

## Research

# Implementation and insights from the MedXMentor structured mentorship program for undergraduate health science students at Mbarara University, Uganda

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## Abstract

**Background** Mentorship is essential for education and career development in health-related fields, yet Sub-Saharan African universities often lack structured programs. To address this, the MedXMentor program was established at Mbarara University of Science and Technology (MUST) to provide structured mentorship to undergraduate health sciences students in Uganda. This paper outlines insights gained from implementing the MedXMentor hybrid mentorship program.

**Methods** Using a mixed-methods approach, the study employed the Kirkpatrick Model of Evaluation to assess mentees' reactions, learning, behavior, and goal achievement. Data were collected via Google Form surveys, feedback forms, mentoring logs, and session attendance records. Descriptive statistics and thematic analysis provided a comprehensive understanding of the program's impact.

**Results** The program served 80 mentees, with 48 participating in one-on-one mentorship and 32 in group sessions. It enlisted 24 mentors, mainly from the medical field. Between April and September 2022, eight online group sessions were held, with an average attendance rate of 52%. These sessions focused on project planning, grant writing, and soft skills development, resulting in improved mentee comprehension and skill acquisition. Mentees reported an enhanced understanding of project planning, grant writing, communication, leadership, and teamwork. Their experiences were categorized into four themes: Mentor Engagement, Goal-Oriented Study, Skills and Professional Development, and High-Yield Mentor–Mentee Engagements.

**Conclusion and recommendations** Implementing the MedXMentor program proved effective in providing crucial mentorship and equipping students with vital academic and professional skills. The program highlighted its potential to bridge the mentorship gap in low-resource settings. By empowering future healthcare professionals in Africa, MedXMentor exemplifies how mentorship initiatives can drive significant advancements in healthcare education and practice.

**Keywords** Mentorship · MedXMentor program · Sub-Saharan African universities · Hybrid mentorship initiative · Kirkpatrick Model of Evaluation

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## 1 Introduction

Mentorship is a well-established concept in education and professional development, involving a nurturing relationship in which an experienced individual (mentor) guides, supports, and facilitates the growth and development of a less experienced person (mentee). It is recognized as a crucial element in students' education and career development, particularly for those pursuing health-related courses [1, 2]. Numerous studies have demonstrated the positive impact of mentorship in contemporary medical practice, including reduced feelings of burnout and depression, heightened career satisfaction, and both personal and professional growth [3–5]. However, structured mentorship programs are notably lacking in Sub-Saharan African universities [6], with academic medical centers in Uganda and many other resource-limited countries facing a substantial deficit in structured mentorship programs. In Uganda, studies have indicated a student-to-faculty ratio in medical schools as high as 7:1, highlighting the severe shortage of available mentors [7]. This deficit is a critical concern, as mentorship is widely recognized as a cornerstone of professional development and future success for students pursuing health-related disciplines. It should be noted that challenges such as lack of motivation and inadequate preparation for professional life persist without mentorship. While extensive literature exists on the benefits of mentorship in various educational and professional contexts [8, 9], there is a dearth of research specifically addressing the impact of mentorship programs tailored to the unique challenges and needs of health professions students in resource-limited settings. The MedXMentor program was established in February 2022 by passionate student leaders at Mbarara University of Science and Technology to address this gap, providing structured mentorship to undergraduate health sciences students in Uganda. The program's name, "MedXMentor," reflects its primary emphasis on mentorship within the medical and health sciences domains. The study evaluates the effectiveness of the MedXMentor program at Mbarara University of Science and Technology in Uganda. Mentorship is shown to benefit students by improving academic performance, increasing career satisfaction, enhancing research productivity, and developing essential soft skills. The MedXMentor program aims to address these challenges by providing structured mentorship to empower health sciences undergraduates, ultimately aiming to enhance their academic and professional outcomes. This structured hybrid initiative operates on an annual cohort basis spanning eight months, utilizing both virtual platforms like Zoom and physical workshops to provide mentor–mentee sessions, ensuring accessibility and hands-on learning experiences. While there is no standardized manual, the program follows a structured framework, and participants engage for a defined duration. This engagement model ensures continuity and consistency in mentorship interactions, fostering meaningful relationships and sustainable learning outcomes, thus highlighting the effectiveness of hybrid mentorship models in promoting accessibility and engagement among participants. The program uses several theoretical frameworks and concepts to inform its design and implementation, including social learning and adult learning theories, which emphasize the importance of role models and supportive relationships in individuals' educational and professional development [10, 11]. Additionally, the program integrates the concept of transformative mentorship, which goes beyond traditional mentoring by emphasizing personal and professional growth, fostering leadership skills, and facilitating community engagement [12, 13]. This initiative uniquely integrates online and physical interactions to create a dynamic and engaging community of mentors for health professions students. Through a mixed-methods approach, we assessed how the MedXMentor program influenced students' professional development, knowledge, and career choices. While our study effectively assessed mentees' knowledge, attitudes, and mentorship practices, it did not fully evaluate their career choices in the acute setting. However, the interactions between mentors and mentees hinted at the potential influence of the program on career decision-making processes.

