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Remediating health science students' perceptions of factors contributing to their successful completion of physiology and biochemistry courses at the University of the Witwatersrand

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Masters in Health Sciences Education

DECLARATION

I, Kennedy Honey Erlwanger, student number 12213, declare that this research report is my own, unaided work. It is being submitted for the Degree of Masters in Health Sciences Education at the University of the Witwatersrand, Johannesburg; Human Research Ethics Committee (Medical) clearance number M220435 (see Appendix A1a-b). It has not been submitted before for any degree or examination at this or any other university.

Signed:  on the 9th day of September 2024

PRESENTATIONS ARISING FROM THIS RESEARCH PROJECT

K.H. Erlwanger and E.S. Ndofirepi. Factors contributing to successful completion of physiology and biochemistry courses at a South African University: Perceptions of remediating health science students. An oral presentation made at the 50th congress of the Physiological Society of Southern Africa. Held at The Protea Ranch Hotel, 25-28 August 2024.

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Thanks to Mrs Lynne Pritchard for assistance with recruitment of participants.
Funding from the Wits staff bursary is greatly appreciated. Last but not least, the continued encouragement and support from my wife Nomusa is greatly appreciated.
To God be the glory.

ABSTRACT

Background: A significant proportion of students who enrol for courses in the health sciences either do not complete them or have to remediate the courses before succeeding. However, they often fail to remediate successfully. In order to meet the increasing demands for qualified health care practitioners, there is need to ensure that all students complete their degree programmes. Understanding factors which contribute to successful academic throughput is therefore essential.

Aim: This study explored factors which health sciences students perceived to have contributed to their successful progression after remediating medical biochemistry and physiology.

Methodology: For this qualitative non-intervention study, phenomenography was used. Students were purposively sampled and semi-structured interviews conducted online or in-person. They were asked what they felt contributed to their poor academic performance initially, then what they attributed to their success in the remediation year as well as their emotions and advice they would give to remediating students and to faculty. The interview audios were transcribed and a systematic thematic analysis undertaken to explore themes and sub-themes.

Findings: The reasons proffered for initially failing included poor study techniques, lack/inappropriate use of teaching and learning resources, failure to adjust to remote learning due to covid-19 lockdown restrictions, heavy workload, neglect of the course due to wrongly perceiving it as easy compared to the other courses and the innate difficulty of the course. Factors perceived to have resulted in successful academic progression in the remediating year included, increased self-efficacy, increased and purposeful use of teaching and learning resources (tutorials, past exam papers and eQuip), use of institutional support systems (Office of Student Success, academic advisors, course coordinators and tutors) and tapping into social support systems (family, peers, clergy and senior students). The students' emotional feelings during remediation included, fear, isolation, stigmatisation, embarrassment and stress. They generally recommended that remediating students should use the interventions that they used in order to succeed. Advice to faculty centred on providing academic and emotional support to remediating students as well as to actively monitor their progress.

Conclusions: There is need to review the workload of the medical biochemistry and physiology course. Students need to be equipped early with appropriate study skills and how to make the most of the support systems available to them in order to

increase their prospects for academic success. Remediating students are under emotional strain and strategies to alleviate it need to be implemented.

LIST OF ABBREVIATIONS

CCDU	Counselling and careers Development Unit
eQuip	eQuestions for Understanding Integrated Physiology
HREC	Human Research Ethics Committee
ICT	Information communication technology
OSS	Office of Student Success
P1-6	Coded identity of participants 1-6
PHSL2003	Course code for Physiology students enrolled for Bachelor of Dental Science (BDS), Bachelor of Science in Occupational Therapy (BSc OT), Bachelor of Science in Physiotherapy (BSc Physio), Bachelor of Pharmacy (BPharm) and Bachelor of Nursing (BNurs) degrees
PHSL2004	Course code for students enrolled in the Medicine and Surgery (MBBCh), Biomedical Engineering (BEngSci (BME)), and Bachelor of Health Sciences (BHSc) degrees
POPIA	Protection of Personal Information Act
TVET	Technical, Vocational and Education Training college
Wits	University of the Witwatersrand

PERSONAL STATEMENT

I come from a background of quantitative research in the basic sciences. I have been teaching human, animal and veterinary physiology for 33 years and I have an interest in student success and throughput. Hence my interest in conducting this qualitative study which allowed me to gain some insights into a cohort of students, for which we do not have much documented literature. The dearth of literature on remediating students in an African tertiary education context has a negative impact on how best to support students in such an all-too-common situation. By conducting this study, I sought to bridge a gap of knowledge and use the findings to help develop proactive interventions and support systems for students in an effort to improve throughput and smoothen the academic journey of students.

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CHAPTER 1: INTRODUCTION AND BACKGROUND

1.0. Introduction

1.1. Format of research report

This research is presented as a monologue according to guidelines in the Faculty of Health Sciences 'style guide for theses, dissertations and research report'. Thus, it is laid out such that the first chapter provides a description of the report layout, an introduction to the study, background information, the theoretical framework, aim and objectives of the study. Chapter two contains a critical review of pertinent literature. The methodology for the study is provided in chapter three while chapter four details the findings. A comprehensive, critical and contextualised discussion of the findings is presented in the fifth chapter of this research report. The overall conclusions, limitations and recommendations are proffered in the fifth chapter. A bibliography and an appendix with supporting documents are included after the fifth chapter.

1.2. Study Background

There is a dire shortage of health professionals in South Africa. Therefore, there has to be high and sustained academic throughput so as to alleviate/prevent the shortages. Physiology and Medical Biochemistry are considered to be key subjects for students in the health sciences. A good understanding and knowledge of physiology, biochemistry and pathophysiology provides students with a solid foundation for their later clinical studies (Joyner, 2011).

The pass rate for medical biochemistry and physiology at the University of the Witwatersrand is not 100%. A significant proportion of students have to repeat/remediate the year, and thereafter, if successful, proceed to the next year of study. Failure results in them having to withdraw or be excluded from the programme. It is therefore important to identify and understand the experiences, beneficial factors and strategies employed by students that ensure their successful progression during their remediation years so as to increase successful completion of the Health Sciences degrees and thereby mitigating the shortage of health professionals nationally.

In the faculty of health sciences at the University of the Witwatersrand, the course 'Medical Biochemistry and Physiology' is offered to two major cohorts. Namely

PHSL2003 [for students enrolled for Bachelor of Dental Science (BDS), Bachelor of Science in Occupational Therapy (BSc OT), Bachelor of Science in Physiotherapy (BSc Physio), Bachelor of Pharmacy (BPharm) and Bachelor of Nursing (BNurs) degrees] and, PHSL2004 [for students enrolled in the Medicine and Surgery (MBBCh), Biomedical Engineering (BEngSci (BME)), and Bachelor of Health Sciences (BHSc) degrees]. The first year for all of these students (exceptions are i. the BDS students who due to a recent change in curriculum, enrol for Medical Biochemistry and Physiology in the first year of their studies; ii. Biomedical Engineering students who enrol for the PHSL2004 course in their third year of study) covers the basic sciences including chemistry, mathematics and biology in the faculty of science. In the second year, the students physically change campuses and move to the Health Sciences Campus and in some instances also have to work in clinical spaces such as hospitals and clinics. The courses at this stage include anatomy, molecular medicine, physiology and discipline specific courses. The learning and assessment thereof require an increased ability for application and integration of knowledge compared to the first year. Hence, a further transitional phase occurs for the students and this often is a stumbling block barrier to progress at first encounter with the course, and consequently the students find themselves having to remediate the courses.

Sadly, a significant proportion of students who repeat, do not complete their studies (Van Der Berg et al., 2019). With current budget cuts in funding for students and a high demand for enrolment in tertiary institutions, it is imperative that throughput is maximized (Potgieter et al., 2016). Remediation has several negative impacts including increasing the expenses of education, causing deterioration in mental well-being, stigmatization, and discord in family dynamics, more so where students may be the first from a family to go to university (Ellery and Baxen, 2015). Therefore, the stakes are high as the successful completion of degrees, especially in developing countries like South Africa is considered an investment for socioeconomic upliftment of the family, both nuclear and extended (McGinn et al., 2020).

The Covid-19 pandemic introduced a sudden unplanned shift in the teaching and learning environment in that there was a forced migration from the traditional approach of use of primarily didactic face to face pedagogies to online and remote teaching in 2020 (Mpungose, 2020). Consequently, the students enrolled in the

Medical Biochemistry and Physiology course in 2020 were the first cohort to have experienced this change in teaching. Students failing the course would be repeating it in 2021 and those that succeeded in 2021, would have fresh memories of their lived experiences in 2022. For this study, I planned to focus on the student academic factors which this cohort of students perceived contributed to their success.

1.3. Theoretical framework

The theoretical framework for the this study is based on the social cognitive theory which considers the interplay between personal influences, behaviour and, environmental factors (Bandura, 2011, 2000). In an educational setting, the environment is that which is either imposed on students by the institution, the environment selected by the student or that which the student constructs (Cacciatore and Sevian, 2006). These three factors (personal influences, behaviour and environment) in their different forms and nuances are fundamental in framing this study.

Within the social cognitive theory, the construct of self-efficacy is pertinent (Bandura, 2011). Albert Bandura describes self-efficacy as an individual's belief in his or her capacity to execute behaviours necessary to produce specific performance attainments (Bandura, 2011). A major factor couched within experiences is resilience which entails 'the ability to bounce back after adversity' as well as the ability to do well despite a background that is not in one's favour (Ye et al., 2021) and this will be further considered in this study.

1.4. Aim and objectives of the study

The aim of this study was to explore the factors and academic strategies that PHSL2003 and PHSL2004 students, who remediated Medical Biochemistry and Physiology, perceive contributed to their successful academic progression.

The objective of this study was to explore, using a semi-structured interview, the students' experiences and perceptions of factors that contributed to their success when they repeated biochemistry and physiology.

CHAPTER 2: LITERATURE REVIEW

A recent report by the World Health Organisation (WHO, 2023) projects a global deficit of 10 million healthcare workers. To address the shortage of healthcare workers, there is need for more healthcare workers to be trained, which includes the provision of facilities for training. However, it is important to not only provide facilities for education, but to also ensure that enrolled students complete their studies within minimal timeframes and join the workforce without delays. Therefore, a high academic throughput is required to mitigate the deficit of healthcare workers.

2.1. Throughput and retention

When considered in the South African context, throughput rate is defined ‘as the rate at which a cohort successfully completes a qualification within the stipulated timeframe for that qualification’ (DHET (2021), Dictionary of Terms and Concepts for Post-School Education and Training). Unfortunately, in higher education institutions from South Africa, data on throughput rates shows that a significant of students do not complete their studies and, that of those who do complete, they do so beyond the minimal time for the specific degree/program (Stats SA Report, 2016). For example, a recent report on throughput rate at TVET colleges is 9.2% (Khuluvhe and Mathibe, 2021).

Consequently, a significant number of students have to repeat at least a year before completing their tertiary studies. Accordingly, in the Republic of South Africa, the model used to fund for students enrolled for tertiary education recognises that repeating is a reality and therefore adopts the ‘N+2’ rule which allows students an extra two years beyond the normal period for a course/degree. In this funding formula, ‘N’ denotes the minimum duration in years allocated to complete a qualification and then an extra 2 years is permitted to complete the degree, after which no further funding is provided to the student for the programme they are enrolled in. Thus financial considerations are factored in for what is a reality (remediation) to many students and having to repeat a year or two adds significantly to the fiscal costs of education (Martorell and McFarlin, 2011).

2.2. Remediation/repeating

Repeating is also referred to as remediation. For the purposes of this research report, the two terms have been used interchangeably. There are multiple reasons why students have to remediate components of their studies. In the case of primary and secondary school children in South Africa, up to 52% of children have repeated at least once before grade 10 (Grossen et al., 2017). The factors implicated as making students have to remediate include slow mental development for age, poor early educational foundations, and financial constraints causing students' class attendance to be erratic, falling behind with the curriculum due to socioeconomic factors (Ikeda and García, 2014). It is well recognised that some of the highlighted factors can also spill over to tertiary level. For this study, the focus is remediation/repeating at the tertiary level.

In tertiary education settings, the first year of study is considered a high risk phase for poor student performance, resulting in many students actually dropping out (Moodley and Singh, 2015). Estimates are that approximately 60% of students who failed to complete their tertiary studies in the USA were likely to drop out in their first year of higher education study. In South Africa the attrition rate in the first year of tertiary study is similarly high (Mbuvha et al., 2021).

A major contributing factor to this poor performance during the first year at tertiary institutions is the poor transition from High school to University (Flanagan Borquez, 2017). This transition has multiple factors associated with it. Some of which are changes in the style of teaching, from teacher focussed to student driven, reduced direct teacher supervision of scholarly works, social freedoms that come with leaving scrutiny from folk at home and pressure from peers to pursue undesirable activities including substance abuse and excessive partying (Armstrong and Biktimirov, 2013; Ayodele Ajani and Gamede, 2020; Flanagan Borquez, 2017).

Additional factors include failure to bridge the articulation gap and secondary education in poorly resourced (material and underqualified teachers) rural schools (Ayodele Ajani and Gamede, 2020). Being the first in the family to attend university is usually also associated with lower socioeconomic status of the parents or guardians which translates into insufficient family support of the students (Ayodele Ajani and Gamede, 2020; Burger and Naude, 2019).

Repetition/ remediation of courses also occurs in later years of studies and is therefore not a preserve of the first year. In some degree programmes, for example in the health sciences, apart from the need for students to successfully accomplish the transition from high school to first year at university, the curriculum also changes significantly through the years of study, namely the preclinical, paraclinical and ultimately clinical phases. These different phases require the students to develop different skills sets and competencies, all of which can contribute to poor student performance resulting in the need for remediation (Chou et al., 2019). For this current research, I focussed on undergraduate students in the preclinical phase (years 1-3), specifically enrolled for Medical Biochemistry and Physiology.

There are different schools of thought on the benefits or lack thereof for remediation as the impact of the Covid-19 pandemic revealed.

