Research article

Adapting the learning environment of a first year interprofessional module towards collaborative-ready graduates

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ABSTRACT

Background: There has been a global call for a more collaborative workforce to combat the complex healthcare challenges experienced in societies. As a result, health professions education has amended their curricula to include interprofessional education as a strategy to allow students to learn from, with and about each other across disciplines during their training. It is imperative to review the learning environment of these interprofessional modules. To determine the learning environment for the acquisition of the interprofessional core competencies, there needs to be an understanding of the changes to the module, and the impact it has on student performance over a selected period.
Objective: This study aimed to determine how have the changes to the material dimension of the learning environment for first-year students in an IPE curriculum promoted student learning.
Methods: A document analysis research design was used to extract data over a two-year period. An adaptation of the Context, Input, Process, Product and Outcomes evaluation model was to determine how changes to the learning environment of students registered for a first year interprofessional module, promoted learning.
Results: The findings reveal that curriculum changes made to the location and setting can yield improvements in the development and enhancement of the selected interprofessional education core competencies.
Conclusion: This study concludes that in alignment with the learning styles of the 21st century student, curriculum development should include an enhanced form of deeper learning in the light of the fourth industrial revolution.

1. Introduction

According to Gruppen et al. (2019), a learning environment (LE) is defined as the various components that influence a student's learning. Gruppen et al. (2019) identified five overlapping and interactive core components that form the two dimensions of a LE, i.e., psychosocial and material dimensions. The psychosocial dimension is made up of the LE at three levels: the personal, the social, and the organizational. The material dimension includes physical and virtual spaces, and cuts across the psychosocial dimension. The authors further indicate that the two dimensions allow for various combinations of the LE (Gruppen et al., 2019). The components will be discussed below.

1.1. Personal component

The personal component refers to how the student reacts to the LE (Gruppen et al., 2019). This component is described as student-centred as it focuses on the student's learning (Gruppen et al., 2019). It is therefore important to explore the various learning styles of students.

1.1.1. Learning styles

Jaleel and Thomas (2019:3) defines learning styles as "...the concept that individuals differ in regard to what mode of instruction or study is most effective for them." Duff (2004) describes students with an inclination for a deep approach to learning as individuals who look for meaning in what they are learning and enjoy the learning activity, make associations with previous learning, use logic, reasoning, and evidence well, and scrutinize critically what they have learned and are learning.

Students with a surface approach to learning use mainly memorization to learn; have difficulty using logic, reasoning, and evidence; make fewer connections with previous learning; and have difficulty studying (Duff, 2004). Students who use a strategic approach to learning want to organize their studying routines, manage their time, and learn what is expected to achieve the highest possible grade (Duff, 2004). In education, the teaching style should depend on the students' learning style (Lage et al., 2010). Given the different learning styles of students, it is evident that curriculum developers need to incorporate a range of these approaches to pose assessment instructions. In conjunction with the personal component, the social component influences how students learn.

1.2. Social component

The social components refer to the quality of interactions between students, and students and their course convenors (Gruppen et al., 2019). To ensure quality interactions, curricula need to be inclusive of all students' learning styles. These learning styles depend on the generation they are from. The current cohort of students are described as 21st century students.

1.2.1. The 21st century student

To develop an appropriate learning environment for the 21st century student, there needs to be constant evaluation of the curriculum (Mesko et al., 2015). Evaluation of curriculum content allows convenors the opportunity to adapt their course to the expectations of the 21st century student (Imansari and Sutadji, 2017). University has been described as a stressful transition from high school (Bojuwoye, 2002). Various factors contribute to this difficult adjustment, including financial constraints, the high demands of the university environment, and the university administrative processes (Bojuwoye, 2002). While the expectations of the 21st century students need to be considered, it should align to learning outcomes of the curriculum. Thus, we need to explore how the social component interacts with the personal component to achieve the requirements of the organization, which in this study is the university.

1.3. Organizational culture and structures

The final component of the psychosocial dimension is the organizational cultures and structures, which highlights the manner in which students relate to their university policies (Gruppen et al., 2019). The graduate attributes of a South African university inform the transition to an interprofessional education (IPE) curriculum to ensure collaborative ready graduates.

