A Cost-Effective Work-Based Interprofessional Collaboration Program for Healthcare Professionals

Karli Brittz, University of Pretoria, South Africa*

https://orcid.org/0000-0001-6342-567X

Montlenyane Madisa, University of Pretoria, South Africa

Lizemari Hugo-Van Dyk, University of the Free State, South Africa

Celia Filmalter, University of Pretoria, South Africa

Tanya Heyns, University of Pretoria, South Africa

ABSTRACT

Despite the availability of online interprofessional collaboration (IPC) programs, few cater for low- and middle-income communities and healthcare workers with limited Internet resources. This article describes how an interdisciplinary team developed an IPC blended learning program for healthcare workers in a low- and middle-income maternity setting. The purpose of the article is to discuss and outline how the authors developed an IPC program that is easily accessible and cost-effective to implement in low- and middle-income communities. To scaffold the program content and structure, the authors integrated IPC principles and the ADDIE instructional design model. By discussing the design process and methodology, the article aims to demonstrate how an accessible learning program can be developed using a work-based pedagogy and blended learning approach. In doing so, the authors trust the design process and approach can guide other healthcare professionals and educators in similar contexts, as well as encourage educational professionals to utilize resources optimally.

KEYWORDS

ADDIE Design Model, Blended Learning, Edpuzzle, Google Classroom, Healthcare Professionals, Interprofessional Collaboration, Low- and Middle-Income Communities, Maternity Care, Work-based Learning

A COST-EFFECTIVE WORK-BASED INTERPROFESSIONAL COLLABORATION PROGRAM FOR HEALTHCARE PROFESSIONALS

Globally, interprofessional collaboration (IPC) is becoming central to clinical practice, with evidence of improved patient outcomes (Kaini, 2017). Since 2010, the World Health Organization (WHO) has recognized collaboration as a priority to improve and strengthen global health systems (WHO, 2010, 2019). Separately trained healthcare professionals (i.e., physicians, nurses, midwives, physiotherapists, and pharmacists) must, therefore, learn to collaborate in their everyday work environment (Bogossian & Craven, 2021).

*Corresponding Author

Interprofessional education (IPE) has been integrated at tertiary educational institutions to promote IPC in clinical practice (Aldriwesh et al., 2022). However, working healthcare professionals are overlooked although they should also be enabled to partner with other members of the healthcare team through work-based IPC education programs (Seppänen et al., 2022). Online learning environments facilitate work-based IPC, supporting development and readiness to collaborate (Aldriwesh et al., 2022).

Online learning IPC interventions often originate from high-income countries that have access to technical resources and connectivity (Mounier-Jack et al., 2017). Low- and middle-income countries, however, are faced with challenges related to accessibility, technical problems, and isolation when implementing such interventions in remote communities (Reeves et al., 2017; Sunguya et al., 2014). The context of the study reported in this article was a sub-Saharan clinical setting of Botswana, an example of a low- and middle-income country as in need of IPC education due to its high maternal morbidity and mortality rates (Statistics Botswana, 2019; United Nations & Botswana, 2017). An IPC work-based program is needed in maternal settings in low- and middle-income communities because existing programs do not address the interprofessional practices of healthcare professionals in the clinical setting (Lutfiyya et al., 2019).

To address the need for a cost-effective, accessible IPC program, the authors developed a work-based blended learning program for healthcare workers in a maternity setting in Botswana, titled *Mabogu-Dinku* (Together We Can). This article provides a meta-discussion that outlines the considerations and reasonings behind the design process of the IPC program. Such a discussion could assist other healthcare professionals in low- and middle-income countries as they face similar challenges in designing and developing work-based learning programs. Additionally, educational professionals working in high-income countries may gain insight into optimally utilizing resources in under-resourced settings.

To demonstrate the design process, the authors identified the preliminary considerations that provided the background for the program and applied the ADDIE model to the design and development of *Mabogu-Dinku*. The next section indicates the preliminary considerations, including the contextual insight, blended learning approach, and required interprofessional collaboration and education (IPC/E) competencies that informed the development of the work-based program.

PRELIMINARY CONSIDERATIONS

The context of Botswana and maternity care, components of blended learning, interprofessional collaboration, education, and the ADDIE instructional design model were taken into consideration before developing the *Mabogu-Dinku* program. Taking these into account assisted the authors in synthesizing work-based program instruction. The fields of existing research provided a framework for program design and development, with the aim of increased collaboration and easily accessible content.

Despite the existing scholarship between blended learning and IPC, as well as blended learning and the ADDIE instructional design model, literature on integrating blended learning, IPC, and ADDIE is sparse. Several studies present blended learning as a pedagogical approach to IPC in healthcare settings (see Cappi et al., 2019; Chen et al., 2017; Kenwright, 2012; Lala et al., 2021; Riesen et al., 2012). Studies also incorporate a blended learning approach, via the ADDIE model of instructional design (see Adri et al., 2020; Reinbold, 2013; Risdianto, 2019; Shibley et al., 2011), to manage and keep blended learning methods and tools organized during the design process (see Shibley et al., 2011). Yet few studies included ADDIE and blended learning technologies when developing IPC/E (Bellucci, 2019; Pintz et al., 2021).

As IPC/E requires further expansion into low-income countries, it becomes important to extend and adapt instructional design methodology. The intersection between blended learning, IPC/E, and ADDIE is important and deserves further investigation. The authors argue that

all three components played a significant role in the development of *Mabogu-Dinku*. When linked, they facilitated the use of effective learning strategies. ADDIE focused and streamlined the blended learning tools; the blended learning approach aided in navigating the content and constraints of the setting.

CONTEXTUAL INSIGHT: BOTSWANA AND MATERNITY CARE

Botswana is a middle-income country in sub-Saharan Africa with a population of just over 2.3 million people. Its healthcare services are structured in six levels of delivery: (1) referral hospitals; (2) district hospitals; (3) primary healthcare hospitals; (4) clinics with maternity units; (5) clinics; and (6) health posts and mobile stops (Nkomazana et al., 2014). Currently, maternal mortality in Botswana is almost 143.2 per 100,000 live births (Statistics Botswana, 2019). A referral hospital that admits the largest number of patients in the country, particularly obstetric cases, is located in the southern part of the country. In 2019, despite being a training site for emergency obstetric care, this hospital had the highest maternal morbidity and mortality cases (Nkhwalume & Mashalla, 2019; Statistics Botswana, 2019). Concerns about this facility include overcrowding, a shortage of healthcare personnel, and a shortage of resources (Ramatiti, 2018; Statistics Botswana, 2019). Comprehensive interventions are needed to address professional, managerial, and operational competencies (Nkhwalume & Mashalla, 2019; WHO Regional Office for Africa, 2018). In addition, the WHO (2022) recommends the implementation of interprofessional collaborative care to address poor maternal healthcare outcomes. However, despite the recommendation for IPE to enhance IPC practices and quality healthcare outcomes, the reality in Botswana and other low- and middle-income countries is that IPC practices are not realized in the clinical setting because current health education programs are not designed to facilitate and support these practices (Barr & Coyle, 2013; Prabawati, 2018).