2.3. The Covid-19 pandemic impact on student remediation

Interestingly, there were reports of requests by students for voluntary repeating due to the impact of Covid-19 restrictions and resultant shutting down of institutions of higher learning as a mitigation approach to the spread of the pandemic (Pokhrel and Chhetri, 2021). Students and lecturers felt that they had not engaged adequately with the curriculum and thus were loath to proceed with knowledge gaps (Pokhrel and Chhetri, 2021). However, this should not be considered the norm especially considering the shortage of health care providers which needs to be remedied.

In response to the Covid-19 pandemic in South Africa, and specifically at the university of the Witwatersrand, there was a policy shift to adopt emergency remote teaching and learning approaches which entailed the use of voice over power point presentations and online Zoom or MS Teams interactive sessions (Emergency Remote Teaching and Learning (ERT&L for 2020). Unfortunately, many students were not prepared for how to use such approaches. Similarly, staff did not all get adequate training and as a result the quality of resources and teaching was often not optimal (Personal observation). This could have negatively impacted academic performance of the students. There is need to identify interventions that can improve student throughput.

2.4. Interventions to prevent student attrition

It is well recognised that Higher education institutions can be, and are indeed proactive/reactive with remedial and pre-emptive strategies to mitigate against student failure (De Klerk et al., 2017; Potgieter et al., 2016). Some of the strategies include aspects of Swail's retention model (Swail, 1995) considering five factors (financial aid, recruitment and admissions, curriculum and instruction, academic services and student services). Successful academic progression by students has also been attributed to those with 'grit' or resilience (Burger and Naude, 2019; Maharaj et al., 2019). Resilience is a phenomenon that needs further interrogation in the South African context.

Closs et al., (2022) highlighted the importance of the learning environment on learning. They identified three key dimensions, namely the physical, psychosocial and pedagogical domains. Aspects included in the physical domain infrastructure and information communication technology (ICT). The pedagogical dimension considered mode of subject content delivery, levels of engagement, in class and extramural activities and assessment approaches. The psychosocial dimension encompasses an individual's behaviour driving, restricting and enabling learning in the academic sphere.

While factors which can have a negative impact on academic performance of students have been widely researched, there is need to interrogate further, students who have remediated during the time of their study and successfully progressed, in order to identify the strategies they employed to ensure ultimate success. It is also important to note that emotional burden which remediating students have to endure is not a light one (Ajjawi et al., 2019). Therefore, the data collected in this study will be useful to guide policy/interventions and develop resources that students can be given to help improve their odds of academic success.

CHAPTER 3: METHODOLOGY

3.1. Ethical and institutional approval of the study

Ethical clearance to carry out the study was granted by the Human Research Ethics Committee of the University of the Witwatersrand. The reference allocated to the study was M220435. A copy of the certificate as well as modifications granted to the study are appended in appendix 1A-1C. Permission to access student records and interview students was granted by the Deputy Registrar of the University of the Witwatersrand (see appendix 2 for copy of approval letter).

The Helsinki Declaration of ethical studies on humans were adhered to. Ethical considerations of this study included informed voluntary consent, anonymity, confidentiality and avoidance of harm. How these tenets were ensured in the study is as described below:

Informed voluntary consent. The students were provided with an information sheet detailing the study aim, objectives methods and conditions. Additionally, consent was sought for recordings to be made. The participants signed off the documents.

Anonymity: records were kept with no identifying information. Additionally in this report where quotations have been used, any identifying characteristics have been removed. Names have been replaced with an 'X'.

Confidentiality: no discussions about the study participants were held with other individuals, other than between the supervisor, fieldworker and researcher. Such discussions were limited to the study and without naming or identifying individuals.

Autonomy: participants were informed about their freedom to make decisions without coercion while maintaining their dignity and so they were not pushed into situations of discomfort during the interviews. they were informed of their right to withdraw from the study at any time.

Avoidance of harm: non maleficence was ensured by protecting the participants as well as their data.

3.2. Study design

This interpretive study was qualitative and non-interventional, based in phenomenography. “Phenomenography studies address various conceptions of, or various ways of experiencing, a phenomenon” (Fyrenius et al., 2007; Sundler et al., 2019). Additionally as the study aimed to report students’ individual perceptions, it was undertaken as a second order perspective (Marton, 1981; Ornek, 2008). Phenomenography was developed in the 1970s in Sweden and is described as “aiming to identify and interrogate different ways in which people perceive or experience specific phenomena” (Tight, 2015). It is a research design that usually involves interviews (semi-structured with probing questions) to collect data (Tight, 2015). It is an iterative process in which all data are considered and, treated collectively for analysis. The transcripts need to be read to identify foci which are interrogated for similarities and contrasts and structural relationships. The data are then categorised to 4-5 variants of increasing hierarchical experiences. Generally, the sample size in most studies using phenomenography is 20 or less (Tight, 2015) . However, it is important that the sample size should not make the data difficult to handle (Tight, 2015).

3.3. Study setting, sampling and inclusion criteria

3.3.1. Study setting

This study was carried out at the University of the Witwatersrand, Faculty of Health Sciences. The University has one of the largest health sciences faculties on the continent and offers training to a significant proportion of health sciences disciplines including medical Physiology and Biochemistry in Africa.

3.3.2. Sampling

Purposive sampling was used. Purposive sampling allows for participants to be chosen with the expectation that each will provide rich and unique information (Palinkas et al., 2015).

Faculty of Health Sciences (University of the Witwatersrand) student records were examined to identify second year BDS and third year BSc (OT), BSc Physiotherapy, BNursing, BPharm, MBBCh and BHSc students as well as fourth year Biomedical Engineering BEngSc (BME) students who repeated/remediated Medical Biochemistry

and Physiology in 2021 or 2022 and successfully proceeded to the second/third/fourth year of study in 2022 or 2023.

The BDS students take the course in first year and hence were expected to provide information which sheds insights into the first year at university experiences. The Biomedical Engineering students represent a more senior cohort of students and therefore were expected to provide information following a longer exposure to university life as they take the PHSL2004 course while in their third year of the degree programme. The remaining students who take the course in second year would have undergone the traditional first year experience at university.

3.3.3. Exclusion criteria

Students who were not enrolled for Medical Biochemistry and Physiology (PHSL2003 or PHSL2004) in the faculty of health sciences were excluded from the study. Additionally, students who did not remediate the course were excluded from the study.

3.3.4. Recruitment of participants

An administrator in the School of Physiology emailed all students (individual) meeting the criteria for inclusion in the study, informing them about the study and asking them to contact her if they were interested in participating in the study. This was done twice in 2022 (September and follow up in November). As there were no respondents in 2022, permission was sought from the HREC-medical to modify the study and include students who remediated in 2022 and successfully progressed to the next year of study in 2023. Permission was granted. Thereafter the School Administrator emailed eligible students informing and inviting them to participate in the study. This was done twice (March and follow up in May 2023).

The contact details of students who expressed an interest in participating in the study were forwarded to me and I then sent them a copy of the detailed participant information sheet (see appendix 4) and consent forms (see appendix 5) to sign if they were still interested in participating in the study after reading the information sheet.

Following receipt of the signed consent forms, arrangements were made for the interviews to be conducted. The original ethical clearance was for face-to-face

interviews. However, several students preferred to have online interviews. Therefore, permission to hold online interviews was sought and granted by the HREC-Medical (see appendix 1C).

3.3.5. Recruitment challenges

In 2022, there were 15 eligible (remediated in 2021) students (8 in the PHSL2003 cohort and 7 in the PHSL2004 cohort) who were invited to participate in the study. However, none responded. To address this challenge, permission was sought from the HREC to invite students from the 2023 cohort to participate in the study. After permission was granted, an invitation was sent to all students in the first teaching block of the year and a follow up invitation was sent in the second block. The students who participated in the study were also asked to inform their peers (who they knew had remediated) about the study.

In 2023, there were 118 eligible (remediated in 2022) students and they were all invited to participate in the study. A summary of the class breakdown for the 2023 cohort from which a positive response was received is shown in Table 1 below.

Table 1. Number of students eligible to participate in the study, positive response rate and self-reported sex of respondents from 2023 cohort of students.

Cohort	**Year of study when remediated**	**Eligible students invited**	**Positive response**	**Self-identified sex of respondent(s)**
BDS	1	9	1	Female
BSc OT	2	9	0	n/a
BSc Physio	2	12	1	Female
BNurs	2	23	0	n/a
BPharm	2	17	1	Female
BME	3	4	0	n/a
MBBCh	2	27	0	n/a
BHSc	2	33	2	Female

n/a = not applicable as there were no respondents from the cohort.

3.4. Data collection methods

3.4.1. The interviews and transcription

Following receipt of signed consent forms, the students were asked to participate in an interview with semi-structured questions related to their experiences and perceptions on factors and strategies that they perceived contributed to their success when remediating. The specific questions that were posed are detailed in appendix 3. The interview also entailed the collection of minimal biographic information, with compliance with the Protection of Personal Information (POPI) Act of 2013. The biographic information collected included programme of study, year of study, age, preferred description of sex and number of courses that were being remediated in the year of interest.

As I taught the PHSL2004 cohort in 2020, 2021 and 2023, and the PHSL3006A cohort in 2022 and 2023, I used a fieldworker (Mrs Aretha Maposa) to interview the two (2) students (that I had previously taught) in order to avoid any interviewer bias (Oberai and Anand, 2018) or effect on the students' responses.

The interviews were conducted with six (6) students either in person or online. The one in person interview was conducted in neutral meeting room in the administrative block of the faculty of health sciences, where the interviewee was out of sight of peers and could ensure confidentiality. The online interviews were conducted via videotelephony software using either Zoom (Zoom video communications inc. USA) or Microsoft Teams (Microsoft corp. USA) depending on the students' preference. The online interviews were recorded on Zoom or Microsoft Teams with back up recording on a voice recorder (Phillips, Voice tracer LFH0882, Korea). All questions and responses were recorded to ensure credibility (Rutakumwa et al., 2020).

3.4.2. Pilot study

Pilot studies allow researchers to test whether the study is feasibly, reliable and valid amongst its key aims (van Teijlingen and Hundley, 2002). In qualitative studies pilot studies are often included as they can help develop the researcher's confidence, competence and help to refine the study (Janghorban et al., 2014; Wray et al., 2017).

Janghorban et al., (2014) further identified four potential roles for pilot studies, namely, to identify challenges in recruitment of participants; increasing researcher engagement ‘in studies, assessment of the protocol for the interviews.

Prior to conducting the actual interviews, a pilot study was first conducted in which I interviewed a student who had repeated PHSL2004 and had successfully progressed to graduation. The interview was conducted online using MS-Teams and the audio was then transcribed into a word document. A meeting was subsequently held between my supervisor (Dr Ndofirepi, the field worker (Mrs Maposa) and I, to discuss the transcript so that we could interrogate its content thereby using it for training on interviewing to avoid interviewer bias and procedural as well as measurement, response and confirmation bias (Pannucci and Wilkins, 2010). Questions which required further probing were identified and incorporated into the semi-structured interview protocol. Being my first encounter with conducting interviews for research purposes, I found the pilot study extremely beneficial. Additionally, semi-structured interviews are an iterative process, each providing its own richness and when reviewed, further probing questions can be identified, hence the pilot studies are of value in qualitative studies (Janghorban et al., 2014).

Thereafter we (Mrs Maposa and I) proceeded to interview the rest of the students. Mrs Maposa transcribed the audios of the interviews she conducted, however I listened to all of her audios and crosschecked with the written transcripts to ensure that the audios were transcribed verbatim and accurately.

Data from the pilot study was incorporated into the main study as the interviewee provided some unique perspectives but also shared similar experiences of remediation as the other participants.

3.4.3. Inter-rater variability and rigour

Dr Ndofirepi, ~~who~~ was not involved in the interviews, but checked all of the transcripts for inter-rater variability and rigour.

3.4.4. Data management

The audio interviews were transcribed into Microsoft word documents and the electronic copies of the transcriptions were archived with codes (P1-P6) which were

not linked to identifying participant information so as to maintain participant anonymity. All electronic records of the audio interviews and word documents were archived in password encrypted folders. Additionally printed paper copies we anonymised and either shredded after use or stored in a locked cupboard accessible by the researcher only.

3.5. Data analysis

A manual approach was used in the analysis of data. A systematic thematic analysis was carried out to ascertain recurrent key themes (Naeem et al., 2023). Thematic analysis allows for qualitative data to be analysed precisely, consistently and exhaustively (Nowell et al., 2017a).

The thematic analysis was a stepwise process (Braun and Clarke, 2006). In carrying out the thematic analysis I was cognisant of current modifications to the original process by Braun and Clarke (2006) wherein systematic thematic analysis involved key steps as described by Naeem et al. (2023) namely,

i. “transcript creation and data familiarization” (page 2). Transcripts were initially generated by using an auto caption generation software (MS Teams or playing back the audios to Google docs which then generated captions). Thereafter, the audios were carefully listened to and amendments made where errors in auto-caption generation were picked up. To familiarise myself with the transcripts, I listened to the audios several times and also read the written documents several times.

ii. “key word identification; code selection” (page 2). To accomplish this, I identified descriptive key words used by the participants. Additionally, sentences and phrases expressing specific perceptions were manually highlighted on printed transcripts using different coloured markers.

iii. “theme development” (page 3). The codes were then arranged into common, broad and coherent themes.

iv. “conceptualization through the interpretation of keywords, codes, and themes” (page 3). The aforementioned were then interpreted and conceptualised, culminating in the last step.
v. “development of a conceptual model”(page 3) wherein the main components and relationships between them were presented visually and in a written format.

In presenting the results for this study, use of direct quotations from the students is employed in order to vividly present the data, taking cognisance of robust patterns, whilst embodying the diversity of the participants and for authenticity while considering ethics and confidentiality (Eldh et al., 2020).

Other considerations in this study were:

Trustworthiness

This describes the rigour of the study and collected data as well as the presentation of the findings (’Connelly, 2016). The pillars which were considered included credibility, confirmability, transferability and authenticity (Nowell et al., 2017b). Reflexivity was also a major aspect of the study (Peddle, 2022).

Credibility

This was accomplished by iteratively and repeatedly analysing the transcripts and by use of an established theory (’Connelly, 2016) namely, phenomenography.

Confirmability

This was strived for by ensuring that the findings presented are from what emerged from the data and not my personal predispositions (Shenton, 2004).

