Why Did They Fail? A Case Study on Undergraduate First Year Medical Students

Nurul Atira Khairul Anhar Holder

Universiti Malaya

Nik Nadia Nik Nazri

Universiti Malaya

Chan Choong Foong (✉ foongchangoong@um.edu.my)

University of Malaya <https://orcid.org/0000-0003-4790-005X>

Vinod Pallath

Universiti Malaya

Joong Hiong Sim

Universiti Malaya

Wei-Han Hong

Universiti Malaya

Jamuna Vadivelu

Universiti Malaya

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Abstract

Background: Academic struggle is a concern for students, medical schools and the society. As academic struggle does not develop in one day, qualitative research could gain an in-depth understanding on why it occurs. This qualitative research aimed to explore the reasons for why Year 1 medical students failed in their studies.

Methods: This study adopted a single, embedded case design. Six Year 1 medical students repeating their studies wrote an essay to describe their experiences during the previous year. Semi-structured interviews were then conducted with each student and data was analysed by two researchers. Independent analysis was compared, and discrepancies were resolved through discussions between the researchers.

Results: Each student went through different experiences. Some students engaged less in studies and spent more time in leisure and extracurricular activities or having ineffective learning methods. These actions may be influenced by various reasonings such as being overconfident or unmotivated to study. However, interpreting on Theories of Action, the students' failures may be explained by three types of invalid governing variables found in the data. Students may have performed their actions based on either inadequate knowledge, possessing misbeliefs or have no rationales at all. Invalid governing variables may have led to ineffective actions, and subsequently result in unintended consequences. Hence, all students failed the mid-year and/or end-year assessments.

Conclusion: Struggling students lacked the valid governing variables in rationalising their actions. One suggestion based on the Theories of Action is the recommendation that students perform double loop learning to deeply assess and alter their governing variables.

Background

Every year, there are a number of students who struggle in the medical programme and are at risk of failing in their studies (1), with one systematic review summarizing the attrition rate ranging from 2.4–26.2% in medical schools (and at an average of 11.1%) (2). These struggling medical students are those who fail to fulfil the minimum requirements to progress to the next year of medical studies due to either insufficient knowledge, unsatisfactory skills, problems with their professionalism or all of the reasons mentioned (3, 4). As struggling students exist in all medical schools, they are often a concern for many of the stakeholders involved. Students who struggle may experience emotional distress, stigma and poor self-esteem after putting in substantial amount of time and energy into the medical programme (5, 6). In addition, additional resources and workload are consumed for the schools to remediate and re-assess struggling students (5, 6). These students may potentially drop out and raise the attrition rate, in turn affecting the reputation of medical schools (5). Furthermore, through the payment of tax where tuition fees are subsidized for all public medical schools, attrition will also result in a wastage of public funds.

Struggling students have also been found to be the ones who are most likely to be involved in professional misconduct in their future practices (7). With the prospect of patients being adversely

affected by even the slightest of professional misconduct, this is a concern for the society where interventions from medical schools are necessary to ensure patient safety (8). Therefore, medical schools must first identify the causes, as well as the processes that lead to academic struggle in order to develop appropriate remedial strategies.

Based on previous quantitative studies, variables associated with struggling medical students have been identified using statistical analyses. The findings reported that pre-admission variables such as age, gender and pre-university education level did not contribute significantly to the prediction of Year 1 students' failure (9), whereas social class and previous school backgrounds also had a negligible effect on the prediction (10). Although quantitative findings may have advantages in terms of its generalizability, literature review on academic struggle among medical students concluded that dropouts are most likely multifactorial in nature (2). For this reason, statistics alone do not help to unveil on why one particular factor has taken place which have led to academic struggle.

Human beings are designers of their own actions, in which these actions subsequently impact their lives. Goals are set based on their personal framework of values (e.g. philosophies of life, ethics) where they later plan and execute actions in order to achieve their goals. Using terminologies as used by Argyris and Schön, actions of a person has its consequences, and these actions are driven by governing variables (i.e. why a person does what he or she does) (11–13) (Fig. 1). These designs (i.e. consequences, action strategies, governing variables), or the Theories of Action, enables one to understand human actions (14). In an organizational or managerial context in which the theory was developed, if a member of the organization possessed invalid governing variables such as maximizing winning and minimizing losing, he or she would perform action strategies such as advocating his or her position to win, and the possible consequences could result in miscommunication, escalated errors or self-sealing processes (15). Valid governing variables lead to effective action strategies, and effective action strategies will eventually lead to intended outcomes, and vice versa. If a member of an organization made an informed choice, and he or she encourages colleagues to examine the choice, then miscommunication and putting blame on others may be avoided (15). Theories of Action may be able to identify invalid governing variables and ineffective action strategies of unintended outcomes. In the context of this study, the theory is used to investigate the case of academic struggle among medical students. Ahmady and colleagues (2019) reported a number of ineffective action strategies (e.g. bad study habits, mismanagement of time) related to academic failure (16). Their study urged careful planning in remediating the struggling students. Hence, identifying the invalid governing variables is useful as it is the key to alter ineffective action strategies.

