MAKERERE UNIVERSITY

THE PERCEPTION OF UNDERGRADUATE STUDENTS STUDYING ANATOMY ABOUT THEIR EDUCATION ENVIRONMENT IN THE COLLEGE OF HEALTH SCIENCES, MAKERERE UNIVERSITY

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DECLARATION

I WAMBAKA Bill declare that the work presented in this dissertation is my original work and has never been presented to any institution before for any award. I, therefore, present it for the award of a Master of Science in Health Professions Education of Makerere University, Kampala.

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LIST OF ABBREVIATIONS

COVID-19 –Coronavirus Disease of 2019

CAID –Cronbach's Alpha if Item Deleted

CITC Corrected Item-Total Correlation

DCA - Domain Cronbach's Alpha

DREEM –Dundee Ready Education Environment Measure

IPE –Interprofessional Education

MakCHS –College of Health Sciences, Makerere University

MBChB – Bachelor's degree in medicine and surgery

MNRH –Mulago National Referral Hospital

MoH –Ministry of Health

PBL –Problem-based learning

SASP –Students' academic self-perceptions

SCT –Social Cognitive Theory

SLT –Social Learning Theory

SOMREC –School of Medicine Research and Ethics Committee

SPL –Students' perception of learning

SPT –Students' perceptions of teachers

SPA –Students' perception of atmosphere

SSSP –Students' social self-perception.

UNCST –Uganda National Council for Science and Technology

WFME –World Federation for Medical Education

OPERATIONAL DEFINITIONS

Curriculum – All the scheduled learning activities through which a learner will systematically progress during their period of study to achieve the desired learning competences (Rogers, 1996).

Education climate – This refers to the perception of the education environment (Genn, 2001).

Education environment – The physical, social, and psychological context within which learning occurs (Sabbott, 2013).

Perception − the way someone thinks about or understands someone or something (Perception Definition & Meaning | Britannica Dictionary, n.d.)

Interprofessional education –Teaching approach where students from two or more professions learn about, from, and with each other (WHO, 2010).

Nontraditional student –A student that has studied a different course prior to medical school that is not considered part of the direct preparation for medical school studies (Non-Traditional Medical School Applicants, 2022; Nowak, 2019).

Reliability – A measure of consistency of results produced by a test (McLeod, 2013).

Validity – Refers to well the results obtained from study participants correspond with the actual findings among similar individuals outside the study (Patino & Ferreira, 2018).

Undergraduate –a student pursuing a bachelors' degree qualification.

Basic medical sciences – Refers to the subjects of anatomy, physiology, biochemistry, pathology, microbiology, genetics, pharmacology, epidemiology, and related sciences that are a prerequisite to thorough understanding of clinical and public health sciences (Basic Medical Science and Next Generation Medicine, 2018; Basic Medical Sciences, n.d.).

Clinical clerkship/rotation –This is usually the last stage in training where medical students rotate through different specialty and hospital settings, allowing them to be active participants in patient care, under the supervision of medical specialists (What Is Clinical Clerkship | IGI Global, n.d.).

ABSTRACT

Introduction: Students' perception of their education environment is fundamental for successful curriculum design and implementation. The recommended tool for its measurement in undergraduate medical education is the Dundee Ready Education Environment Measure (DREEM). In the College of Health Sciences, Makerere University (MakCHS), this had not been studied among preclinical students. Research Questions: 1) What is the perception of undergraduate students studying anatomy about the education environment in the College of Health Sciences, Makerere University? 2) What is the validity and reliability of the DREEM tool when used in measuring the perception of undergraduate students studying anatomy about their education environment in the College of Health Sciences, Makerere University?

Objectives: 1) To determine the perception of undergraduate students studying anatomy about the education environment in the College of Health Sciences, Makerere University. 2) To determine the validity and reliability of the DREEM tool when used in measuring the perception of undergraduate students studying anatomy about their education environment in the College of Health Sciences, Makerere University.

Methods: This was a cross-sectional study. The study population was students in MakCHS studying anatomy in first and second year. Data was collected using the DREEM inventory and analysis was done using Stata Statistical package, version 17.0.

Results: The overall DREEM score was 114 (more positive than negative). Cronbach's alpha showed excellent reliability (0.91) but the original 5-factor model of the DREEM did not demonstrate model fit with confirmatory factor analysis. Model fit was only achieved after item reduction to an abridged version of 19 items with a good Cronbach's alpha of 0.89.

Conclusion: The students perceived the education environment as more positive than negative. Although the internal reliability of the DREEM tool was satisfactory, its construct validity was sub-optimal. The DREEM inventory remains a valuable measure of the education climate even in the context of Uganda where this study was conducted.

CHAPTER ONE: LITERATURE REVIEW

1.1 Background

In the fundamental "Ten questions to ask when planning a course or curriculum", Harden (1986) explicitly identified the education environment as a cornerstone that should be carefully monitored in medical education. Measurement of this education environment has been adopted by many reputable medical schools worldwide, so much so that some institutions routinely assess it as part of monitoring-and-evaluation of their education service (Miles et al., 2012). This, the education environment, is the manifested representation of a renowned archetypal description of academia – the curriculum (Genn, 2001). Rogers (1996) described the curriculum as the incorporation of all the scheduled learning activities through which a learner will systematically progress during their period of study to achieve the desired learning competences. This can be broadened to include all activities happening in an institution from the level of the classroom to the level of the entire institution (Stenhouse, 1975). Specifically, the education environment is defined as the "physical, social, and psychological context" within which learning occurs (Sabbott, 2013). It is sometimes referred to as the learning environment (Harden, 2001; Hutchinson, 2003; Shochet et al., 2013; WFME, 2020). It is the perception of this education environment that is termed the education climate (Genn, 2001). This perception, the education climate, influences student behavior and, consequently, the level of academic achievement (Ahmed, Taha, Al-Neel, et al., 2018; Genn, 2001). It is critical, therefore, in the pursuit of student-centered learning because it incorporates the contribution of the actual consumer of the education service –the student– in decision-making concerning their learning (Miles et al., 2012).

The Dundee Ready Education Environment Measure (DREEM) is a renowned tool for measuring students' perception of the education environment (Roff et al., 1997). Although it is reliant on the subjective opinions of students, it has remained particularly informative because it is these perceptions that influence actual student behavior which in turn affects academic performance and students' satisfaction with their programme of study (Genn, 2001). It is currently prescribed for use in undergraduate medical education. It has been used in various countries worldwide (Khan et al., 2011; Miles et al., 2012) including multiple African countries in sub-Saharan Africa (Ahmed, Taha, Alneel, et al., 2018; Ogun et al., 2018). In the region, these include the medical schools of Gezira University, International University in Uganda and University of Nairobi (Ahmed, Taha, Alneel, et al., 2018; Aisha et al., 2017; Ojuka et al., 2021). In Uganda, only two published studies have been conducted using the DREEM: one (described

below) was conducted in Makerere University (Kagawa et al., 2021) and another was conducted among first year undergraduate medical students in Islamic University in Uganda (IUIU) (Aisha et al., 2017). The reported findings of the above studies were primarily positive with some room for improvement. Of all the studies conducted in Uganda and surrounding regions using the DREEM tool, none comprehensively assessed the psychometric properties of the tool.

In the College of Health Sciences, Makerere University (MakCHS), the education environment was measured among undergraduate medical students doing hospital placements in 2016 (Kagawa et al., 2021). Similarly, the findings showed a more positive than negative perception of the education environment. Since the conduction of this study, the college revised the medical school curriculum and adopted earlier introduction of clinical rotations (third versus fourth year). This meant that the duration for studying basic medical sciences was reduced from three to two years and that clinical rotations were increased to spread over a period of 3 years in contrast to two previously. These changes, however, never affected the already existing early clinical exposure that is offered to students throughout their study of the basic medical sciences as part of vertical integration in the problem-based learning (PBL) strategy which the college implements. Implementation of this revised curriculum started in 2016. Other modifications were introduced during the COVID-19 pandemic in 2021 (Olum et al., 2020). These included incorporation of online teaching approaches in the overall teaching strategy and halting early clinical exposure for students studying basic medical sciences as measures to reduce the spread of the disease at the time. These changes primarily affected the first two years of medical school during which students study basic medical sciences. It was also these same years-of-study whose education environment had never been assessed in MakCHS. The purpose of this study, therefore, was to assess the perception of undergraduate students studying anatomy about the education environment at the College of Health Sciences, Makerere University and to determine the validity and reliability of the DREEM tool in the context of MakCHS.

1.2 Problem Statement

In order to achieve a quality and relevant medical education service, it is important to constantly develop new, and improve old, teaching practices in medical schools. One fundamental way of doing this is by incorporating the students' voice regarding their learning through the assessment of their perception of their education environment. This assessment has been very informative in diverse settings worldwide (Genn, 2001; Miles et al., 2012; Roff, 2005) and in the East African Region (Ahmed, Taha, Alneel, et al., 2018; Aisha et al., 2017; Ojuka et al., 2021). In the context of Makerere University, the College of Health Sciences (MakCHS) has revised its undergraduate medical curriculum several times in order to improve its quality of medical education (Kiguli-Malwadde et al., 2006, 2014) with the last revision being in 2016. Although the measure of the educational environment is fundamental in guiding this process (Genn, 2001; Harden, 1986), there hasn't been any explicit demonstration of that in the preceding curriculum revisions. When the perception of the education environment among undergraduate medical students in MakCHS was evaluated in 2016 (Kagawa et al., 2021), two particularly worrying subscales in the DREEM needed to be improved: the social self-perception and perception-of-atmosphere subscales. That measure, however, only assessed students doing clinical rotations and it was, therefore, not known whether students studying basic medical sciences would express similar concerns. From the time of that study, the college made two major curriculum modifications, that significantly affected the first two years of medical school. The first was reduction of the duration-of-study of basic medical sciences from three to two years with corresponding increase of the duration-of-study of clinical rotations from two to three years. The second was incorporation of online teaching methods in the previously face-to-face teaching approach and halting early clinical exposure among preclinical students as mitigation measures against spread of COVID-19. The effect of these two changes, especially on students studying basic medical sciences, was not known. In addition, the perception of the education environment among undergraduate students studying basic medical sciences in MakCHS was still not known. The subject of anatomy stands peculiar among the basic medical sciences because it has been reported to have a relatively high intrinsic cognitive load (Qiao et al., 2014) and has remained controversial on the modern and innovative teaching strategies like problem-based learning that is used in MakCHS (Bergman et al., 2013). It was, therefore, critical that an assessment of the perception of the education environment by undergraduate students studying anatomy in MakCHS be conducted to address this knowledge gap and inform future decision-making.

