International Journal of Learning, Teaching and Educational Research
Vol. 23, No. 12, pp. 402-422, December 2024
https://doi.org/10.26803/ijlter.23.12.21
Received Aug 25, 2024; Revised Nov 3, 2024; Accepted Dec 29, 2024

Competency-based Medical Education: An Analysis of the Mandatory Internships of Medical Courses

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Abstract. Medical competence goes far beyond a knowledge of theory to incorporate its application in a variety of clinical circumstances. It includes skills and attitudes for the effective, precise and safe use of this theoretical foundation according to current demands. The objective of this study is to analyze the curricula of mandatory internships in medical programs in Mato Grosso do Sul based on the learning objectives outlined in the teaching plans, relating them to the National Curriculum Guidelines (DCNs) and the CanMEDS framework. The study aims to assess the alignment between the competencies proposed in local curricula and those defined by national and international standards. The present study employed qualitative and descriptive document analysis. It included 36 teaching plans extracted from the curricula of mandatory internships in medical programs from five universities in the state of Mato Grosso do Sul, Brazil. Bardin's content analysis was conducted through three fundamental stages, supported by the IRaMuTeQ software. The results demonstrate that these curricula align with the DCNs and CanMEDS, reflecting coherence between locally defined competencies and the international expectations. This convergence highlights that both frameworks are essential for ensuring competency-based medical education, equipping professionals to meet the specific demands of the national context as well as the evolving global challenges in healthcare. The analysis of the teaching plans revealed the predominance of learning objectives expressed through verbs such as "know," "develop," and "perform," reflecting the acquisition of knowledge, the development of practical skills, and their application in healthcare delivery, health education, and management. These objectives align with the competencies outlined in the DCNs as well as the roles defined by CanMEDS, covering the dimensions of medical expert,

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communicator, collaborator, leader, health advocate, scholar, and professional.

Keywords: medical education; competency-based education; curriculum

1. Introduction

Medical competence goes far beyond knowledge of theory to its application in a variety of clinical circumstances. It includes skills and attitudes for the effective, precise and safe use of this theoretical foundation in accordance with current demands (Aikat, 2024; Gontijo et al., 2013; Pacca, 2024). Thus, it is important to evaluate how medical education has been carried out in the light of preparing professionals from a competency-based perspective. The evolution of medical education has been driven by the needs and exigencies of society through time, enabling future physicians to provide competent care in complex healthcare environments.

These transformations in the educational patterns over recent decades confirm societal expectations as to who is an ideal doctor, as well as regulations shaping curricula and general pedagogical tendencies at national (as well as international) administrative spheres. The medical education system has been long criticized for how it teaches and also what content is being delivered, prompting curricular reforms in various schools with an ultimate goal of providing more competent training to physicians, preparing them to meet society challenges (Freitas et al., 2018).

Today, the physician is an all-rounder who is not restricted to their role of caregiver but is also required to have attributes such as educator and health promoter as well as leader, thereby necessitating an integrated competency-based curriculum (Batista, 2006; CNE-RM, 2022.). Therefore, rendering education along the lines of the knowledge-skills-attitudes triad is vital to attaining excellence in medical practice (Epstein & Hundert, 2002; Santos, 2011). This strategy is defined by the combination of various knowledge areas, allowing a more interdisciplinary education and the training of professionals who can see interconnections between different fields (Machado & Batista, 2012; Zabala, 2002; McNair, 2005).

In contrast, competency-based education is anchored in a globally recognized framework incorporating the knowledge, skills and attitudes required of future medical professionals. Globally, the CanMEDS model organizes medical competencies under seven roles: medical expert, communicator, collaborator, leader, health advocate, scholar, and professional (Frank et al., 2015). First devised in Canada in 1996, CanMEDS has evolved through numerous iterations and been adopted internationally (Royal College, 2023; Thomas et al., 2023). The contents of the Brasil 2014 National Curriculum Guidelines (DCNs) for medical education combine knowledge with practice to train generalist physicians capable of understanding health and disease in its social context.

In the United States and United Kingdom, key changes in curricular organization of medical education occur as a result of landmark reforms, including the Flexner Report and Dawson Report (Pagliosa & Da Ros, 2008; Pisco & Pinto, 2020). In

Brazil, this journey led to the DCNs which seeks for a curriculum which is competences oriented towards meeting their own demands and those of SUS (Brasil, 2014).