## 2 Methods

*Design:* The study aimed to evaluate the lessons learned during the implementation of the student-led hybrid mentorship initiative, MedXMentor, at Mbarara University of Science and Technology (MUST). The secondary objectives included identifying challenges encountered, strategies employed to overcome them, and insights gained regarding the program's structure, facilitation, and participant engagement. The target population comprised undergraduate students pursuing health-related courses within the Faculty of Medicine at MUST, a public university in Uganda accredited by the National Council for Higher Education (NCHE).

*Participants:* Mentors for the MedXMentor program were selected by the program secretariat based on criteria such as expertise, openness to mentorship, and availability. These mentors, including professionals from various fields such

as doctors and nurses, were sourced for their expertise and recommended by the dean and existing mentors, representing different institutions. The two-hour weekly and fortnightly sessions were conducted either physically or via Zoom, depending on the comfortability and vicinity of mentors and mentees. Mentees participating in the program ranged across all undergraduate study years, from year 1 to year 5. The selection process for mentees involved completing an online Google form distributed by the Secretariat of Student Leaders to students within the Faculty of Medicine at Mbarara University of Science and Technology (MUST) through class WhatsApp groups. This form gathered comprehensive data on student demographics, involvement in mentorship activities, attitudes towards mentorship, preferences for e-mentoring platforms, time availability for mentoring, and suggestions for improving the mentoring process. Inclusion criteria required mentees to be undergraduate students from the five medical programs offered at MUST, with information collected on their motivation for joining the program, areas of interest, and commitment in terms of hours willing to dedicate to the program. Mentees were then assigned to either the dyadic mentorship or team group mentorship model based on their preferences and the program's design.

*Monitoring:* The placement of participants into the two mentorship models, dyadic and team group mentorship, was overseen by the program's secretariat, led by the Dean of the Faculty of Medicine and the Medical Students Association president. This interim secretariat coordinated the program's day-to-day activities and ensured alignment between participants' goals and available mentors. Those with clear goals and available mentors were matched with the dyadic model group, while those with unclear goals or an interest in learning about mentorship were placed in the group mentorship model. The mentors and mentees were then paired based on mutual interests. Additionally, feedback collection and data gathering throughout the program were managed by the secretariat. The Kirkpatrick Model of Evaluation guided the assessment process, focusing on participants' immediate reactions, knowledge acquisition, changes in behavior, and short-term outcomes [14, 15]. This modified version of the model was adapted to the specific needs of the mentees, providing comprehensive insights into the program's effectiveness. The topics for group mentorship sessions were guided by a survey conducted among the mentees at the beginning of the program, ensuring relevance and alignment with their needs and interests.

*Reactions:* Feedback from both mentees and mentors was collected through evaluation forms after each session, allowing us to quantify their experiences, and identify noteworthy aspects, and areas for improvement.

*Learning:* Pre- and post-session assessments were used to evaluate learning. Mentees received sample questions related to the session topic before each online or physical session. Mentors tailored discussions based on these assessments. Post-session assessment forms measured knowledge acquisition among mentees.

*Behavior:* Behavioral changes were assessed through the dyadic mentorship model. Mentors and mentees provided assessments after each meeting using a structured mentoring log. This included mentor reports on mentees' progress and mentees' self-evaluations.

The dyadic or traditional mentorship utilized a one-to-one mentorship between mentor and mentee [16, 17]. This enabled the mentors and mentees to build close interpersonal relationships. This required both mentor and mentee to meet at least once a week with designed monitoring and evaluation tools for tracking and reporting progress.

The study lasted 12 months, starting two months before the eight-month cohort with proposal development, and concluding two months after the cohort ended with data analysis and summarization of findings. This timeline allowed data collection as it fits within the academic year, which began in September and ended in June, ensuring alignment with the student's academic schedules.