The available literature recommends users of the DREEM inventory to conduct preliminary assessment of its psychometric properties because of inconsistences that had been reported about this tool in certain contexts (Hammond et al., 2012; Jeyashree et al., 2018; Saiful & Yusoff, 2012). Although this inventory has been used before in Uganda, there is no available literature about its validation for the context of Uganda or neighboring areas. In this research, I assessed the perceptions of the education environment by undergraduate students studying anatomy in MakCHS and conducted psychometric appraisal of the DREEM tool in the context of MakCHS, Uganda.

1.3 Research Questions

1. What is the perception of undergraduate students studying anatomy about the education environment at the College of Health Sciences, Makerere University?
2. What is the validity and reliability of the DREEM tool when used in measuring the perception of undergraduate students studying anatomy about the education environment at the College of Health Sciences, Makerere University?

1.4 Research Objectives

1. To determine the perception of undergraduate students studying anatomy about the education environment at the College of Health Sciences, Makerere University.
2. To determine the validity and reliability of the DREEM tool when used in measuring the perception of undergraduate students studying anatomy about the education environment at the College of Health Sciences, Makerere University.

1.5 Significance

Makerere University, similar to other universities in Sub-Saharan Africa, suffers from limited resources. It is therefore imperative that these resources be prioritized to address specific pressing needs within the College of Health Sciences. The measure of the education environment will help identify these priority areas of need and hence inform appropriate decision-making to optimize resource utilization for a better medical education service.

1.6 Justification

Establishing the measure of the education environment will contribute in guiding future curriculum revisions. Validating the DREEM tool will authenticate the use of the tool for further study of education environment within the studied population or closely related contexts. This will in turn contribute to holistic improvement of education climate thereby

improving the competency of the medical personnel trained by the institution for local and international contribution in healthcare.

1.7 Conceptual Framework

The education climate consists of four components i.e. faculty, students, administration and physical features in the school. Each of these in turn has diverse factors that influence their contribution to the education climate. It is the combined contribution of these components that comprehensively defines the education climate (Genn, 2001a). This relationship is illustrated in Figure 1.1 below.

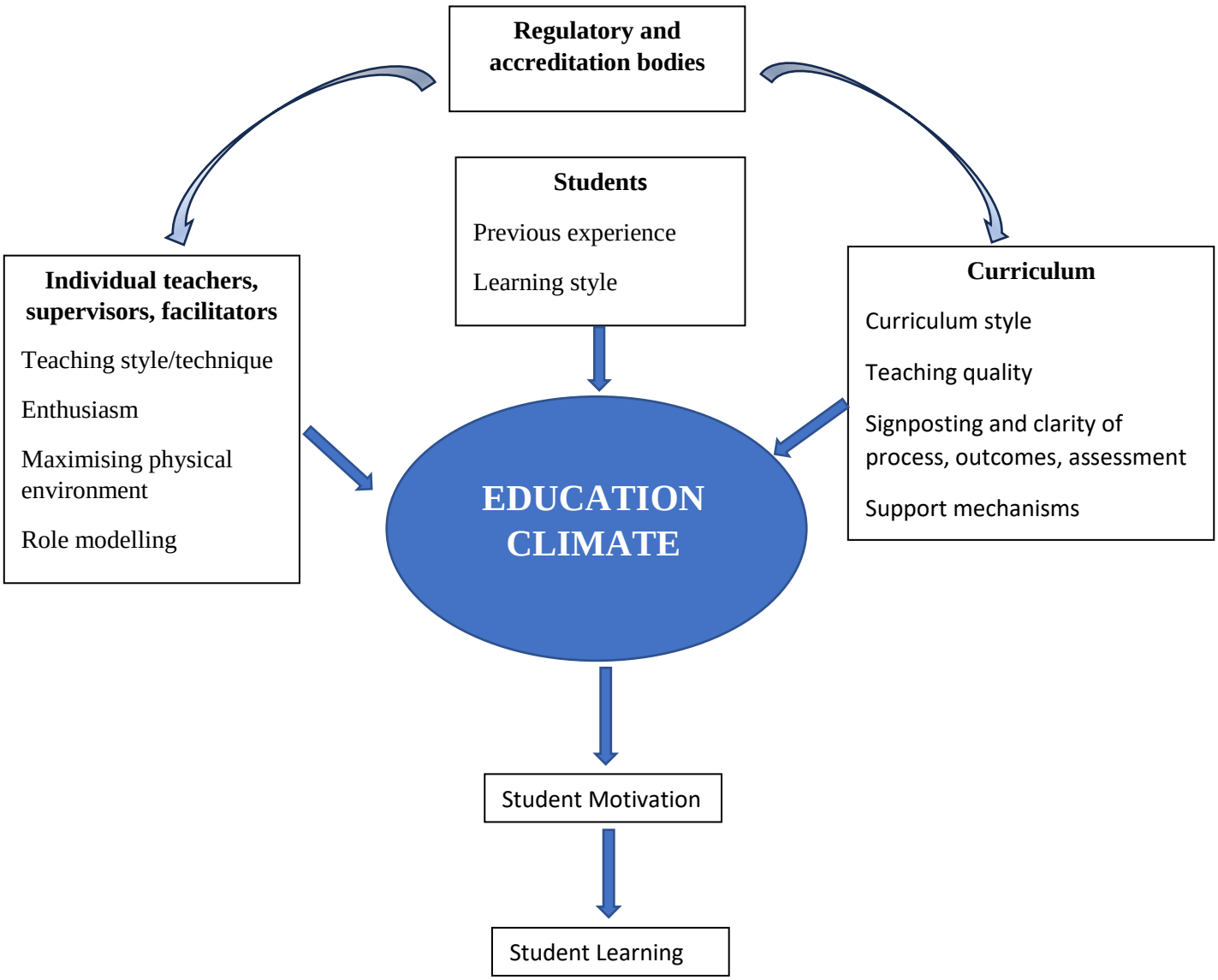

Figure 1.1: Factors that influence the education climate and learning, modified from Hutchson (2003)

CHAPTER TWO: LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Education environment

The education environment, sometimes referred to as the learning environment (Harden, 2001; Hutchinson, 2003; Shochet et al., 2013; WFME, 2020), is one of a few closely-related terms that are commonly used in medical education. The most familiar one, and renown at any level of formal education, is the curriculum. This was initially viewed as an elaboration of the content for a specific programme of study to be taught to students (Rogers, 1996). Rogers further elaborates, however, how this description has gradually transitioned into a more comprehensive one that incorporates all the scheduled learning activities through which a learner will systematically progress during their period of study to achieve the desired learning competences. The education environment on the other hand encompasses the "physical, social, and psychological context" within which learning occurs (Shochet et al., 2013). Genn (2001) clearly elaborates how the perception of the education environment, termed the education climate, is the realistic representation of the curriculum and education environment. The education climate has been found to influence academic performance of students in medical education (Ahmed, Taha, Al-Neel, et al., 2018; Genn, 2001).

Measurement of the education climate is a new undertaking in Uganda and the East African region with only a few published studies available. One study was conducted in the College of Health Sciences, Makerere University (MakCHS) in 2016 by Kagawa et al. (Kagawa et al., 2021). It assessed the perception of the education environment by medical students doing hospital placements. They found the perception more positive than negative because of having unrestricted access to many patients and a diversity of patient conditions as well as knowledgeable lecturers. They, however, reported overcrowding and stressful learning atmosphere as particular challenges that needed to be addressed. The under-performing subscales were the students' social self-perception and the students' perception of atmosphere. At about the same time, an Arabic version of the DREEM was used to measure education climate in Faculty of Medicine, Gezira University (FMGU) (Ahmed, Taha, Alneel, et al., 2018). This also reported a more positive than negative environment but identified problems with subscales of students' perception of learning and with the students' social-self-perception. In the same institution, FMGU, the students' perception of the education environment was compared to their academic performance and found that students with higher academic achievement had more positive perceptions regarding their education, while low-achieving

students had more negative perceptions of education (Ahmed, Taha, Al-Neel, et al., 2018). Another assessment of the education environment among medical students doing clinical rotations in University of Nairobi was conducted in 2019 and reported, rather, worrying findings (Ojuka et al., 2021). Although the students perceived their teachers as knowledgeable, a finding that was consistent with the preceding studies above, education environment was generally perceived to have multiple challenges that spread across most of the subscales. A second study in Uganda was conducted in the Habib Medical School of the Islamic University in Uganda (IUIU) but this time assessing perceptions of first year medical students (Aisha et al., 2017). Of note, this institution is a private university and at the time of that study, the medical school had been in place for only 3 years. This study also reported a more positive than negative environment and, in keeping with the studies described above, had its lowest scores in the social self-perception subscale. Although similar results have been reported in other studies (Irfan et al., 2019; Ogun et al., 2018), there is plenty of literature reporting more positive findings in the social self-perception subscale in various institutions across the world (Bakhshialiabad et al., 2015; Hongkan et al., 2018; Pinnock et al., 2011). One particular study reported their highest score in the social self-perception (María et al., 2020). There was good internal consistency in the above studies as illustrated by their high Cronbach's alpha coefficients of: 0.914, 0.88 and 0.882 from studies in FMGU, IUIU and University of Nairobi respectively. The perception of the education environment by undergraduate students studying basic medical sciences of MakCHS had not been studied or reported in the available literature.

2.1.2 Basic Medical Sciences

Following Flexner's report in 1910, basic medical sciences were prescribed as a mandatory core that would provide a suitable foundation for subsequent clinical training in medical practice (Duffy, 2011). This resolution, consequentially, divided medical education into two phases –basic medical sciences (preclinical) and clinical sciences– a subdivision that persists to date (Mbiydzenyuy & Chisompola, 2021). Basic medical sciences traditionally refer to the subjects of anatomy, physiology, biochemistry, pathology, microbiology, genetics, pharmacology, epidemiology, and related sciences that are a prerequisite to thorough understanding of clinical and public health sciences (Basic Medical Science and Next Generation Medicine, 2018; Basic Medical Sciences, n.d.). Sibbald & Neville (2016), however, recognize inclusion of other foundational subjects like behavioral and social sciences among the basic medical sciences. In an endeavor to improve application of basic sciences in clinical contexts, and to reconcile the large amount of information obtained from basic medical science

research with what is directly relevant in clinical practice, vertical integration came in handy in medical curricula (Mbiydzenyuy & Chisompola, 2021; Sibbald & Neville, 2016). Vertical integration involves maintenance of a relevant balance of preclinical and clinical learning throughout medical education i.e., preclinical students get clinical exposure to actual patients while students doing clinical rotations continue taking relevant classes in the basic medical sciences. Vertical integration smoothens the transition from basic medical sciences to clinical training through early introduction of clinical exposure (Wijnen-Meijer et al., 2020). This establishes a balance between basic medical sciences and clinical sciences that is carefully regulated throughout the students' progress in the medical school. Among these basic medical sciences, anatomy stands-out because it has been found to have a high intrinsic cognitive load (Qiao et al., 2014). In addition, students' academic achievement in anatomy has remained relatively unresponsive to innovative education strategies like problem-based learning (Bergman et al., 2013). In MakCHS, the basic medical sciences are learnt jointly by a composition of students from different programs as expected in interprofessional education (IPE). The learning incorporates elements of vertical integration described above.