There was, therefore, a clear need for researchers to develop a work-based interprofessional education training program to enhance IPC for healthcare professionals working in maternity care in Botswana. A work-based program using blended learning is a pragmatic approach to facilitate IPC in such an environment, where healthcare professionals are already practicing within a clinical setting (Cameron et al., 2012).

BLENDED LEARNING

Blended learning refers to the use of multiple modes of delivery and instruction, with an overall objective to improve the program experience and learning result (Halan, 2005). The ADDIE model structures the development of a program for the designer; blended learning establishes the means of presentation to the participant.

The term "blended learning" was first used in a corporate environment to refer to programs that allow people to work and study simultaneously (Sharma, 2010). The term evolved to describe a fusion of traditional instruction (face-to-face and in-person learning or practical application) and digital, online delivery through technological platforms (Hrastinski, 2019). Additionally, Oliver and Trigwell (2005) emphasized that healthcare professionals learn through experience in their clinical setting. Several studies confirm that blended learning is a significant, efficient, and successful means of instruction with high student satisfaction (see Akhunzada et al., 2021; George-Walker & Keeffe, 2010; Lala et al., 2021). Blended learning scaffolds and supports learners, allowing them to develop self-reflective and self-determined skills (George-Walker & Keeffe, 2010). Based on the successes of blended learning, the *Mabogu-Dinku* program presents a blended mode of instruction. It is work-based, presented online interspersed with face-to-face instruction, and relies on participants' experience and implementation of IPC in their working environment.

INTERPROFESSIONAL COLLABORATION AND EDUCATION (IPC/E)

The content and scope of *Mabogu-Dinku* are based on the Canadian competency framework for IPC suggested by the Registered Nurses Association of Ontario (Bainbridge et al., 2010). Although the scope of the program is not the focus of this discussion, it remains relevant as it played a role in understanding the context and rationale for the use of specific materials, methods, and applications during the design.

The WHO prioritized IPC/E interventions on a global scale (Oandasan & Reeves, 2005; WHO, 2022). In recent years, healthcare practice has advocated for the importance of collaboration among various professionals in terms of decision making, organization, and daily routines to ensure safe and effective patient care (Hornby & Atkins, 2008; McAuliffe, 2021; Thistlethwaite, 2012). As a result, it is important for healthcare systems to attempt to incorporate a collaborative approach and education among their healthcare workers.

IPC refers to two or more professions collaborating toward solving problems, making sense of complexities, and achieving a common goal (Green & Johnson, 2015). In healthcare environments, IPC takes place when professionals combine their skills and knowledge to make decisions and provide the best care for patients (Kaini, 2017). To achieve IPC in a clinical setting, professionals must be educated to learn together and from each other to collaborate for improved patient outcomes (Sunguya et al., 2014).

A framework with the following core competencies of IPC was developed: (1) role clarification; (2) patient-centered care; (3) team functioning; (4) collaborative leadership; (5) interprofessional communication; and (6) conflict resolution (Bainbridge et al., 2010; Schmitt et al., 2011). The framework has been employed in various programs (Prast et al., 2016; Rozensky et al., 2018; Tick et al., 2015; Zabar et al., 2016). The *Mabogu-Dinku* program is, therefore, based on the six core competencies of IPC. It aims to improve IPC among healthcare professionals in a selected maternity unit in Botswana. The ADDIE instructional design model was used to structure the competencies in the program.

ADDIE INSTRUCTIONAL DESIGN MODEL

Instructional design and technology employ processes to reach learning objectives. ADDIE is an overarching model used to describe a systematic structure for instructional development. It follows the following phases: (1) analysis; (2) design; (3) development; (4) implementation; and (5) evaluation (Durak & Ataizi, 2016; Molenda, 2015).

The first phase analyzes a designated learning environment and context. The second phase designs goals and ideas to improve and address concerns in the learning environment. The third phase develops learning resources, materials, and methods to meet these goals. The fourth phase implements the resources, materials, and methods in the learning environment. The fifth phase evaluates the effectiveness of these resources and the way they have addressed the stipulated goals.

The ADDIE model relies on intentional feedback, revision, and responsiveness from educators, instructors, and participants to navigate complexities in learning development, validate decisions, and encourage responsible approaches to learning design (Yu & Jee, 2021). The phases are in a constant feedback loop. These can be worked on simultaneously while creating an instructional program (Reinbold, 2013). For example, a change in the evaluation phase might affect the design or a change in the analysis phase could influence implementation. The study, therefore, relied on ADDIE to structure the design of *Mabogu-Dinku* and reflect critically on the learning design process in a systematic way.

The purpose of this article is to describe how the researchers implemented the ADDIE model to design *Mabogu-Dinku*, elaborating on the phases of development and use of blended technologies. By elaborating on the development and design of the program, the researchers demonstrate how they

considered a cost-effective, accessible work-based blended learning program to encourage active learning and collaboration in the maternity setting in Botswana.

APPLYING ADDIE TO *MABOGU-DINKU*

The program was developed by an interdisciplinary team with various degrees of experience in the development of educational programs. The team of five included a midwife, educators, and an e-learning technologist. The design team created an online learning platform using Google Classroom. It included integrations from various (free) sources like Edpuzzle and YouTube. The program purposefully incorporated work-based activities to develop, implement, and integrate IPC in the maternity setting. Additionally, the program structure encouraged reflection on the benefits and further potentials of IPC in the workplace and in relation to personal development. The pedagogy is based on a blended learning approach, with an emphasis on competency development and collaboration within the workplace. In doing so, participants do not have to break away from their everyday work to learn about IPC. Instead, healthcare professionals are encouraged to integrate the IPC competencies into their everyday practices. In the next section, the five phases of ADDIE are used to analyze the development of the program.

ANALYSIS

During the analysis phase, background research and information should be collected to consider the structure and content of the program, as well as identifying and meeting participant needs (Reinbold, 2013). Analysis for *Mabogu-Dinku* took place by consulting existing research and study materials, interviewing healthcare professionals involved in midwifery care in Botswana, and reviewing existing online resources related to IPC.

