Abstract
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A conducive educational environment is vital to successful learning. Perception of students about their particular educational environment may vary depending on their educational background, gender, level of study, and many other factors. Awareness and understanding of the students' perception of educational environment are a key to improve our teaching and learning environment. The aim of the study was to determine the perception of undergraduate medical students of Taylor's University, Malaysia on their educational environment. A cross sectional cohort study was conducted among preclinical and clinical students simultaneously at Taylor's University, School of Medicine in July 2019. Overall total scores of perceptions (136.55 ± 19.6) and those for the subscales were very satisfactory and similar to those of other local universities as well as international universities. There was a significant difference between preclinical and clinical students in two domains; Perception of Course Organizers and Academic Self-Perception, with higher scores among clinical students in all. There was a significant difference between students with Grade 'B' and those with Grade 'C' in the mean total score and Perceptions of Atmosphere. These results, in spite of being satisfactory, urge us to seek methods of and opportunities for further enhancement of the students' education environment.
Introduction
The environment is defined as the setting or conditions in which a particular activity is carried on (Oxford Dictionaries 2018, environment). The educational environment can be defined as the setting in which teaching and learning activities are carried on. The educational environment is said to be one of the most important determinants of an effective curriculum (Bassaw et al., 2003). The educational environment includes both the physical environment and psychological environment; the latter of which is often overlooked. Hutchinson (2003) highlighted that physical factors such as noise, classroom temperature and long sessions without a break or refreshment can make it difficult for learners and teachers to relax and pay attention. Even intrinsically motivated students can be demotivated by such external factors. Genn (2001) claimed that the learning environment is an important determinant of behaviour and that there is a recognised association between the environment and the students’ achievement. Therefore, all educators should pay attention to the role of educational environment in teaching and learning. As Roff and McAleer (2001) suggested, we believe that if we can identify and evaluate the factors influencing the educational environment and students’ and teachers’ perceptions, we can improve the environment to achieve the desired education outcomes.

Background
Taylor’s University is one of the renowned private universities in Malaysia. It was founded in 1969 as a college and was upgraded to university in 2010. The main campus is situated in Subang Jaya, Selangor and a campus over ten thousand students are studying in many undergraduate and postgraduate programmes, one of which is the medical undergraduate programme (MBBS) in the School of Medicine. The first two years of the five-year MBBS programme constitutes the preclinical phase or ‘Phase I’. Students in Phase I are based in the main campus. The last three years are the clinical years or ‘Phase II’. Phase II students are based at a sub-campus - The Taylor’s Clinical School - in close proximity to the teaching Hospital, approximately 30 km from the main campus. Thus, after the first two years in Phase I, the change affecting the students is not only a change in academic content from basic sciences to clinical medicine, but also their campus life, living accommodation and social environment. The education philosophy remains consistent throughout the five years and pedagogies too, but only to a certain extent, as some differences in pedagogies between the two phases become unavoidable because of the differences in the nature of academic content between these two phases. Despite similar research have been done in some other Universities in Malaysia, our university is relatively new and preclinical campus and clinical campus are in different geographical location. This reason persuades us to look into our education environment.

Methods
The DREEM

The Dundee Ready Education Environment Measure (DREEM) is widely used instrument in the medical education arena ranging from America through Europe, Africa to East Asia. It is a reliable, validated inventory, a scale for measuring perceptions related to the educational environment. It claims to be generic to undergraduate health professions education (Roff, 2005). It was developed in 1997, involved a panel of nearly 100 health professions educators from around the world and validated by over 1000 students. It contains 50 statements relating to students’ perceptions of learning, teachers, atmosphere, self-academic and social perception. Students are to respond using a 5-point Likert-type scale (0 to 4) ranging from strongly agree to strongly disagree. However, 9 of the 50 items (numbers 4, 8, 9, 17, 25, 35, 39, 48 and 50) are negative statements and should be scored 0 for strongly agree, and 4 for strongly disagree. We reminded these negative items to students in the survey form. The 50-item DREEM has a maximum score is 200 indicating the ideal educational environment (Roff et al., 1997).

The inventory used in this study had the word ‘registrar’ in the original inventory changed to ‘student’.

