3. Learning Style Identification, Awareness and Mutability** Descriptions of students' perspectives on achieving self-awareness of learning style preferences and concomitantly identifying aspects of learning style preference for improvement (or identifying maladaptive learning style preferences).
10. Chan-Teach- lec	Changes in lecturer's teaching	

Note: [a]This code contributed to two organizing themes (OT1 and OT2).

Table 2 Demographic Profile of Focus Group Participants

*FG	M	F	Age Range (Years)	Dominant Learning Style
1- Year 2	1	5	19–24	Kinesthetic (1), Multimodal (2), Read/Write (2), Visual (1)
2- Year 5	2	5	20–34	Kinesthetic (3), Multimodal (4)

Note: All males identified as multimodal; among the females, the most frequently identified LS was kinesthetic.
Abbreviations: *FG, focus group; M, male; F, female (self-identified by participants).

the dataset. We present the data in a way that highlights the inter-relationship between the OTs and how they collectively shaped our global understanding of self-efficacy within the medical education environment as shared by the participants.

OT 1 – Dynamics of Information Delivery and Acquisition

Participants described various methods of taking in information during class sessions, giving their perspectives on the types and perceived effectiveness of, and relative preferences for the teaching methods used by lecturers. There were some matches with declared LS.

I was just trying to write um like things that sounded important and not everything but. (FG1-P4: Read/Write)

Practical so actually take note like of the instructions and actually have to carry out um the instructions so ya [you], so ya [you] have a more hands-on way already… (FG1-P6: Multi-modal)

However, students in both levels of the programme also cited benefits from modes of delivery not typically associated with their dominant LS.

Moderator: Okay so it was not a session. Were you taking any notes at all?

Student: Jottings, just jottings. Um generally, I don't like to write down what is said. (FG2-P4: Kinesthetic)

I wrote at one point in time but the in- I, I had notes from before 'cause [because] I read the topic beforehand…Um so the notes I would have made [in class] would've been just points that I would have read but I didn't make note of so when it was mentioned, I figured that it was note-worthy. Um I try to listen like X [name of FG2-P5] does. Um and not write a whole lot of information 'cause [because] I from transitioning from pre-clin [pre-clinical] to here, I realise that I do waste a lot of time writing notes and writing over textbooks basically. (FG2-P3: Kinesthetic)

In sharing their accounts, it became apparent that lecturers employed multiple strategies to achieve the desired learning outcomes. Although individual views about perceived effectiveness emerged, participants collectively identified preferred factors of effective information delivery.

At the pre-clinical level, useful strategies included pairing of lectures with formative quizzes, including team-based "competitions" and other activities designed to increase the interactivity of lectures. Participants also preferred slides to contain relevant details and to be visually appealing in terms of colour and layout as this assisted with studying (including managing data received in class) and later recall of information for examinations/assessments. Thus, visual reinforcement and "packaging" of the information in a way to facilitate recall were important strategies within the information delivery and acquisition dynamic.

Oh yeah listening and taking notes and then he referred a lot to the pictures of the different diseases so that helped as well. So, in addition to him explaining he also showed you exactly what he was saying which helped with retaining… then that was good. (FG1-P3: Read/Write)

Within the clinical setting, most of the instruction occurred at the patient's bedside. Students noted that there was less utility associated with note-taking and more emphasis on discussion of the clinical findings. Techniques to enhance information intake and retention included pre-session reading coupled with visual reinforcement remained an important aspect, but lecturers' "packaging" of the information in a way to facilitate recall remained important in facilitating the process of information intake in the final year of study.