Competency-based medical education (CBME) has emerged globally as a key driver for innovations in training curricula from the undergraduate to postgraduate levels. As such, while this sort of an approach in theoretical consolidation and showcasing the best practices is a continuous process needing real-time investigation, it also offers countless opportunities to delve into various multiple aspects within medicine (McCloskey et al., 2017; Gruppen et al., 2017). Competency has had prominence in discussions on changes to healthcare education with the movement towards recentering professional practice within curricula. This concentration leads institutions to rewrite curricula and reevaluate their evaluation procedures, focusing on the competence profiles of professionals who graduate (Aguiar & Ribeiro, 2010).

This movement is in response to these structural changes and the growing demand for pedagogical practices that allow greater autonomy among students, reinforcing their proactiveness when constructing knowledge related to professional practice (Machado et al., 2018). Over time, active methodologies and educational innovations have gained ground to produce less dependent students who are themselves responsible for their learning. Various countries (for example, the United States, Canada and the Netherlands) have developed competency-based medical education curricula with Brazil beginning to draw up guidelines as well as through DCNs (Freitas et al., 2018). In a state such as Mato Grosso do Sul, with its unprecedented socio-sanitary challenges resulting from population growth and the demand for qualified healthcare services (IBGE, 2022; SEMESP, 2023), this orientation is even more pertinent.

Consequently, the definition of an undergraduate medical curriculum should move forward and go beyond subject areas distribution per se to define competencies that will be built in a clear and objective way through pedagogical practices contemplating student autonomy (Machado et al., 2018; Souza & Negro-Dellacqua, 2021). Focusing on active methodologies thus turns out to be an essential device in this sense — introducing a new curriculum model more closely aligned with current requirements which is aimed at increasingly integrated education helping to develop practical skills and basic competences.

Medical education has been organized accordingly and the teaching/learning processes have taken different forms, always in accordance with prevailing pedagogic theories. Medical education reforms are built around integrating knowledge, skills and attitudes. This method is used to design a curriculum which will not only strengthen technical knowledge but also heightens awareness of cultures, norms and values; therefore, a student become an educated person first, then they can learn in the true sense of medical practice. By articulating these divisions, the educational process would increasingly relate to a more focused and care-based professional practice which aligns, on the one hand, physicians' cooperation with social demands; while, on the other hand, combines some ethics of caring (Bôas et al., 2017).

The compulsory internships (medical clerkships) take place in the two last years of undergraduate medical courses and represent a key moment to integrate knowledge, skills, and attitudes generated during all education process. Clerkships should always be supervised, managed in order to provide actual and parallel training with the healthcare system needs according to what is necessary for DCNs (Brasil, 2014).

The central problem of this research lies in determining whether local curricula meet national and international expectations, providing training that equips future physicians to face the contemporary challenges of medical practice competently.

The objective of this study is to analyze the curricula of mandatory internships in medical programs in Mato Grosso do Sul based on the learning objectives outlined in the teaching plans, relating them to the National Curriculum Guidelines (DCNs) and the CanMEDS framework. The study aims to assess the alignment between the competencies proposed in local curricula and those defined by national and international standards.

The approach taken was qualitative and descriptive, analyzing the teaching plans' learning objectives through Bardin's content analysis and automated content analysis (AAC) using IRaMuTeQ software. The study also aims to provide insight in the theoretical underpinnings of these curricula and identify areas where more work is needed.

This study provides an overview of the extent to which curricula fit within competency-based educational guidelines, promising perspectives for curriculum development so as to ensure that students are adequately prepared towards addressing most relevant contemporary challenges.

2. Methods

2.1 Study Design

The present study falls into qualitative and descriptive document analysis because it is grounded in the purpose of this overall approach. A qualitative approach was considered because of its ability to provide understanding around a topic area, in this case meanings, motivations, and attitudes which are central for an informed hypothesis driven an exploration of CMBE (Minayo, 2014). Through the descriptive approach the study sought to identify curricula approaches and emphases on competencies as expressed in teaching plans by learning objectives recommended by the Brazil DCNs and international standards suggested by the CanMEDS framework (Sampaio, 2022).