Methodology

Objective
The general objective of this study was to determine the perception of medical students at Taylor’s University, Malaysia on their educational environment using the Dundee Ready Education Environment Measure (DREEM). This included the determination of the overall score and scores for the five subscales. In addition, our specific objectives were to determine if there were any differences in perceptions based on gender, the level of study at medical school, academic performance at medical school and pre-university learning experiences. With that our research question is-

Is there any relationship between the students’ perception of educational environment and preclinical and clinical students?

Study design
We carried out a robust literature review of all the research from different continent pertaining DREEM. The knowledge of the literature implied our conceptual framework. We assumed the relationship is a reality between gender, the level of
study in medical school, academic performance at medical school and pre-university learning experiences and students’ perception of the educational environment. Based on our objective, research question, and conceptual framework, we decided to use the DREEM survey questionnaire. A cross sectional cohort study was conducted in phase I and phase II simultaneously at Taylor’s University, School of Medicine in July 2019.

Sampling
Due to the nature to research, we used the universal sampling method. All students enrolled in the MBBS Programme were requested to participate. However, participation was voluntary. The questionnaires were distributed in paper form to all students in July 2019. The questionnaires were to be completed anonymously and without compromising students’ teaching-learning sessions. A Total of 301 questionnaires was handed out of which 278 were returned, which accounted for 92.3% of the total number of students in School of Medicine. However, during data entry, we rejected 26 forms due to incomplete answer. Therefore, total sample size is 252, male 93 and female 159. Total of 87 clinical students and 165 clinical students.

Questionnaire
The questionnaire included instructions for answering the questions. The negatively phrased questions were pointed out so that students may pay extra attention when responding to them. In addition to the statements in the DREEM inventory, questions about the students’ gender, levels of study in medical school, level of academic achievement in medical school and pre-university education were included.

Data analysis
The responses to the DREEM questions were coded as recommended from 0 (strongly disagree) to 4 (strongly agree). The values were inverted for the negatively phrased questions.

Students were coded into four categories based on their academic achievement in their most recent semester grading, the four categories being those students achieving A grades, B grades, C grades and below C grades.

The categorization on pre-university qualifications was based on the pre-university course attended.

The mean overall scores and the means for each subscale were determined. The mean scores of preclinical and clinical year students were compared using unpaired ‘t’ test. Similar comparison was performed based on gender. The mean scores for students at different levels of achievement in medical school and on pre-university academic qualifications were compared using one-way ANOVA with Post-Hoc tests (Tukey).

Statistical significance was set at (p) value of <0.05.

Statistical analysis was performed using IBM SPSS® version 25.

Results/Analysis
A total of 278 questionnaires was returned, of which 26 were rejected due to incomplete responses. Therefore, data from 252 valid completed questionnaires were analysed. Distribution of valid returned questionnaires according to gender and level of study is shown in Table 1 (a). The number of valid responses according to academic achievement in medical school and pre-university qualifications are shown in Table 1 (b) and Table 1 (c) respectively. Students in Semester 1 of the MBBS programme were excluded from the categorisation based on academic achievement.

The mean total score for the DREEM inventory in our study was 136.55 ± 19.6. Table 2 shows the mean total score with the recommended interpretation of the values for the overall mean score.

The total of mean scores for the five subscales were in the satisfactory range. Table 3 shows the total mean score for each of the five subscales with the recommended interpretation of scores for each section.

Table 1 (a). distribution of valid returned questionnaires according to gender and level of study

| Gender | Level of Study | Male | Female | Preclinical | Clinical |
|--------|----------------|------|--------|-------------|----------|
| Number of valid responses | | 93   | 159    | 87          | 165      |
| Total  |                | 252  | 252    |             |          |
Comparison of scores, overall and for subscales between preclinical and clinical demonstrated higher scores for total and subscales in the clinical group. However, a significant difference between the two groups existed only in subscales Academic self-perception \((p<0.05)\) and Atmosphere \((p<0.05)\).

There was no difference in overall or subscale means between males and females. The scores for total, Learning perception, Teaching perception, Perception of atmosphere and Social self-perception were higher in females with only Academic self-perception higher in males, although the difference was not significant in any.