The team group mentorship model, implemented through a combination of webinars and physical workshops, involved clustering all mentees together for learning purposes. In this model, mentors from diverse fields of expertise collaborated to share knowledge, each offering unique but complementary insights from their respective specialty areas [16]. Weekly webinar sessions were conducted online, and mentees were assigned to specific mentors for group learning sessions. Additionally, physical workshops were held every two months to facilitate interactive sessions with the mentors.

For group mentorship, weekly online sessions between April and September 2022 covered topics like goal setting, project planning, leadership, mentorship relationships, self-leadership, personal branding, healthy financial habits, and entrepreneurship skills.

Additionally, a mentorship log was utilized to document outcomes, action points, and progress toward goals. This log was used to assess mentees in both group and one-on-one mentorship models. For one-on-one mentorship, it was filled out after each session with the mentor, including a summary of discussions, action points, and the date for the next meeting. For group mentorship, a database was created to track mentees' attendance at webinars. Together, these tools provided a comprehensive framework for evaluating mentorship effectiveness and facilitating continuous learning and improvement.

## 2.1 Analysis

In our study, we employed a mixed-methods approach, incorporating both quantitative and qualitative methods to evaluate the effectiveness of the MedXMentor program. We adopted a monitoring and evaluation model based on the Kirkpatrick Model of Evaluation, with modifications to align with our program's goals. Data collection took place from February 2022 to October 2022, primarily through online Google forms completed by participants. Throughout the program duration, feedback was gathered at mid-way and end-cohort intervals to monitor changes and identify areas for improvement, with pre- and post-session assessments conducted during group activities, including weekly webinars and physical workshops. Qualitative data were collected through various means, including mentoring logs, questionnaires, and feedback forms, then subjected to thematic analysis to extract meaningful insights. Phone calls and Zoom calls were also utilized to gather qualitative feedback on emerging themes, with recordings transcribed and analyzed alongside other qualitative data sources. Data extracted from the various session assessments, including feedback forms and mentoring logs, was compiled into Excel sheets for organization and management. Quantitative data analysis was conducted using STATA 17.0 (Stata Corp, College Station, Texas, USA), summarizing categorical variables as frequencies and percentages. The validity of the results was ensured through several measures, including timing feedback forms to one hour after each session and cross-linking them with session attendance records. Additionally, mentor reports in the logs were cross-checked with feedback submitted by mentees to validate the data. This mixed-methods approach provided a comprehensive understanding of the program's effectiveness, with quantitative and qualitative data analyzed separately to identify key insights and implications.

## 2.2 Ethical approval

The study obtained a waiver for ethical approval through the office of the Dean of the Faculty of Medicine, Mbarara University of Science and Technology. We certify that the study was performed per the ethical standards laid down in the 1964 Declaration of Helsinki. All participants provided informed consent, and measures were implemented to uphold their rights and confidentiality. Personally identifiable information was anonymized, and only aggregate data was utilized for analysis to protect participants' privacy.

## 3 Results

### 3.1 Demographics of participants

The study encompassed 80 mentees recruited through online application forms. Among them, 48 qualified for one-on-one mentorship and were paired with mentors. These mentees represented various academic programs. It should be noted that the program could not accommodate all mentees, out of the 313 who applied to participate, only 80 met the criteria, while for mentors, out of the 40 recruited, only 24 met the criteria. Additionally, all 80 mentees participated in group mentorship. The key demographic and professional background information for the study participants as well as the mentors who assisted them is summarized in this Table 1.

### 3.2 Implementation of mentorship activities

The MedXMentor program conducted various mentorship activities, including both one-on-one and group sessions. While one-on-one mentorship was exclusive to enrolled mentees, group sessions welcomed participation from medical students across Uganda and Africa. The average attendance for these group sessions was 52% of enrolled mentees, even though the sessions were open to students from other institutions. Despite this, monitoring attendance and gathering feedback for group sessions remained centered on enrolled mentees, ensuring assessments and feedback were tailored to their experiences within the program. The group mentorship sessions were not closed off; however, only parameters from enrolled mentees were assessed, and over the cohort, participants from Nigeria, Kenya, Tanzania, Rwanda, and Cameroon attended.

**Table 1** Demographics

Category	Number	Percentage
Gender distribution		
Male	31	64.6
Female	17	35.4
Year of study		
1st year	2	4.2
2nd year	15	31.3
3rd year	4	8.3
4th year	17	35.4
5th year	10	20.8
Mentor gender distribution		
Male	13	54.2
Female	11	45.8
Mentor backgrounds		
Medical profession	20	83.4
Project management	2	8.3
Data science	2	8.3
Breakdown of medical professions		
Doctors	16	80
Nurses	4	20

### 3.3 Pre- and post-session mentee assessments

Pre- and post-session assessments were conducted to measure the impact of the mentorship program on knowledge and skills. The results revealed a noticeable improvement in understanding, particularly in the project planning webinar, where 67% of attendees reported increased comprehension of project management basics. The average documented knowledge acquisition across the 9 webinar sessions was 67%. This was calculated by administering a pre-and post-survey questionnaire for each webinar. The average scores of all attendees were obtained before and after each session, and the difference between these scores represented the knowledge acquisition for that particular webinar. The overall average knowledge acquisition across the 9 webinars was then calculated from these individual session differences, resulting in 67%.