This technique encompasses the examination of teaching plans, reports and other documents in order to extract useful data. It is a perspective that allows for an aporied and particularized reading, which supports the composition of regional curricular guidelines aligning with the needs of their population (Sampaio, 2022; Ana & Lemos, 2018). Bardin´s content analysis is applied to all curricula and frameworks. Content analysis is a method for systematically capturing the meaning of communication messages that can be applied to texts in multiple contexts (Krippendorff, 2004).

2.2 Research site and data source

This study included 36 teaching plans (N=36) extracted from the curricula of mandatory internships in medical programs from five universities in the state of Mato Grosso do Sul, Brazil. This sample represents the entirety of these documents. The data collection focused on the learning objectives outlined in the teaching plans for the 5th and 6th years from the following higher education institutions (HEIs): the Federal University of Mato Grosso do Sul (UFMS – Campo Grande Campus and Três Lagoas Campus), State University of Mato Grosso do Sul (UEMS), Federal University of Grande Dourados (UFGD), and Anhanguera University-Uniderp. These institutions were selected owing to their being in operation for more than six years and their adoption of competency-based curricula.

2.3 Methodological Procedures and Instrument

The criteria adopted for this research considered updated teaching plans for the 2022/2023 period from HEIs with medical programs in operation for more than six years, featuring competency-based curricula. Medical programs that had initiated academic activities after the start of the research, those with less than six years of operation—meaning they had not yet completed the full period of medical internships—or those that denied access to the documents were excluded.

During data collection, a specific checklist was developed for organizing and categorizing the information from the teaching plans. This checklist included the identification and coding of the HEI, discipline, workload, academic period, instructors, syllabus, learning objectives, program content, teaching methodology, evaluation methods, and references. The content analysis was supported by the IRaMuTeQ software and grounded in a literature review on the topic. The data were correlated with the 2014 DCNs and the CanMEDS 2015 framework.

2.4 Data Analysis

The content analysis involved a detailed examination of the learning objectives in the mandatory internship courses to identify the relationship between curricular competencies and the core domains proposed by the DCNs and the CanMEDS framework. These competencies were analyzed within the domains of healthcare delivery, health management, and health education, as well as across the roles defined by CanMEDS, namely medical expert, communicator, collaborator, leader, health advocate, scholar, and professional.

To delineate the competencies precisely, Bloom's taxonomy was employed to associate educational objectives with the corresponding cognitive levels, and Miller's pyramid was used to analyze skills and knowledge across various levels of practical application, based on the verbs used in the learning objectives.

Bardin's content analysis was conducted through three fundamental stages, following a rigorous and systematic process for interpreting the data: pre-analysis, material exploration, and result processing.

Pre-analysis: First, we systematized the teaching plans that would be analyzed for selection and defined teaching plan corpus research. Learning objectives set the goals of the analysis, thereby also establishing tentative investigative categories where clear reading and coding criteria were available. It was important to rough out the framework at this stage so that we could focus on what data to interpret from here.

Material Exploration: During this phase, the learning objectives were examined for their verb statements and these verbs were used as search terms to locate meaningful units and patterns in read-throughs of exhaustive reading on individual competencies (derived from DCNs) or roles (from the CanMEDS group). Codes and categories were developed under the predetermined thematic domains (such as healthcare delivery, health management, leadership, and medical expert comprising CanMEDS roles). The process of exploration helped to structure and organize all the information.

Data Analysis and Interpretation: In the final stage, data were interpreted according to theoretical frameworks used, thereby identifying relationships between learning objectives and competence measures. Results were synthesized and critically analyzed to identify trends as well as gaps in the studied curricula. This stage had as its objective the translation of the data collected into useful information in order to have a greater comprehension of this curricular documents and to propose implications for educational practice based on these learning objects from participating medical schools.

Mots Clés: Data analysis, IRaMuTeQ (Interface de R pour les Analyses Multi-dimensionnelles de Textes et de Questionnaires), word clouds, similarity analysis, and descending hierarchical classification all offered some features that improved the interpretability of entries and enabled a comprehensive overview of competencies present in study programs.

Word Cloud: It is a graphical representation of the most frequently used words in the corpus analyzed, allowing the establishment of visual correlations enabling the easy identification of the concepts that are more frequently repeated in teaching plans. The more common the term, the bigger it is in the cloud, suggesting a highly central theme of syllabus.