These results are shown in Table 4.

Regarding the scores for students with different grades in the most recent semester, there was a statistically significant difference between groups as determined by one-way ANOVA for mean total score \((F(3, 223) =3.160, p = 0.025)\) and for the perception of atmosphere \((F (3,223) =4.166, p = 0.007)\).

A Turkey post hoc test showed that students with Grade ‘C’ had significantly lower scores than those with Grade ‘B’ in mean total score \((130.14\pm25.6, p = 0.025)\) and in the subscale Perception of atmosphere \((29.82\pm6.9, p = 0.007)\).

ANOVA did not demonstrate any significant difference between groups for mean total or subscale means to students with different pre-university qualifications.
When individual items of DREEM were considered, one item had a mean score of above 3.5, which is shown in Table 5.

Lowest scoring items: Two question items had mean scores of less than 2.0. These are shown in Table 6.

Of the 50 items, 34 had mean scores between 2.0 and 3.0. Fourteen items had scores of 3.0 and above and two had scores below 2. Table 7 gives the distribution of mean scores for individual items.

**Discussion**

The objective of this study was to determine the perception of educational environment among medical students at Taylor’s University and investigate if there is any difference in the perception between preclinical and clinical undergraduates. We also looked for any differences in perception based on demographics such as gender, the academic achievement at medical school and pre university studies. We aim to use the finding to identify aspects that may require
improvement in our educational environment in all domains both in the preclinical and clinical phase. The study was carried out at an opportune time in respect of this aim, as the major curriculum review was due the following year. Since the use of DREEM has shown proven benefits in many countries and many medical universities in Malaysia, we believe the findings of this study will contribute towards identifying strengths and weaknesses in our educational environment.

Overall scores
The overall mean DREEM score in the current study was 136.55/19.6. Which falls into the ‘more positive than negative’ category. This compares favourably with results from other medical universities locally and internationally. In a similar research in Malaysia at the International Medical University (IMU) the mean score was reported to be 133.12 which is in the same category as our score, but lower (Lai et al., 2009). In a study from Universiti Sains Malaysia (USM) the global total score was 117.9 which is considerably lower than ours (Arzuman, Yusoff and Chit, 2010). In Universiti Sultan Zainal Abidin (UniSZA) the mean DREEM score was 128.2 for preclinical and 127.5 for clinical students both of which are lower than ours (Rahman et al., 2015). A research from Management & Science University (MSU) total score was 125.3 (Al-Naggar et al., 2015). While the score of this study is the highest among Malaysian medical schools, it is in the same category with all others (101-150) which is ‘more positive than negative’; the interpretation, therefore, being that all Malaysian medical schools reporting DREEM scores have opportunities to further enhance their educational environment.

Internationally, our study finding of the overall score is also within the same range with other studies in the Germany (109.25), Brazil (146.81), New Zealand (141.4 ± 15.9)); 142.1 (± 16.2)) Pakistan (124.6 ± 21.3, 127.3 ± 19.3) Sri Lanka (108) (Farooq et al., 2018; Foster Page et al., 2011; Jiffry et al., 2005; Placa et al., 2015; Rotthoff et al., 2011).

The total mean score was not significantly influence by level of study, gender or pre-university studies. There was a significant difference between students with Grade ‘B’ and students with Grade ‘C’. This seems to be due to a highly significant difference in perception of atmosphere between these two groups. We are not aware of any other study, which showed this result.

Students’ perceptions of learning
The total mean score of this subscale (33.54±4.5) was in the “A more positive perception” category. A result from a local university, IMU was 32.84 which is similar to our result and one from Pakistan 30.4 (± 6.2) was in the same category although somewhat lower (Farooq et al., 2018; Lai et al., 2009). There was no difference in the mean score between preclinical and clinical students or between males and females. The scores were marginally higher in clinical students and in females. In spite of the fact that our preclinical and clinical students are based on two campuses with many different characteristics, learning appears to have taken place equally and satisfactorily. This indicates that there is no urgent issue that requires attention in our teaching and learning process. Students appear to be able to manage their workload effectively. The absence of a difference based on gender suggests that teaching learning processes are non-discriminatory to either gender. The mean scores were not significantly different in students with different academic achievement in medical school or different pre-university educational exposure. Similar score in all students irrespective of their grades may indicate a discrepancy between the perceived learning and actual learning among those with lower grades. Whether this is due to the learning processes provided by the School or due to an intrinsic characteristic of the lower achievers is not immediately apparent. Little information is available on this from previous studies with DREEM. Pre-university

