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Improving Students' Professional Development through Capstone Projects in Health Sciences Higher Education

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Abstract. There is an urgent need to improve students' professional development at Higher Education Institutions (HEIs) through appropriate modes of delivery, such as capstone projects. Literature reveals that capstone projects afford a high-impact transformative outcome. However, there is a lack of studies focusing on improving students' professional development through capstone projects in health sciences at South African HEIs. This study aimed to explore health sciences students' experiences on capstone projects. The Concerned-Based Model of Student Development was the theoretical framework that anchored this study. The authors employed a qualitative single-case study design within an interpretivist paradigm. The research setting was an identified public university in Gauteng Province. Six participants were recruited, and data were analysed using the thematic analysis proposed by Creswell. Findings from this study highlighted the shared, ambivalent views and experiences of the participants on capstone projects. They confirmed that capstone projects benefited them and enhanced their learning experiences, empowering and capacitating them for the world of work. They agreed that capstone projects improved some of their skills and competencies, thus preparing them for clinical practice. However, participants also voiced challenges in implementing capstone projects in their programmes. These primarily focused on the quality of supervision, time constraints, and methodological complexities during the capstone project. This study provides valuable insights into the views and experiences of students regarding capstone projects in health sciences education. Future studies are recommended using diverse approaches, such as quantitative or mixed method approaches.

Keywords: professional development; capstone projects; health sciences; research; higher education

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1. Introduction

There is a dire need to improve learning outcomes in health sciences higher education through appropriate modes of delivery, such as capstone projects. This approach is intended to enhance the clinical competencies of graduates in the field of health sciences for the world of work. Hu (2023) argues that poor clinical competency is linked to inappropriate modes of delivery of educational programmes, a situation that is particularly critical in professional masters education, which aims to develop students' competency in specific fields of clinical practice [Council on Higher Education (CHE), 2011; Faculty of Health Science (FHS), 2021]. Shurin et al. (2021) state that capstone projects are a high point in educational programmes, a view that concurs with Howe and Goldberg (2019), who indicate that capstone projects play a crucial role in synthesising the knowledge accumulated by students, training them for real-world challenges, and enabling a smooth transition into the professional world.

Capstone projects refer to a multifaceted approach that serves as a culminating academic and intellectual experience for students (Chang, 2019). Literature reveals that capstone has been identified as one of the most essential pedagogical approaches since it has several purposes (Poulin et al., 2021). These purposes include professional development for real-world application, personal, philosophical, and critical reflection, knowledge integration, and quality improvement and innovation (Howe & Goldberg, 2019; Poulin et al., 2021). However, there is a lack of studies focusing on improving students' professional development through capstone projects in health sciences higher education in the South African context.

In this study, the authors posed the research question, 'How do students experience the capstone project in their master's study at a South African university?' The study aimed to improve students' professional development in health sciences education through exploring their lived experiences of capstone projects, and it provided valuable insights into South African students' lived experiences of capstone projects in improving their professional development in health sciences higher education. The findings of this study revealed that capstone projects positively enhanced students' professional development; however, more support and supervision were required.

2. Literature review

2.1 Introduction to capstone projects

Capstone projects aim to facilitate the development of real-world applications, personal, philosophical, and critical reflection, knowledge integration, and quality improvement and innovation (Chang, 2019; Thomas et al., 2014). In many cases, the capstone project includes the development of a physical product, and the project simulates the product development process in the world of work (Hauhart & Grahe, 2015; Kim et al., 2019). Consequently, capstone projects are of profound importance in health sciences education. Queen et al. (2022) concur with CHE (2011) that health sciences professional masters education should focus on clinical application rather than research methodology. For this reason, the capstone research approach has been introduced in health science as a high-impact

transformative practice to support professional master's study. According to CHE (2013) and Rivenbark et al. (2020), a professional master's degree refers to programmes specifically tailored to the world of work, with modules accurately reflecting the needs of the sector.