Similarity Analysis: It maps how words or concepts are implicitly connected. This enabled us to recognize the semantic structure of a text and its most representative term relationships, as well patterns which determine how competencies are organized when they apply.

Descending Hierarchical Classification (DHC): DHC divides the corpus into semantic clusters, enabling a superior examination of both themes. This method allowed for the development of categories that represented salient themes in order to understand patterns across competencies and their connection within different curricular elements.

Not only does this tool present a graphical rendering in an intuitive manner, IRaMuTeQ also enables users to confirm term frequencies and categorize data into hierarchical groups through multidimensional analysis of texts. These functions

proved to be pivotal in locating trends, commonalities, and disparities among the teaching plans. This rendered a comprehensive overview of competence integration within current medical education approaches and contributed towards uniformity through an objective evaluation of curricular data.

2.5 Ethical Implications

This project was submitted to the Collegiate of the Graduate Program in Health and Development in the Midwest Region (PPGSD) and approved by the Research Ethics Committee (CEP) of UFMS, according to Resolution No. 466/12 of the National Health Council. The research relied on the Free and Informed Consent Form (ICF) and the Institutional Authorization Term (IAT), with all HEIs approving the study.

3. Results and discussion

This study investigated the learning objectives present in the curricula of competency-based medical education, aiming to understand the relationship between these objectives and the competencies proposed by the DCNs and the CanMEDS framework. The data analysis sought to provide a clear view of the alignment between the competencies developed in medical programs and national and international educational guidelines.

A total of 36 teaching plans (n=36) were analyzed, representing the complete sample from five universities in a Brazilian state, including four public institutions and one private institution. The investigation focused on the learning objectives outlined in the teaching plans of mandatory internships, examining how these objectives align with the professional competencies required in medical training. Emphasis was placed on analyzing action verbs, correlating them with Bloom's taxonomy and Miller's pyramid to gain deeper insight into the descriptions of the competencies.

The taxonomy proposed by Krathwohl et al. (1999) is one of the existing instruments to facilitate the process of curriculum matrix in higher education courses, and aims to help in the planning, organization, and control of learning objectives. It presents itself as a powerful tool for learning objectives and assessments, and fits the competency-based educational model (Oliveira et al., 2016).

According to Beck et al. (2023), the levels of Bloom's taxonomy can be understood as remember, understand, apply, analyze, evaluate, and create. Regarding assessment, competency-based medical education combines concepts from various educational frameworks, such as Miller's pyramid for assessing student progression (McCloskey et al., 2017). Thus, according to the revised Miller's pyramid, medical training is based on the following five levels: knows, knows how, shows how, does, and is (Marchini & Silva, 2022).

The results are presented to identify patterns and relationships between the learning objectives and the thematic axes of the DCNs—healthcare delivery, health management, and health education —and the CanMEDS roles, namely medical expert, communicator, collaborator, leader, health advocate, scholar, and professional. The teaching plans were organized and regrouped based on

common characteristics and significant differences, demonstrating their alignment with the objectives proposed in the research.

The analysis revealed that the verbs "know," "develop," and "perform" were the most frequently used in the learning objectives, highlighting a focus on knowledge acquisition, skill development, and the practical application of these competencies. The findings indicate that the analyzed curricula align with the guidelines of both the DCNs and CanMEDS, with a consistent emphasis on healthcare delivery, health education and health management. Thus, the education provided by these medical institutions promotes competency-based learning aligned with both national demands and international expectations for medical practice.

In summary, the results presented in this section contribute to a deeper understanding of the relationship between learning objectives and curricular competencies. The detailed interpretations provide a comprehensive view of the educational practices analyzed, offering valuable insights for future improvements and adjustments in medical curricula to ensure comprehensive training aligned with the demands of contemporary medical practice.

Teaching Plan with Learning Objectives

The element that can be noted about learning objectives also followed Bloom's taxonomy: each description starts with action verbs in infinitive. It allows the alignment of students' competencies that need to be honed and instructors using Miller's pyramid to evaluate these. Developed in 1956, Bloom's taxonomy is a helpful resource whereby learning objectives can be planned and organized within a program of instruction to help conceptualize the organization and planning of curriculum maps used at HEIs. It can be a useful tool for learning objectives and evaluation aligned with the competence-based educational model (Olivera et al., 2016).