| Table 6. Items with mean scores below 2.0 |
|------------------------------------------|
| Item Number | Item                                      | Mean scores |
|------------|-------------------------------------------|-------------|
| 25         | The teaching overemphasises factual teaching | 1.65        |
| 27         | I am able to memorise all that I need     | 1.94        |

| Table 7. Distribution of mean scores for individual question items |
|---------------------------------------------------------------|
| Mean scores | Number of question items |
|------------|--------------------------|
| Below 2.0  | 2                        |
| - < 3.0    | 34                       |
| ≥ 3.0      | 14                       |
Students’ perceptions of teaching
The score in this category of 31.13±4.9 in our study places it in the ‘Moving in the right direction’ category. A result from IMU is 30.50 which is within the same range while a study from result from Pakistan reported a score of 24.0 (± 5.0) in this domain (Farooq et al., 2018; Lai et al., 2009). In our study, there was statistically significant difference (p < 0.05) in the mean scores between pre-clinical and clinical students with the clinical students score being higher, although both scores remain in the same category. This may be a result of higher use of more didactic modes of teaching in the preclinical phase as compared to the clinical phase. Preclinical teaching is more classroom based with lectures taking up most of the teaching time. Even more student centered modes such as problem-based learning, practical and seminars are classroom based. Clinical teaching is mainly hospital based providing closer to real life situations and experiential or situational learning which are more conducive to adult learning. However, other studies have failed to demonstrate a statistically significant difference between preclinical and clinical studies in UniSZA (p =0.696) (Rahman et al., 2015). The interpretation is that the teaching is acceptable at all levels of our programme but there is still room for improvement. Thus, the faculty does not need urgent retraining. There was no difference between the scores based on gender, grades or pre-university education in this domain.

Students’ academic self-perception
The mean score for academic self perception was 21.98±3.8 which is interpreted as ‘Feeling more on the positive side’. This is comparable to the finding at IMU, Malaysia (20.60) but lower than that from a study in Pakistan (22.2 ± 4.3) (Farooq et al., 2018; Lai et al., 2009).

There was statistically significant difference (p<0.05) in the mean scores between pre-clinical and clinical students in this domain. It can be naturally understood that students gain more confidence in later year of medical school. In most Asian countries students start undergraduate medical studies immediately after high school level. Naturally, it would be expected that they take more some time to adapt to the high demands of the medical programme. Students are more mature when they reach clinical tears. Moreover the nature of the subjects in the preclinical year is more of a cognitive base, whereas in clinical years is more of understanding and application, which may facilitate one’s perception of achievement. However, many studies locally and overseas failed the demonstrate a difference between preclinical and clinical students (Rahman et al., 2015).

Students’ perceptions of atmosphere
The mean score for this subscale was 32.04±5.8, which is interpreted as ‘A more positive attitude’. This is comparable to findings in other studies - result from IMU being 31.95 and from Pakistan is 31.8 (Farooq et al., 2018; Lai et al., 2009).

There was no difference in scores in this domain between preclinical and clinical students or between males and females.

There was a statistically significant difference between the student with Grade ‘B’ and Grade ‘C’ in the most recent semester (p=0.007). We postulate that the high achievers (Grade A) are deep learners and are less likely to be affected by environmental conditions and student with low grades who are surface learners ignore the effect of atmosphere. For the average student there is a significant effect of atmosphere. We found a study from India, investigating academic achievement as a factor influencing perceptions of education environment (Miles, Swift and Leinster, 2012). They showed a difference between high achievers and low achievers. Interestingly, in our study the difference is between two groups of mid-achievers.

Pre-university studies had no influence on the scores in this domain.