Transferability

This describes how applicable the findings of the study are to others (’Connelly, 2016; Shenton, 2004)By providing details of the circumstances, location, context, conditions, methods and participants in the study, readers can make a decision as to whether the findings of the current study are applicable to them.

Authenticity

As described earlier, direct quotations from the participants are included in reporting the findings of this study. Additionally, by selecting participants from a variety of disciplines and different settings, this contributed to the authenticity of the study (’Connelly, 2016; Shenton, 2004).

The next chapter presents the findings from the study.

CHAPTER 4: FINDINGS

4.1. Response rate and biographic information

For the pilot study, the student who was interviewed was in the BHSc cohort and had remediated year 2 of study. As highlighted earlier, 15 individuals were eligible (remediated in 2021) to participated in the study, however, none responded. In 2023, 118 individuals were eligible (remediated in 2022) and invited to participate in the study, however, five students responded and were interviewed. One student requested to be interviewed in-person while the rest of the students were interviewed online. Therefore, in total, 6 students (including pilot study) were interviewed, of which I interviewed 4 and the fieldworker interviewed 2. All the interviewees self-identified as female. During the remediation year, all the respondents only remediated one course (Medical biochemistry and physiology).

4.2. Factors perceived to have contributed to remediation of the course

Before delving into the students' perceptions about what they attributed their success following remediation, it was important to get insights into what they felt caused the initial failure to progress academically at the first encounter with the course. Therefore, students were asked to identify (without providing graphic details) factors which they felt contributed to them having to remediate the medical biochemistry and physiology course. Table 2 below provides a key point summary of the perceived factors identified by each interviewee.

Table 2. Student perceptions on factors contributing to having to remediate medical biochemistry and physiology

Interviewee	**Factors perceived to have resulted in having to remediate the course**
P1	-Thought physiology was easier than other courses so neglected it -Focused more on other subjects (molecular medicine and anatomy)
P2	-Struggled with studying the course -Studied late for tests (day before) therefore unable to finish revising content

	-Used open book approach for quizzes so didn't internalize content (just looked up answers) -Focused more on home subjects (physiotherapy)
P3	-Shift from 1st to 2nd year had increased workload, did not adjust -Online environment was overwhelming -Being at home gave sense of comfort -Did not attend online classes -Did not attend online tutorials
P4	-Struggled to cope with online lectures, tutorials and practicals -Despite MS-Teams tutorials, missed in person interaction -Anxiety induced by lockdown and uncertainty of covid-19 pandemic -Not being on campus -Difficulty balancing three content heavy courses -No support when at home alone -Hard to dedicate time to all three courses
P5	-Time management -Socially distracted by boyfriend -Did not engage with school resources (eQuip) -Did not attend extra tutorials
P6	-School and personal life issues -Failed to adjust to returning to undergraduate basic sciences as a clinical graduate -Unfamiliar with systems such as negative marking -Overwhelmed with work content

Analysis of the responses highlighted several themes and sub-themes that emerged from the interviews which will be considered in turn.

4.2.1. Heavy workload, poor time management, poor study techniques and underestimating course difficulty

Most of the participants indicated that they found the workload, which entailed at least three content-heavy courses, hard to cope with. For example, one participant stated:

So I was struggling a lot with anatomy and molecular medicine, and I kind of neglected physiology, because all those 3 modules were overwhelming on their own. (P1)

Other responses with a similar sentiment were:

…what was hard was balancing all three, second year courses that I had to do because I also had an anatomy course and a molecular medicine course with physiology course and, umm all three are quite work heavy. (P4)

The participants further detailed how being overwhelmed by the workload affected how study time was allocated between the three courses registered, for example one of the participants said:

Umm, I felt quite overwhelmed and it was just hard to sort of delegate my time between all three courses. (P4)

Poor time management was identified as a major reason for undermining the course:

Number one, time management. I wasn't aware how to manage time of course intensive the courses were, and so I undermined it. (P5)

The heavy workload and poor time management was closely linked to study techniques, particularly leaving studying of physiology to the last minute due to a misconception that physiology was easier than the other courses. Consequently, physiology was neglected so that the study focus was on the other subjects as highlighted by participant 1:

I think the main reason was I thought I understood physiology, so it was sort of like the easier module compared to anatomy and molecular medicine. So, I focused more on the anatomy and molecular medicine and laid back on the physiology. (P1)

A similar sentiment was echoed by participant 2, who further explained how the delayed studying resulted in failure to complete revision of the course content:

I struggled with studying for the course a lot and then... So, when we had tests and stuff, I studied quite late for, for, so probably like the day before. And I couldn't get through all the content obviously. (P2)

Thus, some of the participants showed a lack of life and learning skills. This further resulted in poor utilisation of resources.

4.2.2. Underutilisation of School support systems/resources

To support the teaching and learning activities, the school of physiology avails several electronic resources to students, namely access to eQuip and online quizzes. Additionally, over and above the normal tutorials, the school provides extra tutorials for students at academic risk of failure.

eQuip.

The school has an online archive of past paper questions (eQuip) which is interactive and provides feedback on answers. eQuip (eQuestions for Understanding Integrated Physiology) was developed by the school of physiology working with and external coding expert. Students are encouraged to use it and those that have been shown to actively engage with it improve their success in the course. However, not all students engage with it and tap into its benefits as expressed by this participant:

So in the first year I overlooked the eQuip resource and the extra tutorials. I wasn't, how can I say like I wasn't aware of the usefulness of the eQuip resource which I found in second in the second year, when I repeat said it really helped. (P5)

It is notable that when the participant got to use the resources, the benefits became evident.

Tutorials

The school of Physiology offers two types of tutorials. Those that are an integral part of the course and all students are expected to attend and participate in and the second type is the ‘extra tutorials’ which are specifically for students at academic risk. The former are not compulsory while the latter are compulsory for some students meeting defined criteria.

One participant reported missing tutorials and not engaging in the online content:

I think that was the main reason, and I wasn't attending tutorials and I wasn't attending the on-line classes as I should have been because it was just difficult to have the sense of emergency to do it. (P3)

The participant showed a lack of agency and engagement with the course.

Quizzes

The School of Physiology provides opportunities for formative assessment via online quizzes at the end of each topic. However, when used inappropriately they do not adequately serve as a resource which can be used as a test of understanding as highlighted by P2:

And then when we had quizzes and and yeah, stuff like that, I, I also didn't learn a lot from them because I tended to make it more open book like I would look up all the answers instead of actually thinking about it and working through the problems to gain more like knowledge and yeah.(P2)

Failure to engage with the assessment resources caused unfamiliarity with the assessment types. Although not a factor identified by other students, the marking system i.e. negative marking adversely affected one of the participants coming from a previous course where negative marking was not used:

And that's all I had to sit and focus on once again, and I was a lot different and we had never done uum negative, things that had negative marking. (P6)

The participants' perceived a lack and or underutilisation of resources provided by the School of Physiology as a contributory factor to their poor performance at the first encounter with the course. Changes to the teaching and learning approaches due to the COVID-19 pandemic were also perceived as negative factors.

4.2.3. The Covid-19 pandemic impact on teaching and learning

Prior to the Covid-19 pandemic, the teaching approach was face to face (in person) with very little if any use of online approaches. Due to the restrictions on gatherings, during the Covid-19 pandemic there was a change in teaching approach to

exclusively online with a subsequent gradual partial return to in person teaching and learning which the participants experienced.
There were several facets associated with the covid-19 pandemic which impacted teaching and learning, namely:

Lockdown and uncertainty of covid-19 pandemic
As a new disease shrouded in lots of unknowns, the covid-19 pandemic had an impact on students. The switch to remote teaching and learning, and anxiety and fear associated with the disease was a contributory factor to poor academic outcomes as highlighted by participant 4:

Also, just being in lockdown at the time, 2021 was when I first did the physiology course. (P4). So yeah, we were in lockdown with the pandemic, and I felt those were definitely factors leading to me repeating again because I wasn't at university and just the stress of having to be in lock-down and dealing with this pandemic, which was largely unknown at the time. I mean, COVID was largely unknown at the time. So there's just a lot of uncertainty and uncertainty whether I would go back to university, umm at all in person so and it was also quite hard… (P4)

The shift to remote teaching and learning approaches

The change to remote teaching and learning meant that for students there was need to adjust to online systems. This seems to have created an additional workload for students as well as having to work from home which gave false comfort were highlighted by P3:

First time around I think it was the on-line learning; I hadn't adjusted to the work load that was kind of needed and the reason being I think from first year to second year the work load was a lot and I think the first time around, I underestimated it and being at home as well kind of gives you that sense of comfort that you wouldn't have had if you go to classes often and attend classes. (P3)

The difficulty of adapting to online teaching and learning were further detailed by P4:

I found what led to me repeating the course was the fact that we were online and we were doing full online learning. So this included online lectures, umm, online tutorials and online

practicals as well. So we were not at campus in person for any academic activities at all, and that was quite difficult. I I really struggled. (P4)

The isolation identified earlier by P3 also negatively impacted P4:

With tutorials, even though it was an MS Teams meeting, I still felt like I missed that in person interaction and I felt my …and that really impacted my understanding for the whole year. (P4)

4.2.4. Social factors

Apart from the isolation due to covid-19 lockdown, some of the students highlighted personal relationships and social factors as having a negative impact on their academic performance. The identified factors were:

Distraction from a boyfriend:
This was particularly stated by P5:
Also, at the time I was a bit socially distracted by… I had a a boyfriend, so that did take a bit of my time. (P5)

Personal life issues
The participant seemed to be able to cope with a change in the approach to teaching and learning given their prior background:
There were some school issues that had occurred and also personal life issues, but I don't, I don't know, I needed to change up my entire situation since I was moving from clinical year to preclinical years, to just purely based theory again. (P6)

In summary, the participants perceived, the workload, poor time management, poor study techniques, underutilisation of resources, the Covid-19 pandemic, teaching and learning approaches as well as social factors, the main reasons for their poor academic performance resulting in them having to remediate the course.
Having gained insights into what the participants perceived to have resulted in poor academic outcomes at the first encounter with the course, the factors around success were then explored. The findings are highlighted in the next section.

4.3. Factor(s) perceived to have contributed to passing medical biochemistry and physiology after remediation

The main objective of this study was to get the students perceptions on factors which resulted in successful progression. To accomplish this, the students were asked probing questions specifically, whether there was a change in their academic strategies and if so, to explain further. They were also asked whether they received any institutional support and social support and to provide details. The students were also asked to elaborate on any other factors they felt contributed to their success. The findings are summarised in table 3 below which shows a variety of factors.

Table 3. Summary of factors that students perceived had contributed to successful progression during the remediation year

Participant code	**Factors perceived to have resulted in passing the course after remediation**		
	Academic strategy adopted	*Institutional/social support*	*Other*
P1	-Focused on key components -Did past papers and tutorial questions -Consulted lecturers when stuck -Used eQuip	-Extra tutorials with X -Consulted BHSc course coordinator -Got tutor from OSS -No social support sought	-None identified
P2	-Only course remediated so increased focus -Increased time dedicated to study the course content -Worked on past exam papers -Attended many tutorials	-Joined tutoring group run by senior medical student -Moved out of residence back to home -Family support -Aware of OSS but didn't seek their services	-nb. Did not seek help from institution -No support from home department
P3	-Worked on past papers -Used eQuip	-Extra tutorials with Dr Muller	-Did not ask questions in lectures due to

		-Studied with a friend from a different degree and attended tutorials together -Got emotional support from OSS -Moved out of residence back to home -Family (mother) support and encouragement	feeling intimidated, but asked in tutorial environment
P4	-Return to physical practicals and tutorials enabled more interaction and questions -Worked on more past papers -Attended more extra tutorials than in remediating year -Used eQuip much more than previous year -Formed study groups	-Contacted OSS -Regular check in meetings with academic advisor from school of Physiology -Sought help for study skills - Received support from BHSc coordinator -Received support from mother and father (encouragement) -Worked with peers in same class and different degree courses	-Increased self accountability -Sought consolation from remediating peers
P5	-Increased time to focus on content -Regular attendance of extra tutorials -Used eQuip more regularly -Working on past papers before studying	-Parents provided support -Attended extra tutorials	-Motivated by congratulatory letter on good performance at mid-year -Aware of CCDU and OSS but did not use them -Parents lost job and so had to work part time
P6	-Was more relaxed about the course	-Sought advice from senior students	-Did not use eQuip in

	-Got a tutor and met once or twice a week -Worked on past papers immediately after lectures, practicals and tutorials to test self on understanding -attended all extra tutorials with Dr Muller	-Sought academic advice from staff in School of Physiology -OSS for help with personal issues -Received emotional support from family	remediation year -Used internet for some difficult concepts

Several themes and sub-themes emerged from the systematic thematic analysis of the data. These mainly centred around students making changes in academic strategies and changes in environment and extrinsic motivating factors. Specifically:

4.3.1. Use of institutional support structures

The students showed an increased awareness and acknowledged the availability of the different support structures that they could tap into, namely:

Extra tutorials run by the School of Physiology

These tutorials are facilitated by dedicated fulltime contract 'Academic Development Officers' appointed by the School. All of the participants identified the extra tutorials as a positive determining factor for their success as highlighted by the following two examples:

So we had tutorials with X, and I feel, like those were….they, they contributed a lot, but also because I was repeating it. (P1)

The second time around ….I attended the Tuts, especially the Tuts with Dr X, yah, she's been an incredible tutor, yah. I really appreciate, she made me understand, especially acids and bases. Dr X was actually a contributor for my second time around. (P3)

It is notable that attendance was compulsory for some the participants as part of the conditions for readmission as highlighted by P5:

OK, so I attended the extra tutorials which was compulsory for my re-admission anyway, but I attended all the extra tutorials. (P5)

However, despite the extra tutorials being compulsory for students identified as being at risk, there was an element of truancy:

I also attended the extra tutorials in 2022. However, I did also attend these tutorials in 2021, but not every single one. (P4)

Other tutors

The Office of Student Success (OSS) also provides tutors for students and risk and some of the students reported tapping into the academic support by the tutors provided by OSS as stated by P1:

Oh, I also had a tutor from the Office of Student Support. Yes, I had a tutor, and yeah, he helped a lot. We'd have sessions every week, where we went over content, and we also did questions together. So, yeah, that was like a huge part of me passing. (P1)

Faculty staff

Some of the students also reported that they consulted members of the faculty which include lecturers, course coordinators and staff in the OSS providing support to the students. These are considered in turn:

Lecturers/Academic advisor in School of Physiology:

The staff that taught the specific course content topics were identified as a support system.