### 3.4 Workshops

Two key workshops were conducted:

1. **Grant Writing and Research Skills Workshop:** This workshop equipped 60 mentees with knowledge about research skills, research proposal requirements, manuscript writing, the importance of mentorship in research, and grant writing. Following the workshop, 20% of attendees reported an improved understanding of research concepts.
2. **Soft Skills Workshop:** This workshop focused on the significance of soft skills in healthcare careers, and assisting in CV writing. After this workshop, 63% of mentees submitted updated resumes, and 50% reported improvements in their CVs.

### 3.5 Monitoring and evaluation

The parameters listed below were assessed using a Likert scale, where 5 represents excellent and 1 indicates poor performance.

- I. **Mentorship Models**
- II. *One-on-One Mentorship*: Mentees were required to submit at least two mentoring logs monthly, and 37% of mentees had five or more mentorship meetings in six months as shown in Table 1. Additionally, 27% of mentees achieved their mentorship goals, while 34% were in the process of implementing their action plans. The remaining 39% did not meet the criteria of achieving at least 50% of their set goals, primarily due to ineffective communication between mentor–mentee pairs. Mentors cited a lack of assertiveness from some mentees, while mentees cited busy mentor schedules. Furthermore, 66.6% of mentees rated their convenience in reaching out to their mentors at a satisfactory level (3 or higher on a scale of 1 to 5). Among the mentors, 52% reported productive mentorship relationships with their mentees.
- III. *Group Mentorship*: Monitoring group mentorship included assessing attendees' knowledge before and after sessions using the Likert scale and the Kirkpatrick model. Sixty percent of mentees reported increased awareness and understanding of the covered topics, with at least 30% incorporating the skills learned into their daily work. Notably, three students initiated a project on Personal Branding following a session on the topic.

### 3.6 Mentee and mentor experiences

Mentees and mentors shared their experiences, highlighting three main themes:

1. *Professional Development*: Mentees emphasized that their mentors supported their professional, clinical, and personal development. The mentor–mentee relationship fostered a comfortable and supportive environment for mentees.

*Mentee 1, a 23-year-old male: "It has been a worthwhile journey because I enjoyed working with my mentor. I'm glad she was the one for me because I was comfortable with her during our mentorship sessions. She understood and guided me on whichever topic I brought up and so made it easier for me to open up more about which I was finding difficulty in..."*

*Mentee 2, a 22-year-old female: "The meetings with my mentor built me into the resilient and formidable lady I am today: willing to be at the front, determined and confident to always stand out. She was a mother figure; caring, understanding, inspirational, goal-oriented, and always encouraged me..."*

*Mentee 3, a 23-year-old female: "I found all the webinars that I attended very educational, with high-impact content and skills for survival in life, especially after school. They opened my eyes to the current trend in the job market, life skills such as project development, CV writing, and grants writing..."*

*Mentor 1 expressed, "I wish I experienced this during my training because most of what I have learned has been by trial and error, which has cost me a lot of scars. I believe early mentorship saves this."*

*Mentor 2 highlighted, "Structured mentorship can serve as a solution to ensure students' holistic development, even with concepts they don't get from class."*

2. *Goal-Oriented Study*: Mentees credited the program with helping them set and pursue specific goals.

*Mentee 4, a 24-year-old male: "Before I joined the program, I wasn't intentional about the many things I wanted to achieve in life. With guidance, I learned to develop SMART (Specific Measurable Attainable Realistic Time bound) life goals, break them into smaller achievable ones, and translate them to each day and month..."* life and career goals, transforming abstract aspirations into actionable plans.

*Mentor 3 emphasized, "Mentees need to learn that mentorship is mostly mentee-driven, and they need to understand this."*

3. *Inspirational Engagements*: The diverse mentors' success stories, shared during mentorship sessions, served as a source of inspiration and motivation for mentees.