IPE is defined as "...occasions when members or students of two or more professions learn with, from and about each other to improve collaboration and the quality of care and services" (CAIPE, 2016). Collaboration between health professionals from different professional backgrounds results in the delivering of high quality of care (WHO, 2010). As a result, there is a call for a collaborative workforce to combat the growing healthcare needs in society (Interprofessional Education Collaborative Expert Panel, 2011). Thus, in higher education institutions, health professions education (HPE) programmes have incorporated IPE into their curricula. According to the Interprofessional Education Collaborative (2016), the four competencies needed to ensure a collaborative practice-ready workforce are: i) values/ethics, ii) roles/responsibilities, iii) interprofessional communication, and iv) teams and teamwork. Each competency has a set of sub-competencies, which can be used as indicators when assessing the students enrolled in health professions programmes. Specific sub-competencies are selected under each core competency, which are deemed appropriate at each year-level of study. Assessing whether students achieved these interprofessional core competencies along the continuum of learning allows course convenors to make changes to the learning environment that would result in collaborative ready students. In order to foster the ability to collaborate,

an interprofessional curriculum encompassing these core competencies needs to be created for the students. At this specific university, a scaffolded approach was adopted to introduce students to the core competencies through a range of learning and teaching methods.

The first-year theoretical module focuses on interprofessional communication, and teams and teamwork. In the second-year service-learning module, course convenors focus on the interprofessional communication, teams and teamwork, and roles/responsibilities core competencies. In their senior years of study, students are exposed to all four core competencies through practical and simulation activities. As recommended by the Interprofessional Education Collaborative Expert Panel (2011), core competencies guide the development of learning approaches and assessment strategies in HPE.

The interprofessional core competencies were used to develop the content needed to complete the formative and summative assessment tasks. To assess the acquisition of the core competencies, the selected sub-competencies were used to design the assessment rubrics. Assessing the grade point average of assessments may indicate the students' understanding of an assessment task. Following student evaluations, the physical and virtual spaces of the modules are reworked annually. It is important to ensure that any changes to this component of the learning environment of the modules in an IPE curriculum result in improved IPE core competencies in students.

The first-year module is the only compulsory component in the IPE curriculum at this specific university. Thus, allowing the researchers to develop a curriculum aligned to the different learning styles of the entire cohort of students. The focus of this study is therefore on this module as the entry point into the IPE curriculum as a whole.

1.4. Physical and virtual components

The materials dimension focuses on the physical and virtual spaces in which learning and teaching occur (Gruppen et al., 2019). At a first-year level, students are offered an interprofessional theoretical module called Primary Health Care (PHC). The main outcome of this module is to gear first-year health and social sciences students' thinking towards becoming health professionals in a collaborative setting. In their interprofessional teams, students explore the concepts related to health, development, and ethics.

As the assessment rubrics used in learning and teaching activities are developed using the sub-competencies highlighted by the Interprofessional Education Collaborative (2016), student achievement is an indication of the acquisition of the core competencies (Table 1). To determine whether the changes to this first-year interprofessional module enhanced the student's ability to acquire the sub-competencies, it is imperative to determine students' performance in this module.

In the PHC module, students are expected to engage in various learning activities that include different types of environments, for example, classroom-based and community-based. Should changes be made to the physical and virtual components of the module, it is important to explore the advantages thereof to the student cohort. The physical and virtual components (the PHC module in the IPE curriculum) need to complement the personal components (student learning styles) and the social components (21st century student) to meet the organizational culture and structure (collaborative-ready graduates).

There are various educational benefits of diverse learning environments for students (Kansas State University, 2018). One of these benefits includes a broader perspective on knowledge, strategies and applications. Students are also more willing to examine (and re-examine) their personal perspectives and values while learning more about themselves since they are exposed to ideas and points of view that they disagree with or do not understand in a safe (non-hostile) environment. Thus, adaptations to the material dimension of the learning environment could enhance the acquisition of the interprofessional core competencies.

To evaluate the changes to the physical and virtual components of

Table 1

Interprofessional sub-competencies (Interprofessional Education Collaborative, 2016).

