Improving Time-To-Degree of Health Sciences Students through Adapted Postgraduate Student Support Initiatives: An Initial Evaluation

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Abstract. Postgraduate student progression and attainment remains a measure of success for universities. Postgraduate student support is important to improve retention and time-to-degree. South Africa has poor postgraduate student output and the literature on integrated postgraduate support strategies remains scarce in this context. This paper describes the development of an integrated postgraduate student support programme for health sciences students at a South African university. Furthermore, it provides an initial evaluation of the influence of the programme on the postgraduate students' progression from time-of-entry to pivotal milestones, compared to the progression of students prior to the implementation of the programme. Institutional demographic and school-specific data on the time taken to achieve pivotal milestones for 65 postgraduate students were included in this descriptive analytical study. The sample consisted of 50 master's and 15 doctoral degree students. A comparative analysis was conducted using quantitative progression data for the master's 2018/2019 cohort (prior to intervention implementation) (n=28) and the 2020/2021 cohort (after intervention implementation) (n=22). The support strategies implemented almost halved the time from entry to evaluation committee (i.e. research protocol approval committee) (mean 7.3 months) and final ethical approval (mean 14.5 months) for the 2020/2021 cohort. The current limited analysis found the time-to-submission for the 2020/2021 cohort (mean 33.6 months) (n=7) comparable to that of the 2018/2019 cohort (mean 37.4 months)(n=28). Ongoing mapping and analysis of time-to-pivotal-milestones is necessary to identify the barriers and facilitators to achieving sequential pivotal milestones. The initial evaluation indicates that a variation in the type, format, and timing of support interventions is needed to reduce time-to-degree.

Keywords: postgraduate progression; pivotal postgraduate milestones; time-to-degree; postgraduate student support

1. Background

Recently, there has been a sharp global increase in the number of postgraduate enrolments. Nwosu et al. (2024) attribute this trend to the massification of higher education, increasing the number of students now seeking postgraduate study opportunities. In line with this trend, South African universities are predicted to continuously increase their postgraduate enrolment numbers and therefore produce increasing numbers of successful postgraduate students; however, persistent low throughput rates remain a concern. Research studies on postgraduate progression in South Africa have been widely conducted and have focused on time-to-degree, graduation rates, dropout rates, and the factors associated with postgraduate progression. Financial constraints, poor supervision culture and/or practices, age, gender, discipline (or faculty), and work/employer expectations (i.e. work-life balance) are consistently reported to contribute to student dropout rates and prolonged time-to-degree (Zewotir et al., 2015; Botha, 2018; Mphekgwana et al., 2020).

Despite these prior studies on postgraduate progression, the 2022 South African doctoral degree review, published by the Council of Higher Education (CHE) in South Africa (2022), has highlighted the varying stages of progress towards providing quality doctoral programmes at various South African universities. Ongoing high failure and dropout rates among doctoral students in South Africa are not surprising considering that few universities have made any proactive efforts towards creating effective institutional contexts for doctoral provisioning or implemented doctoral capacity development strategies (CHE, 2022). Frantz et al. (2022) emphasise that effective and supportive postgraduate environments for improved postgraduate student retention can only be created if institutions adopt an empirical basis upon which to effectively integrate academic and non-academic factors influencing postgraduate success into a comprehensive, operational system.

The varying degrees of readiness of South African universities to support quality postgraduate programmes, according to the CHE report (2022), is even more worrisome in an environment in which increased postgraduate enrolments are expected and incentivised. Since 2005, the national implementation of incentives has successfully achieved increased postgraduate student enrolments. Mouton et al. (2019) reported an increase in the average number of doctorates per million of the population from 21 in 2000 to 49 in 2015. However, South African numbers still compare unfavourably with leading global research countries and even with other African countries. Indeed, South Africa produces only the third most doctoral graduates (i.e. 49) per million of the population on the African continent, behind Tunisia and Egypt, with 118 and 73 per million of the population, respectively (Mouton et al., 2019). It should further be noted that in 2014 South Africa produced fewer doctorates than a single university in Brazil, despite both being upper middle-income countries (Mohamedbhai, 2018; World Bank, 2023). Considering the considerable efforts and resources that are invested to answer the call for increased postgraduate graduates (especially in South Africa, which is the focus of this paper), Dowling (2021) justifiably refers to the achievement and attainment of postgraduate students as a measure of institutional performance.

Several South African studies have focused on institution-specific postgraduate graduation and/or dropout rates. The University of KwaZulu Natal (UKZN) reported on the progression of a cohort of 2,368 research-based master's students, across various faculties, who were registered at the institution between 2004 and 2011. Many of the students (40.6%) completed their master's degrees in two years, with the biggest dropout (35.4%) occurring in year one. After four years, only a few students remained in the programme, among whom there was an equal likelihood of their graduating or discontinuing their studies (Zewotir et al., 2015).

The University of the Free State (UFS) reported slightly lower throughput rates for 2017 compared with those reported in the UKZN study. Approximately one-third of research-based master's and doctoral degree students completed their studies in the expected three years and four years, respectively, or fewer (UFS, 2019). The University of Limpopo (UL), which is perceived as a less research-intensive university than UKZN and the UFS, reported even lower completion rates of 18.2 % for master's and 13% for doctoral degree students from a cohort of 1,652 master's and 138 doctoral degree students (Mphekgwana et al., 2020). However, it must be acknowledged that the reported completion rates for the UFS and the UL included all research-based master's and doctoral degree students, across all faculties and disciplines. Furthermore, there are challenges when comparing postgraduate student progression data across studies and reports. Reported data are widely heterogenous in terms of the type of master's degrees included (structured/ modular or research-based), the registration status of students (full-time and/or part-time), and the faculties/schools/departments and disciplines represented. Consequently, comparisons require cautious interpretation.

When specifically considering the progression of postgraduate students in the health sciences, Zewotir et al. (2015) found that these students took longer to complete their studies compared to students from other disciplines. This may be attributable to the professional careers of these students, which place higher demands on the time they have available for their studies. Aside from the extended time taken to complete their studies, fewer health sciences students enrol for postgraduate studies (Cobbing et al., 2017; Leider et al., 2015). This, in turn, places additional pressure on higher education institutions to successfully graduate these students. Within the context of the current study, during the period 2014-2018, only 17.1 % of full-time research-based master's and 14% of full-time doctoral degree students in the School of Health and Rehabilitation Sciences (SoHRS) at our university completed their studies within three and four years, respectively. These completion rates were almost half the reported institutional rate of approximately 33%. It should be noted that our study included only research-based master's and doctoral degree students in a section of the health sciences (i.e. Physiotherapy, Occupational Therapy, Optometry, Human Movement Sciences, and Nutrition and Dietetics), which links to the study of Zewotir et al. (2015), indicating that the progression of health sciences students is slower.