I would consult if I didn't understand something, like after a lecture I would consult. (P1)

Additionally, the School of Physiology allocates all of the students enrolled for the course an academic advisor who is a member of the academic staff tasked with providing academic guidance to the students. Consultation is encouraged but voluntarily driven by the students.

I had regular check in meetings with an academic advisor there and I felt that helped me hold myself more accountable in terms of just providing feedback of what I've been doing and just improving my study skill techniques, that definitely helped. (P4)

One of the participants stated the nature of some of the advice provided during their consultations:

I just got academic advice from one of the other lecturers and she's on the suggested that I work very closely with the past papers and practice rather than just trying to swot all the work in at once. (P6)

The course coordinator (BHSc):

The BHSc course coordinators were also identified as providing support which assisted in the students doing well the second time around:

The course coordinator. I was aware there I could go and ask, and for support if I needed any support. (P1)

And another one said

Umm, I just had the support from my BHSC office. (P4)

Staff in the OSS:

On the University website, the Faculty of Health Sciences Office of Student Success describes itself as "staffed by a dedicated professional team that enables the holistic development, wellbeing and support of the HS student towards their academic success". Participants reported an increased awareness of the services offered by the OSS and intentional consultation of staff in the OSS as highlighted by P4

Umm. And that's why I was referred to the OSS, the Office of Student Success.
I also I have because I was repeating I had to contact the OSS at the Faculty of Health Science. (P4)

However, students also consulted the OSS voluntarily for emotional support

I did contact OSS last year coz I was going through some mental problems. So I did go for counselling and that helped me a lot. (P3)

I went for them, I went to them for…. interpersonal help rather…. (P6)

It was also notable that despite awareness of the OSS, a student opted not to contact them as stated by P5:

Umm, I think I was briefly aware of it, but I did not utilise any of the services. (P5)

Physiology is offered as a service course. Therefore, students register for degrees in specific departments which we refer to as their home departments. While some home departments provide support for remediating students, one home department was reported as not providing any support for remediating students when asked:

..there was no support from there. (P2)

Participant also noted the positive impact of support from their peers as detailed in the next section.

4.3.2. Making use of formal/informal peer support systems

The students in the Faculty of Health Sciences have put in place structures (formal and informal) to support each other in their academic journey.

Support from peers

Some of the participants reported that they had worked with their peers from the same discipline during the remediating year and especially noted support from students that were also remediating thus getting assurance that they were not alone and could work together:

There was a lot of friends and acquaintances that were repeating physiology or any other second year courses, so the fact that you know, we all realized we are repeating that was a sense of camaraderie and we were supporting each other, encouraging each other. We also would work together if we had any issues with the question for like a tutorial (P4).

However, peer support was also provided by colleagues in different disciplines:

I had a friend that was also re-doing physiology so we would, if we went to the university together, we would study together and she also attended Dr X's tutorials with me, so she's in

nursing, but we did physiology together and we would attend Tuts together and study together and do past papers together. (P3)

The students also took the initiative to speak to senior students who also provided guidance and motivation to the remediating students:

I went and just got advice from some of the seniors of the course…. they told me not to overthink it, Just take the past papers as I'm going through the notes and just go through it one or two times (P6).

Formally appointed tutors by the OSS also proved to be beneficial to the students:

…..and just having someone like the tutor also was very helpful in terms of just umm reminding me that, it's OK, or showing me that I know my stuff and words of encouragement throughout the way. (P6)

Some senior students also informally started student tutorial support groups which they facilitate on a voluntary basis. Students also attributed attendance of the tutorials to be a factor contributing to their success:

He studies medicine and then he had a tutoring group. (P2)

4.3.3. Greater use of teaching and learning resources provided by the School of physiology

The participants indicated that part of the strategy employed for success during the remediation year included working on past papers, using eQuip and attended tutorials. These are considered in turn.

Past papers

Students reported increased engagement with the past paper questions. The School of Physiology provides the students with a pack containing all of the end of block and final examination questions (excluding marking memoranda) from the preceding three years and the students are expected to work through them as a resource for learning and familiarisation with the types and formats of questions and assessments

that the students are likely to encounter. Some of the questions from the past papers are discussed in the tutorial sessions. And so for example, P2 reported working through a lot of past papers:

So when I did that course, it was the only course I was doing that year. And it was the only thing I was focusing on. So I literally had a lot of time to study for it and prepare for it. And then, yeah, I work through a lot of papers, a lot of questions. (P2)

P1 and P2 went on to explain why working through the past papers was of benefit, specifically by knowing how the questions were structured and as a means of getting insight into their level of understanding.

So I did a lot of past papers. And tutorial questions, so that I…. I know how they ask questions and also how to answer questions. (P1)

I also found that I was doing past papers before I studied so that I could identify which areas still lack more like attention. So doing past papers before studying helped a lot. (P5)

P6 further explained a change to their strategy to working with on past papers which involved self-testing soon after lectures:

OK, what I did do differently, I did in the new year, I did from the beginning work with past papers. I think I immediately like as I went through the work content, I took a past paper like right after that lecture. If I did it, if we did it in class or attended the pracs or anything like that, I just did those that and the past papers from the jump like I was advised rather than trying to take in all the content and not testing whether I knew it or not.

Additionally, not memorising answers,
Umm and I didn't try to know it word for word. (P6)

Therefore, not waiting until the end of the block to self-test understanding of the course content:

I was just trying to understand it and I could see that from the past papers that I was doing throughout the entire rather than just at the end. (P6)

Working with others on the past papers was also helpful as highlighted by P4.

Umm, it's more for my friends and colleagues and also doing regular past paper eQuip practice was definitely helpful. Umm, that repetition really helps you grasp the concepts (P4).

eQuip

The participants reported an increased use of the online resource 'eQuip' where a similar strategy to the use of past papers was used. Namely an increased frequency and strategic use of the resource as mentioned by most of the students as exemplified by P1, P3 and P5 below:

We had eQuip helped like a lot. It helps me a lot, so I'll do eQuip again and again and again, and it did help me. (P1)

I used e-quip mostly… so before I did the Tut I would go on e-quip just to see how they structure/ask the question and then upon seeing that okay, I'm good at that, then I would do Tuts. (P3)

And yeah, also just using eQuip like regularly like every three days just to refresh my memory on the type of questions that I was gonna encounter and yeah. (P5)

4.3.4. Familiarity with course content, reduced workload and use of supplementary resources

The majority of the students noted that the second time around they came into the course with full insights about the course, expectations and how to study its assessments as highlighted by several of the students. For example participants 3 and 5 said:

….so the second time around, um the content I was familiar with because I did it the first time around; I just didn't do well the first time around. I knew what was needed for me to pass. (P3)

….the questions I found were similar and I was able to recall that from studying and then it helped me to pass. (P5)

Familiarity with the content gave the participant a renewed sense of confidence:

I found a lot more confidence in 2022 because of that knowledge from 2021 (P4)

There was also a perceived reduced work load which contributed to success the second time around:

So obviously the fact that I had more time to focus only on physiology, because that was the only course. (P5)

There was also a reported use of supplementary teaching and learning resources which was perceived as contributing to successful remediation as highlighted by P6 who used internet sources and voice over PowerPoint recordings from previous years:

if I ever like, really got stuck, I would maybe go get an explanation from like the Internet, but other than that I found that the lecture notes were sufficient and maybe it's because I had the a voiceovers from the previous year as well. (P6)

4.3.5. Change in living conditions

Several of the students who previously were in university residences moved out for several reasons, including costs and for their mental wellbeing and such a move was to their benefit:

So I stopped living at Res and I moved back home and that helped quite a bit. I was with my family so, mental health wise, I was in a better place. (P2)

A similar sentiment was echoed by P3 who also expounded on how being with family was helpful. The family is said to have not only provided positive emotional support through the remediating year but also provided a conducive space to study as well as monitoring and motivation:

I moved out of Residence, I was at home, I was with my mum, I was with my family so it was much easier to just focus on school work because they were encouraging me.
Um, they were encouraging in the sense of, they would remind me that you have to do this and they would help me focus on it as opposed to if I was alone, I could just will nilly go

about my time however I wanted, but they gave like a sense of discipline, if I can put it that way (P3).

4.3.6. Return to in-person teaching and learning

With the easing of Covid-19 lockdown restrictions and a change in the teaching and learning policy of the institution in 2022, wherein there was a concerted effort to increase in-person teaching and learning, the school of Physiology retained the delivery of lectures remotely but required students to attend tutorials and practical sessions in person. This reportedly had a positive impact on some of the students' academic performance:

And although the lectures were still online, I felt being in person for the tutorials and the practicals help understanding because umm, it was covered a lot more in depth and I was able to ask questions more freely and also the practicals really helped with understanding the content, seeing it in you are seeing the knowledge you've learned being applied and that helped my understanding because in 2021 as I touched on earlier, we had online practicals, but it was just videos and reading the prac manual (P4).

The ability to do practicals physically rather than online demos was a positive contributor to success:

So now being actually able to physically do all those practicals really helped in me being successful in 2022. (P4)

The student emphasised the remote teaching and learning was not ideal for them:

uumm definitely being back in person was so helpful and that definitely contributed to my success in 2022 because doing Physiology online is not ideal. (P4)

The student further expounded why they felt the remote teaching and learning was not ideal for them:

It's definitely a more practical subject that you need in person, contact for and even though the lectures were online in 2022, having that hybrid learning with the tutorials and practicals being in person, that was definitely, I would say the most number one factor that contributed to my success. (P4)

4.3.7. Support from family

Support from family was highlighted as a success enhancing factor with mothers particularly being singled out as playing a significant motivating and nurturing role. Though dads and friends were also identified as being supportive. The nature of parental support was mainly identified as being emotional support as repeating was perceived to be a shocking and confidence shattering experience as stated by P4:

I did receive that social support from my family and friends, especially my my mom. She definitely supported me throughout my year of repeating because the fact that it's repeat was quite a shock to me because I've always been an academic child, especially in high school and primary school. So just it was definitely a blow to my confidence. So having that parental support also from my dad was, umm, vital for me and my family. They were also supportive of, you know, me being perseverant and or having perseverance rather and completing my course, which ultimately help me complete my degree. (P4).

While parents were available to provide support, a reality for many in Africa is the impact of unemployment and in fact, one of the students had to support family by finding a part-time job despite their own struggles:

Umm, yes, in terms of my parents I did receive like support but also at the time both my parents lost their job. So it was kind of like, I was also trying to get like part time work as well last year also because I only had physiology to focus on. So in terms of support, yeah, it was there, but also it was kind of circumstances at home was a bit hectic. So, like we couldn't just only focus on my problem of having to repeat physiology. There are other problems at home to focus on besides, yeah. (P5)

4.3.8. Letter of recognition and self-efficacy

The students also identified some other extrinsic factors as motivating them to success. The extrinsic factor included a letter of recognition.

Extrinsic motivation from congratulatory letter

The Head of School of Physiology sends top achieving students congratulatory letters at Mid-year in recognition of academic excellence. A participant indicated that the letter had a positive motivation effect to sustain good performance:

Doing better I did receive in the mid semester while mid-year they gave me like a uh congratulatory letter to say, like we acknowledge you doing well keep up the good work. And yeah, so that motivated me, I guess to continue to do well for the rest of the year…(P5)

Self efficacy (Intrinsic motivation)

The students also reported that the fear of failing, learning from their past mistakes and taking more of an initiative in pursuit of their goals for success the second time around positively contributed to their success:

I think also just the fear of having failed once is what motivated me not to fail again, you know. So I I realized I would set me back in my goals of completing this degree, but also just now that I've failed, I know what methods, what practices and habits not to repeat. (5)

In summary, participants perceived the use of support systems (institutional, family and peers), change in residence, a blended teaching and learning approach with increased in person learning opportunities as positive contributors to their successful progression.

In order to provide the right support systems to remediating students it was important to also document their experiences during the year in which they remediated. The next section provides some insights into the students' experiences during the remediation year.

4.4. Experiences (feelings) as a remediating student

The students were asked to describe how they felt during the year that they remediated. Several feelings were expressed. Generally, the students described negative feelings during the remediation year. The participants made very strong expressions about their feelings, key terms describing emotional states specifically were:

4.4.1. Disappointment or sadness or nerve wracking

A participant described feeling all of these emotions, however they also reported feeling better with the passage of time:

It was quite disappointing, obviously when you find out the results that you need to remediate also. I was sad for quite a bit of time and then it got better towards the end.
And then like just going into classes and lectures in-person, that was very nerve wracking each each time, but then it got better, yeah. (P2)

P2 having described the experience as ‘nerve wracking’, when probed to expound on this explained that they felt isolated in a new class with unfamiliar classmates, but also an element of shame for repeating:

Umm, so you're seeing like people in? So like, I don't know, the people who are now in the class that I'm in, the group I was with has moved on already and I'm still doing studying of physiology again. (P2)

4.4.2. Stigmatisation

The sentiments demonstrated an element of stigmatisation. Which was expressed by another student.

So I think being in a class full of people who are like straight from, like high school, it felt like I was supposed to be doing better than most people. I should already be like, have the hang of everything. So it was tough trying to not beat myself up about it every step of the way.
I mean, I still struggle with it now sometimes, but… (P6)

4.4.3. Fear

Another emotion that was explicitly described was fear.

….but I was so scared all the time. (P6)

One participant explained that the fear was rooted in concern about wasting their parent’s money.

“I was scared of having to waste my parents money again”. (P5)

Although implied in the earlier statements, participants also went on to explicitly identify feeling embarrassed, losing confidence and feeling isolated as emotions harboured during the remediation year.