To ensure successful graduates are competent in clinical practice, many HEIs adopt different tasks in capstone projects to strengthen the learning outcomes of their educational programmes. Literature reveals the value of diverse capstone projects as they relate to developing competency and confidence in transitioning to a future healthcare provider (Chang, 2019). The project grants a relatively large number of academic credits and requires considerable effort from both the students and the academic institution regarding logistics, time, and means (Shurin et al., 2021). According to the Department of Complementary Medicine [DoCM] (2022), the University of Johannesburg (UJ) implemented a capstone project for their master's students who are registered for the Master of Health Sciences in Complementary Medicine (MHScCM). Each capstone project requires five interrelated tasks to complete the project over two years (DoCM, 2022). The capstone projects aim to increase students' depth and breadth of clinical knowledge, develop independent thinking, improve clinical skills, and enhance their ability to communicate inter-professionally. Table 1 outlines the tasks of the capstone projects at UJ.

Table 1: An outline of a capstone project at UJ (DoCM, 2022)

Capstone tasks	Descriptions
Task 1	Capstone proposal
Task 2	Narrative review (on the selected topic according to the proposal)
Task 3	Scientific op-ed article (on the selected topic according to the proposal)

Task 4	Action research activities:
	• Part 1: Elective component
	  o Observation of laboratory work, or
	  o Development of a questionnaire, or
	  o Regulatory and compliance reviews, or
	  o Healthcare-related research enquiries
	• Part 2: Clinical case reporting

Task 5	Portfolio compilation and oral defence

2.2 Importance of capstone projects in health sciences education

Capstone projects have received increased attention in education over the past few decades on account of their crucial roles in learning new knowledge and evaluating students' competency (Shurin et al., 2021). In the 1970s, the capstone project was included in only 3% of all academic institutions. In the 1980s and 1990s, there was a sharp rise in its popularity. In the past few years, researchers estimated that the project is suggested or required in 66%–75% of all practical skills-related programmes (Hauhart & Grahe, 2015). Moreover, Wesevich et al. (2023) are of the view that capstone projects provide valuable feedback and insights into students' strengths and areas of improvement, which further assist

them in integrating knowledge, skills, and attitudes from didactic coursework and applying it in a scholarly way, improving critical thinking, communication skills, and professionalism (Burke & Dempsey, 2021).

Capstone projects serve as culminating experiences that integrate students' learning throughout their academic journey. This view concurs with CHE (2013) and Poulin et al. (2021), who believe that the capstone research holds profound significance as a culmination of academic training, a demonstration of professional competence, and a catalyst for advancing knowledge and practice within the field. The reason cited is that capstone projects serve as a vehicle for fostering critical thinking and analytical skills among students within health sciences programmes (Morreale et al., 2017). Through engagement with complex issues, theoretical frameworks, and empirical data, students are challenged to evaluate evidence, identify gaps in knowledge, and formulate research questions that address salient matters within their respective disciplines (Luft et al., 2022). By navigating the iterative process of inquiry, analysis, and interpretation, students develop the capacity to synthesise diverse sources of information, critically evaluate competing perspectives, and construct reasoned arguments grounded in empirical evidence (Maree, 2020).

Moreover, the capstone project is a cornerstone of professional identity formation within health sciences programmes, providing students with opportunities to integrate theoretical knowledge with practical experience and professional values (Hamilton et al., 2017). Through engagement with real-world problems, ethical dilemmas, and professional responsibilities, students develop a deeper understanding of the complexities inherent in healthcare delivery, public health practice, and biomedical research (Dolezel & Morrison, 2017; Hu, 2024). By collaborating with interdisciplinary teams, engaging with diverse stakeholders, and reflecting on their roles as future practitioners or researchers, students develop a sense of professional identity grounded in a commitment to ethical practice, social responsibility, and lifelong learning (Kim, 2024; Marin et al., 2017).

In addition to their role in student learning and professional development, the capstone projects advance evidence-based practice and policy within the health sciences (Kim et al., 2019). By generating new knowledge, validating existing theories, and translating research findings into practice, students contribute to the evidence base that informs clinical decision-making, public health interventions, and health policy initiatives (Hedayatipour et al., 2024). By contrast, Shurin et al. (2023) argue that capstone projects have hardly changed at academic institutions over the years, aside from slight adaptations, and most of the changes are in the project topics rather than in their essence or structure.