2.1.3 Diversity, Equity and Inclusion in medical education

The emphasis of equity and diversity in medical school admissions by World Federation for Medical Education (WFME) (2020) has translated into increased admissions of nontraditional medical students. These are students that have studied a different course (that is not considered part of direct preparation for medical school) before joining medical school and are typically older at the start of medical school (Non-Traditional Medical School Applicants, 2022; Nowak, 2019). In the context of Makerere university, this includes students that are admitted through the mature entry scheme; all those that completed diploma training in allied health disciplines; and those that had a different bachellor's degree qualification prior to starting study for achievement of another bachelor's degree qualification e.g., MBChB.

This diversity in students is fundamental because it equips them with the necessary skills for effective healthcare delivery in the ever-increasing heterogeneous contexts that they are being trained to work in (Fernandez, 2019; Saha et al., 2008). These students, however, need to have an equitable and inclusive education experience during studies in order to yield the desired benefits of this undertaking (Bollinger, 2003). For this purpose, some universities have adopted a flexible curriculum with alternative paces-of-study to ease and optimize performance in students that would otherwise find it more difficult to progress through medical school (Agan & Casarez, 2018; Arvidson et al., 2015). In a study measuring education climate among

students studying different health programmes, it was found that programmes that used integrated curricula had a significantly better perception of the education environment than those that were not integrated (Irfan et al., 2019). Although the College of Health Sciences has demonstrated interest to increase student diversity in the college through the more inclusive admission criteria, it still implements a uniform, rather rigid, curriculum to all students. It was not clear how the education climate of these diverse students varied under these circumstances.

2.2 Assessment of the learning environment

2.2.1 Background of the DREEM tool

The DREEM tool was published in 1997 to measure education environment in medical institutions by using students' perceptions. It was developed in consultation with 78 medical and health profession educators from various countries worldwide using the Delphi technique (Roff et al., 1997; Roff & McAleer, 2001). It was soon labeled a generic instrument that was deemed nonculturally specific (Roff, 2005) because of its widespread effectiveness across various countries worldwide. It was eventually established as the instrument of choice in undergraduate settings and was been translated into multiple languages to that effect (Miles et al., 2012).

2.2.2 Validation of the DREEM tool

The DREEM tool has been validated for use in many countries worldwide (Gosak et al., 2021; Khan et al., 2011; Pinnock et al., 2011). However, a few studies have raised concerns about its construct validity, and in some studies, reliability (Hammond et al., 2012; Jeyashree et al., 2018; Saiful & Yusoff, 2012). This variability could possibly arise due to gaps in translation of the questionnaire into other languages. In response, some authors have explored the possibility of reducing the number of items assessed in the questionnaire to optimize the performance of the instrument (Jeyashree et al., 2018; Koohpayehzadeh et al., 2014; Saiful & Yusoff, 2012). Two abridged versions of the DREEM tool have been proposed by Jeyashree (2018) and Saiful & Yusoff (2012) consisting of 12 and 17, instead of 50, items respectively. These versions have not yet been used in sub-Saharan Africa or other parts of the world. Some authors have, however, discouraged the development of shortened versions (Hammond et al., 2012). In Africa, no published studies were found to have explored validation of this test despite using the instrument in multiple countries. Although not yet studied in MakCHS, internal reliability has been found to be good in various studies in the region (Ahmed, Taha, Alneel, et al., 2018; Aisha et al., 2017). It is, therefore, incumbent upon the users of the

DREEM instrument to test its psychometric performance when the tool is used in a new context.

2.3 Theoretical Framework

This study was constructed on the principles of the social cognitive theory (SCT). This theory explores mental thought processes as an explanation of learning in what was originally described by Bandura as the social learning theory (SLT). The SLT asserts that learning can occur through observation of others peoples' behaviour (and the ensuing consequences). Learning, according to this theory, can, therefore, occur without change in behavior and is not limited to actual behaviour exhibited by the specific individual in response to environmental stimuli (as implied in behaviorism)(Bandura, 1986). The SCT, adds to the SLT by introducing thought processes in its holistic explanation of how learning occurs. The SCT is typically characterized by an interplay of three determinants: the environment, the person, and behaviour (Ormrod, 2012). In regard to education environment, this translates into a relationship between student attributes, their environment and student performance. A concept that stands-out in the SCT is that of self-regulation. It is this, self-regulation, that underpins the diverse innovative teaching strategies used in medical education today (Loeng, 2020; Spencer & Jordan, 1999; Towle & Cottrell, 1996).

CHAPTER THREE: METHODS

3.1 Study Design

This was a cross-sectional study with a quantitative approach.

3.2 Study Setting

The College of Health Sciences, Makerere University (MakCHS) is situated on Mulago Hill, Kampala, Uganda. It is neighboured by Mulago National Referral Hospital (MNRH) which, in addition to being the national referral hospital, also serves as the college's teaching hospital. The institution trains healthcare personnel in diverse medical and surgical subspecialties, in addition to dentistry, emergency medicine, pediatrics, and intensive care. In order to achieve this, the college incorporates interprofessional education (IPE) within the overall teaching strategy of Problem-based learning (PBL) during the first two years of study. In this approach, students studying different programmes learn "with, from, and about" each other (WHO, 2010). During this period, students learn basic medical sciences that include: anatomy, biochemistry, cell biology, genetics, histology, immunology, microbiology, neuroscience, behavioral science, pathology, pharmacology, and physiology. They also study other subjects that include: leadership and management, professionalism and ethical practice, communication and interpersonal skills, among others. The programmes that study together include: bachelor's degree in medicine and surgery, dental surgery, pharmacy, nursing, biomedical sciences, optometry, medical radiography, cytotechnology, speech and language therapy and dental laboratory technology. These programmes share varying course units with each other depending on the desired learning outcomes of the individual programmes. For example, the first five programmes mentioned above share almost all course units in the first two years while the remaining programmes only share a few course units with the others. The studying is primarily conducted within the MakCHS premises i.e., lecture theatres, laboratories, tutorial rooms et cetera. Prior to the COVID-19 pandemic, students studying basic medical sciences also had sessions of clinical exposure in MNRH, where they observed real-time patient care in hospital. This was intended to provide context for the learning of biomedical sciences and demonstrate their relevance in medical practice. The college also implements a Community-based Education, Research and Service (COBERS) programme where students are posted to diverse, primarily rural, health facilities across the country. At these facilities, students continue their learning within both the health facilities and the community. They develop a project proposal and implement it in the community during these placements. This is aimed at

preparing students to learn in contexts within which they will eventually practice after graduation.

3.4 Study Participants

Target population: undergraduate students studying anatomy in MakCHS. Study population: undergraduate students in first- and second-year studying the anatomy in MakCHS. The study enrolled undergraduate students in first-and-second year that had course units in anatomy. These included students pursuing a bachellor's degree in medicine and surgery, dental surgery, pharmacy, nursing, biomedical sciences, optometry, medical radiography, cytotechnology, speech and language therapy and dental technology. All potential participants were approached to participate in the study.

3.5 Selection of Study Participants

3.5.1 Eligibility Criteria

Eligible participants were undergraduate students in MakCHS studying anatomy in year one or year two. This included student pursuing bachelor's degree in medicine and surgery, dental surgery, pharmacy, nursing, biomedical sciences, optometry, medical radiography, cytotechnology, speech and language therapy and dental technology. Participants should have completed at least one semester in the medical school.

3.5.2 Exclusion Criteria

The study excluded students studying programmes that did not share any other course units with the rest of the programmes in the College of Health Sciences, Makerere University (MakCHS) under the inter-professional education (IPE) system. This included programmes like bachelor of environmental health science and bachelor of biomedical engineering.

3.6 Sample Size Estimation

In order to obtain an absolute sample size that was consistent with recommendations by Comrey and Lee (1992), the required sample size was computed using a common rule for factor analysis i.e. 10 participants for every item on the DREEM Questionnaire (Everitt, 1975). This resulted in a total estimated sample of 500 because the DREEM questionnaire has 50 items. Another 50 participants (10%of initial sample) were added to cater for incompletely filled questionnaires. The final estimated sample size for the study was 550 participants. Sampling adequacy was confirmed using The Kaiser–Meyer–Olkin (KMO) test.

3.7 Sampling Procedure

This was achieved with stratified random sampling in order to maintain the general demographics of the study population. Stratification was done using the programme of study i.e., the number of participants chosen per programme corresponded with their proportion in the entire class. The department of anatomy was consulted and a comprehensive list of undergraduate students from eligible programmes studying anatomy in MakCHS was obtained. This list was used to compute the percentile contribution of each programme to the provided comprehensive list of students. These percentages of the actual population were, in turn, used to compute the corresponding number of students from each programme in order to total to the target sample of 550 students. After obtaining the absolute number of students per programme, the pool of students was randomized per programme to identify students that would be approached to participate in the study. This was done by generating random numbers for each participant according to their programme of study and ordering these numerically. If a student who was selected using the above procedure was found not to be interested to participate in the study, the next participant on the randomized list was approached and asked for possible participation in the study in order to achieve the desired sample targets per programme.

3.8 Study Variables

Independent Variables: Year of study, programme of study, age, sex, sponsorship, area of residence, education background, marital status and nationality.

Dependent Variables: perception of learning, perceptions of teachers, academic self-perception, perception of atmosphere social self-perception

3.9 Study Procedure

After obtaining approval from the School of Medicine Research and Ethics Committee, 3 research assistants were trained by the principal investigator on the study protocol and how to collect the data. The questionnaire was pre-tested on 5 eligible students (as per eligibility criteria above) to assess ease of usage in the target population. No issues were identified during the pre-testing and therefore no additional modifications were made on the data collection questionnaire. Potential participants were approached from each class and after obtaining written informed consent, a copy of the questionnaire was given to the participant to be completed and returned that same day. However, many students returned the questionnaires the next day.

3.10 Role of Principal Investigator

The principal investigator recruited and trained the research assistants. He also ensured that informed consent was obtained and confidentiality of data was achieved (see 3.16 Ethical Considerations). He oversaw and supervised the entire research process.

3.11 Data Collection Tool

3.11.1 General Description

The DREEM tool was used to assess education environment. The DREEM consists of five subscales: students' perception of learning; students' perceptions of teachers; students' academic self-perceptions; students' perception of atmosphere and students' social self-perception. These subscales have 12, 11, 8, 12 and 7 statements respectively to make a total of 50 statements. They were randomly arranged in the questionnaire independent of the sub-scale that they belonged to. The level of agreement with each of the statements was scored on a five-point Likert scale with values ranging from zero to four as follows. "Strongly disagree" is scored zero, "Disagree" is scored one, "Unsure" is scored two, "Agree" is scored three while "Strongly agree" is scored four. The negative statements were scored in a reverse order. As such, a higher score signified a more positive perception of the education environment.