Students’ social self-perceptions
The mean score in this subscale was 17.83±3.8 in our study. This is similar to the findings in a local study from IMU (17.22) and one from Pakistan (17.6) (Farooq et al., 2018; Lai et al., 2009). This is interpreted as ‘Not too bad’. We do not see any difference between male and female in our study, although a study in a local university, UniSZA, male students had a statistically significant (p=0.001) lower social self-perception when compared to females (Rahman et al., 2015). There are no differences between preclinical (17.20±3.8) and clinical (18.01±3.5) students in this domain in our study.

There is no difference among different groups based on grades and pre-university education.
Scores for individual items

For the individual questionnaires the highest mean score of 3.528 (SD 0.546) is question number 2 (the course organizers are knowledgeable). In our study this was the only item that had a score considered to be ‘excellent’ (>3.5). Several other studies have also reported this item to have the highest individual mean score. However, in these studies the responses did not place the item in the ‘excellent category. Studies with this finding include a similar study from UniSZA, Malaysia, where the highest. The mean score was also for the same item with the score of 3.39 (SD ±0. 568) and another study from Sri Lanka that had 3.26 as the mean score for the item (Jiffry et al., 2005; Rahman et al., 2015).

In our study, two items had mean scores of less than 2.0, placing them in a ‘negative’ or ‘requiring improvement’ position. The two items were: Item 25 - ‘The teaching overemphasises factual teaching’ (1.65) and Item 27. ‘I am able to memorize all I need’ (1.94). A similar finding was reported in the study at UniSZA which had the lowest score of 1.67 for Item 27 (Rahman et al., 2015). It is arguable whether the ability to memorize is a major necessity or even desirable in the medical curriculum. A counter argument would be that some facts require remembering and analysis and interpretation could not happen without factual knowledge. The phrase ‘.. all I need’ within the item probably supports the latter argument.

In this study, the majority of the items had scores in the ‘more positive than negative’ range. While this can be reassuring that the institution provides a reasonably conducive education environment for the students, it also indicates that there could be much more that can be done to provide an optimal environment. DREEM is not a tool that suggests how improvements can be made. It is left to the authorities and the faculty to devise possible means of improving the environment.

Conclusion

DREEM is a well established inventory in assessing the education environment. In our study overall perception as well as all scores for each subscale was in the satisfactory range. Score were similar to but marginally higher than in most Malaysian and overseas studies. The significantly higher scores for perception of teaching and academic self-perception in clinical students are expected, although not many other studies demonstrated this. Neither gender nor pre-university studies had an effect on the scores.

Although satisfactory, the results leave room for further enhancement of the education environment of our students. While there does not seem to be any urgency to bring about major changes immediately, future curriculum reviews need to focus on the possible means of further improvement.

Study limitations

Small sample size. The study does not represent all students from school of medicine. Being a cross sectional cohort study, we could not claim cause and effect relationship is absolutely true.

Take Home Messages

There could be a difference in perception of educational environment among the students. We should not underestimate the impact of student psychological wellbeing pertaining their performance.

Notes On Contributors

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Declarations
The author has declared that there are no conflicts of interest.

Ethics Statement
The research proposal was submitted to Taylor’s University Human ethics committee and was approved by the committee with the reference number HEC/2019/038. Approval of the Human Ethics Committee of Taylor’s University was obtained prior to the commencement of the study.

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Migrated Content

Version 1

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Ken Masters
Sultan Qaboos University