We didn't take any notes …because it was around the patient's bedside and more of a discussion…Um so, I don't really, the images that were shown afterwards that were relevant to the case. Um I thought this was beneficial um as you could appreciate the sound and then um relate it to what you would have read. (FG2-P2: Multimodal)

Yeah so, he basically had, was giving us like these methods on um recalling information, so he had…like these, he called it his Bible, these five categories where you could get take any topic and put it into these five categories in order to better remember it. And I really like that because you would read a topic in a textbook but then when you have to come and speak about it or bring it up in an exam, it's kinda difficult to like put things in their compartments, but he kinda showed us how to consolidate all of the information that we would need around a particular topic by putting it in these categories, which I thought was really helpful. (FG2-P6: Kinesthetic)

This dynamism of student and lecturer interactions within the classroom influenced the type of self-initiated strategies students used to consolidate their learning.

OT 2 – Pivoting (Leveraging Multiple Methods to Optimize Learning)
This theme captures the varied methods, both traditional and modern, which students used to supplement the information received in class sessions in order to achieve the intended/required learning outcomes.

Augmentation of Information

In managing information received in class students of all LS used textbooks mainly if they perceived that the combination of lecture delivery, slide presentations and their personal notes still left unfilled knowledge gaps. Interestingly, use of YouTube videos to assist with the management of information received in class was universal across the LS preferences.

> Moderator- …anyone else how do you, do you make any adjustments to your notes? So, after class we heard uh slides, lecture notes, textbooks those are your references after the class. Okay.

> Of course, YouTube is always (chuckles). (FG1-P2: Multi-modal)

> Oh yeah. YouTube. FG1-P3 (Read/Write)

> Ya [You] can't, ya [You] can't leave out YouTube. (FG1-P2: Multi-modal)

> Definitely. (FG1-P6: Multi-modal)

One pre-clinical student with a stated preference for reading highlighted how YouTube filled some of her self-learning gaps.

> Yeah, I do but like I said my attention span super short so it's like if I really don't understand something then I would refer to YouTube and then sometimes I realise that hey YouTube is actually pretty golden… And I should use it more but yeah…It depends like sometimes, some concepts reading just doesn't cut it so if you have someone explaining it to you especially in some video series sometimes, they just put across information in such a way that has you like a lightbulb just kinda went off ya [you] know. (FG1-P5: Visual)

Some students in the clinical years further clarified that to varying extents they found YouTube was useful when preparing for practical sessions.

> I would. I would watch um, I go on YouTube and there's a lot of O-S-C-E (Observed Structured Clinical Examination) help on YouTube. There's a lot of, which is our practical, O-S-C-E. And there's a lot of help videos, so I would watch those and then I would write it out step by step and then practise from the notes that I would have made. So sometimes I might actually write down exactly what I would say in the exam and then kinda use it as like a something to rehearse from. Kinda like a script. (FG2 P2: Multimodal)

> That's a chore. (FG2 P3: Kinesthetic)

> That's exactly what I do. (FG2 P6: Kinesthetic)

Self-Directed Learning Activities

Thus, there seemed to be a general recognition by students, regardless of LS preference, that they needed to work out for themselves how to incorporate various modalities, particularly as relates to preparing for assessments. Apart from the use of open-access media, self-preparation activities, whether individually or in groups, included creation of self-tests, modifying and memorising course material.

> Um the textbook has a lot of them, so I usually just add them to the notes [personal notes on the computer] that I have 'cause [because]it makes it like it shows you how it is in real life and sometimes it makes a better picture so then you're able to relate. (FG1 P3: Kinesthetic)

> Yeah, like sometimes especially if like the lecturer puts on the slide find examples …okay I think I need to because then if they bring it in the exam and you don't know it that's on you, ya know so in cases like that yes or like if you don't really grasp something it might be helpful to google it to find the examples just for your understanding. (FG1-P5: Multimodal)

> Yeah, if I was to write after reading a textbook, I don't write back in paragraph form or anything like that. I might get a Post-it and put a simplified version of this paragraph next to it or I may do a diagram. Like read and understand and then do a diagram with what I understood from the paragraph for myself, but I wouldn't write back paragraph notes. (FG2-P6: Kinesthetic)

Furthermore, participants appeared to leverage the potential benefits of all LS through group study, particularly for intense examinations such as "spotters" (a comprehensive exam widely used to test students' practical knowledge of anatomy), which required comprehensive knowledge but precise answers.