The authors concluded that limited IPC was implemented in the maternity setting in Botswana. The need for work-based IPC training was highlighted, which is congruent with the views of Rahimi et al. (2019). Consulting studies on IPC interventions, the researchers noted that a work-based training program would provide an opportunity for healthcare professionals to develop IPC competencies while furthering their knowledge on the potential and importance of IPC (Bridges et al., 2011).

Once the need for the program was established, it was necessary to further analyze and understand the specific learning needs of potential participants. Guided by Reinbold (2013), the following questions were posed:

- What are the participants' characteristics?
- What is the level of experience and knowledge of the participants?
- What is the current environment of the participants?
- What motivates the participants?
- How do participants prefer to learn?
- How will participants learn best?

An analysis of participants' learning needs is crucial because it contributes to an effective program and enhanced motivation (Durak & Ataizi, 2016). It was established that the participants were healthcare professionals (i.e., doctors, nurses, midwives, dieticians, and physiotherapists) with limited IPC knowledge. Additional training to their everyday workload could have been overwhelming. Participating healthcare professionals indicated that they preferred to learn while working. They also noted that they would benefit from a digital format, which they could review in their own time. However, as noted by O'Doherty et al. (2018), participants most likely use work-based digital resources because their own resources are limited in low-income countries.

As a result, the researchers realized that the program needed to incorporate e-learning materials and practical work-based applications. This led to a blended learning approach. In turn, the learning materials and program had to be accessible and integrate seamlessly with the participants' working environment. Additionally, it was important to make sure that the program would be rewarding in terms of skills and personal development. For that reason, the program prioritizes personal and professional development. The program aims to act as an intervention strategy rather than a credit for additional qualifications.

Next, best practices for blended learning and usage of e-learning tools were explored. Based on blended learning principles of Lai et al. (2016), the following blended learning specifications were incorporated:

- Learning should consolidate knowledge through various activities.
- Both face-to-face and online learning should extend the learning environment and address the diverse needs of participants.
- Participants should remain active learners.
- The material should provide an opportunity for feedback, reflection, and discussion.
- The blended learning environment should show an awareness of participant diversity.

The program should, therefore, be scaffolded by an easy-to-use, free online learning platform that incorporates diverse activities like face-to-face and physical applications. Additionally, the program should emphasize opportunities for feedback and reflection.

Furthermore, the team analyzed studies to indicate the most effective manner of outlining content related to IPC. Oandsan and Reeves (2005) identified key elements for interprofessional education:

- IPE initiatives should be grounded in educational theory and constructs.
- Effective learning can only take place in non-threatening learning environments that support for the participants.
- Self- and group-reflection opportunities are key components of IPE teaching strategies.
- IPE should employ learning approaches based on clinical practice.
- IPE initiatives should use multiple modes of delivery, including group activities.

The IPE content analysis correlates with the blended learning and participant analysis. This indicates the following: the program provides a safe, open space with opportunities for reflection and feedback; it is application-based; and it includes multi-modal activities. Based on the analysis phase in the ADDIE model, these principles guided the creation, content, structure, and development of *Mabogu-Dinku*.

DESIGN

The design phase utilized the information gathered in the analysis to outline the program and develop a roadmap about its evolution in praxis (Reinbold, 2013). The design team determined the objectives and learning outcomes of the program during this phase by generating a list of objectives. Examples include "identify and apply the core competencies of IPC in everyday healthcare," "foster effective communication between healthcare professionals," and "constructively engage self and others to manage the diverse values, roles, and goals that arise in collaborative care." Thereafter, the content was structured using the learning objectives and six core principles of IPC. The team structured the program into six clear, scaffolding learning units. Each learning unit included individual outcomes, interactions with other units, and the overall aim and objectives of the program (see Figure 1).

Figure 1. Learning unit outcomes and objectives
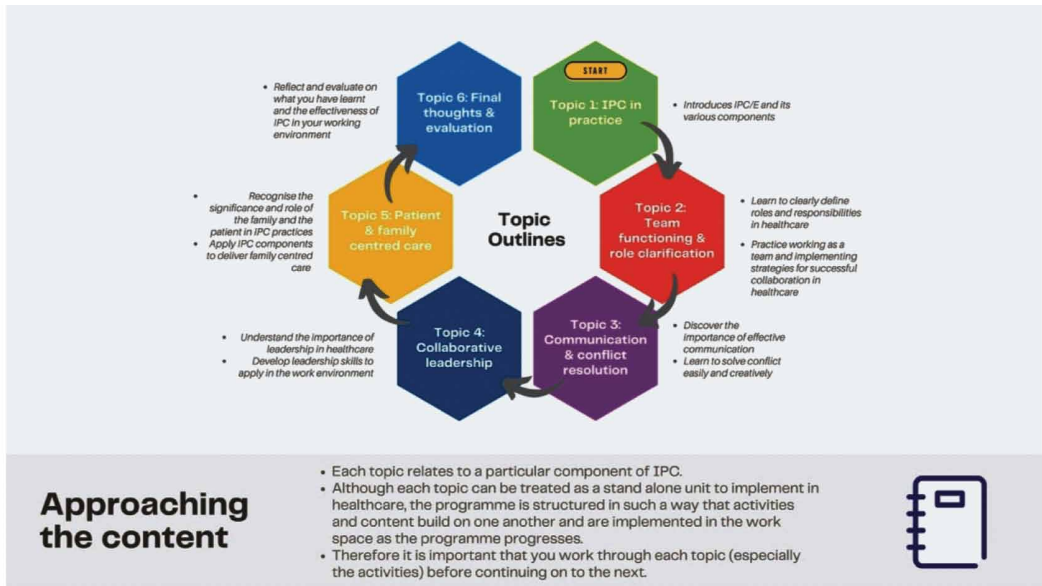
Source: Screenshot from Mabogu-Dinku by the authors

Participants had access to all materials from the start of the program, allowing them to work through the content in their own time.

Based on this list of learning units, divisions, and outcomes, each member of the design team assumed a role in advancing the program design. Roles included activity design, research and resource design, technology and tool design, and content design.

Activity Design

The design team established that *Mabogu-Dinku* should focus on active learning, workplace application, and self-assessment in the analysis phase. Therefore, activities were a focus of the program design. The activity designer identified and researched activities that could be applied in group settings to promote the competencies of IPC. Activities were discussed during collaborative sessions and adapted for effective online instruction. The design team agreed that units should consist of the following activities:

- One formative activity to assess knowledge.
- One practical activity to guide participants to apply IPC competency in their work.
- One self-reflection activity that allows participants to reflect on their progress and discuss lessons learned.