Against the backdrop of poor South African postgraduate student performance, and its significance in global (and national) institutional quality ratings, the (un)readiness of South African universities to offer quality postgraduate education on the one hand, as well as increasing postgraduate enrolment numbers on the other, creates a conundrum for research managers. Current challenges are likely to persist if a clearer understanding of institutional (and, by extension, faculty and departmental) progression rates is not acquired. Linked to the insights into postgraduate student progression, institutions also need to develop targeted support initiatives to address the identified gaps. In the authors' context, the SoHRS poor progression rates thus raised serious concerns, which led to the development of our postgraduate support initiatives and the initial evaluation of these initiatives, as reported in this paper.

Insights into postgraduate student support initiatives are provided in the next section, along with a description of the development of the postgraduate student support initiatives implemented in the SoHRS.

2. Postgraduate student support initiatives and research context
A plethora of literature is available on individual factors, such as personality, motivation, finances, and supervision quality, influencing postgraduate student success in varying contexts (e.g. contact learning, distance/online learning, and international studies). However, few authors to date have focused on integrated support systems, whereby academic and non-academic factors are integrated in a single student support programme. When the authors joined the SoHRS at the UFS in 2019, as the new Head of School and Postgraduate Coordinator, respectively, they were faced with extended time-to-degree for postgraduate students enrolled in the school. At the time, data indicated that no postgraduate students in the school completed their studies within the indicated time-to-degree for full-time research master's degree students of two years and three years for doctoral degree students (UFS, 2023). Many students were taking nearly double this time to graduate, despite the institutional expectation that full-time master's degree students should complete their degrees in no more than three years and doctoral degree students in no more than four years (UFS, 2022).

On average, the SoHRS enrols 62 master's degree students and 13 doctoral degree students annually across five departments (Physiotherapy, Occupational Therapy, Optometry, Exercise and Sport Sciences, and Nutrition and Dietetics). Research supervision is primarily provided by academics in the respective departments. Furthermore, supervisors are also heavily involved in the undergraduate professional degree training. At the time of implementing the adapted support initiatives in 2020, there were 34 active supervisors in the school. Half (n=17) lacked supervision and research experience and were appointed at a lecturer level, with the highest qualification being a master's degree. Five supervisors (14.7%) were professors/ associate professors/ adjunct professors and 12 supervisors (excluding the professors) (35.3%) held doctoral degrees.

According to supervisors, the main reason for the poor postgraduate student progression rates was that postgraduate students were working full-time whilst

studying, with many struggling to balance their professional career with personal/ family responsibilities, in addition to their postgraduate studies (work-life-balance). Students were also solely reliant on the guidance provided by their supervisory team, with little or no additional institution/faculty/school-specific guidance and/or support provided. The reasons for extended time-to-degree were consistent with those reported in previous research (as highlighted in the Background section).

The authors came to the realisation that, despite knowing the factors contributing to extended time-to-degree, poor graduation rates and high dropout rates for South African postgraduate students, throughput rates for postgraduate students remain poor (as also confirmed in our context). This realisation raised questions regarding the structure and efficacy of postgraduate student support initiatives in South Africa, but more specifically in the authors' own context. Rather than focusing on any of the individual contributing factors separately, the authors considered the potential impact of an integrated student support system on time-to-degree. After careful consideration of the available frameworks, the authors utilised the models of Kinsey (2021) and the Vitae Research Development Framework (RDF) (Vitae, 2010) to inform their SoHRS postgraduate student support initiatives.

Kinsey (2021:8-10) combined various student support models and went on to propose the four most common categories of persistence factors and influencers of student attainment. These categories included academic, social, circumstantial and personal factors. Within the category of academic factors, it is assumed that '*a student who achieves high marks and (or) experiences intellectual growth is more likely to continue.*' In the social category, persistence could be enhanced if institutions '*are instrumental in forging a sense of community and addressing the need for students to feel supported*'. This links to the work done by McLaughlin and Sillence (2023), focusing on the academic loneliness of postgraduate students. These authors postulate that postgraduate students should be afforded sufficient opportunity for collaboration within their cohorts, to buffer loneliness and enhance retention. White and Ingram (2021) allude to the postgraduate student experience, which directly links to the intra- and interpersonal processes occurring across all areas, such as students' daily lives, university services, and the academic requirements. The work by White and Ingram (2021) further provides the link between the first two categories mentioned by Kinsey (2021). The third category included by Kinsey (2021) is circumstantial factors, which relate to a student's personal circumstances, such as financial factors. As mentioned, personal/ family challenges are known to negatively impact student persistence. Lastly, personal factors relate to indicators such as age, gender, self-discipline and motivation, amongst others.

Samuel and Fhatuwani (2023) support the notion that postgraduate support programmes should focus on cognitive, affective and systemic support (as proposed by Kinsey) but, interestingly, they feel that such support should be led by supervisors (rather than research managers/coordinators). Ghani (2020) agrees that supervisors are ultimately responsible for the professional development of

their postgraduate students and for ensuring that these students have a societal impact by acting as role-models within society upon graduation. Due to the fact that most supervisors are successful researchers, it might be a viable option for institutions to explore the implementation of postgraduate support programmes at an institutional level rather than those implemented by individual researchers on an individual or small group level. Malunda et al. (2021) allude to the possibility of support programmes that bring supervisors and postgraduate students together in different contexts to support postgraduate progression. Thus, there may be an opportunity for institutions to implement programmes that integrate postgraduate student support and researcher development.