Peer Support Synergies

From Year 1 of the MBBS programme, collaborative approaches based on using each other to "fill in gaps" appeared to be an important strategy in creating a multiplicative or synergistic effect (body of knowledge) that potentiated mastery of the subject matter.

> So especially we, we look at histology slides so that's the slides with um cells on them…and just kinda test each other; test each other sorry because that's how it's going to be in the exam, you're just gonna get a random slide and you have to know like what it is and …Yeah… (FG1-P3: Read/Write)
>
> Yeah. (FG1-P6: Multi-modal)
>
> Or you could do it by yourself but in groups it's better because then you get to like… (FG1-P3: Read/Write)
>
> You might know something different. (FG1-P1: Kinesthetic)
>
> Something yeah and you could explain to the person like what features to remember for the particular like cell or and … (FG1-P3: Read/Write)

The perceived utility of peer-support persisted into the clinical years, a period where the teaching, and by implication the learning, was described as fast paced.

> And because of how classes are taught in clinical phase of medical school, a lot of it isn't. slow. Or there's a, there's a particular um calculation, this is the algorithm you're to use, we will go through it and it is there. It is more of a okay so you put that, that and that there and you must understand that. So I am, because I am not fast with calculations I need to, you need to explain to me the logic behind the, why the, why there is this calculation, then after I understand that, then you must go through step by step how I am, how I am to arrive at the answer and then you must do it one more time…And then you must allow me to do it. Then I am to explain to you what I did and why I did it that way. (FG2-P4, Kinesthetic)
>
> M: Okay. And how many people allow you to do that?
>
> Maybe one. Um. I would have to ask somebody in the class to do that for me. (FG2-P4: Kinesthetic)

Empathetic approaches and the smaller numbers within the co-learner groups appeared to foster deep learning.

> So, like right before the class just now, we had, we had our own class, and we did it… I think I grasped it better because we had more time and it was, it was a lot more okay this step, you understand…like as compared to in a classroom where it's sixteen of us, on the rotation it's just like okay this, this, this, right? Practise it. It's, I think with colleagues, I mean, not saying that we don't need, you know, tutors and stuff… But another thing too is that when you learn with your colleagues, you learn a little better um I don't know if that is for everybody but for me sometimes. In terms of retaining the information because I think somebody who struggled to understand a topic and understands it now and then teaches it is better than somebody who knows it and does it all the time every day. (FG2-P3: Kinesthetic)

Irrespective of LS preference, participants in both phases of the MBBS programme coupled self-identified learning needs with a complementary set of external factors (lecturer guidance, print, and online resources) to optimise preparation for, and performance in, the various examinations formats presented. Students provided further insights into the anticipated or actual influence of their learning style preference along the continuum from pre-clinical to clinical MBBS studies.

OT 3 – Learning Style Identification, Awareness and Mutability

Anticipatory Approaches

In looking toward the future years in their MBBS journey, Year 2 students expressed mixed views about the potential persistence and utility of current LS preferences. Multimodal participants confidently anticipated no major changes in LS preference as they transitioned to the clinical years because they already employed all four learning modes.

> Um no, I don't think it would change…I prefer [inaudible] I know a bit of everything, so I read, write, watch YouTube videos, hands-on literally everything. (FG1-P6: Multi-modal)

In contrast, unimodal participants appeared contemplative; their opinions encapsulated an emerging theme centred on utility. Namely, they posited that any possible change would be dependent on the demands of the new learning environment, such as the topic, time availability, and the requirement for direct clinical interaction with patients. This demonstrates a willingness for adaptability.