2.3 Challenges of capstone projects

Despite the importance of capstone projects in health sciences education, Hauhart and Grahe (2015) reveal that there are barriers to implementing them which is particularly critical for students and researchers with limited resources. This view concurs with Shurin et al. (2021), who report that the challenges of capstone projects include methodological complexities to logistical constraints, particularly

in Africa, where poverty is still prevalent (Hu & Venketsamy, 2022). One of the foremost challenges in capstone projects revolves around formulating and refining research questions that are theoretically significant and empirically feasible (Shurin et al., 2023; Yasuda, 2017). Maree (2020) points out that identifying a research topic that aligns with one's academic interests, fills gaps in existing literature, and contributes to advancing knowledge within the field can be daunting. Moreover, articulating clear and concise research questions amenable to empirical investigation while remaining theoretically robust requires careful consideration of epistemological assumptions, ontological commitments, and methodological constraints (Shurin et al., 2021).

Navigating the complexities of research design and methodology presents another formidable challenge in capstone research (Proulx, 2021). Selecting appropriate research methodologies, data collection techniques, and analytical strategies aligned with the research questions and objectives requires a nuanced understanding of the strengths and limitations of different approaches (Hauhart & Grahe, 2015). Ensuring methodological rigour, ethical integrity, and validity in data collection, analysis, and interpretation demands meticulous attention to detail and adherence to established standards of research conduct (Maree, 2020).

In addition to methodological challenges, capstone researchers often encounter logistical constraints that can impede the progress of their research projects (Shurin et al., 2023). Securing access to research participants, obtaining necessary approval from institutional review boards, procuring research materials or equipment, and managing time and resources effectively are just a few of the logistical hurdles researchers may encounter (Bartlett et al., 2017). Balancing the demands of capstone projects with other academic, professional, or personal commitments can exacerbate these challenges, necessitating careful planning, organisation, and time-management skills (Hauhart & Grahe, 2015).

Downey (2018) reveals that reporting research findings effectively and disseminating them to diverse audiences presents another significant challenge in capstone research. Whether through written reports, oral presentations, or multimedia formats, researchers must distil complex concepts and findings into accessible formats that resonate with academic peers, practitioners, policymakers, and the broader public (Maree, 2020). Navigating the peer-review process, responding to feedback, and revising research outputs per disciplinary norms and standards can be time-consuming and iterative (Yin, 2018).

3. Theoretical Framework

A theoretical framework serves as a cornerstone, offering a theoretical foundation for analysing research findings (Hu, 2023). Within this context, the present study adapted Fuller's (1969) Concerned-Based Model of Teacher Development to the Concerned-Based Model of Student Development (CBMSD) to illuminate students' views and perceptions of capstone projects. The CBMSD model provides a conceptual framework through which students' concerns are recognised and addressed, facilitating their learning within HEIs.

Three distinct stages of concerns lie at the heart of the CMBSD model: self-concerns, task or situation concerns, and concerns regarding impacts on students' learning. This framework delineates a progression wherein individuals traverse these stages, each representing a different facet of their developmental journey. Scholars such as Conway and Clark (2003) corroborate Fuller's assertion (1969), affirming that this tripartite division reflects a natural evolution in individuals' cognitive and emotional engagement with their educational experiences (Bacus & Tagalog, 2023).

Self-concerns, the first stage in the CBMSD model, revolve around students' introspective reflections regarding their knowledge and understanding of the subject matter within their academic programmes (Hergan & Pecar, 2022). This facet remains largely unaffected by external influences such as lecturers' or patients' perceptions of their competence (Leijen et al., 2023). Significantly, deficiencies in self-concerns, wherein students fail to attain a profound grasp of content knowledge, can harm their ability to provide effective patient care in professional settings (Dignath et al., 2022; Fuller, 1969). Within the context of the present study, students' self-concerns serve as a pivotal lens through which their comprehension of how capstone projects enhance their content knowledge and competencies in real-world practice settings can be elucidated.

Task or situation concerns, the second stage of the CBMSD model, pertain to the daily responsibilities and challenges individuals encounter within their educational journey. These concerns encapsulate the practical application and transferability of theoretical knowledge into real-world contexts. By reflecting on task or situation concerns, students can elucidate how their day-to-day responsibilities are bolstered and supported by their engagement with capstone projects. Indeed, as emphasised by Olivos and Yuan (2023), the integration of capstone projects into the planning and execution of educational activities can serve to enhance students' abilities to navigate the complexities of their professional roles.