Key domains included in Kinsey's (2021) integrated model, as described above, are clearly aligned with the domains of the Vitae Research Development Framework (RDF) (2010)(see Figure 1). Vitae developed the RDF for researchers, in collaboration with the higher education sector in the United Kingdom. The RDF describes the knowledge, behaviour and attributes of successful researchers (Vitae, 2023). The framework is structured into the following four domains: knowledge and intellectual abilities (i.e. knowledge, intellectual abilities and techniques for conducting research); personal effectiveness (i.e. personal qualities and approach needed to be an effective researcher); research governance and organisation (i.e. knowledge of the professional standards and requirements for research); and engagement, influence and impact (i.e. knowledge and skills to work with others to ensure the wider impact of research). Each domain is further divided into 12 sub-domains, highlighting the characteristics of excellent researchers (Vitae, 2010). The purpose of the Vitae RDF is to facilitate researchers to evaluate and plan their professional development, for research managers and/or supervisors to support the development of younger researchers and for research developers to develop the necessary support initiatives (Vitae, 2010).
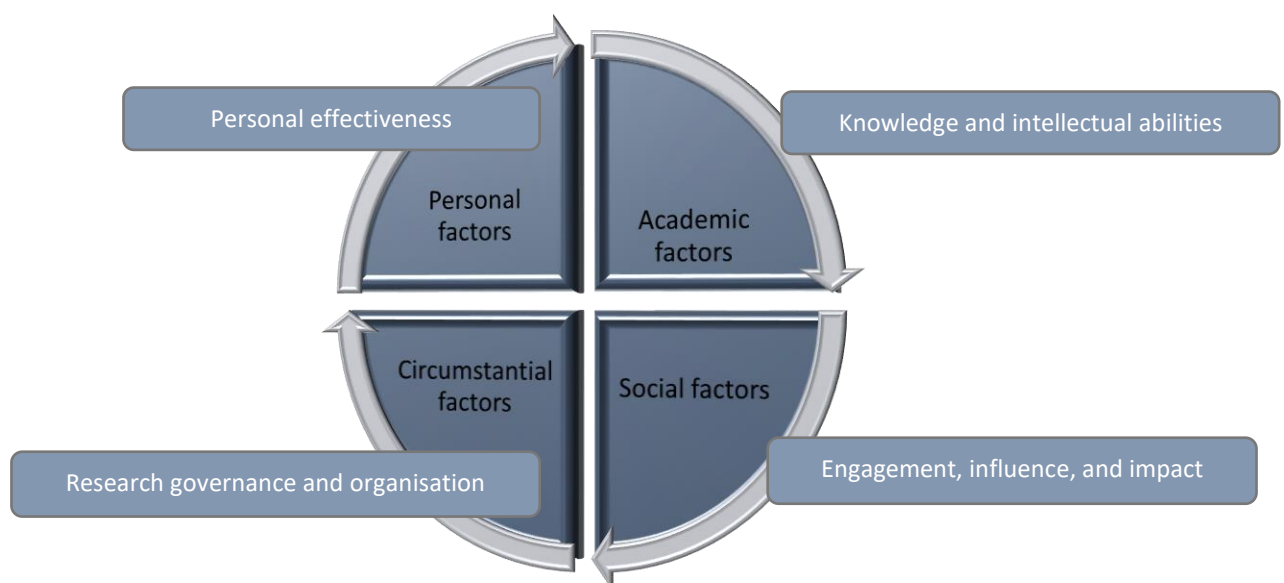
	Kinsey integrated framework (2021)
	Vitae Research Development Framework (2010)

Figure 1: Overlap of student attainment and persistence factors

As the project leaders, the authors deemed the integration of the models proposed by Kinsey and Vitae to be relevant as a foundational framework for developing the SoHRS postgraduate student support initiatives. Even though these frameworks were not specifically developed for the South African context, the authors considered the content to be generalisable to the local context. Specific contextualisation occurred within the content design and delivery of our own postgraduate student support initiatives. The authors used these foundational frameworks to create their own postgraduate support framework, the first step of which was the identification and description of the four domains wherein our support initiatives would be situated (see Table 1).

Table 1: SoHRS postgraduate student support domains adapted from the integrated frameworks of Kinsey (2021:8-10) and Vitae (2010:2)

Student attainment factors (Kinsey 2021:8-10)	Vitae RDF domains (Vitae, 2010:2)	Adapted SoHRS postgraduate student support domains
Academic factors	Knowledge and intellectual abilities	Being a knowledgeable researcher
Personal factors	Personal effectiveness	Being an effective researcher
Circumstantial factors	Research governance and organisation	Being a skilled researcher
Social factors	Engagement, influence, and impact	Being an engaged researcher

Following this, the key researcher characteristics (skills, knowledge, and attributes) that we wanted to develop in our postgraduate students in each of the four domains were identified, with the overall consideration being the development of competent and employable researchers. These characteristics were also aligned with the university's focus on graduate attributes, which evolved to researcher attributes in the postgraduate space. Specific support content was then identified and/or designed (and contextualised where necessary) to support the development of these identified characteristics. School-specific support strategies/activities were planned as the vehicle by which the support content would be delivered in such a way that promoted student retention (see Figure 2 and supplementary Table 1).
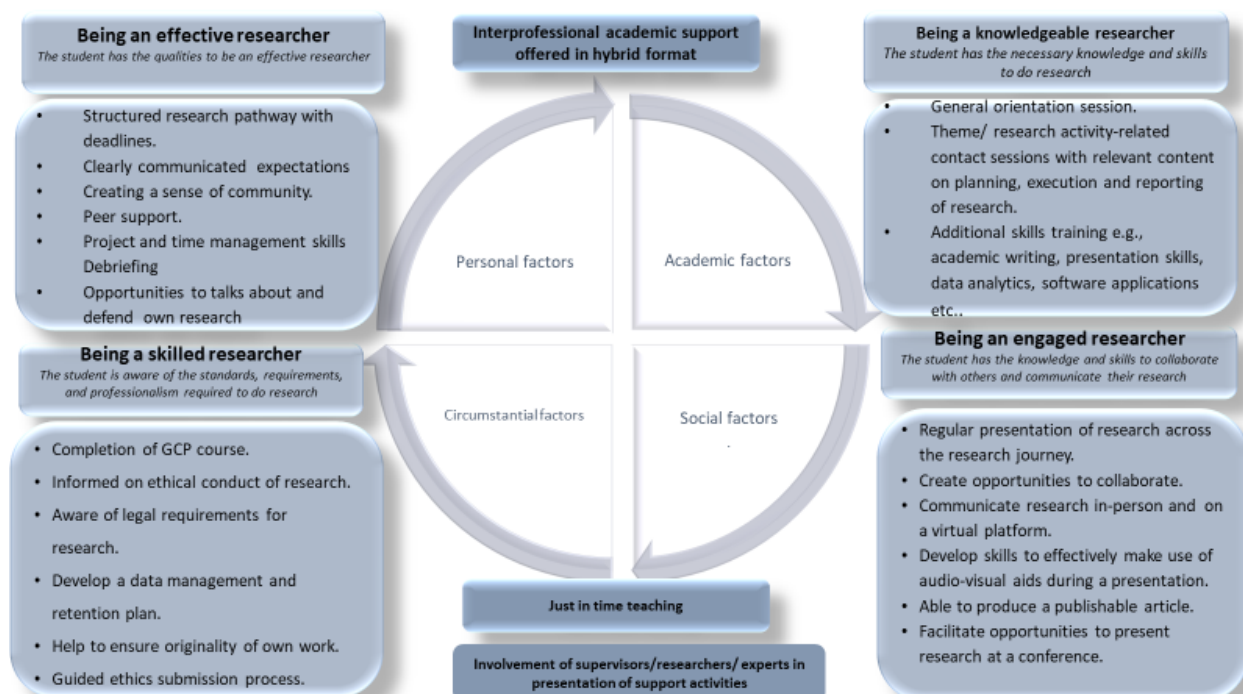