4.4.4. Embarrassment and loss of confidence

These feelings were stated by P4:

My feelings during my remediated year? Umm well, I did feel umm embarrassed and ashamed.
As I mentioned earlier, I was always an academic student, so I felt this was definitely a failure for me personally, and it also my confidence, really took a knock.(P4)

4.4.5. Stress and isolation

Most of the students reported feeling stressed. However, the students were not probed on their definition of stress. One student (P5) particularly spoke about feeling that they were wasting their parents’ money and that was a major cause of stress for them:

Well, as I said, ummm, because of the home situation last year, there was a bit of stress. Also, I was just scared of having to waste my parents’ money again, so I was feeling a bit pressurised to like. I really need to pass this year now because I can't waste my parents’ money 2/2 times in their year, so I was feeling a bit pressurized and stressed…(P5)

Being in a new class resulted in a feeling of isolation as was categorically stated by P4. However, that too waned with time.

I was like, I was an outsider, but those feedings did pass. Eventually. Yeah. (P4)

4.4.6. Emotionally draining/overwhelming

This sentiment was expressed by P1:

I feel like to some point. It's emotionally draining. (P1)

However, despite feeling overwhelmed the student sought solace from peers in a similar academic predicament:

…it is draining. But I think I was I was mostly coping because I had other friends who were also remediating. (P1)

P4 reported feeling overwhelmed:

I did feel a bit umm, overwhelmed as well in my remediated year. (P4)

4.4.7. Shift in emotions as the year progressed

It was notable that for several of the students the initial negative feelings transformed to more positive ones as the year progressed and apart from the factors highlighted earlier such as peer support, this was additionally motivated by the reduced pressure associated with only having one subject to deal with and improvement in marks following assessments:

However, as the year progressed and I applied all the new study techniques and just being more motivated and basically everything I've mentioned earlier, that really helped me gain confidence…… Positive feelings like I was proud of myself when I would do better and tests compared to 2021 tests. uumm I felt pride when I got exemption in 2022. (P4)

P3 felt less pressure and reported even enjoying the course second time around, possibly due to being at home, the reduced workload and also getting a better grasp on the importance of the subject for future practice:

To be honest with you because I was at home, I felt like it was, like there was less pressure because I knew what was needed of me, what was required of me, so I just was able to do it. So it wasn't too much academic stress and I actually enjoyed doing it again because I could really focus on physiology and even like physiology for what it is.
……doing it again kind of made me realise why it's important, like physiology, why it's important coz now being in third year, I see that physiology is like the foundation of everything; for pharmacology, for pharmaceutical chemistry even, it's like the basis of everything. So I honestly enjoyed the second time around ….(P3)

The change in emotion resulted in a more positive outlook and increased confidence:

So in 2022, I think I was more calm. I just took the course as it is and I actually did very, very well. I just calmed down and I worked with my tutor maybe once every two weeks……
I didn't overthink it and I just trusted that I, I have it together and it wasn't a reflection of my abilities from the previous year, the fact that it didn't do well at all. (P6)

Having considered the students' emotions; to further probe the students' perceptions, it was important to hear their perspectives on what they felt were challenges during the remediating year and how they overcame the challenges.

4.5. Challenges experienced by the participants and strategies used to overcome them

The challenges identified were generally related to the emotional aspects described earlier. However, there were some other issues identified by the students, namely:

4.5.1. Adjusting to Covid-19 restrictions

One of the participants remediated during the height of the Covid-19 pandemic wherein there was no access to campus. This was identified as a major challenge to academic success due to the online nature of teaching and learning, and the shift from earlier having been on campus as a first year student:

I think it was mostly just because of Covid, because that's when we had Covid. So that was like the only challenge we couldn't, I couldn't go on campus as often as I wanted like we didn't have classes on campus. We were doing everything online. And like that shift from campus life to online life made it a bit difficult because already I was already used to like having physiology on campus and doing the tutorials going on campus and having everything on campus and now that whole shift was just another dynamic for me to adjust to. (P1)

4.5.2. Difficulty Socializing and integrating with a new cohort of students

For the other students who remediated when their presence was required back on campus reintegrating was identified as a challenge to some when asked to detail

specific challenges. Unfamiliarity with classmates was again highlighted. This was expressed graphically by P4:

Also umm, like the social aspect of it was also a bit of a challenge even though I had friends and I made new friends in my remediated year, it was a bit of a challenge because it's a new set of, umm, a new cohort, a completely new cohort. So a lot of these people are rather a lot of these students already knew each other vaguely through online meetings and however they had, and they had in their first year. (P4)

The practicals and tutorials require students to work in groups, at least in pairs, this caused discomfort for some students as exemplified by P4:

…the In-person tutorials and practicals ….that became a challenge in where you had to do practicals with groups…..or we have to find a pal and not all my friends were in my practical session. So you know you have to interact with these completely new students and new colleagues. (P4)

4.5.3. Transport logistics to get back to campus

The return to campus also required students to have to find transport to campus for the in person teaching and learning activities. This proved to be a challenge to some:

So, like coming to campus was like a bit of a mission because, you know, it was just, it was a bit of a mission. (P5)

4.5.4. Grappling with the same information/difficult knowledge

The course content does not change significantly from year to year. Consequently, the students have to grapple with the same difficult knowledge and concepts which if they don't understand has an impact on the rest of the topic/course (these are known as threshold concepts). This was identified as a challenge by one participant:

another challenge during remediation was being, umm, able to grasp this knowledge again.
P4 And just like I felt that I it took time for me to, umm, grasped for certain sections.
For example, umm cardiovascular, the cardiovascular system. I really struggled with that in

2021, so in 2022 it was a struggle for me to basically umm, redo that knowledge or redo that section and gain this knowledge and understanding of it. (P4)

Based on the students' own experiences, I sought to enquire briefly how they handled some of the abovementioned challenges they had faced while remediating. The findings are highlighted in the next section.

4.6. Students' approach to challenges

Strategies to mitigate the challenges included, consultation beyond the academic circles for example members of clergy, depending on one's belief systems as one of the students reported doing:

Well, firstly I went to consult with my priest at Church because I'm a religious person. So he just guided and directed me on like, how I can now, you know, place my focus on completing the academic year to the best of my ability. (P5)

For the student whose parents had lost their jobs, there was a proactive effort to help out the family by getting a job

I got like a part time job. (P5)

Having got insights into the challenges the students reported facing during the remediation year, they were further asked to share advice they would give to students remediating the course. Their responses are presented in the next section.

4.7. Lessons learned: Advice to a student who is about to remediate medical biochemistry and physiology

The student responses were mainly in line with the strategies they had taken to improve their performance during their remediating year.

4.7.1. Consult others for help

They recommended seeking help:

I would say, get all the help that you need like, even if you feel like you are bothering people. Don't worry. You can bother people. They want to be bothered because they want to help you. (P1)

Umm, I think asking for help. I was always…I always thought that we, shouldn't,… I always felt like I couldn't ask for maybe I thought I was supposed to know everything.
Umm, I'd advise them not to be scared to ask for help whenever they need it from anyone, whether it's a senior external tutor, the lecturers are always honestly always there and I didn't know how friendly everybody in the Department of Physiology was actually, until my remedial. (P6)

4.7.2. Attend and participate in the teaching and learning activities

The recommendation was not to avoid tutorials:

If you have to attend every tutorial they have, attend every tutorial if you have to go for extra things that maybe you feel like you might not need, do that and (P1)

I would tell them definitely number one is to seek help in terms of extra tutorials, attend the extra tutorials like even if sometimes they repeat the same thing, I found that the repetition that they did in the extra tutorials in the tutorials and the lectures helped me to consolidate that information. (P5)

There was also a recommendation by several of the students to go beyond the tutorial attendance and to also use eQuip for its benefits as exemplified by P3:

Attend the Tuts, and before doing the Tutorials on Ulwazi, the ones that count for the assessment marks, before doing that, do the e-quip and make sure to understand the content and go through it as it is on the schedule. (P3)

4.7.3. Use past papers strategically and attend tutorials

Use of past papers to understand the types of questions, for self-testing and to practice how to write the answers for the different formats of assessments was put across as advice to fellow students:

use your past papers. Practice practice practice answering questions, because I feel like for most students that, the difficult… like they know the information but they don't know how to answer the questions. So doing, past papers will give you sort of like an idea on how to….. the flow and how to answer questions, especially the long questions. (P1)

4.7.4. Adopt the right mental attitude to the remediation year

The advice was to accept the situation, be positive and make the most of it:

and I'd say it's okay to repeat like you're not wasting time, you on time, you're on your own path. Own race, own pace, and just take it one day at a time, and you'll definitely get the results that you want at the end of the year. (P1)

There is no need to feel shame, but rather tap into prior knowledge to increase chances of success:

Well, first of all, not feel ashamed. So you are you already have experienced physiology, so going forth into repeating, take that experience and keep an open mind with repeating physiology, trying to enjoy it as well. (P4)

Additionally, the advice was for remediating students not to feel discouraged:

Not to get discouraged. I mean, we are in a very difficult line of work. So, to not be discouraged, but rather just figure out where they went wrong and just push.
That will try to work through that, because it's only gonna make them better.
I mean, physiology ended up being my favourite…(P6)

The studying of the course content should not be delayed:
also to not leave things for the last minute because it's the work is not difficult.
It's just you need to stay on track with it. P5

4.6.5. Don't assume you know everything

The statement by P2 was exemplary of this advice:

Well, I'll tell them that even though you have done it like the previous year, it doesn't mean that you actually know the content. You still need to study again and like go through the lectures. (P2)

4.6.6. Connect with peers in the class

Within the same class, two sets of peers were identified as resources to tap into for support, for those who are remediating:

You can actually talk to that other people who are remediating it. And that is actually quite helpful as well because then you know that you're not alone with the way you feeling your emotions. And yeah, they understand what you're going through as well. (P3)

As well as those who are not remediating:

Make sure to also engage with classmates who even if they're not redoing it but like study partners help a lot. P3

4.6.7. Consult senior students

Recognising the academic potential and tapping into the experiences of senior students was also proferred as advice to remediating students:

Definitely ask, the older people that have succeeded, you should ask them as well. (P3)

4.6.8. Keep the end goal in sight

The need to see that the course is part of a greater degree and foundation for a career:

And in the long run it will….It will show its benefits so for no one to just be discouraged, it's difficult. Decide that it's ok that it's difficult. We are going to be practitioners.
So it's meant to be not going to always be so easy.P6

Also understanding that medical biochemistry and physiology will come up again in future years of study:

My favourite module but it still comes up in my other modules and I still understand it better and I didn't realize the lack that I was missing.
So it's nice that I have a proper base and I'm glad for it in a way that I actually took time to understand it and engage with it properly. P6

Considering the lived experiences of the students, they would best be in a position to discuss aspects they felt would be pertinent advice for members of the academy

when dealing with remediating students. The findings are highlighted in the next section.

4.8. Advice to the faculty regarding remediating students

Participants gave the following advice:

4.8.1. Actively monitor and engage students

The faculty needs to actively monitor and engage with the remediating students as stated by two of the participants:

I feel like I'd say, ummm, like pay attention, because it's easy to…. like if it's especially if we have like a big class like in University. The students who are lagging, but they also won't reach out, and then they fail. And then, even when they fail, they struggle to reach out so I'd just say, like, pay attention to those students. (P1)

I I would say that they must actually get to…. maybe meet them one on one.
So I think it if they, even if it's just one meeting, could just meet the repeating students.
Just say have a meeting just to figure out what they specifically need or didn't work out for them and that particular year. (P6)

There is also need to establish some rapport with the students:

I know each course has a coordinator. Maybe the coordinators could just move the repeating students and just make sure that they are fine and they know them just so they're comfortable to come to them. (P6)

4.8.2. Provide support to the students

Although one of the students who mentioned this specifically did not expound on the nature of the support:

Yeah, I think maybe just providing more support then because you remediating and if nothing changes, well obviously the person has to do their work themselves also. But then if like no outside tutors or someone else though, like to help then. (P2)

P4 provided clarity on a specific circumstance requiring support (online learning):
I would really like to see more support given to students especially. Well, in hindsight, I would have liked more of online support. Umm. During online learning and I would also advise the faculty to umm I think that's about it actually. Yeah, that's my answer. (P4)

4.8.3. Prepare the students for the expectations for the course

There is need to give students full details upfront about the relevance of the course:

I think they should, specifically during Orientation, they should stress how important physiology is for the foundation of medicine, you know. (P4)

Advise the students how to study effectively for the course:

And they should also during the Orientation also stress that it's not the same like first year, it's not the same like the past because it is very application based. In the past it was like cram, you know and then write it but physiology is really application based so there's a way of thinking, a way of going about it that is different from first year and second year. (P4)

And also make the students aware of the resources available early on:

So I would want them to like stress that but the structures in place are good, very good, like as in the Tutorials as well as e-quip and past papers, so I do enjoy that. (P3)

4.8.4. Adopt a balanced blended teaching and learning strategy

The teaching approach should recognise the importance of in person teaching and learning events:

what I would advise the faculty is to…. I really would like to emphasize that the these courses, especially in Health Science, they need to be taught in person as much as online learning had to be done, and I absolutely understand that because of the pandemic, now that we're coming out of that pandemic, umm, online learning, I mean in person learning is essential and as much as possible in person learning on campus should be done especially for practicals like I've mentioned…. (P4)

This blended approach was exemplified by the use of a summary session

The summary sessions in person were helpful

We also did last year…. it was a summary lecture for the topics that was covered online and that was also quite helpful. So even if online learning has to be done, umm, time in, those timetable needs to be accommodated for. I guess umm a summary lecture just to broadly go over topics because it was really helpful not just for me but for my colleagues. (P4)

4.8.5. Compulsory extra tutorials

The emphasis was making the tutorials compulsory in the first block and then assessing whether students should continue attending the tutorials if they were doing well:

…they should maybe emphasise compulsory attendance from the first block already, so that students can see the value of it, and if they feel by like second block or third block, they don't need it, then they can go because they've already said that foundation of having the good marks. (P5)

Having presented the findings of the study, the next chapter of this research report discusses the findings from the interviews.

CHAPTER 5: DISCUSSION

This study sought to explore the factors student perceived contributed to their successful academic progression after remediating medical biochemistry and physiology. However, it was important to first establish what the students perceived as the causes for their poor academic performance at the first encounter with the course. Thereafter the factors perceived to have resulted in success were explored. It was also important to get an understanding of the students' emotional state during the remediating year. This together with the advice from students to fellow students in a similar situation in future as well as for faculty staff, was important information for holistic interventional systems to be identified in the process of making the findings from this study translatable. For proper context of the study findings, it is essential to have insights into the response rate to the call for participants and well as the demographics of those who participated.