The third stage of concerns, concerns regarding impacts on students' learning, underscores the overarching objective of education: to enable individuals to realise their full potential. As posited by Fuller (1969), this stage embodies the aspiration to foster transformative learning experiences that empower students to reach new heights of intellectual and professional attainment. Within the context of the present study, the authors contend that concerns regarding impacts on students' learning offer invaluable insights into students' perceptions of how capstone project initiatives contribute to their overall educational journey and personal development.

In adopting the CBMSD model as a theoretical lens, the authors assert that it offers a comprehensive framework for understanding and analysing participants' views and perceptions of capstone projects within their respective academic programmes. By delineating the developmental trajectory of students' concerns, from introspective reflections to practical application and ultimate educational impact, the CBMSD model provides a nuanced framework through which the

complexities of students' experiences can be unpacked and comprehensively analysed.

Moreover, adopting the CBMSD model underscores the authors' commitment to theoretical rigour and conceptual clarity within their research. By grounding their study within an established theoretical framework, the authors aim to enrich scholarly discourse surrounding the role of capstone projects in enhancing students' educational experiences and preparing them for professional practice. This theoretical framework offers valuable insights into the multifaceted nature of students' academic experiences within HEIs. Through adopting the CBMSD model, the authors aim to contribute to a deeper understanding of the role of capstone projects in shaping students' educational journeys and preparing them for success in their future professional endeavours. For these reasons, this study adopted the CBMSD model as a theoretical lens.

4. Research Methodology

The authors used a qualitative approach nested within a single case study framework to elucidate the perspectives and encounters of individuals regarding capstone projects within a specific South African HEI. Grounded in an interpretivist paradigm, the study sought to delve into the firsthand experiences of participants concerning the phenomenon of capstone projects in the HEI, aligning with the views of Venketsamy and Hu (2022) and Yin (2018). This stance resonates with Creswell (2014) and Hu (2022), who argue that an interpretive paradigm facilitates the comprehension of truths and knowledge about the natural world. By employing a single case study design within an interpretivist framework, the authors could thoroughly explore and understand participants' lived experiences. Hu et al. (2022) assert that such a design offers a focused and comprehensive investigation into the key elements of a phenomenon. The specific case examined in this study was the Research Project module within the MHScCM programme at the designated HEI.

Sampling technique and participants

The authors employed a purposive sampling approach in this study, explicitly targeting volunteers as participants. Students were invited to participate through an advertisement posted as a poster on the notice board of the identified HEI campus. Selection criteria were established, requiring participants to meet specific qualifications and to consent to participation. These inclusion criteria comprised: a) enrolment in the Research Project module of the MHScCM programme; b) provision of consent and signing acceptance for participation, and c) attainment of legal adulthood (age 18 or above). Owing to the limited response to the invitation and the subsequent consent, six students were recruited as participants for this study. To protect the anonymity of participants, pseudonyms were used during the data analysis and reporting phases. Table 2 presents a summary of participants' demographic information.

Table 2: Participants' information

Participants	Gender	Age
P1	Male	28
P2	Female	27
P3	Female	26
P4	Female	24
P5	Male	26
P6	Female	27

Data collection and analysis

Formal permission was granted by the head of the department from the university prior to the commencement of the study. All participants were invited to a semi-structured interview which took place between September and October 2023. The data was transcribed and organised into themes for thematic analysis. The six-step framework of thematic analysis proposed by Creswell (2014) was followed in this study to analyse the data. The six steps include: becoming familiar with data, coding, generating themes, reviewing themes, defining themes, and writing up (Hu, 2023). Qualitative validity criteria, including credibility, transferability, dependability, and confirmability, were ensured in this study by being audited by a second coder (Venketsamy et al., 2023). A Research Ethics Committee approved ethical clearance at a public university in Gauteng Province (Reference: EDU137/21).