Figure 2: Overview of the postgraduate support framework for the School of Health and Rehabilitation Sciences

Having been developed, the adapted postgraduate student support initiatives were implemented in the SoHRS in 2020. The main reason for implementing the adapted support initiatives was to enhance the graduation rates of postgraduate students and to reduce time-to-degree. Additionally, these initiatives were intended to serve as a platform from which inexperienced researchers and/or supervisors could also develop their own research and supervision skills in a non-threatening environment whilst simultaneously continuing on a research journey with their postgraduate students. Finally, these initiatives had to supplement existing departmental supervisory practices and/or initiatives in the school. To reduce time-to-degree, support interventions were planned and timed around deadlines for achieving pivotal milestones and in accordance with institution-specific submission deadlines. Securing the approval of the evaluation committee (i.e. research protocol approval committee) was selected as the first pivotal point in the postgraduate journey; for this reason, it was targeted as the first outcome to be achieved through the implementation of the adapted student support initiatives. From there, the next pivotal milestone identified was obtaining final ethical clearance to conduct the research, followed by the submission of the dissertation/ thesis for examination, before, finally, the awarding of the degree. Several research activities were associated with each pivotal milestone (see Figure 3).
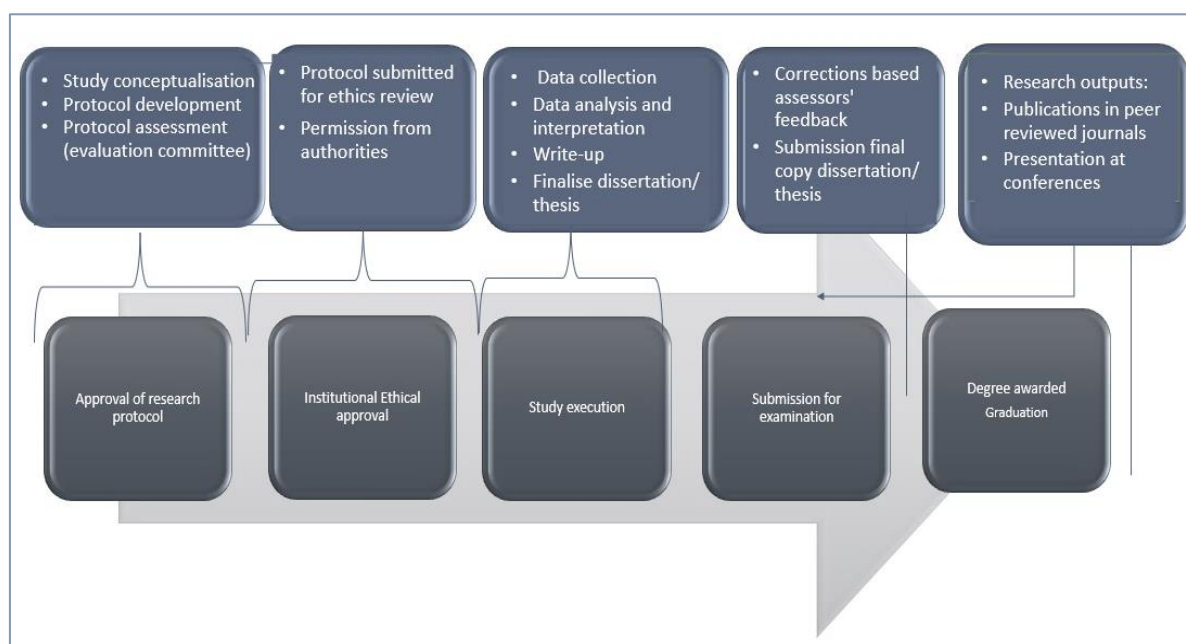
Figure 3: Pivotal milestones and related research activities in the postgraduate journey

After implementing the adapted postgraduate student support initiatives in the SoHRS, an initial evaluation was conducted to measure the influence of these initiatives on student dropout rates, student progression between pivotal milestones and, ultimately, time-to-degree. The methodology followed for the initial evaluation and the results are included in the next section of the article.

3. Research methodology

3.1 Research design

The study utilised a quantitative descriptive analytical design, and the authors used data from the two preceding years (2018-2019 cohort) and two years following (2020-2021 cohort) the implementation of the adapted student support initiatives. Ethical clearance was obtained from the institution's General/Human Research and Ethics Committee (GHREC) prior to the commencement of the study (UFS-HSD2021/0921/21). All participants provided informed verbal consent for their institutional demographics and school-specific data to be used to report on their progression.

3.2 Research participants

All students registering for postgraduate programmes in the SoHRS for the first time from 2018-2021 were purposefully selected to be included in the study. Initially, eighty-two postgraduate students were included in the study (66 master's and 16 doctoral students). Subsequently, seventeen students were excluded from the analysis after they cancelled their studies (16 master's students and one doctoral student). Data for 65 students were included in the analysis across the two cohorts:

- 2018 -2019 cohort (n= 35): 28 master's and seven doctoral students.
- 2020 -2021 cohort (n=30): 22 master's and eight doctoral students.

The cohort sizes were comparable, with the 2018-2019 cohort being slightly larger than the 2020/2021 cohort. A contributor to the smaller 2020/2021 cohort was that the master's degree and Doctor of Philosophy degree programmes in Human Movement Sciences were discontinued at the end of 2019. Proportionally more master's students enrolled in programmes in Nutrition and Dietetics (see Table 2). All postgraduate programmes in the SoHRS are registered as full-time and, by implication, full-time master's and doctoral students at the UFS are expected to complete their studies in no more than three and four years, respectively.