Academic struggle of students at the early stage of the medical programme has been observed to possess a strong association with attrition (2, 17). A longitudinal study reported that medical students who failed at least one of the basic science courses or scored low grade-point averages in Year 1 possessed greater chances of attrition during the later stages of the medical programme (17). Therefore, it is imperative for more researchers to explore an in-depth understanding of what leads to academic struggle at this particular stage. This understanding is crucial for struggling students to cease them from

entering the cycle of failure (i.e. a situation of an initial failure and subsequent repeated failures due to the same reasons) (18, 19). Qualitative research is an appropriate approach to gain an in-depth understanding of a phenomenon (20). In spite of that, published qualitative evidence is limited. The few that exists are one qualitative study exploring the impact of motivation in academic failure (21), and two other qualitative studies (22, 23) applying semi-structured interviews to investigate issues contributing to academic failure, where the informants are students from all stages of a medical programme (Year 1, n = 7; Year 2, n = 14; Year 3, n = 13; Year 4, n = 11; Year 5, n = 10). Subsequently, to enrich the existing body of knowledge on academic struggle among medical students, this qualitative research aims to explore why Year 1 medical students failed in their studies through the lens of Theories of Action.

Methods

The Case

This study was a single, embedded case design (24) (24), where the author's institution was the case, and each participating student was the embedded units of analysis. All students who enrolled into this institution had achieved the maximum Cumulative Grade Point Average (CGPA) for their pre-university programme. Other admission criteria included satisfying panel interviews of faculty members. As a public medical school where the government subsidizes a large portion of student tuition fees, admission is competitive. The Ministry of Education implements meritocracy principles in selecting students eligible to study at this public medical school, where merit is based on a weightage of 90% of an applicant's pre-university examination results and 10% of the applicant's co-curricular performance. As such, this investigation was a typical case representing public medical schools where the students have high cognitive and non-cognitive abilities (24).

The institution embraces a vertically- (i.e. early clinical exposure) and horizontally- (e.g. musculoskeletal sciences, cardiovascular sciences systems etc.) integrated undergraduate medical curriculum. The Year 1 curriculum offers conventional large-group lectures, interactive multidisciplinary seminars and laboratory sessions. In addition, there is one problem-based learning session and one clinical (i.e. history taking/communication skills, physical examination or procedural skills) learning session weekly throughout the academic year. The medium of instruction for the medical programme is English. Although Malaysian students are generally English as second language learners, pre-university programmes teach science and mathematics subjects in English. In addition to this, English proficiency is also an entry requirement. Therefore, all students are likely to have no language barrier in comprehending the medical content.

The Year 1 study consists of separate assessments in knowledge (e.g. an accumulated final score of 30% mid-year written assessment and 70% of end-of-year written assessment), skills (e.g. anatomy spot test) and attitudes (e.g. portfolio and interview). Students must pass each individual assessment in order to progress to Year 2. The past six years (i.e. 2013 to 2018) have seen the percentage of students failing to progress to Year 2 ranging from 2.1–12.1%.

Data Collection

Ethical approval was received from the institution to conduct this study. There were 148 Year 1 students registered for the medical programme. At the end of the academic year (August), six students were notified that they had failed one or more assessments, and they were required to repeat Year 1 in the following academic year (September). A time gap of two weeks was given. The six students were identified as target population.

In September, more than two weeks after students were notified of their academic failures, hoping that they have had some time to process the bad news, CCF contacted and arranged a meeting with the six students. The purpose, procedures, possible benefits and risks were explained to students and students were informed that their participation was voluntary. CCF (and other authors) did not have any prior relationships with the students. All authors were attached to the office, which plans, implements and evaluates the medical programme. Students were also informed that their honest responses during the data collection will not be penalised and they may withdraw from the study at any time. At the end of the meeting, all six students consented to participate in this study. Since the meeting, important dates (e.g. conducting meetings and interviews), procedures (e.g. developing codes) and decisions (e.g. revising a lens/theory for investigation) were documented.