5. Results

Findings from this study highlighted the shared, ambivalent views and experiences of participants on capstone projects. They believed that capstone projects benefited them and enhanced their learning experiences, empowering and capacitating them for the world of work. They agreed that capstone projects definitely enhanced some of their skills and competencies, thus preparing them for the world of work. However, participants also voiced challenges in implementing capstone projects in their programmes. Two major themes emerged from the data during the data analysis process, namely a) Participants' views and experiences of capstone projects, and b) Challenges in implementing capstone projects. Verbatim quotes were included in the presentation of findings and discussions.

Theme 1: Participants' views of capstone projects

Participants of this study reported positive views and experiences of the capstone projects in their programme. They believed that capstone projects improved their understanding of research with positive learning experiences.

P1 said: *The interplay between theoretical research and real-life case reporting underscores the comprehensive approach. I learned valuable lessons that extended beyond the scope of the research itself.*

P2 added: *The overall experience I have gained during conducting my research has been extremely beneficial*.

P4 stated: *I gained a profound understanding of the significance of resilience and determination.*

Moreover, P5 explained: *It is essential to recognise that the process of this project extended far beyond the surface of literature review and regulatory analysis. It involved navigating personal and academic challenges, enhancing skills in scientific communication, and embracing the resilience needed to overcome these obstacles. The research process was long and tough, but it was extremely educational and taught me to push myself when I felt I could not do so anymore*.

P6 pointed out that: *A research project of this magnitude requires a vast amount of time and mental capacity. Before implementing the new capstone research format, I wanted to engage in a research design based on my strengths. This part of the project allowed for that. The dedication that it requires and the toll that it takes is underrated and under-discussed*.

Some participants reported that the capstone projects promoted their research understanding while strengthening their clinical skills. Both P1 and P2 concurred that there was no question about whether capstone projects were worthwhile, but one cannot know the toll it takes until the project is encountered.

To this P4 stated: *It has prepared me with several skills such as critical thinking, problem-solving skills, confidence in my ability, understanding key concepts, ability to work independently, and managing time efficiently. Additionally, from my experience, I learned that research requires passion and patience. I plan to dedicate more time to understanding the fundamentals and seeking guidance from supervisors or resources to enhance my knowledge*.

P5 said: *My understanding of research intricacies has increased, along with my proficiency in understanding the topic and ability to effectively convey difficult information. It has also reinforced my commitment to contribute significantly to the field of Complementary Medicine. In many respects, this endeavour has been transformative. When I reflect on the entire process, I see how involving those with expertise sooner could have sped up my learning curve. At the end of the research, I have mastered the skill of data collection and interpretation*.

P6 added: *Learning about successful case studies while also recognising the inherent limitations and challenges motivated me to delve deeper and understand if others shared this interest in a healthcare option for their children. Through this research, I experienced significant growth as a diagnostician, refining my ability to apply medical theory to practice and diagnose various disease conditions. I deepened my understanding of the importance of diagnosing conditions through best practices, including physical examinations and specialised investigations*.

Theme 2: Participants' experiences - Challenges in implementing capstone projects

Despite the positive views and experiences, participants of this study also reported some challenges in capstone projects. These challenges encompassed various aspects, ranging from personal and academic hurdles to the demands of

the research process itself. They believe the project demanded significant time and mental effort, often surpassing initial expectations. Balancing the project with other academic commitments posed a challenge, requiring practical time-management skills. Overcoming moments of self-doubt and maintaining motivation throughout the lengthy research process proved to be a recurring challenge.
P2 indicated: *I am most definitely proud of my decision and the sleepless nights spent completing the research, and I couldn't be more grateful and thankful for the outcome*.

P3 added: *The most challenging part of this research was my time, as I had approximately six months to complete the research while working full-time. I had to overcome this challenge by doing research while on the road, during my lunches and breaks, and during any spare time I had*.

P5 stated: *The most challenging and time-consuming part of my research was to work on case reports. In the future, I would like to improve my understanding of how to work on case reports and work efficiently to get enough time for proofreading*.

The findings of this study also revealed that there was a deficiency of supervision. P2, P3, and P5 all agreed that they would have progressed much better if they had received better supervision in the capstone projects, particularly for the narrative review and academic writing.
P2 explained: *The most challenging part was finding relevant and reliable research; there are so many studies that have been published with improper or incomplete methodology that cannot be trusted*.