*Mentee 5, a 22-year-old female: "Listening to several mentors narrate their success stories with immeasurable vigor and energy was entertaining: how they rose from the comfort of their medical undergraduate, masters, and Ph.D. degrees to venture into the business and research world and eventually succeeded was worth our ears. These gave us some lessons that we could draw on as young adults to enable us to impact and succeed in the contemporary and competitive world..." strive for excellence in their academic and professional journeys*

### 3.7 Results as by Kirkpatrick's model

#### 3.7.1 Level 1: Reactions—measuring satisfaction

Participants expressed high satisfaction with the program. At the end of the cohort, mentees reported positive experiences with mentors and program activities.

#### 3.7.2 Level 2: Learning—measuring knowledge and skill acquisition

Following the project planning webinar, 68% of attendees reported increased comprehension of project management basics.

#### 3.7.3 Level 3: Behavior—measuring application of learning

37% of one-on-one mentees had at least five mentorship meetings within six months, with 27% achieving their mentorship goals. Additionally, 34% were in the process of implementing their action plans, and 66.6% rated their ability to contact mentors as satisfactory. In group mentorship, 60% of mentees reported increased awareness and understanding of covered topics, with at least 30% incorporating learned skills into their daily work. Three students initiated a project on Personal Branding following a relevant session.

#### 3.7.4 Level 4: Results—measuring overall impact

The program led to improved knowledge, skills, and behavior among participants, as evidenced by the described outcomes in one-on-one and group mentorship shown in Table 2. Examples of improved behavior included enhanced communication skills, increased confidence in decision-making, proactive engagement in professional development activities, and a more collaborative approach to problem-solving. Table 3 summarizes feedback on mentees experiences in both one on one and group mentorship.

## 4 Discussion

The primary objective of our study was to gain insights into the MedXMentor mentorship model, rather than focusing solely on its effectiveness. While we aimed to assess its impact, it is essential to acknowledge that efficacy cannot be definitively measured with the available data. Through a mixed-methods approach, we assessed how the MedXMentor

**Table 2** Summary of the number of sessions mentees held with their mentors

Number of one-on-one sessions	Number of mentees
0	4
1	6
2	2
3	4
4	1
5	5
6	4
8	1

**Table 3** Mentee metrics for the 2 mentorship models

Mentorship type	Key metrics
One on one	37% of mentees had five mentorship meetings in six months 27% achieved their mentorship goals 34% were in the process of implementing their action plans 66.6% of mentees rated their convenience in contacting their mentors satisfactorily
Group	60% of mentees reported increased awareness and understanding of the covered topics At least 30% incorporated the skills learned into their daily work Notably, three students initiated a project on Personal Branding following a session on the topic

program influenced students' professional development and knowledge. However, while the initial scope included examining career choices, this aspect was not reported on in the final analysis due to limitations in the data collected or other unforeseen factors.

#### 4.1 Mentor engagement

Our findings highlight the significant engagement of mentors, driven primarily by an altruistic motivation to provide guidance they lacked during their own careers. This desire to support the next generation of health professionals underscores the value of structured mentorship programs. These programs not only facilitate access to mentorship but also meet the diverse needs of mentors, including opportunities for personal satisfaction, professional development, and making a meaningful impact on mentees' careers.

Mentors' needs in the MedXMentor program were met through several strategies:

- *Professional Development:* Mentors had opportunities to refine their teaching and leadership skills, essential for career advancement in academia and clinical practice.
- *Personal Satisfaction:* Mentors experienced a sense of fulfillment from contributing to the personal and professional growth of their mentees.
- *Structured Support:* The program provided a structured framework that facilitated regular interactions, clear objectives, and feedback mechanisms, ensuring that mentors felt supported and valued in their roles.

#### 4.2 Goal-oriented study

Our study sheds light on the value of structured mentorship programs for the academic and career development of health sciences undergraduates and young professionals in Uganda. Participants recognized the importance of a structured hybrid mentorship model in providing accessible opportunities and bridging gaps in career decision-making, self-esteem, and soft skills development. This aligns with existing literature on the benefits of mentoring, emphasizing the reciprocal mentor–mentee interaction model and its impact on professional growth and personal development [18, 19].

#### 4.3 Skills and professional development

With regards to grant writing and research skills where only 20% of participants reported improvement in grant writing and research skills. Investigation revealed that those who showed improvement were often those who actively engaged and practiced, indicating the importance of individual effort in skill development. Comparisons with other programs may support these findings, highlighting the effectiveness of personalized mentorship and the significance of active participation and practice in skill enhancement.