Firstly, each student was required to write an essay which acted as a cathartic tool to record fears, frustrations, anxiety, anger and weaknesses. Students were expected to write 1000 words within a one-week duration. They were allowed to write at home/hostels where they are able to convey their feelings in a safer environment, rather than sitting at the office of the authors. Through this task, personal insights into some of the challenges faced by the students were revealed (25, 26). Examples of questions asked are as follows; (1) You failed Year 1. What happened? (2) You are repeating Year 1. What are you planning to do, if any, to make a difference?, and (3) Add any other matters that you would like to express your feelings on.

Secondly, a semi-structured interview was arranged with each student. The interviews were conducted one to two weeks after students consented to participate in the study. The interview was initiated with open questions such as “What happened?” and “How did you study?”, for students to elaborate on their learning experiences. Their responses were prompted with the use of hypothetical, devil’s advocate, ideal position and interpretive questions, to guide students in expressing their feelings and rationales (27). In addition, students’ willingness to share their personal experiences of academic struggle are essential as these answers will contain their personal and genuine feelings on the failures. The plan was to prompt students during interviews based on the essays written, but all students were unable to submit their essays before the interviews took place. Students submitted their essays approximately one or two weeks after.

The interviews were conducted at a room at the authors’ office. The environment was quiet and relaxed (i.e. interviewees were informed that they could refuse questions if they wished to) and non-threatening

(i.e. re-assurance of anonymity of the interviewees). Prior to the audio recording of interviews, the interviewer informed each student on the purpose of the interview, why the interview is recorded and how the identifiable data would be managed. Upon consent, the interview commenced. Each interview lasted approximately one to 1.5 hours. All interviews were audio-recorded and transcribed verbatim. Rapport and communication were built to encourage honest information.

Data Analysis

The value of a case study design is that it could provide rich and holistic descriptions of a complex process being investigated in real-life situations (20). It is therefore appropriate to use this design in the present study to explore the process of academic struggle among struggling students where each student is an embedded unit of analysis (24).

The data was read multiple times by two researchers (NAKAH and NNNN) to familiarize themselves with the content. Next, codes were generated from the interview transcripts and essays from each student. Data in the interview transcripts were compared with what was written in their essays for the purpose of corroboration whenever applicable. Subsequently, the researchers compared the independent coding results, discussed and resolved any discrepancies until a consensus was reached between the two researchers. Meanwhile, a third researcher (CCF) who was not involved in the process of data analysis reviewed all codes and ensured that the codes were supported by the excerpts from the interview transcripts and essays.

Next, the data (codes) were rearranged where the events are connected in a chronological order, presenting each student's experience as a story. This will aid the researchers in making sense of the events that occurred leading up to their failures. Method and analyst triangulation informed and validated the students' perspectives on their reasons for failing their Year 1 studies (28). This study was guided by the Theories of Action where in the discussion section, stories of each student (i.e. embedded unit of analysis) are assembled (i.e. the case) for evaluation, should there be any shared ideas (i.e. themes) which corresponds to the theory.

It is also understood that the sentence structure and word choice in the students' excerpts may not be in perfect English. Nonetheless, the authors wished for the excerpts to be maintained in the Malaysian English style to preserve the students' genuine expression and the tacit cultural understanding behind what the students have written and said.

Results

Each student is given a pseudonym to avoid identifiable data; Interviewee 1, Interviewee 2, Interviewee 3, Interviewee 4, Interviewee 5 and Interviewee 6.

Interviewee 1, 21 year old, male

When being prompted during the interview, Interviewee 1 described that he was *“very confident”* and he can pass *“Year 1 without breaking a sweat”*, and even if he *“studied at the last moment”*, he *“can still ace this medicine course”*.

In the essay, Interviewee 1 introduced himself as a student who grew up in a small village. He then met seniors in the medical school who were *“nice and kind”* to him and ended up spending most of his time doing leisure activities such as *“going out, enjoying, playing, eating outside, watching movies”*. As he spent much of his time doing leisure activities, Interviewee 1 ended up spending relatively less time in studying. He eventually failed the mid-year written assessment.