5.1. Response rate and biographic information

In 2022, there were 15 students who were eligible to participate in the study. This number increased to 118 in 2023. Although not a direct study objective for the current study, it is important to comment on possible reasons for this almost 8-fold increase. The change in teaching and learning transition into the covid-19 pandemic lockdown and the transition out had a significant impact on student performance. Some factors to consider are that during the pandemic, assessments were done online, without direct invigilation and proctoring, which could have increased opportunities for cheating and contributing to increased student grades (Khan, 2022), consequently increasing the number of students who passed. However, in the following year, there could have been challenges with access to learning resources coupled with a return to invigilated assessments which could have negatively impacted student performance (Al-Maqbali and Hussain, 2022; Guangul et al., 2020).

In the current study, it was notable that there were no males who responded to the request to participate in the study. While in BNursing group this could be attributed to the class only having females, for the rest of the groups invited to participate in the study, there were males in the class. It has been reported that females are more

likely to respond to surveys than men (Smith, 2008). Additionally they are also more likely to respond much quicker than males (Smith, 2008). It has been theorised that participation in surveys is determined either by a deliberate weighing of the costs and benefits of participating or as a decision which is made spontaneously (Becker, 2022). Males are more likely to opt for the former. Fear of victimisation could have also contributed to the poor response rate since I was a course coordinator for the BHSc course in 2022 and additionally I had taught some of the students either before or during their remediating year. Despite the invitation being sent by and administrator on my behalf, the students were not made aware that I would not conduct interviews with students who I had taught. The information was only given to those who responded to the invitation to participate in the study. Therefore it is possible that when the students did a cost benefit analysis of participating in the study (Becker, 2022) they felt that the potential cost to them outweighed the benefits and hence did not participate.

For the first cohort, the timing could have also had in impact on the response rate as they were invited late in the year when they were busy with exams. Thus, if they had not been performing well, they would not want to risk being interrogated on their performance. 'Survey fatigue' could also have contributed to the poor response rate as the students have to complete several surveys for staff teaching reviews as well as invitations from other students (honours, masters and PhD) throughout the year. Indeed it has been reported that administering several surveys to students during an academic year results in a reduction in survey participation later in the year (Porter et al., 2004). This timing effect could possibly also explain why there were respondents in the second cohort who were invited to participate in the study in the first half of the year when they were probably not overwhelmed with a high number of requests for them to participate in studies.

Before exploring what the students perceived to have contributed to their academic success after remediating, it was important to first get insights into what caused them to perform poorly initially.

5.2. Factors perceived to have contributed to poor performance

5.2.1. Heavy workload, underestimating the difficulty of the course and poor study technique

Recent findings from curriculum mapping of the MBBCh first and second year courses in the faculty showed that currently there are significantly more notional hours being imposed on students than is ideal (personal communication). Abrahamson, (1978) identified 'diseases of the curriculum' of which possible current states of the curriculum could be 'carcinoma of the curriculum' wherein one component or in our case one course (physiology or anatomy or molecular medicine etc) has grown or 'curriculum hypertrophy' in which all constituent courses in the discipline or degree programme have grown (Abrahamson, 1978). With the ever increasing knowledge base with time and developments in disciplines, there is need for curriculum renewal, to involve 'identity responsiveness and decolonisation' (Mendy and Madiope, 2020; Olsson, 2023). However, it needs to be managed and monitored to ensure that the curriculum does not become overloaded with new and/or old redundant knowledge which places a cognitive load on students. This could partly explain why students found the course workload to be heavy. It is likely that the current curriculum review of the MBBCH and BHSc programmes in the Faculty of Health Sciences will aid in correcting the increased notional hours and thereby contribute to reducing the workload imposed on students.

Students described the workload as heavy and some of the content as being difficult to understand. Indeed, physiology is a content heavy course and students find it difficult as it has foundations in chemistry, mathematics and physics (Michael, 2007). It is therefore characterised as having difficult/troublesome knowledge and threshold concepts.

Troublesome knowledge according to (Perkins, 1999) is considered as 'that which appears counter-intuitive, alien (emanating from another culture or discourse), or incoherent (discrete aspects are unproblematic but there is no organising principle)'. Knowledge can become troublesome if it is inert, conceptually difficult, ritual or alien (Perkins, 1999). Hill, (2020) also includes tacit knowledge as difficult information.

Threshold concepts are considered to be 'subject material or concepts which are difficult or troublesome, but when mastered are key to deep understanding and

knowing of a subject' (Meyer and Land, 2005, 2003). Thus, when one considers troublesome knowledge and threshold concepts in the context of the current study, it is likely that many of these elements could be used to possibly explain the underlying reasons for the students' poor performance the first time around.

Despite physiology being considered a difficult course due to its nature (Michael, 2007), the students reported initially neglecting it and focussing on the other subjects as they wrongly perceived physiology to be the easier subject. This could possibly be attributed to the way the medical physiology and biochemistry course is structured wherein the first block revisits many basic components from first year and even matric so as to lay foundations for the more complex content in the subsequent teaching blocks. The students may thus find the first block relatively easy as it does not challenge them enough cognitively.
A previous study reported that students found physiology difficult 'due to their lack of familiarity with it and the level of detail required' (Colthorpe et al., 2018). There is need to revisit the content of the first teaching block so that the students are introduced to the complexities, troublesome knowledge and threshold concepts associated with physiology so that they can develop the required cognitive skills and strategies to understand and develop the right mental frame for the course.

5.2.2. Change in teaching and learning format from in person to remote

In considering this factor, it is important to highlight that although the students described the teaching approach as online, the pedagogy did not adhere to the criteria for online teaching and learning. The system adopted by the University of the Witwatersrand in response to Covid-19 pandemic was termed 'emergency remote teaching'. Unfortunately, staff were not all adequately trained for it. Although the university provided some webinars on the topic, attendance was voluntary. Online teaching requires a specific curriculum design to meet the special needs for such a platform.

Quality of teaching resources was not monitored. For example, some lecturers produced voice over power points with a duration over an hour long. It is recommended that such resources should not exceed 10 minutes. Therefore, poor instruction design could have contributed to cognitive overload. Cognitive load theory

(Sweller, 1988) should be applied in instructional design for example in the audiovisuals we use to teach. Based on the dual coding described by Allan Pavio, working memory has a pair of major subcomponents, ‘visual and verbal/acoustic’ (Clark and Paivio, 1991). Consequently, students are better able to apply information learnt with multiple media compared to single media to an extent. The ‘Mayer split attention effect’ highlights this by pointing out that animation + narration is better than animation + narration+ on screen text (Mayer and Moreno, 1998). Therefore, learning by students is compromised when hearing and viewing the same verbal message. This was one of the flaws in the design of many of the audiovisual aids used for remote teaching by staff in the School of Physiology during emergency remote teaching. Another possible flaw was Poor anatomical images that do not correctly represent correct anatomy relationships, these have been reported as contributing to poor comprehension of physiology, particularly that which is applied(Bordes et al., 2021).

Some of the participants reported being overwhelmed by the online teaching. Digital fatigue and technology overload particularly as a result of increased use of information communication technology during the COVID-19 pandemic and immediately after (Sarangal and Nargotra, 2022) could also explain the perceptions of a high workload by the students.

The shift to emergency remote teaching also resulted in social isolation of the students which they reported to have impacted their performance negatively. The lack of peer teaching and learning, no direct interaction with teaching staff and academic support have been reported to negatively impact student performance, this was particularly compounded by the Covid-19 lockdown restrictions (Abdelkader and Barbagallo, 2022; Pokhrel and Chhetri, 2021; Thoradeniya and Jayasinghe, 2021).

5.2.3. Underutilisation of resources and support systems

Colthorpe et al., (2018) reported that ‘to aid their understanding of difficult topics, students commonly reported reviewing information, seeking further information, and seeking social assistance’. From the students’ responses it is notable that their poor academic performance the first time around was due to not incorporating some of

these elements in their practise. Despite the availability of resources such as past exam papers, and eQuip which allow the students to test their understanding, review information and seek additional information to fill in identified learning gaps, some of the students did not use the resources or when they did they did so incorrectly by trying to memorise answers the night before assessments. Such practices result in ritual superficial learning and non-retentive learning which does not aid students in handling difficult knowledge and threshold concepts (Meyer and Land, 2005, 2003).

5.3. Factors perceived to have contributed to success during the remediating year

All of the participants reported only remediating one course and this resulted in a reduction of the workload. This seemingly gave the students more time to engage effectively and actively with the various support systems, increase their own self efficacy (Bandura, 2011, 2000), self-directed learning which has shown positive outcomes in physiology Nandini et al., 2022) and use of resources, to their positive benefit.

When one considers literature on how to tackle or cope with troublesome knowledge and threshold concepts, it is quite evident from the current study participants responses that they employed many of these approaches (‘reviewing information, seeking further information, and seeking social assistance’ (Colthorpe et al., 2018)) in the year that they remediated with evident positive outcomes. For example -more intentional and purposeful use of past papers and resources as learning opportunities and not for cramming only thus going from superficial understanding to much deeper learning (Meyer and Land, 2005). The participants in the current study perceived eQuip to be helpful.

Previously, Kerr et al., (2016) reported that students in the school of Physiology who used eQuip consistently as a formative assessment tool/resource for at least two teaching blocks performed significantly better than those who did not use eQuip. Thus eQuip prepared the students for the formative assessments as it provided

insights into the assessment styles as well as the level of information required (Kerr et al., 2016).

When formative assessments are voluntary and without immediate reward, student participation is very poor (Kibble, 2017). The School of physiology has in recent years introduced an online quiz for formative assessment at the end of each topic. Initially it was voluntary and participation was poor, anecdotally we noticed that it was mainly the top performing students who engaged with the online quizzes. However, we have recently made the quizzes for marks and this has increased participation to over 95%. However as noted by one of the students, their engagement was superficial and they used an open book approach the first time around which did not prepare them adequately for the summative assessments. However, when remediating they used the quizzes more purposefully and intentionally which they reported to have paid off positively for them.

An additional self-assessment resource was the past papers, students reported that engaging with the past papers frequently also contributed to their academic success. 'Assessment drives learning' (Crowther and Knight, 2023) and its importance as a teaching and learning tool has been highlighted by Crowther and Knight (2023) who reported using test question templates to teach core physiology concepts. It is practice in the school of physiology to also use past exam papers for tutorials, however there is no purposeful effort to focus on the core concepts. There is need to change the approach for the benefit of students.

With the move to remote emergency teaching, the element of 'active experimentation' was removed from the learning experiences of the students as they could not attend and participate in physical laboratory practical. They identified not being able to have physical practical sessions impacted their academic performance negatively. However, in the remediating year, for the students who were able to return to campus, they reported that engaging in the practicals aided in their success. In the experiential learning cycle by Kolb there are four key interlinked components, namely, 'a concrete experience, reflective observation, abstract conceptualization and active experimentation' (Kolb, 1984).

Horrigan, (2018) in a study to investigate how students perceived the impact of laboratory sessions on understanding of cardiovascular physiology which is considered one of the difficult topics in physiology, reported that the majority of students felt that the practical sessions helped them comprehend difficult knowledge as they could visualise physiological events and link physical experiences to theory. Thus the laboratory sessions helped to promote conceptual learning (Horrigan, 2018). Group engagement has also been shown to improve learning (Kayes et al., 2005; Wijnen-Meijer et al., 2022).

Peer teaching and study groups

Peer teaching has been reported to positively and significantly improve learning (Meng et al., 2021; Rompolski and Dallaire, 2020; Srivastava et al., 2015). Peer teaching or peer assisted teaching is usually structured and involves guidance from the academic staff (Meng et al., 2021) however it is notable that for the students interviewed in this study, the peer teaching was self-initiated and not under guidance from the lecturers. The students tapped into peers from their own class as well as near peers (students a year or two removed from them) and reported that they benefitted positively from the experience. There is a need to encourage and support such efforts by students. Thus providing safe, physical spaces conducive for near peer teaching could assist in this venture. Making time in the timetables for peer teaching is also recommended. It has also been reported that providing formal qualifications for student peer tutors motivated both the tutors and tutees (Homberg et al., 2022).

While peer teaching and near peer teaching have been reported to have benefits on multiple stakeholders, i.e. the tutees, the tutors and the academic staff (Rompolski and Dallaire, 2020), there is need for more involvement of the academic staff to ensure that there is alignment between the intended syllabus and actual syllabus. Staff can also help with insights on how to tackle difficult knowledge and threshold concepts.

Due to tacit knowledge which staff have internalised and no longer consider difficult, they underestimate that which students find difficult (Hill, 2020; Meyer and Land, 2005) and therefore the informal peer teaching could have helped to bridge the gaps in understanding of physiology by the students.

Closely linked to the peer teaching was the formation of study groups by the students. Group engagement has been shown to improve learning (Kayes et al., 2005; Wijnen-Meijer et al., 2022). Indeed, the students reported it to be beneficial as has indeed been reported in literature with varying outcomes depending on the abilities of the study group members (Jain and Kapoor, 2015) where weaker students benefit from academically stronger ones but not vice versa.

Letter of recognition

Reward/applause systems in the learning environment have been well documented and recognised to have a variable impact on student performance wherein generally 'receiving effort-focused praise affects motivation positively, while ability-focused praise affects motivation negatively' (Kakinuma et al., 2022). Notably in the current study, a student reported feeling motivated to continue excelling by the letter from the Head of school recognising academic achievement at mid-year. Such recognition has also been reported to increase student academic resilience, performance and retention (Bliven and Jungbauer, 2021). Therefore, it should be encouraged for all students not just those remediating.

Leaving residence and moving home

It is widely reported that living in residence on campus can improve student academic performance especially for students coming from poor socioeconomic backgrounds such that the residence environment provides access to resources (e.g. libraries, internet facilities, privacy, access to peers, meals and amenities) which the student would otherwise not have access to in their home environments (Jain and Kapoor, 2015; Turley and Wodtke, 2010). However, the residences can also result in poor academic outcomes where students succumb to peer pressure to engage in extra mural activities which they would not engage in at home. The values espoused by the residence, whether they prompt academic excellence and competition or social influence can positively or negatively impact student performance (Schrager, 1986).