Several studies have highlighted the positive influence of mentorship on career development and academic success in medical education. For instance, Frei et al. found that mentoring programs significantly enhance medical students' career satisfaction and academic performance [4]. Similarly, it is reported that mentoring is associated with improved research



productivity and career guidance [18–22]. Our study's findings are consistent with these conclusions, as MedXMentor contributed to academic and career decision-making, soft skills acquisition, and self-esteem development among mentees.

However, unlike some studies that measured specific outcomes such as research output or career progression [20], our research focused on qualitative insights, which precludes definitive efficacy assessment. Our study confirms concepts shared in the referenced articles, particularly the importance of mentor–mentee interactions and structured support systems in enhancing mentees' development.

#### 4.4 High-Yield mentor–mentee engagements

Participation patterns revealed that most participants were midway through their training, with notably fewer first-year and final-year students involved. This distribution can be attributed to different focus areas at various stages of training. First-year students are primarily focused on acclimating to academic demands, making them less likely to explore extracurricular opportunities, including mentorship programs. Conversely, final-year students often face significant time constraints due to clinical rotations and exam preparations, limiting their ability to participate in mentoring activities.

Comparing the reported value of mentoring between junior and senior students, mid-stage students (typically in their second or third years) perceived the greatest benefit. These students are at a critical juncture where guidance in career decision-making and skill development is most impactful. First-year students, while appreciative of the mentorship, often found it less immediately relevant to their primary focus on academic adjustment. Senior students, although acknowledging the benefits, reported challenges in balancing mentorship with their rigorous clinical schedules. The data suggests that one-on-one mentorship sessions were well-attended, likely due to their personalized nature and the comfort they offer to mentees. These sessions provided a conducive environment for mentees to express themselves openly, contributing to higher reported improvements.

#### 4.5 Strengths and contributions

An innovation in our study lies in the MedXMentor program's structured hybrid mentorship model, which we propose can be adapted in low-resource settings. While our study lacks results to support easy replication, the program's adaptability to mentors' and mentees' needs is noteworthy. The utilization of qualitative and quantitative data collection methods allowed for a comprehensive evaluation, although the results may not be exhaustive.

Our study contributes to mentorship practice by showcasing the effectiveness of a well-structured mentorship program in addressing challenges faced by young health professionals. It underscores the importance of holistic mentor–mentee relationships and efficient monitoring and evaluation processes in achieving program goals and ensuring stakeholder satisfaction. The MedXMentor program's one-on-one mentorship model was structured to promote professional growth, personal development, and skill acquisition among mentees. The program included key elements such as initial meetings to set SMART goals, regular bi-monthly check-ins for continuous progress monitoring, and maintaining mentoring logs for reflection and documentation. These components ensured that mentees received tailored guidance and feedback, facilitating their development in various competencies like project management, research skills, and soft skills through hands-on experiences and workshops.

The program's pacing was designed to incrementally build competencies over six months. In the first two months, the focus was on establishing the mentor–mentee relationship and setting foundational skills. Months three and four emphasized intermediate skills such as project management and research proposal writing. In the final two months, advanced skills like manuscript writing and data analysis were introduced, with mentees applying these in real-world scenarios. This phased approach ensured a comprehensive skill development process, reinforcing the program's structured and impactful mentorship experience.

#### 4.6 Challenges

Part of the objectives of the study was to identify the challenges faced by participants. Key challenges included:

1. *Time Constraints*: Both mentors and mentees often struggled to find mutually convenient times for mentoring sessions, particularly final-year students who were heavily engaged in clinical duties.
2. *Resource Limitations*: The program faced limitations in accommodating all applicants, indicating a high demand for mentorship that exceeds available resources.

3. *Diverse Needs*: Addressing the varied needs of mentees at different stages of their education posed a challenge in creating universally applicable mentorship content.

To address the challenges faced by participants in the mentorship program, the following strategies were implemented:

#### 4.7 Time constraints

*Scheduling Coordination*: Both mentors and mentees shared monthly schedules to identify mutually convenient times for mentoring sessions.

*Supportive Follow-up*: The secretariat provided support by conducting follow-up calls to mentor and mentee pairs experiencing difficulties in finding suitable meeting times. This helped in resolving scheduling conflicts and ensuring regular sessions.

#### 4.8 Resource limitations

*Capacity Management*: Despite high demand, the program acknowledged its resource limitations and accepted a manageable number of applicants (80 out of 313). This ensured that the mentorship program could maintain quality standards and effectively support the selected participants.

#### 4.9 Diverse needs

*Tailored Matchmaking*: Recognizing the diverse needs of mentees, efforts were made to match mentees with mentors based on their specific goals and availability.