Table 2: Profile of postgraduate student enrolments 2018-2021 (N=65)

MASTER'S ENROLMENTS 2018-2021 (N=50)					
Cohort	**Size**	**Gender (f/%)**		**Mean age at entry (years)** Mean (SD)*	**Age at entry (years)** Median [Range]
		Male	**Female**		
2020-2021	22	9 (40.9%)	13 (59%)	32.3 (8.9)	30[23-56]
2018-2019	28	4 (14.3%)	24 (85.7%)	30 (9.4)	25 [21-48]
Summary	**50**	**13 (26%)**	**37 (74%)**	**31 (9.1)**	**28.5 [21-56]**
Difference on mean age p=0.38 *Nutrition and Dietetics 17 (34%); Physiotherapy 5 (10%); Occupational Therapy 7 (14%); Optometry 8 (16%); Human Movement Sciences 13 (26%)*					
DOCTORAL ENROLMENTS 2018-2021 (n=15)					
Cohort	**Size**	**Gender (f/%)**		**Average age at entry (years)** Mean (SD)*	**Age at entry (years)** Median[Range]
		Male	**Female**		

2020-2021	8	0	8 (100%)	34.6 (8.5)	31[29-51]
2018-2019	7	2(28.6%)	5(71.4%)	37.1(10.7)	35[24-59]
Summary	15	2 (13.3%)	13(86.7%)	35.8(9.3)	33[24-59]

Difference on mean age p=0.62
Nutrition and Dietetics 8 (53.3%); Physiotherapy 2 (13.3%); Occupational Therapy 4 (26.7%); Human Movement Sciences 1 (6.7%)

Most students enrolling for postgraduate programmes in the SoHRS were mature. The mean age at entry for master's students was 31 years [Range 21 -56 years], which is slightly older than the national average of 27.3 years (Zewotir et al., 2015). One plausible reason for the more mature age at entry could be that most students in the represented professions must first do community service and then go on to establish themselves in their professions, before considering undertaking postgraduate studies. The mean age at entry of doctoral students was 35.8 years [Range 24-59 years], which is consistent with the national average of 36 years (DHET, 2015). The average age of master's students (p=0.38) and doctoral students (p=0.62) were comparable across the two cohorts (Table 2). All postgraduate students enrolled in programmes in the SoHRS worked full-time in their professions whilst studying. This is consistent with the national trend for postgraduate students (DHET, 2015). Most postgraduate students were married, and several had children.

More than three-quarters of all students enrolling for postgraduate programmes in the SoHRS were female. This was expected, as more than three-quarters of all undergraduate allied health students are female (Research Works, 2020) (see Table 2). Furthermore, females in the included professional categories are more likely than males to pursue academic careers in which postgraduate qualifications are prioritised as a core requirement for appointment and/or promotion. Also, there is little professional or financial incentive for allied health professionals working in the public sector or private sector to complete postgraduate degrees. Specialisation is not recognised in these occupations by the Health Professions Council of South Africa (HPCSA) and medical aids do not pay higher tariffs to practitioners with higher degrees. Furthermore, many males in the included occupations are private practice owners with little time or interest in embarking on postgraduate studies. Consequently, this contributes to fewer allied health professionals deciding to enrol for postgraduate studies. This is consistent with the findings of Cobbing et al. (2017) regarding South African health sciences students.

3.3 Research tools and data collection
The researchers used a self-developed data charting table to collect and report on the relevant institutional and school-specific progression data for each student. Data including date of birth (to calculate age at entry), gender and the programme in which students were registered, as well as time from entry to pivotal milestones (evaluation committee approval, final ethical clearance, submission for examination, awarding of degree) were captured. Progression data were captured in the form of the date on which each of the pivotal milestones were reached, as reported in the institutional database and/or official approval dates of

committees, such as the Research Ethics committee. Data captured were independently screened for correctness by both the authors against the original source (as above). All data were depersonalised; any information that could link the data to a specific postgraduate student (i.e. student number, names and surnames, etc.) was removed with the upload of the data into the SPSS statistical software. Data reporting was performed in an aggregated format (as group trends) to further prevent the identification of individuals.

3.4 Data analysis

Data analysis was conducted by the researchers using SPSS statistical software. Sample characteristics are presented as means with standard deviations and medians with ranges for continuous data and frequencies with percentages for categorical data. The differences between means were calculated using a two-sample t-test. The demographic profile of both master's and doctoral students will be reported. However, as the support strategies were only implemented for doctoral students in 2021, they were excluded from further analyses. Analysis of dropouts and study interruptions, and time from entry to and between pivotal milestones were then conducted for the master's cohorts.

Furthermore, it should be noted that results for time from entry to the pivotal milestones three and four need to be interpreted cautiously. At the time of the analysis all students in the 2018-2019 cohort had reached pivotal milestone three (n=28) and all had achieved pivotal milestone four (n=27). However, only a few students in the 2020/2021 cohort, who were in years three and four at the time, had reached pivotal milestone three (n=7) and pivotal milestone four (n=5). By implication, the average time-to-pivotal-milestones three and four, as indicated, is likely underestimated for the cohort as only data for students submitting in 3.5 years or less have been included in the analysis (the best projected average time-to-submission for examination for the entire 2020/2021 cohort based on current progression is around 39.6 months and average time-to-degree is 42.4 months).

4. Results and discussion
4.1 Dropout and study interruptions in the master's cohort
The average drop-out for master's students was 22.7%, which is lower than the 40% reported nationally (DHET, 2015). A probable reason for the lower dropout for master's students in our study could be that they were slightly older at entry and likely had more time to carefully consider their enrolment before starting out in the programme. Students typically dropped out early on in their studies (in year one or two), and before their research protocol had received final ethical approval (i.e. before pivotal milestone two). Most students dropped out due to personal/ family-related challenges, with very few students dropping out for financial reasons. This is contrary to the literature, which indicates financial reasons/ insufficient funds as one of the most prevalent reasons for student dropout (DHET, 2015; Zewotir et al., 2015; Botha, 2018; Mphekgwana et al., 2020). The low number of dropouts in our study citing financial reasons can be explained by the UFS providing partial tuition fee funding support to first- and second-year research-based master's degree students.

On average, 29% of master's degree students interrupted their studies, which is consistent with the national average of around one-third of students (DHET, 2015). Students interrupted their studies early on (typically before data collection), for personal/ family-related reasons. One-third of students who interrupted their studies went on to cancel their studies. Those students who returned were likely to complete their studies in a comparable actual period (albeit over a longer calendar period). It is important to recognise that study interruptions create a bottleneck in the system, as supervisors remain occupied with these students until they complete their studies, limiting their availability to take on new students (DHET, 2015).