3.11.2 DREEM Tool modifications

In order to collect accurate data during this study, the following modifications were made on the DREEM tool. It was this modified DREEM tool that was pre-tested as described in section 3.9:

- The word teacher was replaced with lecturer because that was the common contextual reference to teachers in the College of Health Sciences, Makerere University.
- Statement 26 was modified from "Last year's work has been a good preparation for this year's work" to "Last semester's work has been a good preparation for this semester's work". This was because the study population included first year students who had not yet started their undergraduate studies the previous year but had completed at least a semester in the medical school

3.11.3 Guideline for interpretation of results

The DREEM can identify specific strengths or weaknesses within the educational environment. To do this, the individual items were summed and averaged to get a mean score per item. These were interpreted as follows: mean score of ≥3.5 suggested a strong area; mean score of <2.0

implied problem areas that needed particular attention; while mean scores between 2 and 3 represented areas that may be improved (McAleer & Roff, 2001).

Interpretation of DREEM subscale scores

Subscale score	Interpretation
Students' perception of learning	
0-12	very poor
13–24	teaching is viewed negatively
25–36	a more positive approach
37–48	teaching highly thought of
Students' perception of teachers	
0-11	abysmal
12–22	in need of some retraining
23–33	moving in the right direction
34–44	model teachers
Students' academic self-perception	
0-8	feeling of total failure
9–16	many negative aspects
17–24	feeling more on the positive side
25–32	confident
Students' perception of atmosphere	
0-12	a terrible environment
13–24	there are many issues that need changing
25–36	a more positive atmosphere
37–48	a good feeling overall
Students' social self-perception	
0-7	miserable
8–14	not a nice place
15–21	not too bad
22–28	very good socially

The total of the five subscales generated the overall score and this was interpreted as: very poor for score of 0-50; plenty of problems for a score of 51-100; more positive than negative for a score of 101 – 150; and excellent for a score of 151 – 200. Effect size was assessed using Cohen's d and was interpreted as follows: 0.2 -small, 0.5 - medium, 0.8 - large, 1.3 - very large (Sullivan & Feinn, 2012).

For factor analysis, Normed fit index (NFI) and incremental fit index (IFI) of above 0.9 suggested model fit. Tucker-Lewis fit index (TLI) and comparative fit index (CFI) in the range of 0.90 to 0.95 also suggested model fit. For root mean square error of approximation (RMSEA), a value close to or less than 0.05 and standardized root mean squared residual SRMR value of close to 0.08 or below signified reasonable model fit (Brown, 2006; Goretzko et al., 2023).

3.12 Data Collection Procedure

Eligible students were approached by the research assistant and informed about the study. Upon giving informed consent, they were given the DREEM questionnaire which was filled and returned to the research assistant who assessed it for completion. All consents and filled questionnaires were returned to the principal investigator who also assessed them for completion and stored them in a secure lockable cabinet.

3.13 Data Quality Control

Three research assistants were trained on the research protocol and principles of Good Clinical Practice (GCP) to ensure that the data collected was complete, accurate, reliable, relevant and timely. The DREEM questionnaire is a commonly used tool for measuring perception of the education environment by undergraduate students and is validated for use across various cultures worldwide. It was, however, pre-tested on 5 eligible students to assess ease of use of the questionnaire. No modifications were needed after the pre-testing. All questionnaires were checked for completeness in the presence of the study participants upon returning them to the research assistants. Questionnaires that were found to have missing data were completed in real time with assistance of the research assistants before forwarding them to the principal investigator for another completion check. Questionnaires that were still incomplete after being received by the principal investigator prompted a phone call to complete the missing data before being entered into Redcap. The Redcap database was designed with inbuilt data quality checks that ensured that only complete questionnaires could be submitted. All consents and

completed questionnaires were stored in a secure cabinet drawer under lock-and-key and access restricted to the principal investigator.

3.14 Statistical Analysis

Data analysis was done using Stata statistical package version 17. Descriptive statistics were used to describe the demographics of the data and for comparison between the categories of programme of study, year of study, age, sex and nationality. Scores for every individual were summed for each of the of the five sub-scales and categorized as described in section 3.11.3. The Chi-square, Welch's t-test and analysis of variance (ANOVA) was used to compare between categories of students. The Welch's t-test was used because it is relatively unaffected by differences in sample sizes of the compared groups which was characteristic for this study population. Cronbach's alpha coefficient was used to assess internal reliability of the tool. Factor analysis was used to assess the construct validity of the questionnaire because the education environment is a multidimensional phenomenon with latent variables which cannot be directly measured but can only be closely estimated through multiple measurable indicators in a questionnaire (Brown, 2015; Comrey & Lee, 1992) . Specifically, confirmatory factor analysis (CFA) was chosen as the appropriate approach, instead of exploratory factor analysis, because this study aimed as testing a pre-defined hypothesis about the structure of the DREEM inventory (Brown, 2015). The consequent item reduction for the DREEM inventory was done based on correlation coefficients of the items in the inventory. Variables with weak correlations per domain i.e., values less than 0.4, were eliminated.

3.15 Validation of Instrument

The DREEM is a validated tool that has been used in various contexts worldwide for assessing perception of the education environment by undergraduate students. However, this study assessed the construct validity because of the increasing controversy in the literature on the issue. Content validity was judged to be satisfactory from inception of the tool through the collaboration of 78 medical and health profession educators from various countries worldwide using the Delphi technique (Roff et al., 1997; Roff & McAleer, 2001). This still holds to date and, therefore, was not explored in this study. Some aspects of validity like criterion validity, and the corresponding predictive validity among others, were judged as not applicable for this tool because there is no established gold-standard questionnaire for assessing education environment in undergraduate students to compare against (Miles et al., 2012).

3.16 Ethical Considerations

Ethical approval of the study was obtained from the department of paediatrics and the School of Medicine Research and Ethics Committee (SOMREC) of the College of Health Sciences, Makerere University (approval number: Mak-SOMREC-2022-444). Written informed consent was obtained from all study participants. All study data was kept in a secure cabinet under lock-and-key with access restricted only to the research team. For purposes of confidentiality, each participant was assigned a study number which was used in data collection and analysis instead of a name.

3.17 COVID-19 Mitigation Measures

Interaction with participants maintained the recommended 2m social distance guidelines of the Ministry of Health (MoH). The research team wore facemasks at all times and used an alcohol sanitizer for handwashing.

3.18 Dissemination of Results

Study results were presented to the Department of Pediatrics and Child Health, as a requirement for the partial fulfillment for the award of Master's Degree of Science in Health Professions Education. They will also be shared with Sir Albert Cook Medical Library in College of Health Sciences, School of Graduate Studies, Makerere University, the Ministry of Health and submitted for potential publication in a peer-reviewed Medical Journal.

CHAPTER FOUR: RESULTS

4.1 Participant demographics

A total of 546 questionnaires (N=546) were completed out of the 740 first- and second-year students which represented an overall response rate of 73.8%. Second year students made up 57% of the participants. The majority of respondents were male (61.7%). The mean age was 21 years (range of 19 to 41 years) with 81.9% aged less than 25years (standard deviation of 4.8) and only 18.1% aged 25 years and above. Majority of students (530) were Ugandans with only 16 non-Ugandans. However, one half (51.5%) of the Ugandan students came from the central region, about a quarter (22.3%) from the western region and the remaining quarter shared between students from the eastern and northern part of the country. The demographic findings are summarized in Table 1.

Table 1. Demographic characteristics of study participants

Characteristic	Number (N=546)	Percentage
Sex		
Male	337	61.7
Female	209	38.3
Year of Study		
One	235	43
Two	311	57
Place of residence		
Hall	267	48.9
Hostel	190	34.8
Other (Specify)	89	16.3
Sponsorship		
Self	67	12.3
Parents/guardians	185	33.9
Government	290	53.1
Other	4	0.7
Employment status		
Full-time employed	18	3.3
Part-time employed	106	19.4
Not employed	422	77.3
Marital Status		
Single	490	89.7
Married	56	10.3
Do you have children?		
No	479	87.7
Yes	67	12.3
Program of study		
MBChB	209	38.3
Dental Surgery	48	8.8
Pharmacy	86	15.8
Nursing	40	7.3
Biomedical Sciences	47	8.6
Optometry	27	4.9
Medical Radiography	29	5.3
Cytotechnology	37	6.8
Speech and language therapy	9	1.6
Dental Technology	14	2.6
Highest Education Qualifications Completed		
UACE (A level)	449	82.2
Diploma	81	14.8
Bachelor's degree	12	2.2
Other	4	0.7

4.2 OBJECTIVE 1: To determine the perception of undergraduate students studying anatomy about the education environment in MakCHS

4.2.1 DREEM Inventory

General DREEM scores and subscale results

The overall DREEM score was 114 (more positive than negative) with 58.8% of students perceiving the education environment more positive than negative, 33.3% as one having plenty of problems and 7.9% as excellent. All the five sub-scales were generally consistent with a more positive perception of the learning environment but with marginal scores for social self-perception (See Table 2 and Table 3).

Table 2. DREEM Subscale scores (N=546)

Subscale	Mean	SD	Interpretation
Students' perception of learning	27.2	6.4	A more positive approach
Students' perception of teachers	25.0	5.3	Moving in the right direction
Students' academic self-perception	18.6	4.8	Feeling more on the positive side
Students' perception of atmosphere	27.4	6.4	A more positive atmosphere
Students' social self-perception	15.8	3.7	Not too bad
DREEM Total Score	**114.0**	**22.3**	**More positive than negative**

Table 3. Perception of undergraduate students per subscale

Sub scale	N=546	Percentage
Students' perception of learning		
Very poor	1	0.2
Teaching is viewed negatively	213	39
A more positive approach	282	51.6
Teaching highly thought of	50	9.2
Students' perceptions of teachers		
Abysmal	2	0.4
In need of some retraining	185	33.9
Moving in the right direction	323	59.2
Model teachers	36	6.6
Students' academic self-perceptions		
Feeling of total failure	5	0.9
Many negative aspects	202	37
Feeling more on the positive side	271	49.6
Confident	68	12.5
Students' perception of atmosphere		
A terrible environment	5	0.9
There are many issues that need changing	195	35.7
A more positive atmosphere	296	54.2
A good feeling overall	50	9.2
Students' social self-perception		
Miserable	4	0.7
Not a nice place	207	37.9
Not too bad	299	54.8
Very good socially	36	6.6
DREEM Total score		
Plenty of problems	182	33.3
More positive than negative	321	58.8
Excellent	43	7.9

Between group analysis

Sex

The DREEM score was affected by sex with the male students perceiving their education environment more positively (116, SD=22) than the females (110.7, SD=22.2) with a small effect size (Cohen's d=0.24, p=0.0067).