Interviewee 1 lost his confidence after failing the mid-year written assessment. He felt that he had low motivation to study and doubted his abilities to pursue the medical profession. If he was not fit for the profession, then why should he study?

“Even after that I was not confident in doing anything.” (Essay)

“...when I’m in doubt, I don’t actually have that motivation to study. Because you know that, okay, you have that doubt, if I’m right for this course or not. So for me, I just took it as, what if I’m not right, then why should I study?” (Interview)

Subsequently, he did not have a timetable to guide him on his daily activities and followed no specified timetable to study. Interviewee 1 then recalled his previous study methods during his pre-university days when he was more disciplined.

“...discipline is, if you want to study, this is the time that you should do it. Like when I was in matriculation [note: pre-university education], after I finished my studies at 5pm, I would come back, rest for a while, like half an hour, then at this specific time, I will do this, at this time, I will do that. I have a timetable so that I can manage my life much easier. Here, when I came, it was all messed up. If that day I didn’t want to study, I’ll just sleep.” (Interview)

In addition, Interviewee 1 skipped the difficult content and did not make any attempt to comprehend it. Furthermore, lecture notes were his only sources of information as he *“very rarely”* referred to recommended textbooks.

“If I don’t understand anything, I will just put it on the side and move on to the next (topic).” (Interview)

Interviewee 1 also failed the end-of-year written assessment. As a result, Interviewee 1 was required to repeat Year 1 as he failed to obtain a satisfactory accumulated score for the mid-year and end-of-year written assessment.

Interviewee 2, 21 year old, female

Interviewee 2 entered university with full of anticipation and promise.

"At first, when I entered medical school, I was so fresh and I had the spirit, I wanted to finish this medical course in 5 years. I think that's everyone's dream." (Interview)

However, something seemed to distract her from her studies. An informal orientation was conducted by the senior medical students at her residential college in which she was forced to participate in. Interviewee 2 commented that the orientation was *"a waste of time"*. Although she made negative remarks regarding the informal orientation activities, she still conformed.

"...but I will be going to the class and will be sleeping there because I would have that stupid session [note: orientation activities] until early in the morning. So (there will be a) lack of sleep. I used to sleep at like, 10 o'clock and wake up in 4 o'clock in the morning." (Interview)

"I have to remember all my batch mates' names, (this) means, (those) in my group. They give all kinds of tasks. These kinds of tasks that doesn't make sense, like writing an essay about a senior." (Interview)

Meanwhile, although she disagreed with the social culture and learning styles of her new peers in medical school, once again she followed the ways of her peers.

"I started to adapt myself to their culture but that is not my culture. Like going out and talking and not studying and those kinds of things." (Interview)

"...my kind of friends, they won't go for classes. They skip the classes and they won't study. But they are smart. But I thought I can be that kind of person too." (Interview)

It seems that Interviewee 2 compromised her beliefs in order to avoid conflicts with her seniors and peers and as a result, she neglected her studies. She skipped classes or slept during lectures as she was either too exhausted from the previous nights' orientation activities or likely to be adapting to the ways of her peers. She eventually failed the mid-year written assessment.

Despite Interviewee 2 claimed that she loved medicine, Interviewee 2 was not "brave to face" the workload of studying medicine. Hence, she kept procrastinating in her studies.

"I like to procrastinate...I love medicine. But when it comes to a few things, I didn't that brave to face it. Like anatomy classes, like anatomy lectures, there are a few things - there are lots of things in the lectures." (Interview)

When she made notes from the lectures, she was also careless, constantly misplacing the notes she made. Furthermore, she complained about the overwhelming amount of topics she had to revise and was selective of the topics she studied, even though she knew she must read all; *"...(there are) too many things so I have to concentrate on other things..."* but *"I will wait for the last – until the last minute to study."*

In addition, she joined extracurricular activities, which only made her busier and gave her less time to study.

"(I joined) debate for other universities. Like inter varsity competitions. And even for (my religion) we have to arrange a few things. Like a prayers thing, (...) I was in charge of that (...) I was never used to these kinds of things. It was very new to me." (Interview)

Interviewee 2 did not explain why she engaged less in her studies after her mid-year written assessment. In the end, Interviewee 2 also failed the end-of-year written assessment. As a result, Interviewee 2 was required to repeat Year 1 as she failed to obtain a satisfactory accumulated score for the mid-year and end-of-year written assessment.