Interprofessional communication sub-competencies:
CC1	Choose effective communication tools and techniques, including information systems and communication technologies, to facilitate discussions and interactions that enhance team function.
CC2	Communicate information with patients, families, community members, and health team members in a form that is understandable, avoiding discipline-specific terminology when possible.
CC4	Listen actively, and encourage ideas and opinions of other team members.
CC5	Give timely, sensitive, instructive feedback to others about their performance on the team, responding respectfully as a team member to feedback from others.
CC7	Recognize how one's uniqueness (experience level, expertise, culture, power, and hierarchy within the health team) contributes to effective communication, conflict resolution, and positive interprofessional working relationships (University of Toronto, 2008).

Team and teamwork sub-competencies:
TT5	Apply leadership practices that support collaborative practice and team effectiveness.
TT8	Reflect on individual and team performance for individual, as well as team, performance improvement.
TT10	Use available evidence to inform effective teamwork and team-based practices.
TT11	Perform effectively on teams and in different team roles in a variety of settings.

the LE, it is imperative to use an evaluation model that explores the various components of a curriculum. The Context, Input, Process, Product and Outcomes (CIPPO) evaluation model determines various aspects of the learning environment (Fig. 1) (Imansari and Sutadji, 2017). Imansari and Satadij (2017) used the CIPPO model to evaluate an electrical engineering curriculum. The CIPPO model can be used as an evaluation tool to explore the components of a curriculum (Imansari and Sutadji, 2017). In this study the researchers use the CIPPO evaluation model to explore the appropriateness of curriculum adjustments to promote the acquisition and enhancement of the specific interprofessional core competencies mentioned above. In addition, this study provides researchers with an opportunity to explore how the changes to the material dimension provides an appropriate entry-level module into an interprofessional curriculum. To understand the impact of the changes applied to the learning environment, this study applied the CIPPO evaluation model over a two-year period.

2. Methods

2.1. Design

The research design was a document analysis. A document analysis is a methodology that allows the researcher to review or evaluate documents (Bowen, 2009). In this study, the researchers evaluated documents to determine how the changes to the material dimension of the LE promoted the attainment of interprofessional core competencies. Evaluation is a systematic process to assess the design, implementation, effectiveness, and impact of a programme (Kartowagiran, 2010). Therefor, module evaluation is an important factor when we consider curricular adjustments and implementation.

Dalgish et al. (2020) proposed a 4-step approach to document analysis, which are: i) prepare your documents, ii) data extraction, iii) data analysis, and iv) refine your findings. In this study, the researchers used this 4-step approach.

2.2. Procedure

In this study, data was collected by analysing two documents.
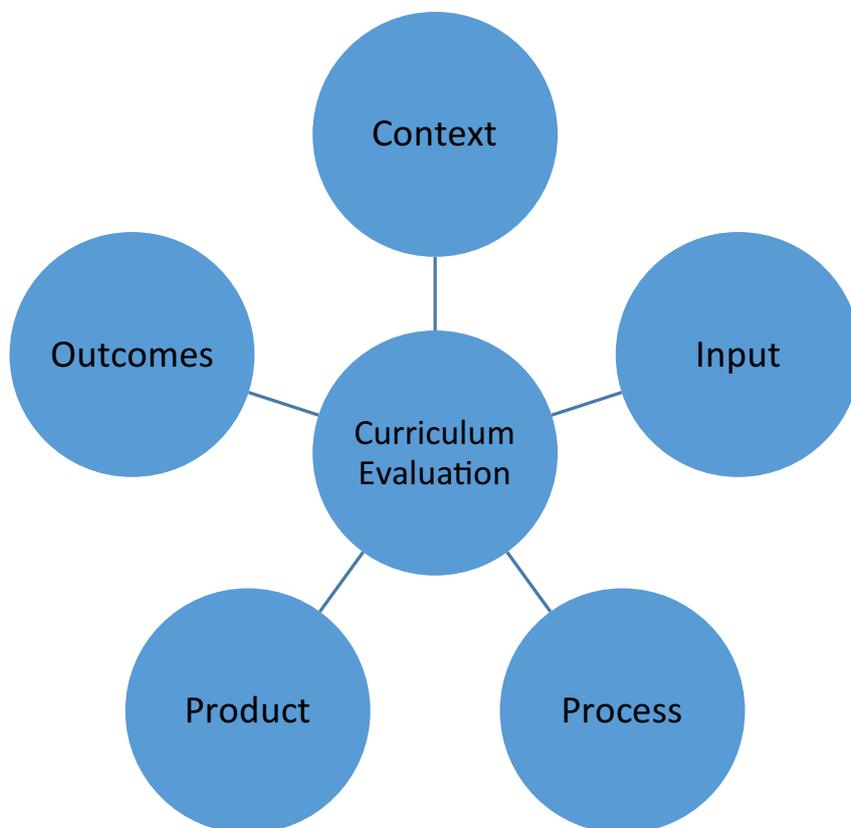
i) Prepare your documents