It was interesting to note that two of the students felt their academic success could partially be attributed to moving back home during their remediation year with parental support being one of the main benefits of being at home. Unfortunately, the

students did not share insights on what negative impact they got from being in residence the first time around.

Nevertheless, participants identified parental support as being an instrumental factor to their academic success. This study highlights the need for more parental engagement in tertiary student education. It has been reported that parental involvement in children's learning improves academic performance (Lumadi, 2019; Salac and Florida, 2022). While there seems to be a higher involvement in the academic performance of students by their parents and guardians while they are in primary and high school, anecdotally, this seems to wane when the students go to tertiary education. There is need to explore this further. Thus the often spoken perception that 'university students are adults and do not need parental supervision' should be challenged and revisited.

Religiosity

In terms of support, one student reported consulting a priest as a factor contributing to their success. It has indeed been reported that religiosity can have a positive impact on academic outcomes, in part associated with positive behaviours such as reduced truancy (Sinha et al., 2007). The student was not probed further to explain whether it was a belief in divine intervention, positive words or prayer among many factors that could be attributed as contributing to her success following her interaction with the priest. This definitely is an area that needs further research especially in higher education settings and specifically in the African context where spirituality encompasses many different belief systems.

5.4. Challenges faced by participants while remediating and how they were surmounted

Although most of the participants' common challenges were related to academic factors which have already been alluded to earlier, the study also revealed socioeconomic factors such as financial constraints with the return to on campus teaching. South Africa is considered to be amongst countries with the highest inequality globally in the world with more than half of the population being

impoverished (Francis and Webster, 2019). Lack of funding for students in South Africa especially the ‘missing middle’ (Garrod and Wildschut, 2021) who do not qualify for financial aid and their parents/guardians do not earn enough to sufficiently cover the costs of education is a big problem.

It was notable that the student sought a part time job to contribute to the financial needs at home. Working while studying can have a negative impact on academic performance, however in situations of poverty, part time jobs can provide a much needed source of finances to meet social, basic and academic needs hence giving some dignity and sustenance to the affected students (Aslam et al., 2022; Budi Santoso et al., 2020; Dedehouanou et al., 2022; Tumin and Faizuddin, 2017). Considering the positive impact of part-time work on the student, opportunities should be provided for health sciences students to engage in part-time work through increasing awareness of opportunities advertised via the Wits CCDU and through internal student jobs such as invigilation and near-peer tutoring. However, the students’ wellbeing and ability to cope and balance academics and work should be monitored so as to avoid jeopardising the students’ success.

Another factor identified as a challenge was readjusting to working in groups for tutorials and practicals especially with students they had either not met in person previously due to the remote teaching or due to being in a new class with a new cohort of students. Generally integration into academic groups is not a quick and straightforward process as there are several issues including personality, academic and belief systems which need to be navigated (De Bruyn and Van Eekert, 2023).

5.5. Advice to students remediating

Generally, the advice to fellow students was to replicate/adopt strategies which they felt benefitted them during the remediation year. Therefore, the need to seek help from peers, near-peers, academic support systems and social support were highlighted. Additionally, the need to engage actively and purposefully with the resources such as past exam papers, eQuip and online quizzes was emphasised. However, all of these have been discussed earlier so will not be repeated.

5.6. Advice to faculty regarding remediating students

A study by Horrigan (2018) in which students and staff were surveyed on what they felt was troublesome knowledge, it was notable that staff highlighted less aspects perceived as difficult for students compared to the students themselves. This could be due to tacit knowledge (Hill, 2020) as discussed earlier. Hence it was important to seek the students' advice to faculty on how to deal with remediating students. Notably the advice from the students generally focussed on provision of support, active monitoring and providing insights into the course as well as advice on how to study the course effectively.

The students highlighted the need for the provision of academic advice for success early. This has been identified as a key factor ensuring student success, retention and satisfaction (Zhang et al., 2019). It is important the academic advising is structured, appreciative, not prescriptive and offered at various levels e.g. faculty, department, individual and group (Zhang et al., 2019). There needs to be communication between the stakeholders and common purpose and vision for it to be successful. Unfortunately, in our setting I feel that there is a disconnect between the OSS, School of Physiology and Home departments and hence despite academic advising systems being in place they may not be effectively reaching and benefiting all students.

There was also mention of making activities such as extra tutorials compulsory. However, from our experiences, making such activities compulsory where student engagement and commitment is required, does not necessarily produce the desired outcomes as the students feel forced to attend, and only tick the attendance register but in so doing, they don't actively engage in the activities and can often be disruptive to the rest of the class.

A particularly helpful aspect of the extra tutorials was the teaching approach which simplified difficult concepts as explained by one of the students *"Let's say maybe she is teaching about respiration, she would have like balloons, and she demonstrate for us how the things work. So she made…… She made learning easy". (P1).*

The use of props to teach difficult concepts has been well established at Bristol Institute for Teaching and Learning (Palmer, 2023). The majority of the students reported positively on the impact of the props on their teaching and learning. So despite physiology being a difficult subject, there is room for the well thought fun props to be used in the content delivery as long as real life context is maintained and emphasised. Otherwise as with the case of poor anatomical diagrams and over simplification, students can get a false sense of reality further complicating their learning (Bordes et al., 2021),.

5.7. Remediating students' feelings during the remediating year

The study also sought to get some insights into how the participants of this study felt during the year they remediated and although mostly negative, there was a progression in some instances to more positive feelings and outlooks.

A recent review focussing on the impact of the Covid-19 pandemic on the mental health of college students in middle and high income countries reported that during the pandemic the students experienced greater levels of stress, increased anxiety and depressive symptoms (Elharake et al., 2023). These were particularly increased in students in rural areas, those of a low socioeconomic status and those with close proximity to healthcare workers (Elharake et al., 2023).

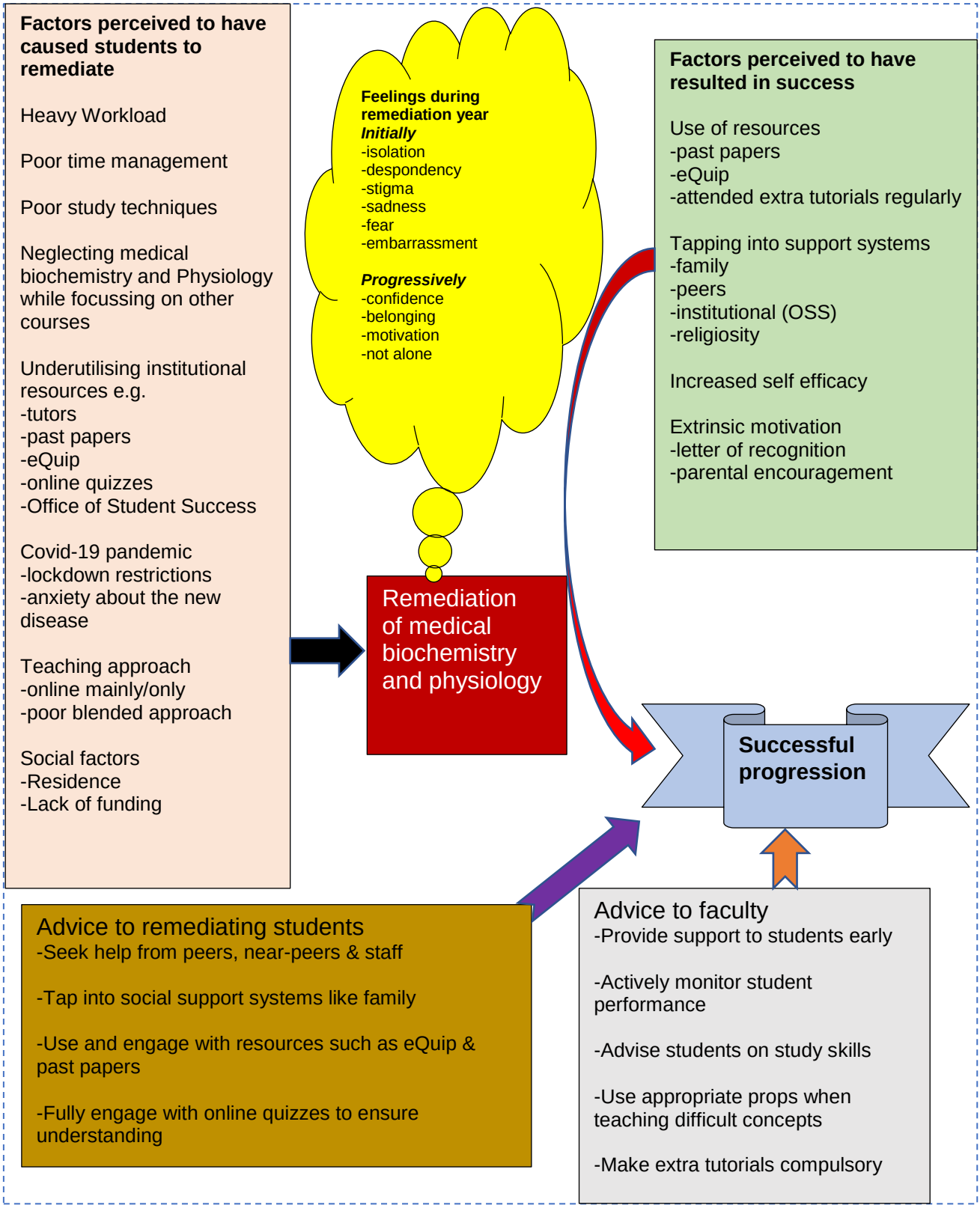
The negative mental impact of covid-19 on student performance was also noted by students who participated in the current study. South Africa is described as one of the most socioeconomically unequal societies globally with the majority of the population falling into the lower socioeconomic brackets. Hence it is unsurprising that students would also be negatively impacted. However, the socioeconomic status of the students interviewed was not established.

Causes of anxiety during the covid-19 pandemic identified in literature and in some instances reported by the students interviewed in the current study included the social isolation, uncertainty of the future, the morbidity and mortalities of family members and friends, loss of income and lack of resources to engage in online/remote learning (Elharake et al., 2023; Son et al., 2020)

The descriptions of feelings of isolation and difficulty integrating into the new groups as well as feelings of stigmatisation give further insight into the emotional difficulties that the remediating students faced. It is therefore essential that there is close monitoring and support of the remediating students to ensure good mental health. Purposeful connectedness systems and integration activities such as the ‘ice breaker activities’ which are often used in team building exercises could help to integrate the students socially and help mental wellbeing. However, these needed to be carefully managed without singling out the remediating students.

Based on the study summary findings, figure 1 below shows a visual framework that was developed.

Figure 1. Summary of study findings



CHAPTER 6: CONCLUSIONS, RECOMMENDATIONS AND STUDY LIMITATIONS

This study explored health sciences students' perceptions of factors which they perceived contributed to their successful progression after remediating medical biochemistry and physiology. The participants were asked what they felt contributed to their poor academic performance initially, then what they felt they attributed their success to in the remediation year as well as their emotions and advice they would give to remediating students and to faculty.

The factors identified as contributing to poor academic outcomes the first time the students encountered the course included poor study technique, lack/inappropriate use of teaching and learning resources, failure to adjust to remote learning due to covid-19 lockdown restrictions, heavy workload, neglect of the course due to wrongly perceiving it as easy compared to the other courses and the innate difficulty of the course.

Factors perceived to have resulted in successful academic progression in the remediating year included, increased self efficacy, increased and purposeful use of teaching and learning resources (tutorials, past exam papers and eQuip), use of institutional support systems (OSS, academic advisors, course coordinators and tutors) and tapping into social support systems (family, peers, clergy and senior students).

The students' emotional feelings during remediation included, fear, isolation, stigmatisation, embarrassment and stress. They generally recommended that remediating students should use the interventions that they used in order to succeed. Advice to faculty centred on providing academic and emotional support to remediating students as well as to actively monitor their progress.

This study has shown that the reasons for poor academic performance in medical biochemistry and physiology at the University of the Witwatersrand are many, and are intrinsic and extrinsic as well as complex. Although many were common to the students, there were also some that were individualised. Thus, there is no one size

fits all approach that can be used to improve student performance. There is need to review the workload of the medical physiology course and students need to be equipped early with appropriate study skills and how to make the most of the support systems available to them in order to increase their chances for successful academic progression.

There is no doubt that remediating students are under emotional strain and strategies and interventions to alleviate it need to be implemented. When asked about the OSS, while some students made use of their services, some did not and apart from knowledge of existence of the OSS, a student indicated that they were not aware of what the OSS does. There is therefore need to actively inform students about the OSS and the services it has on offer including emotional, social and academic support.

Not all students found online learning conducive and preferred in person teaching and learning (Fatima et al., 2021). Therefore, a blended approach that caters for the student needs while meeting the educational goals of the course should be implemented. The resources developed for the emergency remote teaching were not always appropriate and not grounded in pedagogy and educational principles. Therefore, it is recommended that there is a greater involvement of instructional and graphic designers in the development of resources for the teaching so as to avoid cognitive and digital overload of the students. Additionally, data analytics can be used to predict and improve student success (Fleur et al., 2023). Therefore, there is need to use data analytics to track student progress, achievement and access to resources so as to flag those at academic risk early so that interventions and support can be provided.

Recent studies have also shown that analytics showing students dashboard analytics of their academic behaviours, activities and performance analytics compared to their peers and predicted models of their academic outcomes can positively influence self-regulated learning and motivate students to perform better (Fleur et al., 2023). Thus, analytics should not just be used exclusively by faculty to monitor student performance, but the dashboards can also be shown to students to motivate them while maintaining confidentiality.

The students noted that where available, they found the support provided by the home departments to be beneficial. Therefore, there is need for each home department or school to establish student support systems and appoint specific individuals to look after student academic needs.

The tutors and tutorials also came through strongly as contributing to student success. Therefore, the role of tutors and tutorials in the teaching and learning environment needs to be explored further in future studies. Such studies should also include interviews of tutors for their perceptions of their roles as facilitators for academic success.