> Because in first year when we did like locomotor the whole um skeleton and muscle system. I had to see these things to remember this stuff right… but now doing physiology now physiology … I don't have to like see these processes in the body like physically so I have to read more and if I could get a video to like uh give an animation…which has changed…And I don't know what would happen in the future…It depends on the subject. But generally, I learn hands on. Anything I see I remember yeah. (FG1-P1: Kinesthetic)

> I think it would change. Because um, um the type of exams you do change 'cause it's not just recall or like writing you have actual like in your test from like third year you have to actually perform exams on people. (FG1-P4: Read-Write)

The clinical students confirmed the need to retain information based on clinical observation and interaction, since note-taking was minimal and delivery of information was more conversational at the bedside. Several participants described an "adapt or perish" motivation for the ensuing changes to their LS preferences during the clinical years. Other change factors included the relatively shorter duration, and the increased number of topics and associated variability in lecturer styles, experienced during the clinical rotations.

Pragmatic/Context-Driven Changes in LS Preference

These descriptions shared by Year 5 participants suggest that self-awareness and application of LS preference to study strategies, is variable and linked to internal and external factors in the pre-clinical years.

> Right. So, in terms of what FG2-P5 is saying, I, so before I used to write. I used to copy like, it was literally copy and paste from the Power Point…Like in, in pre-clinical…So, First Year to Third Year but now, that doesn't work either like it just doesn't make any sense. So, I mentioned eye contact before, right? So, if I'm able to sit in a class or on a ward round or wherever somebody is teaching and I make eye contact and I pay attention, I'm going to remember. If I break that and I write, that's it. Like I can't, I can't switch between I'm listening to write and I'm listening to retain. So, it's either I pay attention, so sometimes when, when consultants say don't write, it's, for me it's easy because then I have friends who write every single word. And we're not allowed to record so, and I don't read textbooks, so I go to UpToDate or I just Google everything. (FG2-P3: Kinesthetic)

> I think my style of learning has changed as a matter of circumstance, not in the fact that I wanted it to change but in the fact that I had to change it because we really don't have any time to go home and write down things at night or read out, you don't have time to do anything so your style, our style, well my style of learning has changed as a result of circumstance, (FG2-P1: Multimodal)

Yet for some students, adaptability was a characteristic of their approach to learning from Year 1 of the programme.

> My style never changed. I don't know. I still want to record my lectures. Like in [another country], when I did my first degree, they used, the lecturer used to have it available like every, on E-learning…they would always record it themselves and have it as like a video or just a recording that you could play along with the slides. And that's what I did in all of them 'til pre-clin[pre-clinical] and that's what I did until I came here. And even on Path [Pathology] I used to, when we would have sit-down lectures and I'm allowed to record, I still do. And it helps me more than desperately trying to cram all this information and scramble

from UpToDate [online learning resource] and it's not as sit down and nice and organised, it's more desperation. (FG2-P7: Multimodal)

Adjustment periods are needed for all LS preferences to be optimally utilised across the various clinical disciplines.

Um and then each rotation varies. Each discipline varies so there's a different approach that you, you have to adjust to…Every nine weeks or eight weeks as the case may be. (FG2-P4: Kinesthetic)

… It's hard to adjust it takes two weeks. (FG2-P7: Multimodal)

LS Self-Awareness and Empowerment

Having knowledge of their LS facilitates students' ability to identify areas of strength and weaknesses which could be leveraged or improved respectively, to increase the likelihood of success. This level of self-awareness resulted in students operationalizing plans which would aid them in transitioning to bedside or clinical scenario-based teaching and successfully completing the clinical portion of the MBBS programme.