This review has been migrated. The reviewer awarded 3 stars out of 5

An interesting paper on undergraduate medical students' perceptions of the educational environment at Taylor's University, using the DREEM tool. Overall the paper is well-written, although the authors do need to take into account the errors and suggestions of the other reviewers. The main weakness of the paper is in the reflection of the results. The paper lays a good grounding by comparing their results to other local and international schools, but then, apart from one or two minor comments, end it there. The comparison with other schools only is a weakness, as (unless things were a complete disaster), it would be relatively easy to find studies showing a lower score. Without reference to a more detailed literature review, the authors could be accused of cherry-picking. In addition to this, however, the greatest value of the study would be in the reflection of why. It is obvious that the school has done some things right. The importance there is to reflect on why and how those things worked (so that lessons and principles could be applied elsewhere). Simultaneously, for the areas where things are not working (notably on factual learning). The authors have rather side-stepped this issue by finding a university that had a lower score than theirs (cherry-picking?) and a reader would be tempted to ask: what about all those other studies that you cited on the other points? What do they show? More worrying is the fact that the authors give the impression of simply shrugging their shoulders at this. Given that the idea of the study is to improve and strengthen, it would have been useful if the authors could have given some more pointers, rather than simply says that it is up to the authorities. Perhaps what would have strengthened the value of the research would have been qualitative work (interviews and focus groups), because, frequently the problem is not so much the activity of the school, but the students' perception, and this may have been influenced by many things. So, I would like to see a version 2 of the paper in which some of these concerns are addressed (one cannot run the qualitative study now – perhaps that can be an opportunity for another paper).
Competing Interests: No conflicts of interest were disclosed.

Reviewer Report 26 March 2020

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Deb Halder

This review has been migrated. The reviewer awarded 3 stars out of 5

Title, Abstract and Referencing
This paper tends to make an evolutionary study between students’ perception and educational environment in order to designate how educational affects learning. But the very term ‘Study’ beginning with the title fosters redundancy of insertion as a research paper studies in general sense. Again, the clause ‘students’ perception of educational environment are a key to improve our teaching and learning environment’ uses personal pronoun ‘our’ which posits lack of impersonality of the interpretation of the results and it raises a question of ‘who’ this ‘our’ is basically targeted. The references used for this study are convincing with the aims and objectives of the study though a few references like Roff, S., McAleer, S., Harden, R.M., Qahtani, M.A., et al. (1997) are old fashioned as the environment of educational institution and their measurement change with the change of time due to rapid advancement of information and technology.

Introduction and Background
Background of this study presents rationale of this initiative. But this part along with introduction fails to highlight the identification of variables, positioning the research question and exhuming the hypothesis of the study. Again, the educational environment includes both the physical environment and psychological environment; the latter of which is often overlooked- this very sentence has posited two ideas which have not been justified with referencing. Again, the exposition of the paper cannot affirm what the educators should do without evaluating findings.

Methodology
The methodology section has covered almost all the criteria used as the research methods for this targeted paper. But it lacks proper order, as the title ‘Method’ precedes ‘Methodology’ which harms academic construction of a paper. The discussion under the title ‘Method’ should be research instrument. There is also confusion in sampling while it says ‘Total of 87 clinical students and 165 clinical students’. This paper does not say which scale the paper choses to interpret the result (as ratio or nominal etc.).

Results and Discussion
The results have been presented with tables and it follows categorical progression. Graphs and charts claim appropriateness for better interpretability of the results. Discussion of the result has been made on comparative study. But the intervention of various results from the institutions of various countries could have been justified previously at a literature review part of the paper so that the paper could have provided with preconception what this paper had intended to reveal.

Conclusion, Implication and Recommendation
This paper does not highlight what the implication this result presents for future educational thought. Conclusion must have more analytic than descriptive and a well knitted recommendation adds strength
to the wholeness of the paper. Only result is not that much important for academic research. The proper judgment for that speculation should be done through proper synchronization of all important parts which a paper must covers as crucial.

**Competing Interests:** No conflicts of interest were disclosed.

**Reviewer Report 18 March 2020**

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**P Ravi Shankar**
American International Medical University

This review has been migrated. The reviewer awarded 4 stars out of 5

Thank you for the invitation to review this manuscript. The manuscript is well-written and well organized. The authors have described their medical school and the medical program adequately. They have compared their findings with those noted at other medical schools in Malaysia and other locations. The authors could explain the pre-university academic qualifications in greater detail as they are confusing for the international reader. The authors do mention about differences in pedagogy between the preclinical and the clinical years which can be explained in greater detail. Are there any other differences in the educational set up between these two phases of the program? The authors mention small sample size as a study limitation. Can this be explained? Are there any other limitations? The quality of written English is very good. In a few places there are a few minor errors which can be corrected. This article will be of broad interest to all medical educators.

**Competing Interests:** No conflicts of interest were disclosed.