Lecturers should create a conducive and enabling environment for students to consult them without feeling intimidated. This could include the use of anonymous online tools and open question and answer sessions during lectures. A student indicated that they did not ask questions during lectures as they felt intimidated by the environment.

Overall, the findings of this study have shown that a holistic intersectional approach is needed for support of students. The key elements being academic, technical support as well as emotional and personal support. However, there is need to consider their costs both financial and time-wise. Such support also raises issues of feasibility, ease of implementation and sustainability, especially considering the current cuts in funding to universities as well as massification.

The findings of this study will be shared with relevant stakeholders so that information gleaned can be used to help shape teaching and learning activities as well as to support students insightfully.

For those wishing to replicate the study, it is recommended that the purposive sampling is done early in the academic year before students are inundated with requests by other researchers to participate in studies as well as requests from educators for the students to complete teaching surveys as these demands can cause survey fatigue (Fass-Holmes, 2022). Also consider including a snowballing technique (Streeton et al., 2004) to help increase the sample size. Another recommendation is that individuals conducting the interviews and/or recruiting

participants should not be directly involved in teaching or coordinating courses with a direct bearing on the students as the potential fears of power influence on the students recruitment and participation may be reduced or allayed.

Study limitations

The study could be limited by gender bias as only self-reported females participated in the study. There are societal pressures and behaviours that are more biased to men than females and these could have had an impact on the findings of this study should males have been interviewed as well. Some of the behaviours reported to have sexual orientation differences that impact academic performance include truancy, hostility and addiction

Additionally, the study participants were not representative of all the disciplines that take medical biochemistry and physiology. Specifically absent were The Biomedical Engineering III students who are in the third year when they take the course, The BNursing II students, a cohort which was characterised by more the 70% of the class remediating the course, the BSc OT II students and the MBBCh II students which represent one of the largest cohorts of students taking the course. Thus, the perceptions of these groups of students with distinguishing characteristics were not explored. Hence the findings and recommendations of the study might not be directly translatable to them.

The sample size of six could be considered a limitation, however one of the strengths of phenomenography lies in the richness of the individual participant' unique and sometimes common perceptions of how they experienced the situation differently through their own lens. Hence, each voice and added to the kaleidoscope of participants perceptions of remediating medical physiology and biochemistry. Helping to broaden our insights into the participants experiences and how we can leverage on them to improve students' experiences of the course.

The study did not follow up on the subsequent performance of the students. Therefore future studies should consider whether the students maintained the positive interventions for success or whether they lapsed back to the negative.

There are concerns expressed about reliability and influence of bias on the data in phenomenography, however, computer aided phenomenography has been shown to improve reliability and facilitate reproducibility (Penn-Edwards, 2010). Therefore, the use of a manual thematic analysis is a potential limitation of the study and hence the use of software such as MAXQDA and NVIVO should be considered in future.

Personal insights from the study

Undertaking this study has given me a lot to reflect on in terms of my practice as an educator and my interactions with students. It has given me greater appreciation of the struggles that students go through, especially those that have to remediate. In adjudicating borderline pass-fail candidates following assessments, it is not uncommon for staff to debate whether to allow a student to proceed or remediate the year. Such decisions can sometimes be made without a cost benefit analysis to the student. This study has shown me the need to ensure that such decisions are not taken lightly as they come at a heavy cost to students. I have grown in empathy for students and the study has motivated me to be a better advocate for holistic support of remediating students.

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APPENDICES

Appendix 1: Ethical approval from HREC medical

1A. Copy of ethics clearance certificate

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R49 Professor KH Erlwanger

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M220435

NAME: (Principal Investigator)	Professor KH Erlwanger
DEPARTMENT:	School of Physiology Medical School University
PROJECT TITLE:	*Remediating health science students' perceptions of factors contributing to their successful completion of physiology and biochemistry courses at the University of the Witwatersrand*
DATE CONSIDERED:	2022/04/29
DECISION:	Approved unconditionally
CONDITIONS:	
NOTE:	If contact information regarding student study participants is required, please contact the Registrar's office - <Nicoleen.Potgieter@wits.ac.za>
SUPERVISOR:	Dr E Ndofirepi
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2022/07/08

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **April** and therefore reports and re-certification will be due in the month of **April** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator — Date: 12 July 2022

1B. Permission to use online and face-to-face interviews

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

2022/11/28

Professor KH Erlwanger
School of Physiology
Medical School
University

Sent by e-mail to: Kennedy.Erlwanger@wits.ac.za

Dear Professor Erlwanger

Re: **Protocol Ref No:** M220435
Protocol Title: *Remediating health science students' perceptions of factors contributing to their successful completion of physiology and biochemistry courses at the University of the Witwatersrand*
Principal Investigators: Professor KH Erlwanger

Thank you for your e-mail of 2022/11/15.

We have noted and approve of your proposal to offer your participants the choice of face-to-face or online interviews.

Thank you for keeping us informed.

Yours Sincerely

I. Burns
.....
Mr I Burns
For the Human Research Ethics Committee (Medical)

CB Penny
.....
Dr CB Penny, Chairperson, Human Research Ethics Committee (Medical)

1C. Permission to include students who remediated in 2022 as an additional study cohort

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

2023/01/12

Professor KH Erlwanger
School of Physiology
Medical School
University

Sent by e-mail to: Kennedy.Erlwanger@wits.ac.za

Dear Professor Erlwanger

Re: **Protocol Ref No:** M220435
Protocol Title: *Remediating health science students' perceptions of factors contributing to their successful completion of physiology and biochemistry courses at the University of the Witwatersrand*
Principal Investigators: Professor KH Erlwanger

Thank you for your letter of 2023/01/11.

We have noted and approve of your proposal to include students who remediated Physiology in 2022 as an additional study cohort.

Thank you for keeping us informed.

Yours Sincerely

.....
Mr I Burns
For the Human Research Ethics Committee (Medical)

.....
Dr CB Penny, Chairperson, Human Research Ethics Committee (Medical)

Appendix 2: Study approval from University Deputy Registrar

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

OFFICE OF THE DEPUTY REGISTRAR

21 July 2022

Kennedy Honey Erlwanger
Student Number (12213)
Master of Health Sciences Education
School of Clinical Medicine

TO WHOM IT MAY CONCERN

"Remediating health science students' perceptions of factors contributing to their successful completion of physiology and biochemistry courses at the University of the Witwatersrand."

This letter serves to confirm that the above project has received permission to be conducted on University premises, and/or involving staff and/or students of the University as research participants. In undertaking this research, you agree to abide by all University regulations for conducting research on campus and to respect participants' rights to withdraw from participation at any time.

If you are conducting research on certain student cohorts, year groups or courses within specific Schools and within the teaching term, permission must be sought from Heads of School or individual academics.

Ethical clearance has been obtained. (Protocol number: M220435)

Research Expiration: (08 July 2027)

Nicoleen Potgieter
University Deputy Registrar

Appendix 3: Minimal biographic information and interview questions

a. Biographic data to be collected from participating students:

i. Degree for which student is registered

ii. Year of study

iii. Sex

iv. Age

v. Which other course(s) was remediated in 2021/2022.

b. Interview questions

1. *What do you feel contributed to you having to remediate medical biochemistry and physiology (PHSL2003 or PHSL2004) in 2020? Explain without providing graphic details.

2. What factor(s) do you feel contributed to you passing medical biochemistry and physiology (PHSL2003 or PHSL2004) when you remediated the course in 2021?

Probing questions:

i. Was there a change in your academic strategies? If yes, explain further.

ii. Did you receive institutional support?

- Were you aware of what institutional support was?

- Whom did you turn to for help and why?

ii. Did you receive any social support? Explain further.

iii. What other factors do you feel contributed to your success?

3. The next questions relate to your experiences as a remediating student.

i. How would you describe your feelings during the remediating year?

ii. What challenges did you experience during remediation?

iii. What strategies did you use to overcome the challenges?

4. What advice would you give a student who is about to remediate medical biochemistry and physiology?

5. What advice would you give to the faculty?

**nb the first question should not be probed extensively as it may elicit negative emotional feelings based on the circumstances which led to the failure.*

Appendix 4: Study information document

WITS UNIVERSITY

STUDY INFORMATION DOCUMENT

Study title: Remediating health science students' perceptions of factors contributing to their successful completion of physiology and biochemistry courses at the University of the Witwatersrand

Dear Student,

Introduction: I, Kennedy Erlwanger (supervised by Dr Ndofirepi), am doing research on factors contributing to student success. Research is a process used in seeking new knowledge. In this study we want to learn what it is that students who remediate medical physiology and biochemistry feel contributed to their success. This information is important as it may help to shape policies and guidance for students in future.

Invitation to Participate: We are inviting you to take part in this research, which forms part of the requirements for my Masters in Health Science Education degree.

What is involved in the study: This is a qualitative, non-intervention study. We are specifically including health sciences students who remediated Medical Biochemistry and Physiology (course code PHSL2003 & PHSL2004) in 2021, and successfully proceeded to the second/third year of study in 2022.
Following consent and minimal biographic information collection, the students who consent to participate in the study will individually participate in an interview with semi-structured questions related to their experiences and perceptions on factors and strategies that they used and perceive to have contributed to their success.
Depending on the participants preference and convenience, the interview will be carried out either in a private venue at the faculty of Health Sciences Phillip V Tobias Health Sciences Building OR online via MS-Teams/Zoom to enable recording. The interview is expected to last for 20 to 30 minutes.
Recording will only take place with your consent. This is applicable, whether face-to-face or online.
Participants confidentiality will be maintained throughout the process. Personal data collected will only be available to the Principal Investigator (Kennedy Erlwanger) and my Supervisor (Dr Ndofirepi).

Risks of being involved in the study: There are no risks associated with participating in the study. We will ensure that the interview is confidential and all data collected is retained anonymously. Participants can withdraw at any time during the process.

Benefits of being in the study: There will be no direct benefits for participants in the study. However, the information collected in this study will be useful to guide policy/interventions that will help improve students chances of success.

Participation in this study is voluntary. Refusal to participate will involve no penalty or loss of educational benefits to the participants. Participants in this study may discontinue participation at

any time without penalty. There is also no requirement to provide a reason for withdrawing and any data collected from participants who withdraw will be destroyed, unless the Participant specifically consents to its retention.

There is no payment or costs associated with participation. However, participants may be reimbursed with R100 for internet data costs associated with the interview.

Contact details of researcher/s: Should you require any further information you can contact Kennedy Erlwanger (Email: kennedy.erlwanger@wits.ac.za) or my supervisor, Dr Ndofirepi (email: Elizabeth.Ndofirepi@wits.ac.za).

Outputs: The data collected from the study will be used to write a research report and may be published in an appropriate educational journal. The Participants will be given pertinent information on the study while involved in it, and after the results are available, on request.

Contact details of HREC administrators and chairperson
This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg. A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.
If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Thank you for reading this Study Information Sheet, kindly keep it for your own records.

Date: November 2022

20180329

Iain0007/InfoSheet

Appendix 5: Participant consent sheet

WITS UNIVERSITY

PARTICIPANT CONSENT SHEET

Remediating health science students' perceptions of factors contributing to their successful completion of physiology and biochemistry courses at the University of the Witwatersrand

1. I have been given a Participant Information Sheet which explains the nature and processes involved in this study, which is attached hereto;
2. I was given time to read it, or had it read to me, in the language I best understand;
3. I was given time to ask any questions I wanted to and found any answers given to me to be reasonable and satisfactory;
4. I believe I fully understand why the study is being conducted and what the intended outcomes will be;
5. I understand that there will be no immediate benefit to me, should I agree to participate, nor will I receive any payment; conversely, participation will not cost me anything but my time;
6. I understand that, even if I initially consent to take part in the study, I may subsequently withdraw at any time and would not be required to give any reasons; if that happened, any data collected about me for the purposes of the study would immediately be destroyed, unless I give consent for it to be retained
7. I have been given a range of contact details, listed below. If I require further information or become concerned about any aspect of this study I am free to speak to any of these contacts.
8. I grant retrospective consent to accessing of my student records for the purposes of this study.

Contact details:

Kennedy Erlwanger, Principal Investigator, telephone no. 011 717 2454, or by e-mail at 12213@students.wits.ac.za

Dr Elizabeth Ndofirepi, Supervisor, on telephone no. 011 717 2211, or by e-mail at Elizabeth.Ndofirepi@wits.ac.za

Professor CB Penny, Chairperson of the Human Research Ethics Committee (Medical) at the University of Witwatersrand, on telephone no. 011 717 2301, or by e-mail at Clement.Penny@wits.ac.za.
Ms. Z Ndlovu or Mr Rhulani Mkansi, Committee Secretariat, telephone nos.: 011 717 2700 or 1234, or by e-mail at: Zanele.Ndlovu@wits.ac.za or Rhulani.Mkansi@wits.ac.za

All consenting Participants should be given a copy of this Form to keep, for their records, after signature

Name of Participant: _____
Date: _____
Place: _____
Signature or mark _____

Witnessed by:

Name of Witness: _____
Signature: _____
Date: _____

20180329

Iain0007/GenericConsent.docx

All consenting Participants should be given a copy of this Form to keep, for their records, after signature

WITS UNIVERSITY

CONSENT FORM FOR AUDIO RECORDING OF STUDY PARTICIPATION

Remediating health science students' perceptions of factors contributing to their successful completion of physiology and biochemistry courses at the University of the Witwatersrand

I hereby consent to audio recording of the interview[1], or focus group discussion[1], or classroom interaction[1]

.

I understand that:

- The recording will be stored in a secure location (a locked cupboard or password protected computer) with restricted access to the researcher and the research supervisor.
- The recording will be transcribed and any information that could identify me will be removed,
- The recordings will be erased within either (a) two (2) years of the publication of the research findings, or (b) six (6) years, if no publications arise from this research
- Anyone wishing to access this information in the future will first have to obtain the approval of the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg
- Direct quotes from my interview, without any information that could identify me, may be cited in the research report or other write-ups of research.

Name of Participant: _____
Date: _____
Place: _____
Signature or mark _____

Witnessed by:

Name of Witness: _____
Signature: _____
Date: _____

[1] Delete as appropriate

All consenting Participants should be given a copy of this Form to keep, for their records, after signature