Age

Students aged 25 years and over perceived the education environment more positively (122, SD=21.5) that their younger counterparts (112.2, SD=23.9) with a statistically significant medium effect size (d=-0.45, p=0.0001). These differences were primarily evident in first year students.

Nationality

No statistically significant difference was demonstrated between nationality and DREEM score (p=0.3842). See Table 4 below.

Year of Study

Students in first year had a more positive perception of their learning environment (125.6, SD=23.5) than those in second year (105.2, SD=16.6) with a large effect size (d=1.03, p<0.0001).

Sponsorship

Self-sponsored students had the highest DREEM score compared to the parent/guardian sponsored, government-sponsored and other- sponsored counterparts (p=0.0004). When compared to parent/guardian-sponsored students alone this difference was significant with a medium effect size (d=0.60, p=0.0003).

Place of residence

Students staying outside the campus vicinity (others) had a significantly higher DREEM score compared to those staying within campus vicinity i.e. hall or hostel (d=-0.49, p=0.0001). The was no significant difference in perception of the education environment between students staying in hall compared to those staying in hostel.

Programme of study

The programme of study never affected the DREEM scores significantly (p=0.3614). However, the programme of Biomedical sciences had the lowest DREEM score (106.8) while speech and language therapy had the highest DREEM score (119.6).

Individual scores

A scrutiny of the individual scores in Table 5, revealed 5 items that were suggestive of problem areas (mean score less than or equal to 2). These included:

- The teaching over-emphasizes factual learning (SPL)
- There is a good support system for students who get stressed (SSSP)
- The enjoyment outweighs the stress of studying this course (SPA)
- I am able to memorize all I need (SASP) and
- Learning strategies which worked for me before continue to work for me now (SASP)

The rest of the 45 items were identified as areas that could be improved (mean score of between 2 and 3). There was no strong area (mean score of 3.5 or more).

Table 4. DREEM score across different demographic characteristics

Characteristic	Number	Mean	SD	Effect size (95% CI)	P-value
Current Place of Residence					
Hall	267	113.1	22.4	0.10 (-0.09, 0.28)	0.2941 [a]
Hostel	190	111.0	21.0		
Residents (Hall+Hostel)	457	112.2	21.8	-0.49 (-0.72, -0.26)	0.0001 [b]
Other (Specify)	89	122.9	22.5		0.0001
Sponsorship					
Self	67	121.7	24.9		
Private	185	109.1	19.2	0.60 (0.32, 0.89)	0.0003 [c]
Government	290	115.2	22.8	-0.28 (-0.47, 0.10)	0.0018 [d]
Other	4	119.8	28.8		0.0004
Current employment status					
Full-time employed	18	132.9	19.1	0.94 (0.42, 1.45)	0.0003 [e]
Part-time employed	106	112.3	22.4	0.08 (-0.12, 0.28)	0.4691 [f]
Not employed	422	113.6	22.1		0.001
Marital Status					
Single	490	113.3	22.2		
Married	56	120.2	22.5	-0.31 (-0.59, -0.04)	0.0322
Do you have children					
No	479	113.0	21.6		
Yes	67	121.2	25.7	-0.37 (-0.63, -0.12)	0.0142
Program of study					
MBChB	209	112.7	22.4	112.7	
Dental Surgery	48	115.8	19.6	115.8	
Pharmacy	86	116.3	24.7	116.3	
Nursing	40	113.3	25.5	113.3	
Biomedical Sciences	47	106.8	15.3	106.8	
Optometry	27	117.1	18.0	117.1	
Medical Radiography	29	118.9	24.0	118.9	
Cytotechnology	37	114.2	22.5	114.2	
Speech and language therapy	9	119.6	30.8	119.6	
Dental Technology	14	117.9	20.0	117.9	0.3614
Achieved Education Qualifications					
UACE (A level)	449	112.3	21.3		

Diploma	81	122.4	24.3	-0.46 (-0.70, -0.23)	0.0006 [g]
Bachelor's degree	12	124.8	29.6		
Other	4	96.0	5.7		0.0002
Region of origin for Ugandan students					
Central	273	110.7	19.8		
East	89	118.6	25.4	-0.37 (-0.61, -0.13)	0.0084 [h]
North	50	119.0	22.4		
West	118	116.6	24.4		0.0029

[a] - P-value comparing students staying in hostels versus those staying in halls

[b] - P-value comparing resident students (hall+hostel) versus non-residents

[c] - P-value comparing self-sponsored versus Private

[d] - P-value comparing private sponsored versus government sponsorship

[e] - P-value comparing those in full time employment versus part time employment

[f] - P-value comparing employed students to unemployed students

[g] - P-value comparing students with UACE versus Diploma qualification

[h] - P-value comparing students from East versus Central regions

Note: Effect size was calculated using Cohen's d and means were compared using Welch's t-test

Table 5. Mean and standard deviations of the DREEM questionnaire items

Subscale	No	DREEM Question/Item	Mean score	Standard deviation
Students' perception of learning (12 items)	1	I am encouraged to participate in class	2.36	1.13
	7	The teaching is often stimulating	2.1	1.05
	13	The teaching is student-centred	2.58	1.08
	16	The teaching helps to develop my competence	2.5	1.07
	20	The teaching is well-focused	2.42	1.05
	21	I feel I am being well prepared for my profession	2.37	1.11
	24	The teaching time is put to good use	2.12	1.13
	25	The teaching over-emphasizes factual learning*	1.55	1.01
	38	I am clear about the learning objectives of this course	2.61	0.97
	44	The teaching encourages me to be an active learner	2.09	1.16

	47	Long-term learning is emphasized over short-term learning	2.35	1.09
	48	The teaching is too teacher-centred*	2.39	1.1
Students' perceptions of teachers (11 items)	2	The lecturers are knowledgeable	2.6	1.18
	6	The lecturers are patient with the patients	2.04	0.97
	8	The lecturers make fun of their students*	2.43	1.06
	9	The lecturers are strict and controlling*	2.05	1.04
	18	The lecturers have good communication skills with patients	2.35	0.99
	29	The lecturers are good at providing feedback to students	2.12	1.08
	32	The lecturers provide constructive criticism here	2.15	1.03
	37	The lecturers give clear examples	2.4	1.03
	39	The lecturers get angry in class*	2.32	1.04
	40	The lecturers are well-prepared for their classes	2.39	1.07
	50	The students irritate the lecturers*	2.17	1.15
Students' academic self-perceptions (8 items)	5	Learning strategies which worked for me before continue to work for me now	1.92	1.11
	10	I am confident about passing this year	2.66	0.98
	22	The teaching helps to develop my confidence	2.1	1.18
	26	Last semester's work has been a good preparation for this semester's work	2.34	1.1
	27	I am able to memorize all I need	1.88	1.09
	31	I have learned a lot about empathy in my profession	2.38	1.06
	41	My problem-solving skills are being well-developed here	2.52	1.04
	45	Much of what I have to learn seems relevant to a career in healthcare	2.54	1.13
Students' perception of atmosphere (12 items)	11	The atmosphere is relaxed during the histology/ dissection sessions	2.36	1.09
	12	This school is well-timetabled	2.44	1.15
	17	Cheating is a problem in this school*	2.25	1.21
	23	The atmosphere is relaxed during lectures	2.22	1.04
	30	There are opportunities for me to develop interpersonal skills	2.4	1.09

Table 5. Mean and standard deviations of the DREEM questionnaire (Continued)

Subscale	No	DREEM Question/Item	Mean score	Standard deviation
Students' perception of atmosphere (continued)	35	I find the experience disappointing*	2.26	1.07
	36	I am able to concentrate well	2.26	1.06
	42	The enjoyment outweighs the stress of studying this course	1.87	1.16
	43	The atmosphere motivates me as a learner	2.19	1.09
	49	I feel able to ask the questions I want	2.24	1.08
Students' social self-perception (7 items)	3	There is a good support system for students who get stressed	1.74	1.11
	4	I am too tired to enjoy this course*	2.5	1.09
	14	I am rarely bored on this course	2.18	1.15
	15	I have good friends in this school	2.76	1.08
	19	My social life is good	2.38	1.09
	28	I seldom feel lonely	2.05	1.1
	46	My accommodation is pleasant	2.18	1.14

*Negative statement for which the scoring scale was reversed

4.2.2 Anatomy-related questions

The greatest motivation for studying anatomy was cases discussed in PBL (See Figure 2). Half of the students rated their accumulated knowledge of anatomy as average and majority (73%) felt that they would be ready for clinical clerkship by the end of their second year of basic medical sciences (See table 6 below).

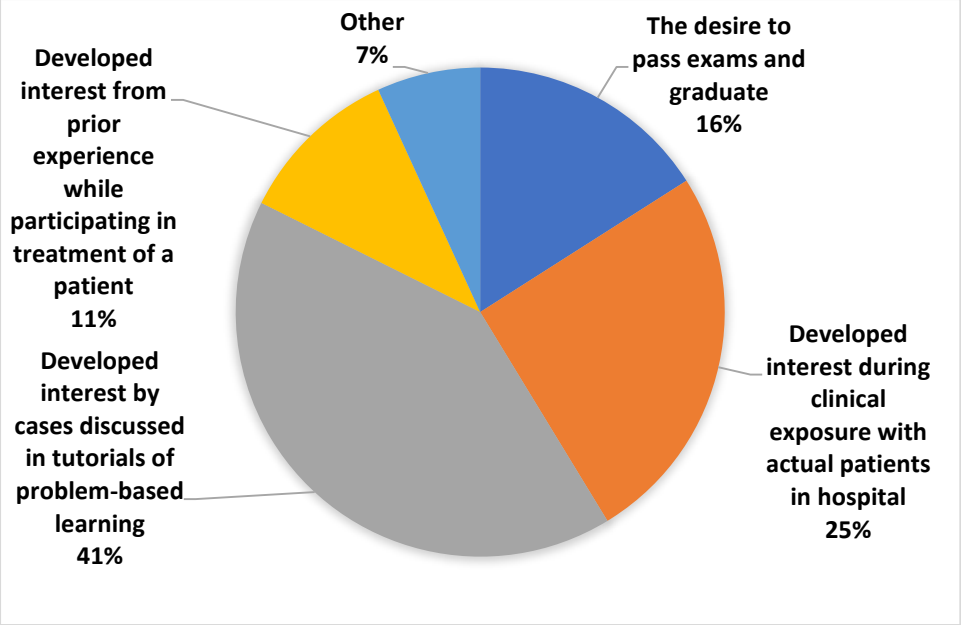

Figure 2: Motivation to study anatomy

Table 6: Anatomy related questions

Anatomy related questions

Characteristic	**Total n (%)**
Current state of the accumulated/retained learning of anatomy since joined medical school*	
Very good/excellent	31 (5.7)
Good	214 (39.2)
Average	261 (47.8)
Bad	28 (5.1)
Horrible	12 (2.2)
Thinks will be well-prepared/ready for clinical clerkship by the end of your second year of basic medical sciences	
Yes	398 (72.9)
No	67 (12.3)
Not sure	81 (14.8)

* Means the n = 482 – Excluded year one students who do not study anatomy in programs – pharmacy, optometry and dental technology

4.3 OBJECTIVE 2: To determine the validity and reliability of the DREEM tool when used in measuring the perception of undergraduate students studying anatomy about their education environment in MakCHS

The Cronbach's alpha showed an overall reliability of 0.909. The values for the subscales ranged between 0.416 to 0.786 (see Table 6). The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was 0.912 suggesting sufficient evidence to perform factor analysis. During Confirmatory Factor Analysis (CFA), the one factor model failed to demonstrate model fit (Table 7). Despite splitting the inventory into the original five factor model of the DREEM tool, model fit was not realized. See Table 8 in appendix I for reliability analysis and mean score of all the 50 items of DREEM according to the five domains.