I think that I learnt my learning style in, in clinical years because I learn better with um having the patients there and having discussions with people. So, I found that I consolidated a lot more information in the clinical years from doing that than sitting down in a lecture in pre-clinical… So, I didn't know what my learning style was back then, so I wasn't able to say, well this is why I was taking a little bit longer for me to catch onto topics and stuff like that. (FG2-P6, Kinesthetic)

Right. So, in terms of what FG2-P4 is saying, I, so before I used to write. I used to copy like, it was literally copy and paste from the Power Point…Like in, in pre-clinical…So, First Year to Third Year but now, that doesn't work either like it just doesn't make any sense. So, I mentioned eye contact before, right? So, if I'm able to sit in a class or on a ward round or wherever somebody is teaching and I make eye contact and I pay attention, I'm going to remember. If I break that and I write, that's it. Like I can't, I can't switch between I'm listening to write and I'm listening to retain. So, it's either I pay attention, so so sometimes when, when consultants say don't write, it's, for me it's easy because then I have friends who write every single word…They, like they literally transcribe right? (FG2-P3, Kinesthetic)

Global Theme/Summary Construct – Individual and Environmental Factors Modulate the Ability of LS Awareness to Trigger Self-Efficacy

The global theme encapsulates the inter-relationship of individual and environmental factors and LS preference in shaping students' self-efficacy (Figure 1) and provides a foundation for representing the overarching construct of self-efficacy within the medical education environment in this study.

Discussion

This study, which explored various aspects of the teaching and learning dynamic, demonstrates that LS self-awareness is useful for operationalizing/facilitating self-efficacy throughout medical school especially at points of transition within the programme of study. The effect is modified by the extent to which students can identify learning needs and leverage available resources, and by lecturers' ability to employ variable and adaptive teaching approaches which can benefit a range of learners.

OT 1 – Dynamics of Information Delivery and Acquisition

This theme explicated the dynamics of information delivery by lecturers and subsequent acquisition and application, among Year 2 (pre-clinical) and Year 5 (clinical) MBBS students. Students stated their preferences regarding receiving and managing information, the use of various methods to take in information during lectures and preferences for various teaching methods used by lecturers. While some students' stated preferences matched their LS, this study also found that both pre-clinical and clinical students cited benefits from modes of delivery not typically associated with their dominant LS. The study further revealed that lecturers employed multiple strategies to achieve desired learning outcomes, and students collectively identified preferred factors of effective information delivery by lecturers, that is, delivery in a way
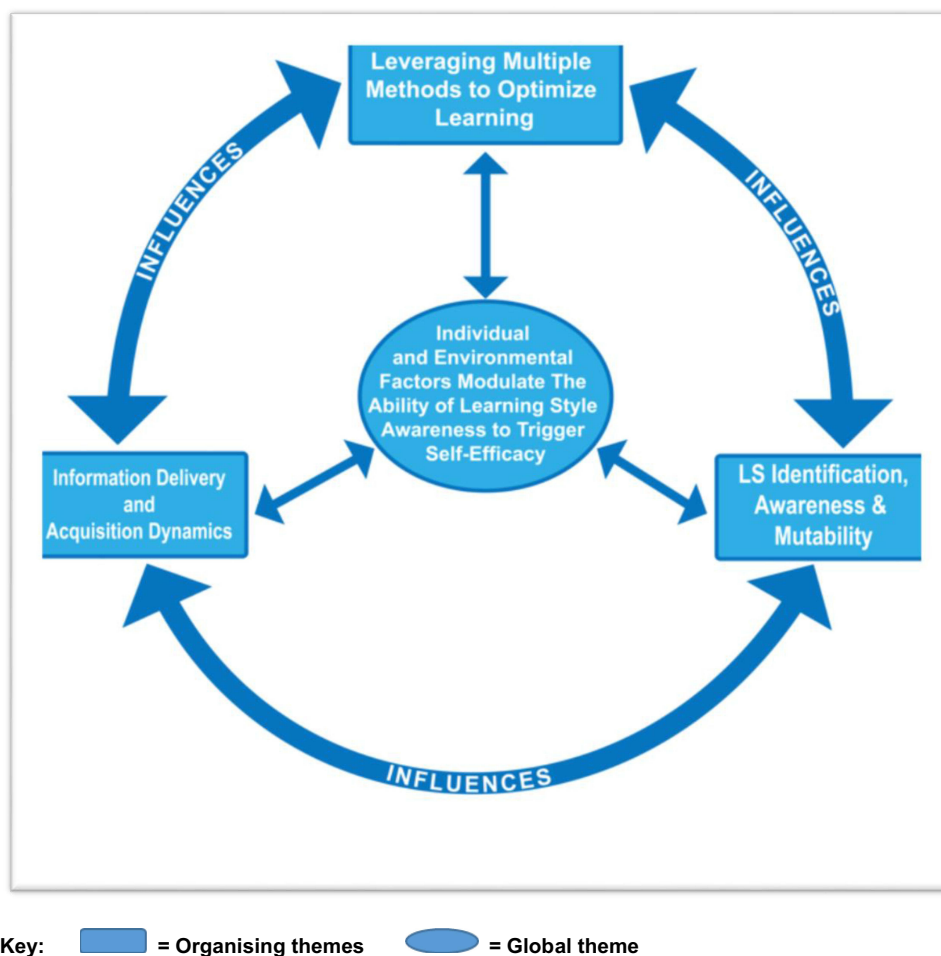
Key: ▢ = Organising themes ⬭ = Global theme