Research and Resource Design

The program was developed with a limited budget. It also had to be presented in an easily accessible manner. Therefore, the team required resources, lecture materials, and media that were available and attainable. The resource designer sourced and created media items like lecture videos, TED Talks, and infographics that would communicate ideas in a clear and efficient manner. These resources were integrated into the program and presented online. Key resource requirements included:

- Materials that convey ideas in a concise manner.
- Content that is interesting, entertaining, and engaging.
- Media that support reading, lectures, and videos.
- Affordable data costs to access online materials.

Content Design

The content was work-based and predominantly led by active learning. Still, it was essential to maintain a thorough theoretical basis for the content. The content designer acquired theoretical resources (i.e., journal articles, books, scholarly online sources) and provided supported summaries of each IPC competency. These summaries were shared, discussed, and incorporated into the design of resources and activities.

Technology and Tool Design

The technology and tool designer arranged the activities, resources, and content on a digital platform to support and structure a blended learning environment (Ellaway et al., 2006). The following characteristics were considered when determining an effective e-learning tool within a virtual learning environment (Aballay et al., 2021):

- Accessible and user-friendly support and documentation.
- Tools with an uncomplicated user interface.
- Visible and easy-to-recover error handling option.
- Integration of tools and media.
- Flexibility in user and system exchange of information.
- Standard and engaging design and user experience.

Additionally, it was important to ensure that the program's online space provided a human experience. In other words, a user should not feel lost when exploring the content and digital environment. Based on adherence to the determined characteristics, the technology and tool designer chose the following tools to create a virtual environment:

- **Google Classroom:** A free service-learning hybrid platform for users with a personal Google account. This can be accessed through computers and mobile phones. It is designed to simplify the creation, distribution, and assessment of tasks (Ni, 2020).
- **Canva:** A free graphic design tool with templates and graphics for education and working environments. Users can easily create engaging, unique content (Gehred, 2020).
- **YouTube, including TED Talks:** A free video sharing and social media application used in higher education to distribute information and connect participants. YouTube, an effective tool in the learning experience, has many advantages for learning and teaching (Moghavvemi et al., 2018).
- **Edpuzzle:** An e-learning platform that integrates into Google Classroom. Users can edit and add questions to YouTube videos, making it an interactive platform. Multiple-choice, open-ended, and short-answer questions can be added to videos. Moreover, the instructor can view and grade answers. Edpuzzle adds an engaging human element to online content (Mischel, 2019).

The design team met weekly to organize and compile the design aspects, as well as share ideas and findings. Figure 2 is a visual representation of the design process.

The program's final design was established through collaborative discussions and adaptations. It is important to note that the design roles interacted in a non-linear manner that extended and built on each other while remaining situated in the established learning outcomes. The researchers contend

Figure 2. Diagram of design feedback loop

Source: Created by the authors
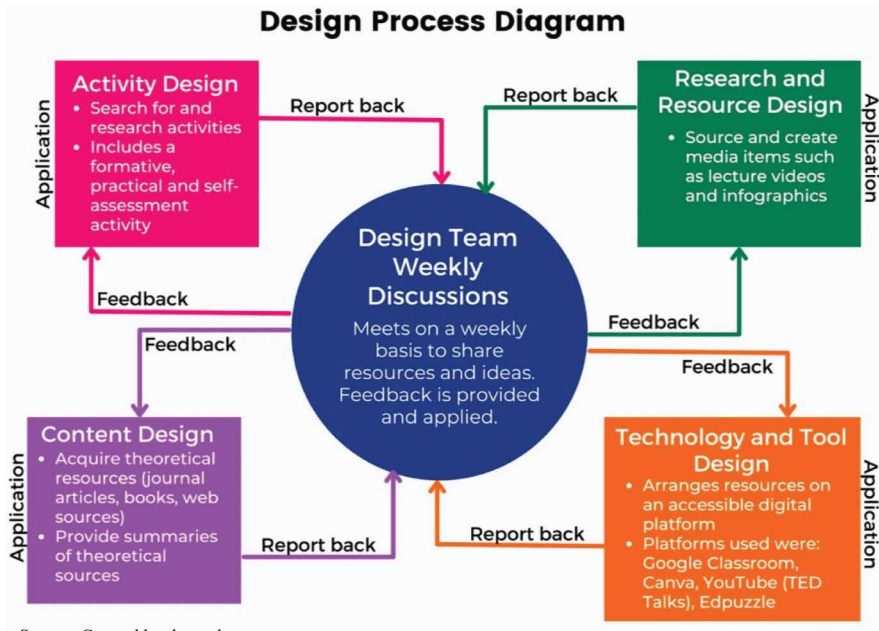
that this is a key benefit of the ADDIE model because it allows for natural, orderly, and coherent growth, design, and development.

DEVELOPMENT

The researchers started to develop the *Mabogu-Dinku* program based on the design phase. Data, cost-efficiency, and material bandwidth were considered during the development phase. The online virtual environment of choice was Google Classroom due to its low cost, especially because it relies on cloud storage (Google Drive) to share media and content (Alajmi et al., 2019). Content could be accessed from a desktop computer or mobile phone. Additional program content, readings, and theoretical perspectives could be downloaded as PDFs. Short infographics could be accessed from home. A formal program syllabus facilitated the instruction. Figure 3 illustrates the Google Classroom layout.

The program was structured into six units based on IPC competencies. The content was populated with interactive activities, assignments, and learning materials. Participants were given an opportunity to engage with each unit's content in the workplace (with access to a stable Internet connection). Users were allotted six weeks to work independently and at their own pace. In addition, a blended learning environment meant that participants could access online written discussions via Google Classroom. Face-to-face discussions were also available with the guidance of a facilitator, which saved live interactive connectivity costs. The participants could review these activities online later. For example, participants could submit reflective notes on key learning via the platform before engaging with and commenting on each other's experiences. In this way, participants had the practical experience and written documentation of lessons learned both individually and as part of an interdisciplinary team.