4.2 Time from entry to pivotal milestones and between pivotal milestones for master's students

At the time of the data analysis (August 2023), all students from the 2018/2019 cohort (n=28) had reached pivotal milestones one, two, and three, whilst most students in the 2020/2021 cohort had reached pivotal milestones one (n=22) and two (n=20). It is evident that the time from entry to the first two pivotal milestones was almost halved for the 2020/2021 cohort following the implementation of the adapted postgraduate support (see Figure 4). Apart from the support strategies implemented, the 2020/2021 cohort was also given definite time limits by which these pivotal milestones were to be achieved.
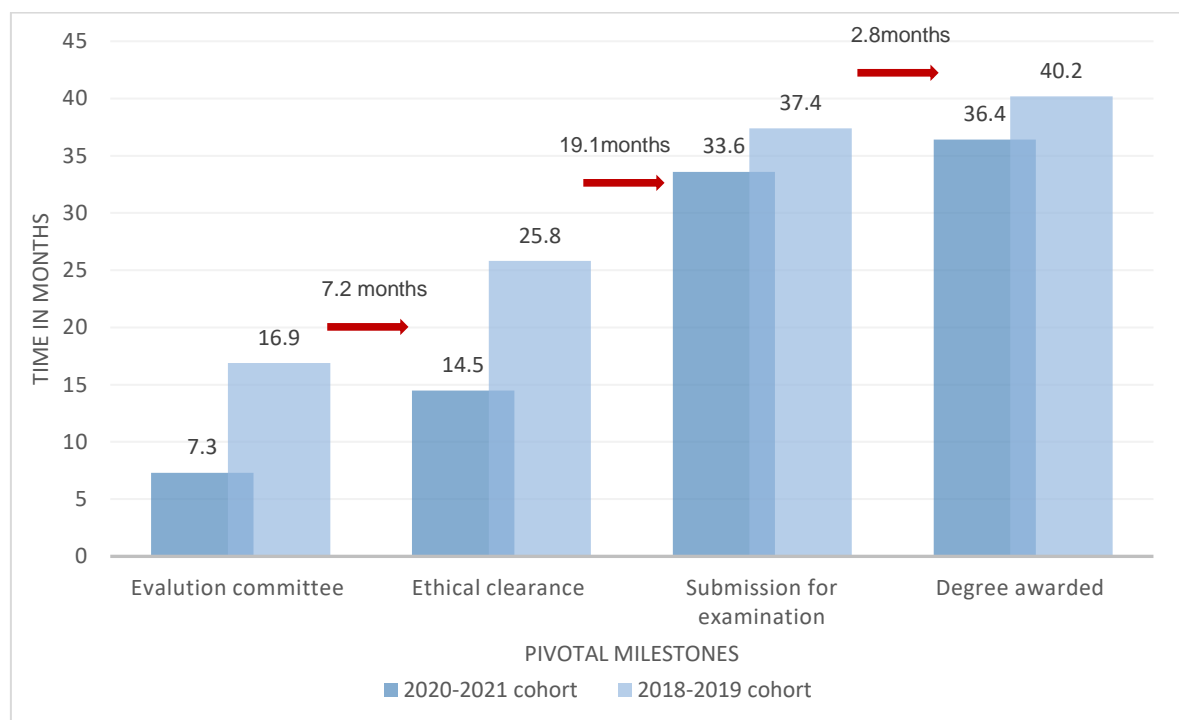

Figure 4: Postgraduate progression of master's degree students between pivotal milestones in the SoHRS

Some of the success in reducing time from entry to pivotal milestones one and two may be attributable to the integrated, evidence-based approach of our adapted support interventions and the varied strategies used. The approach followed is supported by Crane et al. (2016), who highlighted the value of a multi-levelled

approach to support during the postgraduate student experience combined with the involvement of both the student and educators/supervisors/leaders. Several other postgraduate support strategies that were recommended by these authors were also implemented, including creating opportunities for students to present their work, engaging them in a variety of activities, and accommodating various supervision models (see Figure 2 and Supplementary Table 1). A recent Malaysian study by Priyadarshini et al. (2022) affirmed the positive impact of postgraduate support initiatives. Identifying research skills, the provision of institutional support, and self-management were identified as the determining factors in punctual graduation.

Worth noting in our study is the lengthy period (more than seven months for both cohorts) between students achieving pivotal milestone one (evaluation committee approval) and achieving pivotal milestone two (final ethical approval). These results are in line with a study performed at another South African university amongst health sciences postgraduate students, which also reported more than 35% of participants taking longer than six months to obtain ethical approval (Kisansa & Lubinga, 2020). Time lost here in the postgraduate lifecycle is concerning considering students are expected to complete their studies in three years or less. Reasons for this loss of time could be students delaying in making the required protocol changes following their evaluation committee results, delayed or incomplete ethics submissions, or the lengthy ethical approval process, including time taken to obtain the necessary mandatory approvals (e.g. from the Department of Education, Department of Health, and institutional gate keepers, amongst others). Indeed, protracted ethical approval processes for postgraduate students are a national concern (CHE, 2022). Further investigation into the exact causes for the time delay are needed to determine the necessary remediation. It is reasonable to expect that reducing the time-to-final-ethical-approval would consequently reduce time-to-submission for examination and the awarding of the degree.

At first glance, the support strategies implemented following ethical approval (pivotal milestone two) appear not to decrease time from entry to pivotal milestone three (submission for examination) and four (awarding of degree). It must be noted that academic support activities after ethical approval (pivotal milestone two) are recommended but are not compulsory for students. Anecdotally, students seem to engage less with the support on offer when it is not mandated. Additionally, students also do not have clear deadlines/ timeframes for completing data collection and submitting their dissertation for examination (as was the case for milestones one and two). A further contributing factors could be the noted underutilisation of the quarterly writing dyads/ retreats, which are aimed at supporting students' writing progress.

We had anticipated that students would be able to transfer the research skills and attributes (i.e. self-management, project and time management, to name but a few) developed during the protocol development phase into the subsequent stages of their research. Gauging by our initial results for time-to-pivotal-milestones three and four, this appears not to be the case. A more in-depth investigation is clearly

needed into participation and the impact of compulsory support activities with defined deadlines versus more self-directed participation and self-determined deadlines.

The projection that only just over half (54.5%) of master's students in the 2020-2021 cohort will submit for examination in three years or less is concerning. Many students will still only complete the course in four or more years, with just over 10% of the students still likely to be in the programme in year five. Proportionally, the figures are consistent with those for the 2018-2019 cohort (see Table 3). Current results and projections would suggest that ongoing, timely, structured support across the postgraduate journey – with clear timeframes for the achievement of pivotal milestones – is needed to effectively reduce time-to-degree. This aligns with recent reports of the need for ongoing postgraduate support in the national doctoral report (CHE, 2022).