Table 7. Classical psychometric properties (N=546)

Subscale	**Mean**	**SD**	**n**	**Cronbach's alpha (α)**	**Interpretation**
Students' perception of learning	27.2	6.4	12	0.79	A more positive approach
Students' perception of teachers	25.0	5.3	11	0.62	Moving in the right direction
Students' academic self-perception	18.6	4.8	8	0.69	Feeling more on the positive side
Students' perception of atmosphere	27.4	6.4	12	0.71	A more positive atmosphere
Students' social self-perception	15.8	3.7	7	0.41	Not too bad
DREEM Total Score	**114.0**	**22.3**	**50**	**0.91**	

n represents the number of items in each subscale; SD is Standard Deviation.

It was only after item reduction to a level of 19 items that satisfactory model fit was realized. Reliability of this 19-item tool was 0.888. See Table 9 below for detailed reliability analysis of individual items on this abridged version of the DREEM. See Table 10 and 11 in Appendix I for the corresponding analysis for the 17- and 12-item abridged versions of Saiful & Yusoff (2012) and Jeyashree et al. (2018).

Table 8. Reliability analysis on individual item of the best fit DREEM model (19-item model)

Domain	CITC	CAID	DCA
Students' Perception of Learning (SPL)			0.751
Dreem7	0.4338	0.8848	
Dreem16	0.5298	0.8818	
Dreem20	0.4657	0.8838	
Dreem22	0.6723	0.8766	
Dreem38	0.5425	0.8815	
Dreem44	0.5804	0.88	
Students' Perception of Teachers (SPT)			0.496
Dreem37	0.4763	0.8835	
Dreem40	0.4557	0.8841	
Students' Academic Self-Perception (SASP)			0.679
Dreem10	0.4786	0.8834	
Dreem21	0.6195	0.8787	
Dreem31	0.5104	0.8824	
Dreem45	0.4893	0.8831	
Students' Perception of Atmosphere (SPA)			0.693
Dreem23	0.3954	0.886	
Dreem33	0.5375	0.8816	
Dreem34	0.474	0.8836	
Dreem36	0.5155	0.8822	
Dreem43	0.5783	0.8801	
Students' Social Self-Perception (SSSP)			0.516
Dreem15	0.5189	0.8821	
Dreem19	0.4031	0.8859	

CITC Corrected Item-Total Correlation

DCA - Domain Cronbach's Alpha

Table 9: Results of confirmatory factor analysis

Model description	Chi-square statistic (df)	P-value	RMSEA	SRMR	NFI	RNI	IFI	TLI
Model A: One factor model (50 items)	2888.41 (1175)	<0.0001	0.052	0.063	0.618	0.729	0.732	0.718
Model B: Original five factors model (50 items)	2849.78 (1165)	<0.0001	0.052	0.062	0.623	0.734	0.736	0.720
Model C: Five factors model (37 items)	1433.07 (619)	<0.0001	0.049	0.049	0.757	0.844	0.846	0.832
Model D: Five factors model (33 items)	1190.09 (485)	<0.0001	0.052	0.048	0.780	0.855	0.857	0.843
Model E: Five factors model (29 items)	946.21 (367)	<0.0001	0.054	0.048	0.801	0.867	0.868	0.853
Model F: Five factors model (23 items)	551.81 (220)	<0.0001	0.053	0.045	0.847	0.901	0.902	0.886
Model G: Five factors model (19 items)	**398.74 (142)**	**<0.0001**	**0.058**	**0.044**	**0.866**	**0.909**	**0.910**	**0.890**

RMSEA = Root mean squared error of approximation
SRMR = Standardized root mean squared residual
NFI = Normed fit index
RNI = Relative non-centrality Index
CFI = Comparative fit index
IFI = Incremental fit index
TLI = Tucker–Lewis index

CHAPTER FIVE: DISCUSSION

5.1 Students' perception about their education environment in MakCHS.

The first objective of the study was to determine the perception of undergraduate students studying anatomy about their education environment in MakCHS . The overall DREEM score showed that the first- and second-year students of MakCHS perceived their education environment as more positive than negative. Therefore, the students felt that there were many plausible aspects about their education environment but with some areas that needed to be improved (Hammond et al., 2012; Roff et al., 1997; Saiful & Yusoff, 2012). This has been the predominantly reported finding of most DREEM studies (Chan et al., 2018) and was consistent with the findings within the same country by Aisha et al (2017) among first year students of Habib Medical School (IUIU), a private Medical School in Uganda. Similar findings were reported among senior undergraduate medical students doing clinical rotations in the College of Health Sciences, Makerere University (Kagawa et al., 2021). Of note, however, the perception of the education environment in the current study showed some divergence from the findings of Kagawa et al (2021). Although most of the students still perceived the education environment as more positive than negative, this proportion of students reduced from 75.1% (Kagawa et al., 2021) to 58.8% (current study). Correspondingly, the proportion of those that perceived the education environment to have plenty of problems doubled from 16% to 33.3%. This difference in perception due to year of study has been reported in other studies both in the region and elsewhere (Ahmed, Taha, Al-Neel, et al., 2018; Ojuka et al., 2021; Vaughan et al., 2014).

At subscale analysis, the students' social self-perception (SSSP) and student perception of learning (SPL) subscales demonstrated concerning scores. Although their global scores corresponded with average positive interpretations, the scores were just borderline with the corresponding negative interpretations. The subscale analysis showed significant proportions of students who perceived these subscales negatively i.e about 40% for each of the two subscales. In addition, each of these subscales had an area of concern identified in the individual item analysis i.e., "There is a good support system for students who get stressed" in SSSP and "The teaching over-emphasizes factual learning" in SPL. These findings are consistent with those of Kagawa et al in the same institution and findings of Ahmed et al. (2018) in Sudan. The issue of over-emphasis on factual learning seems to suggest that the early clinical exposure in the problem-based learning (PBL) of basic medical sciences in MakCHS

is still suboptimal in creating the desired meaningful learning of successful vertical integration (Wijnen-Meijer et al., 2020). Since early clinical exposure was halted during the COVID-19 pandemic to date, it may not be surprising that the students felt that way.

At individual item analysis, five items scored a mean of 2 or less which implied problematic areas that needed to be addressed. This was similar to Kagawa et al findings but slightly better than those observed by Ahmed et al. (2018) within the region. Of the 5 identified problem areas, the current study shared two of these with the findings of Kagawa et al. (2021) and 3 of these with those of Ahmed et al. (2018). These were "The teaching over-emphasizes factual learning" (SPL) and "The enjoyment outweighs the stress of studying this course (SPA)" from Kagawa et al and "The teaching over-emphasizes factual learning" (SPL), "I am able to memorize all I need" (SASP) and "There is a good support system for students who get stressed" (SSSP) from Ahmed et al respectively. These areas may need to be investigated and addressed accordingly. However, contrary to the Kagawa et al findings, the majority of the 5 items mentioned above (totaling to two in number), were from the students' academic self-perception subscale. This subscale did not have any value of 2 or less in the Kagawa study. This could be because the transition to new ways of learning in medical school was still a challenge during the basic medical sciences but had been successfully achieved by students in clinical rotations by virtue of staying longer in the medical school.

The self-sponsored students had the highest DREEM score, higher than even the government-sponsored students. Although there isn't elaborate reporting on this in earlier studies conducted in the region, it was surprising because students receiving government allowance have been reported to have a more positive perception in other settings due to the additional financial facilitation that they have (Vaughan et al., 2014).

The DREEM score of full-time employed students was significantly better than that for part time or unemployed students ($p=0.001$). This may be due to the fact that full-time employed students were all on paid study leave and therefore had both financial capacity and time to study.

Although students staying in hall (on main campus) are expected to benefit more from proximity to the education facilities (Oluwaseyi, 2015), there was no significant difference between the DREEM score of these students and those staying in hostel (near main campus). This could be because the institutional halls of residence that first-and-second-year students reside in are not within the medical school vicinity (the medical school is not within the main

university campus where these halls are located). In fact, some hostels are closer to the medical school than these halls. As such, there is no significant difference in regard to proximity and easy access to the medical school facility between students residing in hostel and those in university halls of residence. Another unexpected observation regarding area of residence was that students staying outside campus vicinity (home) had a significantly higher score than those staying within campus vicinity (hall and hostel). These students are expected to have a lot of interruptions to study, to waste a lot of time travelling to and from the medical school and to have limited access to additional university facilities like libraries etc. (Timmons, 2014).

It was noted that the main motivation for students to study anatomy was "cases discussed in tutorials" as compared to "clinical exposure with actual patients or prior participation in treating patients". These tutorials are paper-based scenarios that are discussed outside the hospital setting with no actual patient interaction. Although these are thought to be inferior to actual patient interaction (Wijnen-Meijer et al., 2020), the study found them to be the popular motivation for the students to study anatomy. This could be because clinical exposure was removed from the school programme for students studying basic medical sciences and only a small proportion of students (17%) had an earlier qualification that provided clinical exposure before joining the medical school. Therefore, the closest experience to actual patient-care that most students could relate with was these paper-based cases discussed in tutorials. It might, therefore, not be surprising that only 72.9% of students were confident about being well-prepared for their clerkship after completing their basic medical sciences. Although the above discussed findings are generally consistent with the trend observed in the literature, there were a few unexpected observations at sub-group analysis of students' perception that may warrant further investigation to understand these findings comprehensively.