An internal evaluation and feedback system were incorporated to refine the units. Several media platforms were tested; amendments were made accordingly. The feedback allowed the

Figure 3. Example of the Mabogu-Dinku Program outlined on Google Classroom
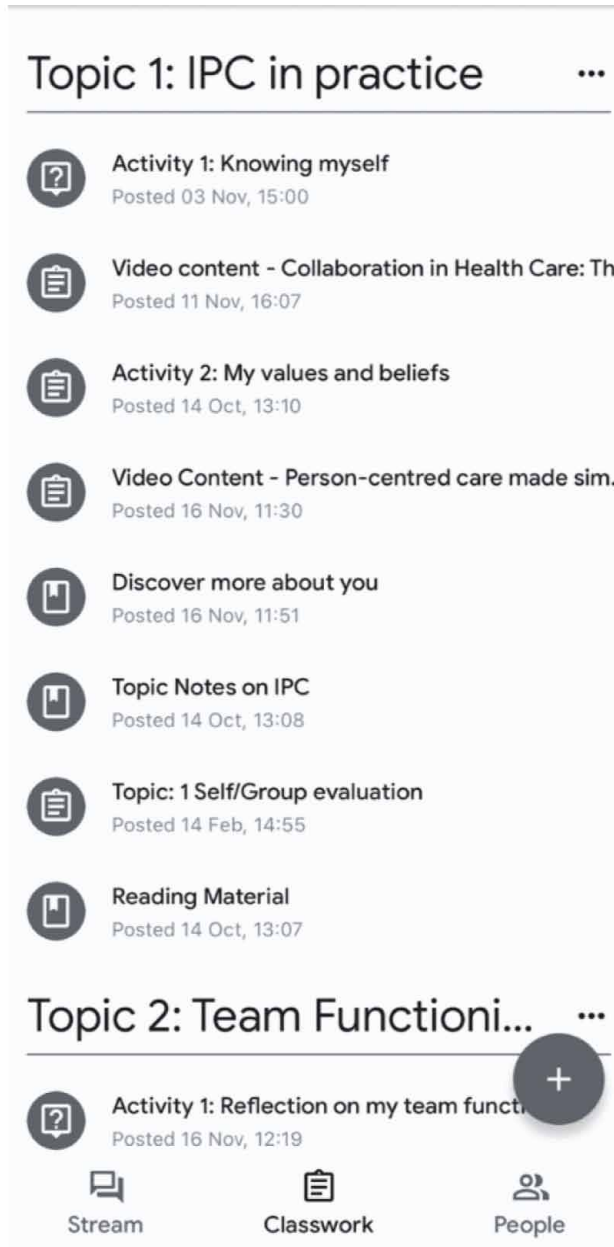
Source: Screenshot from the Mabogu-Dinku program by the authors

team to recognize the omission of a formal introduction to the program, as well as a defined final assessment activity. These shortcomings were addressed. The continuous feedback loop led to a broader perspective on program content, which provided flexibility and diversity in the program. It also allowed for real-time changes, which prevented substantial changes after the program was finalized.

IMPLEMENTATION

Following the non-linear and intersecting characteristics of the ADDIE model, the program was externally evaluated before implementation. The program syllabus was sent to a diverse group of evaluators from fields like digital humanities (n = 1), learning instruction (n = 1), and health sciences (n = 3). This external evaluation focused on the content and face validity of the program.

The feedback from the external evaluators was integrated and implementation took place. The content was delivered during the implementation phase of the program (Reinbold, 2013). Delivery was initially set up and introduced online, with participants joining the *Mabogu-Dinku* Google Classroom platform free of charge via email or using the virtual environment code. Participants could enroll as individuals or as part of a healthcare team to enhance IPC in the workplace. Once joined, participants worked through the material to understand the learning opportunities and ways to integrate the content into their working environment. The introduction aimed to generate enthusiasm and enhance participant success throughout the program.

The *Mabogu-Dinku* facilitators formed part of the initial team of collaborators who created the program. They were, therefore, knowledgeable in the content and application of IPC. They also understood the aim and objectives of the initiative.

The *Mabogu-Dinku* facilitator was responsible for online facilitation. Participants had to apply their acquired competencies in the workplace. This created a partnership between facilitator and participants. The facilitators promoted active engagement by commenting on participants' reflective practices. They guided discussions, gave constructive feedback, and made connections between ideas and concepts. The success of the program's implementation relied on participant engagement. This, in turn, was encouraged through the blended learning environment.

EVALUATION

Based on the ADDIE model, evaluation took place systematically during all phases of program development. *Mabogu-Dinku* was consistently evaluated and revised for improvement as recommended by Reinbold (2013). The program was evaluated throughout the design process. Feedback was incorporated in every phase of development. Evaluation of the program included:

- Initial internal evaluation by collaborators during discussion sessions and via a questionnaire.
- External evaluation by experts in the field of digital humanities, learning instruction, and health sciences.
- Evaluation (via the Attitudes to Health Professional Questionnaire [AHPQ]) by participants before and after program completion (Lindqvist et al., 2005).
- Self-evaluation of competencies gained by participants via reflection activities at the end of each learning unit.

Internal collaborators and external experts received a four-section questionnaire about demographic information, clarity and layout, evaluation of the program, and additional comments. The questionnaire provided detailed feedback and an assessment on both the structure and content of the program. External experts made minor suggestions and additions to the content, including blogs to enhance student engagement, increased assessment on academic reading material, and improvement of the introductory video. Overall, collaborators and experts indicated a high validity level of "proficient" to "exemplary" program based on their review of the syllabus and online learning platform.

Participants' evaluation focused on the workplace, measuring the attitudes of healthcare professionals toward different healthcare groups before and after completing the IPC learning program. The questionnaire, based on an educational intervention developed by The Centre for Interprofessional

Practice (CIPP), measured perceptions of different professions on various sub-scales (Lindqvist et al., 2005). The researchers felt that collaboration between professions took place if perceptions changed between the two measurements.

Additionally, participants evaluated their individual growth and abilities gained during their participation in *Mabogu-Dinku*. The study used an alternative, emotively orientated form of assessment to prompt reflection and self-evaluation at the end of each unit (blob illustrations). Blobs, created by Wilson and Long (2005), are malleable and flexible human-like figures that are performing activities and depicting stages of development. Blob illustrations are used to reflect emotions, reactions to situations, and self-identity (Morton, 2006). Participants were encouraged to engage with the illustrations by choosing the figures with which they identified. They were required to reflect on their choice and discuss their development, skills, and lessons learned online and in groups.

Participants also submitted their reflection reports via the online classroom. Responses were collected to evaluate the program. The program's concluding activity required participants to film a short video that provided a reflection on lessons learned. The task prompted a personal reflection on all content as it built a platform for further application and thought in healthcare. Participants engaged in the sharing of and listening to videos. This promoted collaboration and evaluation.