Table 3: Time from entry to submission for examination (n=50)

Time-to-submission	Time-to-submission	Sample (N=50)	2018-2019 cohort (n=28)	Projected for 2020-2021 cohort (n=22)
2 years or less	27 (54%)	3 (6%)	2 (7.1%)	1 (4.5%)
3 years		24 (48%)	13 (46.4%)	11 (50%)
4 years	23 (46%)	17 (34%)	10 (35.1%)	7 (31.8%)
5 years or more		6 (12%)	3 (10.7%)	3 (13.6%)

5. Study limitations
It is acknowledged that this article provides only an initial review of student progression and time-to-pivotal-milestones for master's students enrolled in the SoHRS at the UFS from 2018-2021. Fewer than one-third of the 2020-2021 cohort had submitted for examination at the time of the analysis. This consequently weakened the strength of the statistical analysis for time-to-pivotal-milestones three and four, limiting the capacity to draw definitive conclusions. These results are for a single school in the Faculty of Health Sciences at the UFS and may not be generalisable to the wider UFS community and beyond.

6. Conclusion
This study provides a unique first perspective on the impact of support initiatives on time from entry to pivotal postgraduate milestones for health sciences students at a South African university. Our initial review of support strategies implemented demonstrates the potential benefit of an integrated approach to postgraduate student support on students' progression to pivotal milestones and ultimately time-to-degree. Importantly, it was noted that structured postgraduate support is not only required when students begin their studies but needs to be ongoing in the form of tailored support to match the stages of the students' research progress, meeting their needs as they evolve. It was initially assumed that if adequate support was provided in the initial stages of the research journey, postgraduate students would automatically transfer those skills (e.g. time

management) to later years. However, once the support became less structured in later study years, the positive effect was lost, resulting in similar time-to-degree for both groups. Ongoing mapping of time-from-entry to and between key pivotal milestones is needed, along with a critical analysis of the barriers and facilitators to these timelines, in order to provide clearer understanding of the specific challenges and types of postgraduate support needed. Such ongoing mapping could also establish best practices for all phases of the postgraduate journey, as well as the preferred timing of support interventions to optimise time-to-degree. This could be achieved through longitudinal studies on the long-term impact of the support strategies, and more specifically the impact of refinement on specific problematic areas, such as the time between pivotal milestones three and four, as identified in our study (see Table 3). Additionally, qualitative data collected through interviews, or similar data collection tools, could provide valuable insights into students' specific experiences.

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Supplementary Table 1: Postgraduate student support framework for the School of Health and Rehabilitation Sciences (SoHRS)

Characteristics	Content (topics/focus areas)	School-specific (SoHRS) support strategies to promote retention
Domain: A knowledgeable researcher		
Descriptor: *Has the necessary knowledge and skills to do research*		
- Can seek information and manage data. - Is digitally skilled and competent. - Is academically literate and can synthesise information. - Can think critically and can construct a sound argument. - Has the necessary research skills. - Has the necessary subject-related knowledge. - Is able to use available resources efficiently and effectively. - Knows how the academic system works.	- Library services and instruction on conducting electronic information searches. - Development of Research Data Management (RDM) plan. - Data retention guidance. - Information on institution-approved data management and storage platforms. - Use of a web-based virtual learning environment (Blackboard). - Use of digital meeting and presentation platforms (i.e. Blackboard Collaborate, Microsoft Teams, Skype). - Use of reference management software (i.e. Mendeley). - Training on electronic ethics submission system (i.e. RIMS). - Use of institution-approved data storage platforms (i.e. Fig share). - Use of institution-approved data collection and management platforms (i.e. EvaSys, REDCap). - Use of grammar and proof-reading tools (i.e. Grammarly). - Use of similarity and artificial intelligence	- General orientation session at entry. - Regular opportunities to engage students through research activity-based contact sessions linked to pivotal milestones and related research activities. - Content of content session chosen to align with the chosen theme/ focus. - Academic writing workshops. - Article writing workshop. - Regular student presentation sessions for feedback and input from school academics and peers. - Participation of supervisors in contact sessions. - Regular debriefing and feedback sessions. - Expert internal and external topic presenters during contact sessions. - Accessibility- all sessions are offered in a hybrid format: - Accommodate geographical diversity of students. - Accommodate personal preferences in format of attendance.

	(AI) detection software (i.e. Turnitin).
	• Utility of AI-powered language models (i.e. ChatGPT) in research.
	• Advice on navigating online journal submission systems.
	• Develop academic writing skills.
	   o Principles of academic writing.
	   o Principles of writing literature review.
	   o Principles of writing a discussion and the art of argumentation.
	   o Article writing.
	• Explores issues, ideas, and evidence before accepting or formulating an opinion or conclusion.
	• Study conceptualisation.
	• Writing a research protocol.
	• Study methodologies.
	• Questionnaire/ survey design.
	• Use of institution-approved survey software (i.e. EvaSys)
	• Use of institution-approved data management software (REDCap).
	• Data cleaning and basic statistical analysis using statistical software package.
	• Core knowledge and basic understanding of key concepts, issues, and advances within own research facilitated by
		• Quarterly writing retreat/ dyad with the availability of an experienced reader and opportunity for students to work under the direct guidance of the supervisor.
		• School evaluation committee programme for protocol approval.
		• Allocation of expert supervisors.
		• Accessible departmental expertise.
		• Accessible network of experts to consult.
		• Share information and resources via Blackboard, announcements and campus email.
		• Administrative officer at the faculty postgraduate officer and postgraduate coordinator in school orientate students to relevant administrative and university/ faculty/ school procedures and systems.

	Department/ supervisor. • Writing of an in-depth self-directed literature study. • Provide students with information on available resources. • Help students to connect and build relationships with peers, student researchers, staff, faculty, and Centre for Graduate support.	