*Flexible Pairings*: Mentors with more flexible schedules were paired with mentees who had demanding schedules, while mentors with limited availability were matched with mentees who had clearer goals and required less intensive support.

These strategies aimed to optimize the effectiveness of the mentorship program despite the challenges presented by time constraints, resource limitations, and diverse needs among participants. By facilitating better communication, managing resources wisely, and offering tailored support, the program sought to enhance the mentoring experience and maximize its impact on the participants' academic and professional development.

### 5 Limitations

Despite yielding insights, our study has limitations. Notably, we couldn't accommodate all program applicants, indicating an unmet need for mentorship. Additionally, our study was limited to one medical school in Uganda, potentially impacting the generalizability of findings. Furthermore, feedback from only 67% of participants may not fully represent the diverse perspectives on the program.

While our study offers valuable insights into the MedXMentor mentorship model, further research is needed to validate its efficacy and explore its applicability in diverse settings.

#### 5.1 Recommendations

*Early Introduction of Mentorship*: We recommend integrating mentorship early in the training of health professional students to ensure continuous guidance and support throughout their academic journey. Early exposure to mentorship can foster a strong foundation for professional growth.

*Monitoring and Evaluation*: Implementing a comprehensive monitoring and evaluation system is essential to ensure the regular occurrence of mentoring sessions, maintain accountability, and promote active participation of both mentors and mentees. This system should include clear metrics and feedback mechanisms to assess program effectiveness accurately.

**Matching Based on Availability:** When selecting mentors, it's crucial to consider their availability. Matching mentors and mentees based on availability can enhance the mentorship experience, ensuring consistent support and fostering a conducive learning environment.

## 5.2 Future research directions

**Scaling Across African Medical schools:** expanding the MedXMentor program to other African medical schools will increase its impact and reach a wider pool of aspiring health professionals. Collaborative efforts can facilitate the exchange of best practices and promote a mentorship culture across institutions.

**Developing Mentorship Metrics:** Developing standardized metrics for assessing mentorship program progress and effectiveness will provide valuable insights into program outcomes and areas for improvement. These metrics should encompass various aspects of mentorship, including participant satisfaction, skill development, and career advancement.

**Conducting Longitudinal Studies:** Longitudinal studies tracking mentees' progress over time can offer insights into the long-term impacts of mentorship on their personal and professional development. Understanding these lasting effects will enable program refinement and optimization to maximize impact.

## 6 Conclusion

Structured mentorship programs serve as valuable tools for providing mentorship access and meeting the diverse needs of mentors and mentees. Lessons learned from programs like MedXMentor highlight the importance of leveraging online platforms to enhance mentorship accessibility and efficiency. While our study did not conclusively demonstrate effectiveness, it underscores the potential of such programs to empower aspiring healthcare professionals across Africa. Moving forward, further research and refinement of mentorship initiatives will be crucial to maximize their impact and benefit a wider range of individuals in low-resource settings.

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**Author contributions** ET and AS developed the idea for the program. ET, AS, LA, and BM designed and administered the monitoring and evaluation tools. ET and LA analyzed the data and wrote the first manuscript draft. IA, VO, KMM, AS, BM, PDM, J.Na, JS, JM, TMK, and J.Ng reviewed and edited the manuscript. All authors read and approved the final manuscript.

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**Data availability** Both original data generated during the research and any secondary data reuse that supports the results and analyses are available from the corresponding author upon request.

## Declarations

**Ethics approval and consent to participate** The study obtained a waiver for ethical approval through the office of the Dean of the Faculty of Medicine, Mbarara University of Science and Technology. We certify that the study was performed per the ethical standards laid down in the 1964 Declaration of Helsinki. All participants provided informed consent, and measures were implemented to uphold their rights and confidentiality. Personally identifiable information was anonymized, and only aggregate data was utilized for analysis to protect participants' privacy.