5.2 Construct validity and reliability of the DREEM tool in MakCHS

The second objective of the study was to determine the validity and reliability of the DREEM tool when used in measuring the perception of undergraduate students studying anatomy about their education environment in MakCHS. The general reliability of the tool was excellent (Cronbach's alpha=0.91). This was consistent with findings from other studies using the tool in the region (Ahmed, Taha, Alneel, et al., 2018; Aisha et al., 2017). However, this particular value was above 0.90 and may, therefore, suggest that the DREEM inventory has redundant items (Tavakol & Dennick, 2011). The confirmatory factor analysis (CFA) found that the one-factor model failed to show model-fit. This was expected because the education environment

has been widely reported to be a multi-dimensional phenomenon (Hammond et al., 2012; Jeyashree et al., 2018; McAleer & Roff, 2001; Roff et al., 1997; Saiful & Yusoff, 2012). However, the failure to demonstrate model fit in the original 5-factor model of the DREEM gave additional support to the contention surrounding construct validity of this tool. Although this has been observed in some studies, most of these were translated versions of the tool (Dimoliatis et al., 2010; Koohpayehzadeh et al., 2014; Saiful & Yusoff, 2012) and, therefore, could have been caused by language translation errors. However, findings from the current study and from a study by Hammond et al. (2012) -both conducted without language translation -demonstrated the same observation. This suggests that the tool itself might have inherent construct validity shortcomings. The achievement of model fit only after item reduction to a level of 19 items further suggests that there could be redundant items in the DREEM tool that may compromise its construct validity (Saiful & Yusoff, 2012; Tavakol & Dennick, 2011). The proposed shortened 19-item version of the DREEM, contained 8 (66.67%) of the 12 items in 12-item abridged DREEM of Jeyashree et al. (Jeyashree et al., 2018) and 8 (47.03%) of the 17 items in the abridged DREEM of Saiful & Yusoff (2012). This suggests that although these three abridged versions were developed in different contexts, the items that were adopted for each version were very similar and these may, therefore, not be limited by cultural context. When the Cronbach's alpha was computed for the available shortened versions of the DREEM, the study's proposed 19-item DREEM had more favorable subscale scores ranging between 0.50 and 0.75 compared to ranges of 0.14-0.64 and 0.30-0.59 of Jeyashree et al. and Saiful & Yusoff (2012) respectively. These findings re-affirm the education environment as a multidimensional phenomenon and the DREEM tool as one such tool that is elaborate in its measurement. However, psychometric performance of the tool needs to be monitored closely.

5.3 Study Limitations

All students in first and second year who had joined the medical school using their senior six examination results were from the same pool of students i.e. both first and second year students had previously sat for their senior six examinations in the same year of study. This was because of studying delays caused by the prolonged lockdown during the COVID-19 pandemic. This unique constitution of students could have affected the findings of the study.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The students perceived the education environment as more positive than negative, an observation that was generally consistent with earlier findings in the region. However, there were a few unexpected observations at sub-group analysis of the students' perception. These included government-sponsored students and students living within campus vicinity having a poorer perception than self-sponsored students and students living outside campus vicinity respectively. Although the internal reliability of the DREEM tool was satisfactory, its construct validity was sub-optimal. To demonstrate model fit, the tool required optimization through item reduction to an abridged version with 19 items. The DREEM inventory, therefore, remains a valuable measure of the education climate even in the context of Uganda where this study was conducted. However, its psychometric performance should be assessed whenever the tool is used.

6.2 Recommendations

Early clinical exposure should be re-introduced among students studying basic medical sciences to encourage meaningful learning instead of the simplistic factual recall reported by the students in this study.

The medical school should establish an effective support system for students who get stressed.

Psychometric performance of the DREEM questionnaire should be assessed and reported in futures studies that use the DREEM inventory.

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APPENDICES

APPENDIX I: ADDITIONAL TABLES FOR RESULTS

Table 10. Reliability analysis and mean score of the 50 items of DREEM according to the five domains

Domain	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree	CAID	CITC
Students' Perception of Learning (SPL)							
Dreem1	5.70%	23.30%	11.70%	47.60%	11.70%	0.8965	0.4471
Dreem7	6.20%	24.50%	28.60%	33.90%	6.80%	0.8968	0.4318
Dreem13	2.40%	16.30%	24.90%	33.70%	22.70%	0.8971	0.4006
Dreem16	4.00%	15.80%	23.40%	39.60%	17.20%	0.8955	0.5384
Dreem20	3.70%	18.10%	24.40%	40.50%	13.40%	0.8962	0.4861
Dreem22	5.70%	34.40%	17.40%	29.10%	13.40%	0.8934	0.677
Dreem24	9.30%	21.60%	26.20%	33.50%	9.30%	0.8971	0.4033
Dreem25	13.40%	39.90%	28.90%	13.90%	3.90%	0.9058	-0.3922
Dreem38	2.20%	12.80%	22.30%	47.10%	15.60%	0.8957	0.535
Dreem44	4.80%	36.60%	15.00%	31.70%	11.90%	0.8947	0.5828
Dreem47	5.00%	18.30%	28.40%	33.50%	14.80%	0.8965	0.4561
Dreem48	2.90%	21.80%	25.80%	32.10%	17.40%	0.8993	0.2195
Students' Perception of Teachers (SPT)							
Dreem2	4.20%	19.10%	15.20%	35.70%	25.80%	0.8954	0.5305
Dreem6	6.00%	22.00%	38.60%	28.40%	5.00%	0.8975	0.3738
Dreem8	2.60%	19.40%	26.70%	34.80%	16.50%	0.8994	0.2043
Dreem9	5.10%	29.70%	26.20%	33.00%	6.00%	0.9022	-0.049
Dreem18	3.90%	15.00%	33.90%	36.50%	10.80%	0.8966	0.4534
Dreem29	7.10%	24.20%	26.20%	34.80%	7.70%	0.8977	0.3565
Dreem32	4.80%	24.90%	28.90%	33.70%	7.70%	0.8989	0.2459
Dreem37	4.00%	18.30%	22.20%	44.70%	10.80%	0.8962	0.4859
Dreem39	2.80%	21.80%	28.80%	34.10%	12.60%	0.8987	0.2685
Dreem40	3.90%	19.10%	25.60%	37.20%	14.30%	0.8963	0.4676
Dreem50	6.20%	24.70%	29.70%	24.40%	15.00%	0.8997	0.1991
Students' Academic Self-Perception (SASP)							

Dreem5	10.60%	28.20%	26.20%	28.80%	6.20%	0.8997	0.1908
Dreem10	0.90%	11.50%	30.20%	35.40%	22.00%	0.8965	0.4683
Dreem21	4.60%	17.80%	32.40%	26.90%	18.30%	0.8946	0.6035
Dreem26	5.10%	21.30%	21.30%	39.60%	12.80%	0.8965	0.4489
Dreem27	9.90%	31.10%	24.70%	29.30%	5.00%	0.899	0.2485
Dreem31	4.00%	18.90%	25.80%	37.70%	13.60%	0.8958	0.5113
Dreem41	3.10%	16.70%	20.30%	44.90%	15.00%	0.8962	0.4867
dreem45	4.00%	17.60%	20.90%	35.40%	22.20%	0.8961	0.4824

Table 11. Reliability analysis and mean score of the 50 items of DREEM according to the five domains (continued)

Students' Perception of Atmosphere (SPA)							
Dreem11	4.60%	19.40%	25.60%	36.10%	14.30%	0.8972	0.3916
Dreem12	5.70%	18.30%	20.20%	37.70%	18.10%	0.8967	0.4344
Dreem17	7.70%	20.70%	30.00%	22.00%	19.60%	0.9009	0.1116
Dreem23	3.70%	24.70%	27.70%	34.10%	9.90%	0.897	0.4169
Dreem30	4.40%	19.10%	24.00%	37.40%	15.20%	0.8962	0.473
Dreem33	3.30%	16.70%	23.30%	43.20%	13.60%	0.8957	0.5258
Dreem34	4.80%	19.10%	22.00%	39.20%	15.00%	0.8962	0.4767
Dreem35	4.20%	23.10%	26.40%	35.00%	11.40%	0.8978	0.3479
Dreem36	5.30%	21.60%	22.90%	41.80%	8.40%	0.8958	0.5152
Dreem42	15.60%	21.10%	30.40%	26.40%	6.60%	0.901	0.0979
Dreem43	6.40%	22.20%	28.20%	32.80%	10.40%	0.8948	0.5895
Dreem49	5.30%	22.90%	24.70%	36.80%	10.30%	0.897	0.4097
Students' Social Self-Perception (SSSP)							
Dreem3	13.20%	32.40%	27.30%	21.30%	5.90%	0.9	0.1617
Dreem4	3.50%	17.20%	25.10%	34.60%	19.60%	0.8994	0.2084
Dreem14	8.60%	21.30%	25.60%	33.00%	11.50%	0.8993	0.2247
Dreem15	2.80%	12.10%	20.90%	35.40%	28.90%	0.896	0.4975
Dreem19	5.00%	18.10%	24.90%	37.90%	14.10%	0.897	0.4111
Dreem28	7.00%	28.40%	26.00%	29.70%	9.00%	0.8999	0.1734
Dreem46	8.10%	22.70%	23.10%	35.50%	10.60%	0.8982	0.3178

CAID Cronbach's Alpha if Item Deleted

CITC Corrected Item-Total Correlation

Table 12. Reliability analysis on individual item of the 17-item DREEM tool of Saiful & Yusoff (Saiful & Yusoff, 2012)

Domain	CITC	CAID	DCA
Students' Perception of Learning (SPL)			0.585
Dreem20	0.4490	0.8090	
Dreem22	0.6250	0.7980	
Dreem24	0.4340	0.8100	
Students' Perception of Teachers (SPT)			0.501
Dreem6	0.3840	0.8130	
Dreem37	0.4780	0.8080	
Dreem40	0.4340	0.8100	
Students' Academic Self-Perception (SASP)			0.486
Dreem26	0.4190	0.8110	
Dreem41	0.4870	0.8070	
Dreem45	0.3760	0.8140	
Students' Perception of Atmosphere (SPA)			0.535
Dreem30	0.4490	0.8090	
Dreem33	0.5010	0.8060	
Dreem42	0.1680	0.8270	
Dreem43	0.5040	0.8060	
Dreem49	0.4190	0.8110	
Students' Social Self-Perception (SSSP)			0.302
Dreem3	0.2570	0.8210	
Dreem19	0.3940	0.8130	
Dreem46	0.3170	0.8170	

Table 13. Reliability analysis on individual item of the 12-item tool of Jeyashree et al. (2018)

Domain	CITC	CAID	DCA
Students' Perception of Learning (SPL)			0.647
Dreem22	0.6560	0.7920	
Dreem44	0.5750	0.8000	
Students' Perception of Teachers (SPT)			0.535
Dreem2	0.4910	0.8070	
Dreem18	0.4340	0.8120	
Dreem37	0.4680	0.8090	
Students' Academic Self-Perception (SASP)			0.566
Dreem21	0.5520	0.8020	
Dreem41	0.4760	0.8090	
Dreem45	0.4670	0.8090	
Students' Perception of Atmosphere (SPA)			0.489
Dreem36	0.4850	0.8080	
Dreem43	0.5590	0.8020	
Students' Social Self-Perception (SSSP)			0.141
Dreem3	0.1550	0.8350	
Dreem19	0.3890	0.8160	

APPENDIX II: QUESTIONNAIRE

MAKERERE UNIVERSITY
SCHOOL OF MEDICINE
INITIAL APPROVAL
VALID UNTIL
★ 26 OCT 2023 ★
RESEARCH & ETHICS COMMITTEE
P.O. BOX 7072,KAMPALA

QUESTIONNAIRE

This questionnaire consists of three parts:

- Part A will require you to fill in simple personal details. This will be kept confidential.
- Part B consists of 50 short statements. You will tick the box that corresponds to your level of agreement with each statement. This section assesses your entire experience in the medical school as a whole.
- Part C consists of 3 questions regarding your experience of studying anatomy.