CONCLUSION AND FUTURE APPLICATIONS

The ADDIE instructional design model was used to build and develop an IPC work-based program for healthcare workers in a maternity setting ideal for low- and middle-income countries. The design process focused on integrating accessible resources in an innovative manner to focus on learners. Participants could complete the program in their own time and apply it in their workplace.

An interdisciplinary group of professionals developed a diverse program. Applying the ADDIE model enabled the researchers to scaffold content and activities, providing continuous feedback through evaluations. This improved the program and created a meaningful learning experience for participants.

Knowledge gained during the development of *Mabogu-Dinku* could inform similar educational projects that use a cost-effective blended learning program. The methods applied, design process, and educational technologies used to create *Mabogu-Dinku* could be implemented by other instructional designers in program development. Scaffolding a blended learning program in both an online and face-to-face environment could benefit other work-based programs. In addition, this program could be amended for different healthcare professionals and various contexts. Healthcare practitioners interested in promoting collaboration in their work environment could build on the units, content, activities, and assessment strategies.

Mabogu-Dinku challenges traditional notions of work-based learning. It emphasizes a learner-centered, continuous professional development approach. It also focuses on optimizing time spent studying and applying skills in the workplace for low- to middle-income countries.

ACKNOWLEDGMENT

REFERENCES

Aballay, L. N., Aciar, S. V., & Collazos, C. A. (2021). Emotions for virtual learning environments. *IEEE Revista Iberoamericana de Tecnologias Del Aprendizaje*, *16*(3), 215–224. doi:10.1109/RITA.2021.3125902

Adri, M., Wahyuni, T., Zakir, S., & Jama, J. (2020). Using ADDIE instructional model to design blended project-based learning based on production approach. *International Journal of Advanced Science and Technology*, *29*(6), 1899–1909. http://sersc.org/journals/index.php/IJAST/article/view/12894

Akhunzada, A. S., Lodhy, I. S., Munshi, P., & Jumani, S. (2022). Blended learning: Past and present with special reference to COVID-19 pandemic. *International Journal of Distance Education and E-Learning*, *7*(1), 61–70. doi:10.36261/ijdeel.v7i1.2226

Alajmi, Q., Al-Nuaimy, L. A., Arul Jose, G. J., Mastan, M., & Al-Sharafi, M. A. (2019). Cloud computing services and its effect on tertiary education: Using Google Classroom. In *Proceedings of the 2019 7th International Conference on ICT & Accessibility (ICTA)* (pp. 1–3). IEEE. doi:10.1109/ICTA49490.2019.9144797

Aldriwesh, M. G., Alyousif, S. M., & Alharbi, N. S. (2022). Undergraduate-level teaching and learning approaches for interprofessional education in the health professions: A systematic review. *BMC Medical Education*, *22*(1), 13. doi:10.1186/s12909-021-03073-0 PMID:34980083

Bainbridge, L., Nasmith, L., Orchard, C., & Wood, V. (2010). Competencies for interprofessional collaboration. *Journal, Physical Therapy Education*, *24*(1), 6–11. doi:10.1097/00001416-201010000-00003

Barr, H., & Coyle, J. (2013). Introducing interprofessional education. In S. Loftus, T. Gerzina, J. Higgs, M. Smith, & E. Duffy (Eds.), *Educating health professionals: Becoming a university teacher* (pp. 185–196). Sense Publishers. doi:10.1007/978-94-6209-353-9_16

Bellucci, N. A. (2019, February). *The importance of interprofessional education in nursing* [Paper presentation]. Creating Healthy Work Environments 2019: Innovating Healthy Clinical and Academic Environments: Optimizing Patient Outcomes and Professional Well-Being, New Orleans, Louisiana, USA. https://sigma.nursingrepository.org/handle/10755/16768

Bogossian, F., & Craven, D. (2021). A review of the requirements for interprofessional education and interprofessional collaboration in accreditation and practice standards for health professionals in Australia. *Journal of Interprofessional Care*, *35*(5), 691–700. doi:10.1080/13561820.2020.1808601 PMID:32935599

Bridges, D. R., Davidson, R. A., Soule Odegard, P., Maki, I. V., & Tomkowiak, J. (2011). Interprofessional collaboration: Three best practice models of interprofessional education. *Medical Education Online*, *16*(1), 6035. doi:10.3402/meo.v16i0.6035 PMID:21519399

Cameron, S., Rutherford, I., & Mountain, K. (2012). Debating the use of work-based learning and interprofessional education in promoting collaborative practice in primary care: A discussion paper. *Quality in Primary Care*, *20*(3), 211–217. PMID:22828676

Cappi, V., Artioli, G., Ninfa, E., Ferrari, S., Guarnieri, M. C., Martucci, G., & Sarli, L. (2019). The use of blended learning to improve health professionals' communication skills: A literature review. *Acta Bio Medica: Atenei Parmensis*, *90*(Suppl. 4), 17–24. PMID:30977745

Chen, A. K., Dennehy, C., Fitzsimmons, A., Hyde, S., Lee, K., Rivera, J., Shunk, R., & Wamsley, M. (2017). Teaching interprofessional collaborative care skills using a blended learning approach. *Journal of Interprofessional Education & Practice*, *8*, 86–90. doi:10.1016/j.xjep.2017.07.002

Durak, G., & Ataizi, M. (2016). The ABC's of online course design according to ADDIE model. *Universal Journal of Educational Research*, *4*(9), 2084–2091. doi:10.13189/ujer.2016.040920

Ellaway, R., Candler, C., Greene, P., & Smothers, V. (2006). An architectural model for MedBiquitous virtual patients. *MedBiquitous.* http://groups.medbiq.org/medbiq/display/VPWG/Home

Gehred, A. P. (2020). Canva. Journal of the Medical Library Association, 108(2), 338-340. doi:10.5195/jmla.2020.940 doi:10.5195/jmla.2020.940

George-Walker, L. D., & Keeffe, M. (2010). Self-determined blended learning: A case study of blended learning design. *Higher Education Research & Development*, *29*(1), 1–13. doi:10.1080/07294360903277380

Green, B. N., & Johnson, C. D. (2015). Interprofessional collaboration in research, education, and clinical practice: Working together for a better future. *The Journal of Chiropractic Education*, *29*(1), 1–10. doi:10.7899/JCE-14-36 PMID:25594446

Halan, D. (2005). Blended learning. *Journal of Educational Technology*, *2*(1), 20–24.