Interviewee 3, 21 year old, female

Interviewee 3 altered her learning methods after entering medical school and simply read her lecture notes, abandoning methods that had worked for her since primary school. Interviewee 3 analysed the cause of her failure as not constructing her notes *"in a way that"* she *"would understand"*.

"...I was very enthusiastic in printing lecture notes. (Though) I did not construct it in a way that I would understand. I am the type of person who can remember and understand things better when I construct it in a way that I will understand. I am used to doing mind maps and concept maps which are easy and colourful. They make it easier to study. That was how I studied since my primary and secondary studies." (Essay)

However, she did not explain her reason for altering her learning methods. Interviewee 3 eventually failed the mid-year written assessment.

After her failure in mid-year assessment, Interviewee 3 modified her learning methods once again where she *"decided to not print lecture notes anymore"* and made her *"own notes"*.

"I brought my own handbook to note down important things in (the) lecture. I went back to (my) room and constructed my own notes. I made myself consistent. I studied every night." (Essay)

She also informed that during lectures she *"will listen. I will concentrate and I will listen"*. Her rationales implied that she believed in passive learning in which the lecturer talks, and learners listen.

Interviewee 3 did not explain why she changed her learning methods again without rationalising on its effectiveness. However, she said *"I was thinking I was progressing."* It was only during the interview when Interviewee 3 realised that she *"didn't know whether I was really progressing or I was just thinking I was progressing"*. Interviewee 3 was also asked to reason her actions several times during the interview (e.g. why did she seek advice from seniors and how did she know if the advice is useful). However, she gave no reasons and informed *"I don't know. It didn't cross my mind"*. Interviewee 3 eventually failed the end-of-year written assessment. As a result, Interviewee 3 was required to repeat Year 1 as she failed to obtain a satisfactory accumulated score for the mid-year and end-of-year written assessment.

Interviewee 4, 21 year old, female

Interviewee 4 admitted that she chose to study medicine simply because she wanted “*to give a try*”. For her, the “*passion will come by itself*” when she enrolled in the programme, implying she lacked the motivation to study medicine in the first place.

“It doesn’t matter. Whatever course it is, if you study well, the passion will come by itself, along with your interest. I believe in that.” (Interview)

Upon entering medical school, Interviewee 4 confessed that she was a “*lazy*” person. She infrequently studied during the first two month period of the Foundation Block for medical and clinical sciences as she thought it was a bore and only studied according to her mood.

“Honestly, I was really bored (at) that time and (have) not prepared anything for (the) foundation (block).” (Essay)

“I study when I have (the) mood. When I don’t have (the) mood, I just sleep or do other things.” (Interview)

Meanwhile, when Interviewee 4 had the mood to study, it seems that she read the lecture notes without comprehending the content. She “*just read*”.

“I didn’t look at it properly. I just looked, read a little. And done. That’s all.” (Interview)

“I just read like that, just on the surface.” (Interview)

In contrast to her medical studies, Interviewee 4’s extracurricular activities dominated much of her time. More time was spent to participate and practice for debate competitions, as well as being a committee member in planning and running student programmes at her residential college. In addition, Interviewee 4 represented her college in basketball and futsal which had regular training sessions.

“During Foundation, I (was) also involved with SUKMUM [note: the university’s inter-residential college sports games]. I played basketball and futsal.” (Essay)

Teaching and learning activities in this medical school are typically scheduled from 8am to 5pm. When being probed on the reasons why she attended the classes late, Interviewee 4 explained that night practices and sport matches from the previous night made her exhausted the next day. It is implied that Interviewee 4 neither had the time, nor the energy to revise lectures of the day, as well as having the time for preparation for the next day’s lectures.

“I think because at that time, (I was) busy with SUKMUM. And (I was) tired after practicing sports.” (Interview)

Meanwhile, Interviewee 4 mentioned that her time management was “*really bad during Foundation Block*”, with the mid-year assessments being conducted immediately after this block. She recalled rarely attending morning classes and going out almost every weekend to watch movies and going hiking with friends.

Interviewee 4 failed both the mid-year and end-of-year written assessments. As a result, Interviewee 4 was required to repeat Year 1 as she failed to obtain a satisfactory accumulated score for the mid-year and end-of-year written assessment.

Interviewee 5, 21 year old, male

Interviewee 5 admitted that he disliked studying and is someone who easily panics. However, he pursued medicine to make his father happy. As the study of medicine requires a substantial amount of reading, this caused him a great deal of stress.