Figure 1 Illustration of the relationship between the organizing themes and the global theme.

that facilitated intake, recall and application of information. Moreover, the dynamism of student and lecturer interactions within the classroom influenced the type of self-initiated strategies students use to consolidate their learning.

These findings suggest that students' preferred LS or preferred modes of information delivery may vary or adapt depending on the topic and learning environment and this is consistent with other findings.[56] Educators need to recognize that each student has his/her own way of learning, and they should have a clear understanding of the range of students' learning preferences.[57,58] Teaching and learning interventions can be designed around those preferences and styles to achieve greater educational satisfaction and academic success.[58,59] This is in keeping with pedagogical literature which suggests that teachers should adapt and deliver material in multi-modal ways,[20] and in the context of university level learners, utilize adult learning theories to do so.[59] Recognizing and accommodating individual students' learning preferences and styles can indirectly influence self-efficacy as when students feel that their preferred learning methods are being recognized and catered to, they may be more motivated and confident in their ability to learn and succeed. Indeed, according to social cognitive theory, students with higher self-efficacy have increased motivation to study leading to better academic outcomes.[60]

OT 2 – Pivoting (Leveraging Multiple Methods to Optimize Learning)

Findings from the study related to this theme indicated that students used varied methods, both traditional and modern, to supplement the information received in class sessions to achieve intended learning outcomes. Textbooks were the main source of information used to fill knowledge gaps and YouTube videos were also found to be universally useful across all LS. These findings are consistent with previous research that has shown the benefits of using multiple learning methods to

optimize learning outcomes.[20] Specifically, a review of the use of YouTube videos highlighted a link with favourable learning outcomes including increased confidence and knowledge.[61] Furthermore, a previous study revealed that 92% of pre-clinical medical students in our faculty used smartphones and medical education applications to enhance their educational experiences.[61] Students also engaged in self-directed learning activities, taking ownership of their learning, and this has been reported elsewhere to lead to better retention and understanding of the material.[62] Other studies have also shown that self-directed learning activities can help promote self-efficacy and students with higher levels of self-efficacy are more likely to be motivated to learn and to persist in the face of challenges and achieve better outcomes.[12–15,63] In our study, collaborative approaches, such as group study, were used to synergize the potential benefits of all LS, fill in knowledge gaps and increase knowledge sharing. Peer support, which can also influence self-efficacy,[64] was found to be an important strategy from the first year of the medical programme which persisted into the clinical years. We argue that the synergistic combination and contribution of the various LS helped maximise mastery of the subject matter and fostered deep learning.