Herath, C., Zhou, Y., Gan, Y., Nakandawire, N., Gong, Y., & Lu, Z. (2017). A comparative study of interprofessional education in global health care: A systematic review. *Medicine*, *96*(38), e7336. doi:10.1097/MD.0000000000007336 PMID:28930816

Hornby, S., & Atkins, J. (2008). *Collaborative care: Interprofessional, interagency and interpersonal*. Wiley.

Hrastinski, S. (2019). What do we mean by blended learning? *TechTrends*, *63*(5), 564–569. doi:10.1007/s11528-019-00375-5

Kaini, B. K. (2017). Interprofessional team collaboration in health care. *Global Journal of Medical Research: K Interdisciplinary, 12*(2), 1-8.

Kenwright, D. (2012). Blended learning. *Pathology*, *44*, S5. doi:10.1016/S0031-3025(16)32612-5

Lai, M., Lam, K. M., & Lim, C. P. (2016). Design principles for the blend in blended learning: A collective case study. *Teaching in Higher Education*, *21*(6), 716–729. doi:10.1080/13562517.2016.1183611

Lala, S. G., George, A. Z., Wooldridge, D., Wissing, G., Naidoo, S., Giovanelli, A., King, J., Mabeba, M., & Dangor, Z. (2021). A blended learning and teaching model to improve bedside undergraduate paediatric clinical training during and beyond the COVID-19 pandemic. African Journal of Health Professions Education, 13(1), 18-22. doi:10.7196/AJHPE.202.v13il.1447 doi:10.7196/AJHPE.2021.v13i1.1447

Lindqvist, S., Duncan, A., Shepstone, L., Watts, F., & Pearce, S. (2005). Development of the 'Attitudes to Health Professionals Questionnaire' (AHPQ): A measure to assess interprofessional attitudes. *Journal of Interprofessional Care*, *19*(3), 269–279. doi:10.1080/13561820400026071 PMID:16029980

Lutfiyya, M. N., Chang, L. F., McGrath, C., Dana, C., & Lipsky, M. S. (2019). The state of the science of interprofessional collaborative practice: A scoping review of the patient health-related outcomes based literature published between 2010 and 2018. *PLoS One*, *14*(6), e0218578. doi:10.1371/journal.pone.0218578 PMID:31242239

McAuliffe, D. (2021). *Interprofessional ethics*. Cambridge University Press. doi:10.1017/9781108980067

Mischel, L. J. (2019). Watch and learn? Using EDpuzzle to enhance the use of online videos. *Management Teaching Review*, *4*(3), 283–289. doi:10.1177/2379298118773418

Moghavvemi, S., Sulaiman, A., Jaafar, N. I., & Kasem, N. (2018). Social media as a complementary learning tool for teaching and learning: The case of YouTube. *International Journal of Management Education*, *16*(1), 37–42. doi:10.1016/j.ijme.2017.12.001

Molenda, M. (2015). In search of the elusive ADDIE model. *Performance Improvement*, *54*(2), 34–36. doi:10.1002/pfi.21461

Morton, P. (2006). Support for Learning. *Reviews*, *21*(2), 110–112. doi:10.1111/j.1467-9604.2006.00414.x

Mounier-Jack, S., Mayhew, S. H., & Mays, N. (2017). Integrated care: Learning between high-income, and low- and middle-income country health systems. *Health Policy and Planning*, *32*(Suppl. 4), iv6–iv12. doi:10.1093/heapol/czx039 PMID:29194541

Ni, L. B. (2020). Blended learning through Google Classroom. *International Journal of Educational and Pedagogical Sciences*, *14*(4), 220–226.

Nkhwalume, L., & Mashalla, Y. (2019). Maternal mortality trends at the Princess Marina and Nyangabwe referral hospitals in Botswana. *African Health Sciences*, *19*(2), 1833–1840. doi:10.4314/ahs.v19i2.5 PMID:31656465

Nkomazana, O., Peersamn, W., Willcox, M., Mash, R., & Phaladze, N. (2014). Human resources for health in Botswana: The results of in-country database and reports analysis. *African Journal of Primary Health Care & Family Medicine*, *6*(1), 1–8. doi:10.4102/phcfm.v6i1.716 PMID:26245420

O'Doherty, D., Dromey, M., Lougheed, J., Hannigan, A., Last, J., & McGrath, D. (2018). Barriers and solutions to online learning in medical education – an integrative review. *BMC Medical Education*, *18*(1), 1–11. doi:10.1186/s12909-018-1240-0 PMID:29291730

Oandasan, I., & Reeves, S. (2005). Key elements for interprofessional education. Journal of Interprofessional Care, 19(suppl. 1), 21-38. doi:10.1080/13561820500083550 doi:10.1080/13561820500083550 PMID:16096143

Oliver, M., & Trigwell, K. (2005). Can 'blended learning' be redeemed? *E-Learning and Digital Media*, *2*(1), 17–26. doi:10.2304/elea.2005.2.1.17

Pintz, C., Posey, L., Farmer, P., & Zhou, Q. (2021). Interprofessional care of people with multiple chronic conditions: An open-access resource for nursing educators. *Nurse Education in Practice*, *51*, 1–8. doi:10.1016/j.nepr.2021.102990 PMID:33621925

Prabawati, D. (2018). The process and implication of inter-professional education: A systematic review. *Nurse Media Journal of Nursing*, *7*(2), 104–115. doi:10.14710/nmjn.v7i2.13883

Prast, J., Herlache-Pretzer, E., Frederick, A., & Gafni-Lachter, L. (2016). Practical strategies for integrating interprofessional education and collaboration into the curriculum. *Occupational Therapy in Health Care*, *30*(2), 166–174. doi:10.3109/07380577.2015.1107196 PMID:26643766

Rahimi, M., Haghani, F., Kohan, S., & Shirani, M. (2019). The clinical learning environment of a maternity ward: A qualitative study. Women and Birth; Journal of the Australian College of Midwives, 32(6), e523-e529. doi:10.1016/j.wombi.2019.01.002 doi:10.1016/j.wombi.2019.01.002 PMID:30665739

Ramatiti, K. (2018, September 3). Marina far from ideal hospital – report. *Weekend Post*. https://www.weekendpost.co.bw/wp-news-details.php?nid=5318

Reeves, S., Fletcher, S., McLoughlin, C., Yim, A., & Patel, K. D. (2017). Interprofessional online learning for primary healthcare: Findings from a scoping review. *BMJ Open*, *7*(8), e016872. doi:10.1136/bmjopen-2017-016872 PMID:28780560