P3 added: *I had no prior knowledge of the research before. I struggled with the narrative review due to not fully understanding the expected outcome and how to properly present it*.

P5 believed that: *The most challenging aspect of the project was the academic writing and the expression of research findings. I had to invest significant time reading academic papers and developing an appreciation for academic writing. Looking back, I believe I could have benefited from more interactions with my supervisor to refine this aspect of the research*.

P6 articulated: *Nonetheless, challenges were not absent from the journey. One of the most daunting tasks was navigating the narrative review, which relied entirely on a literature-based approach. This required a deep understanding of existing research, laws and regulations and the ability to rephrase and synthesise complex information. I wished I could have received better supervision from my supervisor*.

The findings of this study search journey highlighted the importance of resilience and determination in the face of obstacles. P2 said: *I honestly feel that I have failed myself, especially with no prior research knowledge. I feel that had I given myself time and grace and not been overwhelmed by each task, my overall work could have been better*.

P4 contended: *Through these challenges, I profoundly understood the significance of resilience and determination. As I grappled with personal obstacles alongside the academic demands, I learned valuable lessons that will be beneficial beyond university*.

P6 highlighted: *Balancing research with personal challenges was also an ongoing struggle I faced throughout the process. Reflecting on these challenges, I realise that a more structured time-management strategy and seeking support when needed could have potentially mitigated some of these stressors*.

6. Discussion

This study's findings revealed participants' nuanced perspectives and experiences regarding capstone projects within the context of health sciences education at a South African university.

Importance of capstone projects

Participants expressed positive views and experiences of capstone projects, highlighting their role in enhancing an understanding of research methodologies and promoting valuable learning experiences. They emphasised the comprehensive nature of capstone projects, which deepened their theoretical understanding and fostered practical skills and personal growth. This aligns with existing literature, underscoring the multifaceted benefits of capstone projects in health sciences education (Shurin et al., 2021; Poulin et al., 2021). Capstone projects serve as transformative experiences, providing students with opportunities to apply theoretical knowledge to real-world contexts, preparing them for professional practice challenges (Howe & Goldberg, 2019). By delineating stages of self-concerns, task concerns, and concerns regarding impacts on learning, the CBMSD model provides insights into the cognitive and emotional dimensions of students' experiences (Conway & Clark, 2003). This theoretical framework offered a valuable perspective on students' concerns and developmental stages throughout their engagement with capstone projects (Fuller, 1969).

Participants noted the development of critical skills such as resilience, determination, critical thinking, and problem-solving through their engagement with capstone projects. These skills are essential for success in the dynamic and demanding field of health sciences (Burke & Dempsey, 2021). The emphasis on resilience and determination underscores the importance of cultivating a growth mindset and persevering in the face of challenges, qualities highly valued by healthcare professionals (Hamilton et al., 2017). This finding also agreed with task or situation concerns, constituting the second stage of the CBMSD model, which encompasses the daily challenges and responsibilities individuals encounter throughout their educational journey. These concerns revolve around theoretical knowledge's practical application and transferability into real-world contexts. Through reflection on task or situation concerns, students articulated how their day-to-day responsibilities benefit from their involvement in capstone projects. As highlighted by Olivos and Yuan (2023), integrating capstone projects into educational activities can effectively enhance students' capacity to navigate the intricacies of their professional roles. The positive outcomes reported by

participants highlight the value of capstone projects in promoting holistic learning experiences and preparing students for the demands of professional practice.

Challenges in Implementing Capstone Projects

Despite the positive views and experiences, participants encountered various challenges in implementing capstone projects. These challenges ranged from personal and academic hurdles to supervision and time-management deficiencies. Similar challenges have been documented in the literature, highlighting issues such as time constraints, methodological complexities, and the need for adequate support and guidance from supervisors (Hauhart & Grahe, 2015; Shurin et al., 2023). Of particular note is the deficiency in supervision reported by participants, especially in narrative review and academic writing. Adequate supervision is crucial for providing students with the necessary guidance, feedback, and support to navigate the complexities of research projects (Bartlett et al., 2017). Insufficient supervision can hinder students' progress and exacerbate challenges such as navigating literature reviews and expressing research findings effectively (Shurin et al., 2021). The findings of this study further highlighted the need for comprehensive support structures and effective supervision mechanisms to address the challenges students encountered during capstone projects.