Students' descriptions of strategies employed to enhance learning and to achieve academic success can be mapped to "enactive mastery" and "vicarious" (observational) experiences, respectively. These are two main sources of information that people use to self-interrogate efficacy beliefs and create self-efficacy.[12,17] Enactive mastery experience is the most important source of efficacy information since by performing tasks, it offers students' genuine proof that they possess the capability to accomplish the task successfully; while the latter experience is obtained by observing others.[12,65] In our study, students' recurrent focus on repeated practice, going back to fill gaps and implementation of peer-learning strategies is consistent with literature showing the apparent greater contribution of performing the activity over observational immersion.[12,17]

OT 3 – Learning Style Identification, Awareness, and Mutability

In this study, students expressed mixed views on the mutability of their LS preferences, as they progressed through the MBBS programme, with some Year 2 students anticipating no major changes due to already employing all four learning modes, and others acknowledging that changes would be dependent on the demands of new learning environments. Year 5 students confirmed the need to readjust their learning styles based on the clinical environment. In the pre-clinical years, self-awareness and application of LS preference were found to be variable and linked to internal and external factors. Furthermore, adaptability was a characteristic of the approach to learning from Year 1 of the programme. Regardless of the LS preference, adjustment periods are necessary based on the demands of the learning environment. In this study, having knowledge of LS facilitated students' ability to identify areas of strength and weaknesses so they could operationalize plans to aid them in transitioning to bedside or clinical scenario-based teaching. Therefore, it is important for medical students to develop self-awareness of their LS to identify areas for improvement and develop strategies to optimize learning outcomes.[20]

Global Theme: Individual and Environmental Factors Modulate the Ability of Learning Style Awareness to Trigger Self-Efficacy

The overall theme emphasizes how individual and environmental factors, as well as learning style preferences, interact to shape students' belief in their ability to succeed. This understanding of self-efficacy is essential in medical education, and it can help educators create effective teaching strategies that cater to students' individual needs. Metacognitive approaches to learning were described by several participants in the study and in many respects were seen to be emergent adaptations as they progressed through the programme of learning. Interestingly this aligns with other work which highlighted a dynamic process for building self-efficacy among medical students.[63] By taking into account the diverse needs and preferences of students, educators can create a more inclusive learning environment that can promote students' self-efficacy, self-motivation and adaptability of learning strategies leading to more effective learning and better outcomes. Collectively taken, these findings demonstrate the importance of students' use of multiple learning methods and adaptability in leveraging personal and group LS strengths to optimize learning outcomes. It is equally important for educators to encourage students to explore different learning methods that suit their individual learning preferences,

promote their self-efficacy, and provide opportunities for collaborative learning, including opportunities for practicing the required skills. Finally, self-awareness of learning style preference may prompt students to seek methods to build on strengths and address apparent limitations both at the individual and the group study levels. By doing so, students can enhance their self-efficacy, optimize their learning outcomes and develop a lifelong learning mindset.

Limitations

The current work does not fully explore all of the exposures in the clinical setting such as community-based exposures in ambulatory care settings, and in the field as part of the multi-disciplinary health team. The clustering of LS preferences in the Year 5 group excluded other perspectives which would be relevant to understanding the contribution of LS preference to self-efficacy as students transitioned through the MBBS programme. We acknowledge the female preponderance and identify the need for additional work to further explore the male perspectives.

Conclusion

To our knowledge, this study is the first of its kind in the Caribbean region to qualitatively explore medical student self-efficacy from the perspective of LS and therefore adds to the global body of knowledge. LS theory and testing appear to be useful for student and teacher awareness but in practice honing students' adaptability to varying learning settings and building self-efficacy may be more relevant in helping students achieve desired learning outcomes. Specifically, themes which can be used to inform current and future teaching and learning practice in the UWI Cave Hill MBBS programme include increased focus on multi-modal design and delivery of lectures; employing strategies to enhance educators' awareness of LS and their use of instructional strategies that promote academic self-efficacy; providing access to physical spaces that promote group study; and enhancing student access to learning resources which support a range of LS.

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