Fig. 1. CIPPO evaluation model.

In this step, the researchers highlighted the type of documents, dates of inclusion, and the location of the selected documents (Dalgish et al., 2020). Following a curriculum evaluation framework, the entry-level module to an interprofessional curriculum was evaluated over a two-year period. The 2018 and 2019 PHC student workbooks, and student results were analysed in this study as the two sets of documents. Other scholarly work including previous years' workbooks, reading materials and student notes were excluded from this study. The health professions registered for this module were: Dietetics and Nutrition; Occupational Therapy; Physiotherapy; Social Work; Natural Medicine; Nursing; and Sports, Recreation and Exercise Sciences.

ii) Data extraction

According to Dalgish et al. (2020), this step depends on the type of documents that are analysed. As the researchers are doing a module evaluation, the CIPPO evaluation model (Imansari and Sutadji, 2017) was adapted to develop a data extraction tool. The model puts emphasis on the determinants of the context, input, process, product and outcomes of a module. The highlighted content was placed into the appropriate categories. Subsequent to this, the researchers were able to gain a deeper understanding of the learning and teaching techniques, and assessments of the PHC module. The procedure is explained using Table 2.

Using the data extraction sheet (Appendix A) adapted from the CIPPO model, the student workbooks were read thoroughly, and the information was grouped into the appropriate components of the 'Process'. The assessment grade point average was accessed from the Marks Administration System of the university to determine the 'Product'. This process was applied for 2018 and 2019.

iii) Data analysis

In this phase, the researchers made sense of the data extracted from the documents (Dalgish et al., 2020). The data extraction sheets were compared to highlight the changes in the 'Process' of the PHC module. The components of the 'Process' indicated the changes in the LE and styles. The assessment grade point averages were used to determine the change in student performance as a result from a change in the 'Process'. Based on student performance, the acquisition of the IPE core competencies appropriate to the first-year student could be assumed.

iv) Refine your findings

In this step, the researchers were able to reach saturation (Dalgish et al., 2020). In this study, the researchers aimed to answer the following research question: how have the changes to the material dimension of the learning environment for first-year students in an IPE curriculum promoted student learning? In order for the researchers to achieve this, they needed to answer the following questions:

1. What were the changes in an interprofessional module over a two-year period?

2. How have the aforementioned changes impacted student performance over a two-year period?
3. How have these changes promoted the acquisition of the selected interprofessional core competencies in first year students?

2.3. Ethics

Ethics approval was obtained from the BioMedical Research Ethics Committee at the University of the Western Cape (BM19/5/18). Permission to conduct the study was obtained from the Registrar of the university, Dean of the Faculty of Community and Health Sciences and relevant heads of departments. Anonymity was guaranteed by not including student names or student numbers when reporting on their performance and all data was accessible by the researchers through passwords to ensure confidentiality.

3. Results

The aim of this study was to determine how the changes to the material dimension of the learning environment in a first year interprofessional module promoted student learning. The highlighted content from the documents was placed into the appropriate dimensions of the CIPPO model and is presented in the table below (see Table 2).

Following the document analysis of the 2018 and 2019 student workbooks and results, the 'Process' in the PHC module was adapted. The adaptation in the 'Process' in 2019 was to provide students with the desired learning environment. These adaptations included changes to the physical and virtual components of the module, which in this module included the test, blog and assignment, and will be presented below.