"...stressful to me means, study(ing) a lot. Because I don't really like to study. I don't really like studying. Studying medicine is all about reading books and it makes me stressed (out)." (Interview)

"I think it's my emotions' doing because I tend to panic. I'm a person who tends to get panicked very fast." (Interview)

"Becoming a doctor is good, and then he [note: Interviewee 5's father] really hopes that I can pursue my study in this medicine (programme). And what makes my dad happy, makes me happy..." (Interview)

When being prompted on the reason why he did not seek help, Interviewee 5 answered *"I never thought it could be that serious"*.

He recalled his experience during the mid-year written assessment when the panic attacks began. According to Interviewee 5, during the nights leading up to the assessment, the assessment questions appeared in his dreams and tested him. Interviewee 5 was unable to answer these questions in the dreams, so he woke up and read. After verifying his understanding on the topics, he resumed sleeping. Interviewee 5 did not seek for help as he felt he could cope with the panic attacks, in which he defined *"coping"* as still being able to sleep after experiencing the dreams. He was still able to calm himself down and convinced himself that he can sit and pass the mid-year assessment.

"The question came to me (in my dreams), and then asked me and then I forget. And then I wake up and then I read through the book again, and then I close the book, then I sleep again and the question comes again. The cycle repeats." (Interview)

"...I got insomnia during (the) mid-year assessment. But I can still handle it. So I push myself to sit for the exam." (Interview)

Interviewee 5 passed the mid-year written assessment, albeit merely fulfilling the minimum requirements. It can be assumed that the passing of this assessment gave him a false sense of security, vindicating his reluctance in seeking help for his panic attacks. He then proceeded making the necessary preparations for the end-of-year written assessment. Unexpectedly for Interviewee 5, what followed was the worsening of his panic attacks one week before the assessment. Once again, the assessment questions tested Interviewee 5 in his dreams, and he woke up to verify his understanding of the questions. The difference

this time was his inability to answer these questions. To worsen matters, Interviewee 5 failed to resume sleeping and stayed awake for three days. Consequently, Interviewee 5 failed to handle the overwhelming pressure and abstained himself from the end-of-year written assessment altogether.

"I think one week before my exam, I don't know why, but when I tried to sleep, things that I have learned just kept on coming and asking me whether I still (...) remember about that. And then I often couldn't remember them. I keep on waking up and reading through the books. And then the question comes again and then I forget again, and then I wake up again and then the cycle goes like this. I got like 3 or 4 days like that where I didn't sleep at all. And then I just keep on continuing with the cycle. Wake up, read through, sleep and then the question comes (up) again, and then I forget again. And then I wake up and then I read through the book again. And then I couldn't tolerate anymore, and I couldn't cope with that pressure anymore, and then I give up." (Interview)

"Towards the end-of-year, those questions also come (up during dreams). The difference is just that the mid-year assessment you managed to answer those questions." (Interview)

"But then I still can cope with that (during mid-year assessment). But I don't know why I couldn't cope when it comes to the end-of-year assessment." (Interview)

Eventually, Interviewee 5 decided not to attend the examination and failed the end-of-year written assessment. As a result, Interviewee 5 was required to repeat Year 1 as he failed to obtain a satisfactory accumulated score for the mid-year and end-of-year written assessment.

Interviewee 6, 21 year old, male

Interviewee 6 failed the mid-year anatomy spot test where he informed during the interview that he had "overconfidence" and he "underestimated the paper... (the) anatomy (spot) test".

When the end-of-year assessments were approaching, he made a conscious decision to focus less on studying anatomy as he prioritized studying and passing his written assessment instead.

"I didn't concentrate in the anatomy ...because I feel that (the) end of year (written) assessment is more important. I'd rather take (the) risk of failing the anatomy rather than failing my end of year (written) assessment which is more dangerous. The anatomy exam is just like, I go test my knowledge level and test my luck. Just do whatever I can do." (Interview)

Interviewee 6 also failed the end-of-year anatomy spot test, and he began to realize that his studying method was "ineffective".

"I memorized all diagrams of the books. Everything is just in colour, red, yellow, everything is separated. When you come into the dissection hall, everything is in the same colour. The muscle, the nerve, everything is in the same colour. So, we need to identify it in a short time." (Interview)

He realized the differences (e.g. colours) of the specimens during the assessment and the specimens he studied in the reference books only after he attempted to identify them during the end-of-year anatomy spot test. With the limited amount of time that he had during the assessment to identify the specimens which greatly contrasted to the one he studied from the reference books, he panicked and struggled to answer the assessment questions.