PART A: DEMOGRAPHICS		
Study ID: _ _ _	SEX: ☐ Male ☐ Female	AGE: _ _
Phone No: +256 _ _ _ _ _ _ _ _ _ +256 _ _ _ _ _ _ _ _ _	Email address: ……	Registration Number: ……..
Year of Study ☐One ☐ Two	Current Place of Residence: ☐ Hall ☐ Hostel ☐ Other (Specify) ……..	Sponsorship: ☐ Self ☐ Private ☐ Government ☐ Other (Specify) ……
Current employment status: ☐ Full-time employed ☐ Part time employed ☐ Not employed ☐ Other (Specify) ……..	Marital Status: ☐ Single ☐ Married	Do you have Children? ☐No ☐Yes
Programme of study: ☐ MBChB ☐ Dental Surgery ☐ Pharmacy ☐ Nursing ☐ Biomedical Sciences ☐ Optometry ☐ Medical Radiography ☐ Cytotechnology ☐ Speech and language therapy	Achieved Education Qualifications: ☐ UCE (O level) ☐ UACE (A level) ☐ Diploma ☐ Bachelor's degree ☐ Other (Specify) ……	Nationality: ☐ Ugandan (Specify region) ☐ Central ☐ East ☐ North ☐ West ☐ Not Ugandan (Specify Country) ……

PART B: DREEM TOOL

For each of the following statements, tick the most applicable option

No.	Item	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
1.	I am encouraged to participate in class	☐	☐	☐	☐	☐
2.	The lecturers are knowledgeable	☐	☐	☐	☐	☐
3.	There is a good support system for students who get stressed	☐	☐	☐	☐	☐
4.	I am too tired to enjoy this course	☐	☐	☐	☐	☐
5.	Learning strategies which worked for me before continue to work for me now	☐	☐	☐	☐	☐
6.	The lecturers are patient with the patients	☐	☐	☐	☐	☐
7.	The teaching is often stimulating	☐	☐	☐	☐	☐
8.	The lecturers make fun of their students	☐	☐	☐	☐	☐
9.	The lecturers are strict and controlling	☐	☐	☐	☐	☐
10.	I am confident about passing this year	☐	☐	☐	☐	☐
11.	The atmosphere is relaxed during the histology/ dissection sessions	☐	☐	☐	☐	☐
12.	This school is well-timetabled	☐	☐	☐	☐	☐
13.	The teaching is student-centered	☐	☐	☐	☐	☐
14.	I am rarely bored on this course	☐	☐	☐	☐	☐
15.	I have good friends in this school	☐	☐	☐	☐	☐
16.	The teaching helps to develop my competence	☐	☐	☐	☐	☐
17.	Cheating is a problem in this school	☐	☐	☐	☐	☐
18.	The lecturers have good communication skills with patients	☐	☐	☐	☐	☐
19.	My social life is good	☐	☐	☐	☐	☐
20.	The teaching is well-focused	☐	☐	☐	☐	☐

43	The atmosphere motivates me as a learner	☐	☐	☐	☐	☐
44	The teaching encourages me to be an active learner	☐	☐	☐	☐	☐
45	Much of what I have to learn seems relevant to a career in healthcare	☐	☐	☐	☐	☐
46	My accommodation is pleasant	☐	☐	☐	☐	☐
47	Long-term learning is emphasized over short-term learning	☐	☐	☐	☐	☐
48	The teaching is too teacher-centered	☐	☐	☐	☐	☐
49	I feel able to ask the questions I want	☐	☐	☐	☐	☐
50	The students irritate the lecturers	☐	☐	☐	☐	☐

PART C: ANATOMY-RELATED QUESTIONS

APPENDIX III: CONSENT FORM

INFORMED CONSENT FORM (Mak-SOMREC-2022-444)

Title of the proposed study:

The Perception of Undergraduate Students Studying Anatomy about the Education Environment in the College Of Health Sciences, Makerere University (Mak-SOMREC-2022-444)

Investigator:

Dr. Wambaka Bill
Department of Paediatrics, College of Health Sciences, Makerere University
Phone Number: 0702 144 033/ 0784 139 740
Email address: billwambaka@gmail.com.

Background and rationale for the study:

The education climate influences the level of academic achievement and overall satisfaction with the programme of study among students. It is one of the aspects considered when designing or revising a curriculum. The College of Health Sciences, Makerere University has revised its curriculum several times but it is not clear how this has affected the education climate among students studying anatomy. This study will assess the perception of undergraduate students studying anatomy about the education environment in the College of Health Sciences, Makerere University (MakCHS). This will specifically seek for students' opinion about their context of learning by responding to a series of short statements in a questionnaire.

A description of sponsors of the research project and the organizational affiliation of the researchers:

This study is sponsored by the principal investigator (Dr Wambaka Bill).

Purpose:

This study will assess the perception of the education environment among undergraduate students in the College of Health Sciences, Makerere University. Information obtained during this study will identify challenges, if any, that may need to be addressed. It will also contribute to informing the curriculum review process within the College of Health Sciences, Makerere University.

The estimated duration the research participant will take to in the research project:

Every study participant will spend about 20 minutes filling the questionnaire.

Procedures:

You will be approached by our research assistant who will introduce to you the study and thereafter request for your participation by way of informed consent provided in this form. If you agree to participate, you will be handed a questionnaire to fill and return it once completed on the same day. It will take about 20 minutes to complete this questionnaire. The research assistant will guide you in case any question is not clear.

Selection:

Undergraduate students in the first and second year pursuing a bachelor's degree in medicine and surgery, dental surgery, pharmacy, nursing and biomedical sciences.

Potential Risks:

There are minimal risks or discomforts incurred in relation to the study.

Benefits:

There may not be any direct benefits for participating in this study. However, identification of any problem areas will help to inform decision-making for improving the education environment within the College of Health Sciences, Makerere University.

Confidentiality:

Your confidentiality will be protected to the extent allowable by law. The records of this study will be kept private in a lockable cabinet with restricted access to the study staff. Your personal identifiers will be masked as much as is feasible in order to ensure confidentiality. Your records for the study may, however, be reviewed by the regulatory bodies overseeing the study i.e. the School of Medicine Research and Ethics Committee (SOMREC) and the Uganda National Council for Science and Technology (UNCST).

Costs for participation in the study:

You will not incur any costs to participate in this study.

Compensation for participation in the study:

You will receive Ug. Shs 10,000/= (Ten thousand Uganda shillings) to compensate for your time during participation in the study.

Questions about the study:

If you have any questions about the study, please contact the principal investigator: Dr Wambaka Bill on Tel. number 0702 144 033/ 0784 139 740, email address: billwambaka@gmail.com.

Questions about participants rights:

In case you have questions about your rights as a research participant you can contact the chairperson of the Makerere University School of Medicine Research and Ethics committee (SOMREC) Assoc. Prof. Ponsiano Ocama, Tel: +256772421190.

Statement of voluntariness:

Your participation in this study will be voluntary. You may choose to stop your participation at any time without any penalty imposed on your relationship with the College of Health Sciences, Makerere University.

Dissemination of results:

You will get feedback on findings and progress of the study from the principal investigator.

Ethical approval:

This study has been accredited and approved by the Makerere University School of Medicine Research and Ethics Committee (SOMREC).

Statement of consent:

..... has described to me what is going to be done, the risks, the benefits involved and my rights regarding this study. I understand that my decision to participate in this study will not alter my study progress in MAKCHS. In the use of this information, my identity will be concealed. I am aware that I may withdraw at any time. I understand that by signing this form, I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing to participate. A copy of this form will be provided to me.

If you agree, circle "YES". If you do not agree, circle "NO"

YES NO

Name (participant) _____ Study ID: ___

Signature _____

Date DD/MM/YY _____

Name (person obtaining informed consent) _____

Signature _____

Date DD/MM/YY _____

MAKERERE UNIVERSITY
SCHOOL OF MEDICINE
INITIAL APPROVAL
VALID UNTIL
★ 26 OCT 2023 ★
RESEARCH & ETHICS COMMITTEE
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APPENDIX IV: RESEARCH BUDGET

BUDGET FOR STUDY ON THE PERCEPTION OF UNDERGRADUATE STUDENTS STUDYING ANATOMY ABOUT THEIR EDUCATION ENVIRONMENT IN THE COLLEGE OF HEALTH SCIENCES, MAKERERE UNIVERSITY					
ITEM	**JUSTIFICATION**	**UNITS**	**FREQUENCY**	**UNIT COST**	**TOTAL COST (UGX)**
IRB Fees	SOMREC	1	1	100,000	100,000
Printing	All submission documents for IRB and anatomy department (research proposal, consent form, data collection questionnaire, study workplan, approval letters, Head of department clearance, minutes of proposal presentation, COVID-19 risk reduction plan) totalling to 75 pages	75	4	100	30,000
Photocopying	Questionnaires (5 pages) and consent forms (2 copies of consent forms per participant -8 pages). This totals to 13 pages per participant and 7,215 pages for the 555 participants.	7,215	1	100	721,500
DATA COLLECTION					
Participant compensation	Time compensation for study activities: 550 participants for data collection and 5 participants for pre-testing the questionnaire. The amount per participant was fixed by SOMREC	555	1	10,000	5,550,000

Airtime and Internet data	Contacting potential study participants, study team coordination, uploading study data onto google drive for backup	1	1	200,000	200,000
Research assistants	Facilitation to look for all the randomised potential participants, consent them and crosscheck completion of all the 550 completed questionnaires	2	1	100,000	200,000
OTHER STUDY EXPENDITURES					
Data Entrant	Entering the 550 questionnaires into computer for analysis	1	1	200,000	200,000
Data management	Data cleaning, additional data quality checks, running data analysis for questionnaire validation and data interpretation	1	1	100,000	100,000
External hard drive	For data storage (500GB) including both entered data and scanned copies of all study documents, questionnaires and consents.	1	1	100,000	100,000
Transport	The principal investigator will travel to MakCHS frequently to supervise research assistants and oversee the consenting and the data collection process	1	9	20,000	180,000
Total					**7,381,500**