Reinbold, S. (2013). Using the ADDIE model in designing library instruction. *Medical Reference Services Quarterly*, *32*(3), 244–256. doi:10.1080/02763869.2013.806859 PMID:23869632

Riesen, E., Morley, M., Clendinneng, D., Ogilvie, S., & Murray, M. A. (2012). Improving interprofessional competence in undergraduate students using a novel blended learning approach. *Journal of Interprofessional Care*, *26*(4), 312–318. doi:10.3109/13561820.2012.660286 PMID:22559163

Risdianto, E. (2019). Development of blended learning based on web and augmented reality. In *Proceedings of the International Conference on Educational Sciences and Teacher Profession (ICETeP 2018)* (pp. 144-147). Atlantis Press. doi:10.2991/icetep-18.2019.35

Rozensky, R. H., Grus, C. L., Goodie, J. L., Bonin, L., Carpenter, B. D., Miller, B. F., Ross, K. M., Rybarczyk, B. D., Stewart, A., & McDaniel, S. H. (2018). A curriculum for an interprofessional seminar on integrated primary care: Developing competencies for interprofessional collaborative practice. *Journal of Allied Health*, *47*(3), 61E–66E. PMID:30194832

Schmitt, M., Blue, A., Aschenbrener, C. A., & Viggiano, T. R. (2011). Core competencies for interprofessional collaborative practice: Reforming health care by transforming health professionals' education. *Academic Medicine*, *86*(11), 1351. doi:10.1097/ACM.0b013e3182308e39 PMID:22030650

Seppänen, L., Koskela, I., Heikkilä, H., Leino-Kilpi, H., Rautava, P., Stolt, M., Siekkinen, M., Valtanen, E., & Sulosaari, V. (2022). Interplay of coordination, co-creation and community building: Examining interprofessional collaboration in workplace development efforts in health care. *Journal of Workplace Learning*, *34*(5), 455–465. doi:10.1108/JWL-07-2021-0088

Sharma, P. (2010). Key Concepts in ELT Blended learning. ELT Journal, 64(4), 456–458. doi:10.1093/elt/ccq043 doi:10.1093/elt/ccq043

Shibley, I., Amaral, K. E., Shank, J. D., & Shibley, L. R. (2011). Designing a blended course: Using ADDIE to guide instructional design. *Journal of College Science Teaching*, *40*(6), 80–85.

Statistics Botswana. (2019). Botswana maternal mortality ratio, 2019. *Statistics Botswana*. https://www.statsbots.org.bw/sites/default/files/publications/Botswana%20Maternal%20Mortality%20Ratio%20%202019.pdf

Sunguya, B. F., Hinthong, W., Jimba, M., & Yasuoka, J. (2014). Interprofessional education for whom? Challenges and lessons learned from its implementation in developed countries and their application to developing countries: A systematic review. *PLoS One*, *9*(5), e96724. doi:10.1371/journal.pone.0096724 PMID:24809509

Thistlethwaite, J. E. (2012). *Values-based interprofessional collaborative practice: Working together in health care*. Cambridge University Press. doi:10.1017/CBO9781139108904

Tick, H., Chauvin, S. W., Brown, M., & Haramati, A. (2015). Core competencies in integrative pain care for entry-level primary care physicians. *Pain Medicine*, *16*(11), 2090–2097. doi:10.1111/pme.12818 PMID:26178477

United Nations. (2017). Botswana. *UN*. https://sdgs.un.org/statements/botswana-16273

Wilson, P., & Long, I. (2005). *The big book of blob trees*. Routledge.

World Health Organization. (2010). Human resources for health framework for action on interprofessional education & collaborative practice. *WHO*. https://www.who.int/hrh/resources/framework_action/en/

World Health Organization. (2019). Trends in maternal mortality 2000 to 2017: Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. *WHO*. https://www.who.int/reproductivehealth/publications/maternal-mortality-2000-2017/en/

World Health Organization. (2022). Framework for action on interprofessional education & collaborative practice. *WHO*. http://whqlibdoc.who.int/hq/2010/WHO_HRH_HPN_10.3_eng.pdf

World Health Organization Regional Office for Africa. (2018). Botswana continues to explore ways to reduce maternal mortality. *WHOROA*. https://www.afro.who.int/news/botswana-continues-explore-ways-reduce-maternal-mortality

Yu, J., & Jee, Y. (2021). Analysis of online classes in physical education during the COVID-19 pandemic. *Education Sciences*, *11*(1), 1–14. doi:10.3390/educsci11010003

Zabar, S., Adams, J., Kurland, S., Shaker-Brown, A., Porter, B., Horlick, M., Hanley, K., Altshuler, L., Kalet, A., & Gillespie, C. (2016). Charting a key competency domain: Understanding resident physician interprofessional collaboration (IPC) skills. Journal of General Internal Medicine, 31(8), 846–853. doi:10.1007/s11606-016-3690-6 doi:10.1007/s11606-016-3690-6 PMID:27121308

Karli Brittz is a scholar in digital culture and media studies. She is a postdoctoral candidate in the School of the Arts at the University of Pretoria, where she teaches Visual Culture Studies and Digital Culture and Media. Karli obtained a PhD in Visual Studies from the School of the Arts at the University of Pretoria. Karli received the NIHSS award for best digital humanities visualisation project in 2021. Her main research and teaching interests are the complexities of being human in the digital age, as well as critically considering digital culture in relation to teaching and learning.

Montlenyane Madisa is currently based in Gaborone, Botswana where she works as a Lecturer at Botswana College of Distance and Open Learning. She obtained a Masters of Philosophy in Health Science Education from the University of Stellenbosch in 2012 as well as a Masters of Science (MSc) in Nursing (FNP) from the University of North Carolina at Chapel Hill in 2002. She is currently a PhD candidate at the University of Pretoria studying Work-based Interprofessional Collaboration in maternity settings.

Celia Filmalter is a Senior Lecturer in the Department of Nursing Science at the University of Pretoria, where she is responsible for coordinating and lecturing theoretical and practical nursing modules. She obtained her PhD in Nursing at the University of Pretoria. Her field of interest and speciality is Emergency Nursing, Medical - Surgical Nursing and Forensic Nursing.

Tanya Heyns is an associate professor at the Department of Nursing Science, University of Pretoria, South Africa. Her educational involvement includes the education and training of post-graduate programmes, focussing predominantly on Critical Care Nursing, including Emergency Nursing. She has completed her PhD at the University of South Africa in 2008 and has specialised in critical care and emergency care nursing. Tanya's research interest lies in the area of practice development.