Domain: An effective researcher		
Descriptor: *Has the qualities to be an effective researcher*		
• Perseveres and is enthusiastic. • Is self-disciplined. • Is self-directed (leadership). • Is flexible and adaptable. • Can problem-solve by evaluating and implementing a strategy to achieve the desired goal. • Can create own support network. • Takes responsibility and can work independently. • Is aware of own limitations as a researcher. • Seeks guidance when necessary. • Demonstrates good research practices and integrity. • Utilises sources of support that are available. • Able to engage in discussion and defend own research ideas. • Can manage feedback and constructive criticism.	• Advise on strategies for problem solving, time and project management. • Support student wellbeing and mental health through skills training (i.e. mindfulness, stress management, improving wellbeing and resilience, improving physical health/ lifestyle behaviours, peer support, mentoring and coaching). • Strategies on how to develop a support network, i.e. peers, colleagues, partner, family, friends, and community. • Structured research pathway. • Clearly communicated expectations and timelines. • Present, talk about and defend research to an audience, e.g. peers, supervisors, academics, experts. • Provide feedback and debrief.	• Clarification of student-supervisor expectations and signing of the supervision agreement. • Student and supervisor meet regularly. • Expectations, outcomes, and timelines communicated. • Interdisciplinary cohort creating a sense of "community" and belonging. • Platform for peer engagement and support. • Peer group on social media platform, e.g. cohort WhatsApp group can meet up in BB Collaborate meeting space. • Meet students where they are in the research process; "just in time" support. • Regular check-ins with students (both academic and wellbeing).

• Learns from mistakes and feedback. • Can reflect on own behaviours and research experiences. • Can identify areas for research development, i.e. develops strengths and improves on weaknesses. • Able to offer support to peers. • Engages the local community through own research. Work to be effective in local communities and participates in activities of personal and public concern. • Is invested in and nurtures own professional development.	• Opportunities for communicating with and interacting with peers. • Communication of research development opportunities in school/ faculty/ UFS. • Communication of opportunities for community engagement through research and/ or relevant related projects.	• Refer pathway to mental health and social support services if indicated. • Programme leaders and supervisors to monitor research progress using data on key indicators and pivotal milestones. • Address warning signs of poor persistence. Check in and follow-up with student. Identify support interventions to get student back on track. • Hybrid format for sessions allowing sense of inclusion of international students and local students with geographical constraints. • Central postgraduate coordinator to contact for assistance. • Session on 'being a postgraduate student'. • Regular opportunities for feedback and debriefing. • Gathering feedback/reflection from students. • Opportunities for community involvement.
Domain: A skilled researcher		
Descriptor: *Is aware of the standards, requirements, and professionalism required to do research*		
• Writes own research protocol. • Adheres to the principles of good clinical practice. • Understands and applies the relevant codes of professional and research conduct.	• Communication of protocol and dissertation/ thesis standards and requirements. • Encourage autonomy though guided pathways and connecting students with needed assistance.	• Contact sessions planned to address relevant content. • Students informed on UFS/ Faculty/ School policies and guidelines that apply to postgraduate studies.

• Adheres to guidelines for the ethical conduct of research. • Has/ develops a sense of community engagement and social responsibility. • Aware of and adheres to the legal requirements for research, i.e. SA-GCP, POPIA, Research Data management, data ownership, and retention. • Ensures the originality of own work submitted for review and assessment. • Writes own dissertation/ thesis/ manuscripts with the guidance of the supervisors. • Co-authors, contributors and funders acknowledged on research outputs. • Manages the project according to an agreed time schedule (within the expected time-to-degree). • Acts on decisions/ feedback agreed with supervisors. • Knows where to access information on research. • Able to manage research grant/funding if awarded.	• Good clinical practice training (i.e. TRREE GCP). • Aware of and adhere to professional codes of conduct. • Training on ethical submission requirements. • Training on protection of personal participant information (POPIA). • Training on research data management and retention. • Protocol approved by a school-approved evaluation committee meeting. • Protocol must be approved on Research Ethics Committee (HSREC) platform before commencing research. • Permission from relevant authorities and gatekeepers before commencing research. • Necessary protections for human study participants included in research and adhere to research principles where no human participants are involved. • Informed of the UFS general rules that apply to intellectual property. • Recognised authorship guidelines are adhered to, and students informed on the faculty authorship guidelines. • Informed on the principles of academic integrity. • Academic work submitted through Turnitin similarity and AI software, with an acceptable overall	• Information session by HSREC administration office. • Training on online ethics application by the RIMs office. • Training on the use and application of Turnitin. • Training on Turnitin similarity and AI software to ensure originality of work. • Students informed on Faculty authorship guidelines. • Students are informed on the UFS policy on academic misconduct and plagiarism. • Formal supervision agreement from the outset of the project. Revised as needed. • Regular meetings with supervisory team. • Regular monitoring of student progress. • Support and remediation actions implemented as needed. • Centre for Graduate Support funding office provide information session and available for consultations and connect students with available funding opportunities. • Centre for Graduate Support facilitates signing of online research supervision agreement and the annual progress report (GRM).

	similarity (<10%) and AI percentage (<15%). Similarity and AI concerns are addressed prior to submission for assessment. • Valid ethical approval during research process (application for extension where needed) and annual research progress report submitted. • Provide HSREC with a close-out report on conclusion. • Student and supervisors submit annual progress report. • Access on funding opportunities. • Information provided on compiling a study budget. • Student to attend relevant sessions for grant reporting and management, e.g. NRF.	
Domain: An engaged researcher		
Descriptor: *Has the knowledge and skills to collaborate and communicate their research*		
• Listens to, gives, and receives feedback. • Values and acknowledges the contributions of others. • Negotiates and agrees on research activities and deadlines with the supervisor. • Recognises the value of having a mentor on their research journey. • Wiling to contribute to the learning of others through theory and practical teaching, and mentoring. • Recognises the value of own research for the	• How to present research to an audience (oral presentation or written). • Create regular opportunities for feedback, questions, and debate. • Student must take the lead in setting up meetings with supervisors, setting the agenda, sharing minutes on action points and timelines. • Encourage students to identify a research mentor (may not be supervisor). • Create opportunities for students to become	• Regular opportunities to present research with opportunities to receive feedback and manage questions. • Encourage students to participate in Faculty Three-Minute Thesis competition and Faculty Research Forum. • Encourage students to present research at discipline-specific congresses.

real-world context and uses their research to have an impact. • Aware of the value of collaboration and working with others to benefit their research. • Co-produces research outputs with supervisors and other collaborators. • Is skilled at using a range of communication means, e.g. face-to-face, virtual/ online, and interactive technologies. • Has effective oral and verbal communication. • Uses audio-visual aids effectively in presentations. • Produces publishable articles from the research. • Engages meaningfully outside of the research project, e.g. participates in teaching undergraduate students; community engagement. • Attends and participates in research/ scientific meetings, e.g. seminars, workshops, conferences. • Presents research at research forums, symposia, and conferences.	involved in undergraduate teaching and learning, e.g. guest presenter. • Mentor and provide support to more junior students through created opportunities for interaction.	