3.1. Test

The aim of the test was to explore the students' understanding of the theoretical concepts related to interprofessional teams, the perspectives of health, and the PHC system. In 2018, the test was a traditional paper-based assessment; administered and marked by the facilitators of the module. Regarding submissions of marks, university regulations allow for five working days to mark and moderate scripts and assignments. This test was written during class time meaning second chance assessments had to be set up for students with medical certificates and other bona fide reasons for not attending. In an attempt to address the delay in waiting for student marks and to develop a platform that would allow students the ability to complete the assessments at their convenience and from any location, an on-line test was developed and administered in 2019. Students were granted access to the test site for five days in which they were required to complete the assessment in their own time. As this was an online test, the system was designed to score the assessment immediately without any delays. Following the changes, the grade point average improved from 49,94 % to 81,54 %.

3.2. Blog

Publishing a blog post was another formative assessment type where students were required to demonstrate their understanding of global health systems in comparison to the South African health system. In the 2018 course evaluations completed by staff and students, it was reported that the topics were too rigid and resulted in students merely summarizing the content delivered by the facilitator/lecturer during the didactic lecture. The blog post was therefore adapted in 2019. An international guest lecturer from the University of Missouri conducted a lecture via a live feed on global health systems. Students were expected to highlight any questions or comments emerging from this lecture and, by conducting further research, post their answers or views in the form of a blog post. The average score for the blog showed a slight improvement of 4,53 %.

Table 2
CIPPO evaluation model.

CIPPO model	Primary Health Care module
Context	Vision and mission of the module, and learning outcomes of the module
Input	Module structure, lecturers, and module outline
Process	Assessment activities, field learning practice, community work learning, learning strategies, resources and learning media, and learning evaluation
Product	Assessment grade point average
Outcomes	Skills developed

3.3. Assignment

The final adaptation to the physical and virtual component of the interprofessional module was a team assignment. In this assignment, student teams were required to demonstrate their ability to compile a community profile and demonstrate an understanding of how health and social issues are addressed by organizations in the selected area. In 2018, in their interprofessional teams, students had to complete a community profile in the form of a digital story. During a visit to a local community setting, information was collected by taking photographs of the area and interviewing a key member of that community. Information gained was used to compile a digital photo story and students' creativity was tested as they were required to include an audio component to convey the necessary information about the community. Students complained about the costs of travelling to the community, their safety and coordinating logistics with team members from various departments. In 2019, key community members from various organizations were invited to the classroom. Community members provided information about the community and organization through storytelling; while students asked questions related to the community profile to complete their assignments. Using this information, students were able to identify possible causes to health and social issues in the community and make recommendations to senior students on how to address these issues. The average grade point for this assessment improved by nearly 12 %.

4. Discussion

Results will be discussed under two headings related to the material dimension of the learning environment, namely the physical setting and virtual space, and how the changes promoted the acquisition or enhancement of the selected interprofessional core competencies.

4.1. Physical setting

Students achieved an improved grade point average of 31,64 % indicating to course convenors that through storytelling as a narrative pedagogy and eliminating the challenges reported, students performed better. According to Bickham et al. (2008) students no longer limit their means of gaining information to libraries and encyclopaedias only, they are inclusive of various forms as they are tolerant to race, religion and sexual orientation. Students engaged with community members and were able to learn about the community through these indigenous knowledge systems (IKS). IKS are the local knowledge unique to a given society (Noyoo, 2007). According to Noyoo (2007), IKS is the knowledge community members have developed over years and continue to develop as the knowledge moves down from generation to generation. This knowledge is specific to the context of a specific generation and is the basis of many determinants including health care (Noyoo, 2007).

In 2018, students entered communities surrounding the university. In many cases, interprofessional teams only had one member who resided in the chosen community. In other cases, teams chose a community that was geographically more convenient. The 21st century student prefers to navigate their free time on their own (Bickham et al., 2008). Inviting community members to lecture rooms meant the data for their assignments could be collected during their lecture. Two of the sub competencies (CC2 & CC3) that improve interprofessional communication are: i) the ability to communicate with community members in a way that is understandable, and ii) the use of respectful language in crucial conversations (Interprofessional Education Collaborative, 2016). This change in the physical space afforded students the opportunity to communicate with community members respectfully to complete their assignments. Thus, this controlled lecture room setting allowed for the development of interprofessional communication.