"For the end of year examinations, everything I (just) read once, (as) I think I can memorize quite well. So maybe that made me too confident that I failed." (Interview)

A supplementary anatomy spot test (i.e. second chance) was given to him. However, even with the remedial classes provided, Interviewee 6 informed that he attended merely *"one or two"*, indicating he was absent from many of the classes. He even mentioned that he *"didn't ask help from others"* as he explained that he *"can come up with a solution"* by himself. Overconfidence seemed to overtake Interviewee 6 once again.

"I think for me, maybe few weeks later, or few months later I will try asking. Not for help, but asking my friend what is the best way to study. Because I tend to decide a decision on my own first." (Interview)

"Maybe (at) that time, I think I memorized well in anatomy. I don't think it's so hard for me. But when I go for the exam, and I realized I have lots of questions, I don't know how to do (the assessment)." (Interview)

Interviewee 6 failed his supplementary anatomy spot test. As a result, Interviewee 6 was required to repeat Year 1 as the institution requires students to pass each individual assessment and Interviewee 6 failed in all

Discussion

In this study, stories of each student (i.e. embedded unit of analysis) will be assembled as a case. A theme in qualitative analysis could be defined as a broader block of data that consist of codes assembled to produce a shared idea (29). Three themes reasonably matched the Theories of Action; unintended consequences (e.g. failing the mid-year or end-of-year assessments), ineffective actions (e.g. study at the last minute, did not seek for help) and invalid governing variables (i.e. taking ineffective actions). People design specific actions in order to achieve intended outcomes based on their governing variables (i.e. why a person does what a person does) (11, 12). However, a person's governing variable may not always be valid. Invalid governing variables at often times lead to ineffective actions, and these actions subsequently result in unintended consequences (12). In this study, failing the mid-year and end-of-year assessments were the unintended consequences of ineffective actions taken by struggling students. Based on the findings, it was discovered that ineffective actions were likely driven by three kinds of invalid governing variables.

The first invalid governing variable was that some struggling students had reasoned their actions based on inadequate self-knowledge. Self-knowledge is defined as the act of being aware of one's strengths and

weaknesses (30). From the results, Interviewee 1 misjudged his strengths (i.e. being overconfident on his abilities) and performed ineffective actions (i.e. spent more time on leisure activities and studied at the last minute). While Interviewee 6 misjudged his weaknesses (i.e. being unaware that he is weak in the anatomy subject) and designed ineffective actions (i.e. studied and focused on other subjects). Similarly, for Interviewee 3, she misjudged the effectiveness of her new learning method it was only during the interview when she realized that she was unsure if she was progressing or not. As for Interviewee 5, he misjudged his ability to cope with his panic attack and hence, the ineffective actions (i.e. not seeking help).

The second type of invalid governing variable is the reasoning of their actions based on their misbeliefs. Interviewee 2 seemed to believe that a better way to resolve conflicts with seniors and peers was to suppress her negative feelings, one of the invalid reasonings mentioned by Argyris (12, 14). As such, her following actions included obeying seniors to participate in late night orientation activities, following the ways her peers learnt, and skipping the lectures. While Interviewee 4 had no genuine motivation to study, she believed that motivation will come once she enrolled into the medical school. Without motivation, she took ineffective actions such as spending much time on extracurricular activities which she was likely to have more interest in.

The third type of invalid governing variable was the absence of rationales for some of the students' actions. Interviewee 2 did not explain why she over-engaged in extracurricular activities as compared to spending time in her studies after her failure in the mid-year written assessment. As for Interviewee 3, she had performed well during her pre-university education indicating her use of effective learning methods previously. However, upon entering medical school, she changed her learning method without providing a rationale for her actions.

In the present study, actions of the struggling students could be explained using the concept of single and double loop learning (31) (Fig. 2). Single loop learning refers to taking actions to correct a particular problem (academic struggle) without challenging one's own governing variables, assuming he or she has a valid reason for attempting such actions (15). Examples of single loop learning in this study are observed in Interviewee 1 and Interviewee 3 where they continued using ineffective learning methods, albeit the different methods. On the other hand, Interviewee 4 neglected her studies and participated in extracurricular activities as she lacked the motivation to study medicine. Although some struggling students recognized their own limitations and made attempts to correct them, they still failed. Therefore, it can be deduced that only single loop learning has been taken place. Meanwhile, double loop learning involves a deep assessment and the identification of 'false' or irrational reasons, followed by the appropriate amendment on actions (15). Double loop learning was not identified in the present study. Unless, the struggling students re-assessed their existing governing variables and were aware of its 'invalidity', their subsequent actions would not be modified accordingly and will remain to be ineffective.