Institutions should invest in resources and training for supervisors to ensure students receive adequate guidance and mentorship throughout their research journey (Hauhart & Grahe, 2015). Participants recognised the multifaceted nature of capstone projects, which involved rigorous research and demanded resilience and determination to overcome personal and academic challenges. The narratives provided by participants elucidated the profound transformative effects of engaging in capstone projects, wherein they developed a more profound commitment to their fields of study and honed their abilities to communicate complex information effectively. Additionally, participants highlighted the importance of seeking guidance and support from supervisors or resources, indicating a proactive approach to overcoming challenges and maximising learning opportunities.

7. Conclusion and Recommendations

This study provides valuable insights into the views and experiences of students regarding capstone projects in health sciences education. While participants reported positive outcomes and personal growth, they also encountered challenges that highlighted the need for enhanced support and supervision. By contextualising the findings within the theoretical framework of the CBMSD model and drawing upon existing literature, this study contributes to a deeper understanding of the complexities inherent in capstone projects and the implications for student learning and professional development in health sciences education.

Participants expressed positive views regarding their experiences with capstone projects which they perceived as instrumental in enhancing their understanding of research methodologies and real-life applications within their respective fields.

The findings of this study highlighted the significant learning experiences derived from engaging in extensive research, which extended beyond mere academic pursuits. Participants appreciated the opportunity to navigate through the complexities of their chosen topics, strengthening their critical thinking abilities and problem-solving skills.

However, alongside these positive experiences, participants encountered several challenges throughout the capstone project journey. These challenges ranged from time constraints and academic workload to supervision deficiencies and unfamiliarity with research methodologies. Participants grappled with balancing the demands of their capstone projects with other academic and professional commitments, often experiencing moments of self-doubt and frustration. Furthermore, the lack of adequate supervision in certain aspects of the projects, such as narrative reviews and academic writing, hindered participants' progress and added to their perceived challenges.

By elucidating participants' perspectives, this study contributes to a deeper understanding of the impact of capstone projects on students' academic and professional development. Addressing the identified challenges and leveraging opportunities for growth will be essential in optimising the effectiveness of capstone projects in fostering student learning and success. Based on the above discussion, the authors reached the following recommendations:

- Owing to the significant role of capstone projects in promoting students' learning, it is recommended that capstone projects be adopted in professional master education at HEIs (Chang, 2019; CHE, 2013; Rivenbark et al., 2020). Institutions should continue to prioritise experiential learning opportunities, such as capstone projects, to equip students with the skills, knowledge, and resilience needed to excel in their future careers (Howe & Goldberg, 2019).
- It is recommended that HEIs provide capacity building for their staff, ensuring they are competent in supervision. This includes equipping supervisors with the necessary skills to offer effective feedback, guidance, and mentorship throughout students' research journeys. Addressing supervision deficiencies, particularly in narrative reviews and academic writing, is crucial for facilitating student progress and mitigating challenges. Clear and transparent guidelines should be established for both students and supervisors regarding capstone project expectations, milestones, and timelines. This ensures that all parties involved understand project requirements and can effectively plan and manage their time.
- It is further recommended that collaboration and peer learning among students engaged in capstone projects is encouraged to enrich their experiences and alleviate feelings of isolation or being overwhelmed. Institutions can facilitate peer support networks, group discussions, or interdisciplinary collaboration to promote knowledge sharing, idea exchange, and mutual assistance. Peer interaction enhances students' understanding of diverse perspectives and cultivates a sense of

community and camaraderie among participants, fostering a supportive learning environment conducive to success.

8. Limitations of this study

The authors explored a qualitative approach to explore students' views and experiences of capstone projects in South Africa. Although the authors followed a rigorous process in the entire study, the subjective interpretation brought by the interpretivist paradigm was seen as a limitation. Therefore, the authors recommend that future studies be conducted using diverse methods, such as quantitative or mixed methods approaches. This study selected a single case study design; consequently, the results lacked comparison. Future studies can be conducted at national and international universities to gain deeper insights into capstone projects. Further research is needed to explore the long-term impacts of capstone experiences on students' professional development and the effectiveness of various educational interventions.

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