The team and teamwork sub competency TT10 states that the student is able to use available information to guide effective teamwork (Interprofessional Education Collaborative, 2016). By inviting the community

members into the classroom, students were able to build their assignment based on first-hand evidence from the communities (Kock-Africa and Titus, 2019).

4.2. Virtual space

The student grade point average improved by 31,6 % and 4,56 % for the test and blog respectively; indicating that the product submitted by students improved when students were completing work in an online setting. According to Bickham et al. (2008), the 21st century student finds navigating technology easier than a student of an older generational group would. Incorporating technology into curriculum emphasises capabilities by encouraging how content is transferred as opposed to what the content is (Oliver, 2002). The first sub competency of interprofessional communication is to choose effective communication tools and techniques by incorporating communication technologies to facilitate discussion and interactions (Interprofessional Education Collaborative, 2016). While the test was an individual task, it exposed students to technology that may be used for team interaction. Following the guest lecture, teams were required to choose effective communication tools to discuss their blog.

Moving from a physical to a virtual space allowed students to access the test and recording of the online lecture at their own convenience. Bickham et al. (2008) states that this cohort of students prefers to be in control of their own schedules which support this statement. However, a sub competency of interprofessional communication states that the student gives timely, sensitive, instructive feedback to fellow team members (Interprofessional Education Collaborative, 2016). By enforcing due dates, students are given a time frame to access the test and view the recording of the online lecture. Thus, ensuring that the students give timeous feedback to their teams. In terms of the blog, students needed to first view the lecture before interacting with their team. During their interaction, teams needed to provide clear instructions to complete the blog and give sensitive feedback to team members' input. The changes to these assessments thus improved the acquisition of interprofessional communication.

The limitation of this study is that the results cannot be generalised as it was based on the class average of each assessment in one of the interprofessional modules. It does, however, create a view of the LE that could result in the optimal performance of students within an IPE setting. Student performance could be influenced by various factors and not only the LE. An additional limitation is that there is limited literature on IPE learning environments in the South African context. However, this study joins the conversation on how a context-specific IPE curriculum can be developed in resource-constrained higher education institutions.

The study has possible implications on educators, students and future research. The CIPPO model is an ideal evaluation model for educators, which can be used to evaluate curriculum through its five dimensions of the context, input, process, product, and outcomes. By using the adapted CIPPO model as an extraction tool, the researchers were able to evaluate all the components related to the curriculum.

Should course convenors be aware of the aspects that contribute to an optimal physical and virtual component for student learning, the interprofessional curriculum can be modified to suit the learning styles of first-year students. Through continuous curriculum development of the IPE curriculum, the university can produce health professionals who are able to collaborate and, as a result, deliver high quality of care once they enter the workforce.

The researchers suggest that future research employ the CIPPO model to explore the other modules in the IPE curriculum. Given its clear dimensions, the CIPPO model can be used to evaluate health professions education curricula.

5. Conclusion

The CIPPO model allowed course convenors to see how the changes made to a first-year module promoted learning for first-year students enrolled in an IPE curriculum. As it aligns to the sub-competencies of interprofessional communication and teams and teamwork (Interprofessional Education Collaborative, 2016), the findings clearly demonstrate that the changes made to the material dimension can yield improvements in the psychosocial dimension of the LE (Gruppen et al. (2019). It is disturbing to think that higher education has not evolved much since the times of Aristotle, whereby students assemble at a scheduled time and venue to listen to the wisdom of educators (Xing and Marwala, 2017). In the light of the fourth industrial revolution, we need to consider that a new version of university is emerging that does teaching, research and community engagement in a different manner, thereby transforming the LE of HEIs.

CRediT authorship contribution statement

Gérard Filies and Luzaan Kock-Africa: Conceptualization Ideas, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing, Visualization and Project administration.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Data collection sheet

Data collection sheet

CIPPO model		Primary Health Care module *2018*	Primary Health Care module *2019*
Context	Vision and mission of the module		
	Learning outcomes of the module		
Input	Module structure		
	Lecturers		
	Module outline		
Process	Assessment activities		
	Field learning experience		
	Community work learning		
	Learning strategies		
	Resources and learning media		
	Learning evaluation		
Product	Assessment grade point average		
Outcomes	Skills developed		

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