**Consent for publication** Not applicable.

**Competing interests** The authors declare no competing interests.

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## References

1. Mullan F, Frehywot S, Omaswa F, et al. Medical schools in sub-Saharan Africa. *Lancet*. 2011;377(9771):1113–21. [https://doi.org/10.1016/S0140-6736\(10\)61961-7](https://doi.org/10.1016/S0140-6736(10)61961-7).
2. Skjevik EP, Boudreau JD, Ringberg U, et al. Group mentorship for undergraduate medical students—a systematic review. *BMC Med Educ*. 2020;20:299. <https://doi.org/10.1186/s12909-020-02231-0>.
3. Donovan A, Tew M, Thompson R, et al. Feedback and mentoring mentorship in postgraduate training programs: views of Canadian program directors. *Med Educ*. 2009;43(2):155–8. <https://doi.org/10.1111/j.1365-2923.2008.03258.x>.
4. Frei E, Stamm M, Buddeberg-Fischer B. Mentoring programs for medical students—a review of the PubMed literature 2000–2008. *BMC Med Educ*. 2010;10:32. <https://doi.org/10.1186/1472-6920-10-32>.
5. Burgess A, van Diggele C, Mellis C. Mentorship in the health professions: a review. *J Med Educ Curric Dev*. 2018;5:2382120518772566. <https://doi.org/10.1177/2382120518772566>.
6. Ddiba D. Mentorship: a missing link in education in Sub-Saharan Africa. *Afr Educ Res J*. 2013;1(1):1–7.
7. Nakanjako D, Byakika-Kibwika P, Kintu K, et al. Mentorship needs at academic institutions in resource-limited settings: a survey at Makerere University College of Health Sciences. *BMC Med Educ*. 2011;11:53. <https://doi.org/10.1186/1472-6920-11-53>.
8. Kashiwagi DT, Varkey P, Cook DA, Karle B, Beckman TJ. A retrospective investigation of the relationship between quality of clinical supervision and the self-perceived readiness of early graduates for clinical work. *Teach Learn Med*. 2013;25(4):278–84.
9. Sambunjak D, Straus SE, Marušić A. Mentoring in academic medicine: a systematic review. *JAMA*. 2006;296(9):1103–15.
10. Vygotsky LS. *Mind in society: the development of higher psychological processes*. Harvard: Harvard University Press; 1978.
11. Knowles MS. *The modern practice of adult education: from pedagogy to andragogy*. Hoboken: Prentice Hall; 1980.
12. Adoga AA, Ogbe AE, Misauno MA, Dahiru IL, Okon UO. The undergraduate medical student's perception of professional mentorship: results from a developing nation's medical school. *J Educ Health Promot*. 2019;8:105. [https://doi.org/10.4103/jehp.jehp\\_197\\_18](https://doi.org/10.4103/jehp.jehp_197_18).
13. Indyk D, Deen D, Fornari A, Santos MT, Lu WH, Rucker L. The influence of longitudinal mentoring on medical student selection of primary care residencies. *Med Educ Online*. 2011;16(1):5480. <https://doi.org/10.3402/meo.v16i0.5480>.
14. Bates R. A critical analysis of evaluation practice: the kirkpatrick model and the principle of beneficence. *Eval Program Plan*. 2005;28(4):371–7. <https://doi.org/10.1016/j.evalprogplan.2004.04.011>.
15. Quinton ML, Tidmarsh G, Parry BJ. A Kirkpatrick model process evaluation of reactions and learning from my strengths training for life TM. *J Community Psychol*. 2021;47(3):359–68. <https://doi.org/10.1002/jcop.22180>.
16. Henry-Noel N, Gittens S, Ani C, et al. Mentorship in medicine and other health professions. *PRiMER*. 2019;3:8. <https://doi.org/10.22454/PRiMER.2019.953308>.
17. Williams JL, HaunaniKamakana M, Okawa G, et al. Dyadic connections in the context of group mentoring: a social network approach. *J Community Psychol*. 2019;47(3):611–26. <https://doi.org/10.1002/jcop.22180>.
18. National Academies of Sciences, Engineering, and Medicine, Policy and Global Affairs, Board on Higher Education and Workforce, Committee on Science, Engineering, Medicine, and Public Policy, Stemm Committee on Effective Mentoring in Science, Engineering, Medicine, and Mathematics, Dahlberg. 2018.
19. Pololi L, Knight S. Mentoring faculty in academic medicine: a new paradigm? *J Gen Intern Med*. 2005;20(9):866–70. <https://doi.org/10.1111/j.1525-1497.2005.05007.x>.
20. Sambunjak D, Straus SE, Marušić A. Mentoring in academic medicine: a systematic review. *JAMA*. 2006;296(9):1103–15. <https://doi.org/10.1001/jama.296.9.1103>.
21. Nimmons D, Giny S, Rosenthal J. Medical student mentoring programs: current insights. *Adv Med Educ Pract*. 2019;10:113–23. <https://doi.org/10.2147/AMEP.S154974>.
22. Skjevik EP, Boudreau JD, Ringberg U, Schei E, Stenfors T, Kvernenes M, Ofstad EH. Group mentorship for undergraduate medical students: a systematic review. *BMC Med Educ*. 2020;20:299. <https://doi.org/10.1186/s12909-020-02231-0>.

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