While reading through the individual stories in this study, educators may recognize that these students were likely going to fail, but failing an assessment is often a surprise for the students (18). It is likely

because the students fail to recognize that their respective governing variables were invalid. Therefore, introducing reflection as a remedial strategy could enhance self-knowledge (32) and double loop learning (33). Even junior doctors need to be informed as they are most likely to remain believing their beliefs are valid (34). Hence, educators who may have more skills and knowledge are required to guide in reviewing the validity of students' governing variables (34).

The present study has strengths and limitations. Method and analyst triangulation were used to enhance the credibility of the study, important dates, procedures and decisions were documented to enhance its confirmability, and preliminary findings were peer reviewed to enhance the dependability of the qualitative research. The description of the case would also clarify on the transferability of the findings. It is a typical case and its findings are likely transferrable to other medical schools with similar contexts (24).

Meanwhile, to the best of the authors' knowledge, this study may be the one of the few studies that explored reasons why medical students failed through the lens of Theories of Action. The findings are significant to recognize the governing variables as the key to alter ineffective actions. Introductory (or first) steps in future interventions for struggling students should consider correcting values that uphold their ineffective actions.

Limitations for this study was the heavily reliance of the discussion on theories. Hence, future research could conduct intervention studies on the concept of double loop learning to gain empirical evidence on its effectiveness. Future studies involving a larger sample or multi-institutions may prove to be useful to enhance the credibility of the findings. It would also be useful to study students who encounter initial failures in the mid-year assessment but manage to cope and pass the end-of-year assessment. What have they changed and do those changes match the concept of double loop learning?

The authors' institution assigned faculty members to be academic advisors to Year 1 students where their meetings were on a voluntary basis. However, their meetings were not focused during the interviews and the authors had no access to records of the meetings. Realizing that the support system for struggling students may be useful in reporting the students' experience, there is a possibility that relevant findings may have been overlooked. Furthermore, findings of this study may have limitations. "The truth" on why medical students failed could be multi-faceted and may not be transferable across institutions and nations. An example would be how alcohol abuse is a relatively common phenomenon among undergraduate students in India (35). However, as Malaysia is a Muslim-majority country (i.e. Muslims do not consume alcoholic drinks), alcohol abuse was not reported a problem among struggling students in this study. On the other hand, struggling students were reluctant to seek help and this pattern was reported in this study as well as another UK study (36), implying that this problem could be applicable to Asian and Western students. However, this case study has insufficient evidence to make such a conclusion and hence, requires further investigation.

Conclusions

The present study explored the process of academic struggle through the lens of Theories of Action. It seemed that struggling students based their actions on their invalid governing variables (i.e. inadequate self-knowledge, misbeliefs, possessing no rationales). Hence, engaging struggling students in double loop learning may help them to review their governing variables correctly.

Declarations

Ethics approval and consent to participate

The study was conducted with permission from the University of Malaya Research Ethics Committee. The reference number is UM.TNC2/RC/H&E/UMREC-89. Participation of students was voluntary and their written consents were obtained.

Consent for publication

Not applicable.

Availability of data and material

The datasets collected and analysed during this study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Affiliations

Medical Education and Research Development Unit (MERDU), Faculty of Medicine, University of Malaya, 50603 Kuala Lumpur.

Nurul Atira Khairul Anhar Holder, Nik Nadia Nik Nazri, Chan Choong Foong, Vinod Pallath, Joong Hiong Sim, Wei-Han Hong & Jamuna Vadivelu

Authors' Contributions

NAKAH and NNNN analysed the data, drafted and revised the manuscript. FCC designed the study with input from VP, JHS, WHH and JV. FCC collected the data. All co-authors reviewed the manuscript. All authors accepted and approved the final version of the manuscript.

Abbreviations

CGPA: Cumulative Grade Point Average

SUKMUM: Inter-residential college sports games of the University of Malaya

UK: United Kingdom

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Figures

Figure 1

Theories of Action to explain human actions (adapted from the ideas of Argyris and Schön)

Figure 2

Single and double loop learning in the context of this study