Beck et al. (2023) present the following levels of Bloom´s taxonomy: remember, understand, apply, analyze, evaluate, and create. With regard to evaluation, competency-based medical education utilizes ideas from a range of instructional styles that include Miller's pyramid evaluating student competence (McCloskey et al. 2017). Marchini and Silva (2022) adapted Miller's pyramid of medical education into five levels structured as "knows", "knows how", "shows how", "does", and "is". These taxonomies are commonly used in medical education to identify learning objectives, curricular designs and assessment procedures (Dominguez-Torres & Vega-Peña, 2023).

Although the learning objectives section commences by using performance verbs that prompt action, there is not a format for writing style across all plans — indicating individuality in approach, given those are being written from scratch. General objectives are defined in some plans, while specific ones are outlined in others. However, there is little information about the competencies related to knowledge, skills, and attitudes. One of the institutions also identified the psychomotor, cognitive and affective domains.

The verbs found in the drafting of the learning objectives from teaching plans were compared to examine how DCNs and CanMEDS references are used

concretely to design internship curricula implemented in medical programs. The transition from theory to practice is one of the main points in educational planning; curricular aims with professional internships are fundamental elements ensuring that competencies standardized by recent references (used as basis for this study) will be effectively applied within internship periods. This contributes towards convergence with academic graduation consolidation to prepare graduates who apply their knowledge more confidently to future challenges. This integration ensures that faculties shape students' professional attitudes.

Word Cloud of Action Verbs

Figure 1 illustrates a word cloud based on the verbs taken from the learning objectives of the planning activities analyzed. Such visualization provides an integrated display of the prioritized actions at different levels, in turn enabling a means to understand major patterns and trends underlying educational competencies.

Figure 1: Word Cloud

The verbs "to accomplish", "to know" and "to develop" appear most frequently, indicating a strong inclination towards action, the acquisition and the continuous evolution of knowledge, attitudes, and practical skills. This is in line with the competencies described by the DCN and CanMEDS in which the ability to perform procedures, know the basis of the theoretical foundations of medical practice and health systems, and develop interpersonal and technical skills are fundamental. "Recognizing" and "identifying" reflect diagnostic competence, which is essential for any physician, while "training" and "guiding" resonate with

the physician's role as an educator, both regarding patients, teammates, and the community.

A critical analysis of Bloom's taxonomy revealed that these highlighted verbs present the evolution and ascension of the knowledge acquired throughout the training for practice in the mandatory internships. Verbs such as "know", "recognize", "identify" and "learn" are linked to the first two levels of the basis of the cognitive domain (remember and understand) and are part of a necessary and fundamental theoretical foundation for the profession. Verbs such as "accomplish", "develop", "train", "guide", "promote", "integrate" and "evaluate" are part of the top of Miller's pyramid (evaluate and create), justifying its prominence in this stage of training.

Transcending the analysis to Miller's pyramid, this ascension and evolution are also observed where the basis of "knows", "knows how" and "does" is related to the action verbs of the competencies described here. Examples of sentences that used these verbs in the learning objectives of the plans include the following:
"Perform the diagnosis; perform the clinical interview; perform anamnesis; perform a physical examination; perform medical care under supervision…"
"Develop skills; develop clinical reasoning; develop the ability to manage; develop attitudes; develop capacity..."
"Know the most frequent diseases; to know the technical-scientific foundations; to know the health care networks; to know the dynamics of health services..."

When correlating with the DCN and CanMEDS, we can observe that the verbs "integrate", "value" and "stimulate" highlight the importance of a medical practice integrated into the health system which values ethical and humanistic aspects, echoing the social responsibilities emphasized by the DCN, in addition to stimulating clinical conducts for disease prevention and health promotion. At the same time, "promote" and "evaluate" indicate an emphasis on public health and clinical critical evaluation skills, aligning with CanMEDS' health promoter and medical expert competencies.

It is noted that Bloom's affective domain is present in the curricula, with verbs such as "value" and "stimulate" being linked to feelings and postures as exemplified in the description of the plans as follows:
"Valuing the SUS; valuing preventive actions in health promotion; valuing medical propaedeutics; valuing the medical record..."
"Stimulate the entrepreneurial, critical, creative and leadership spirit; to stimulate the responsibility of professional performance towards the patient; stimulate the production of knowledge about Medicine..."

The verbs "take", "treat" and "use" point to clinical decision-making, the use of therapeutic and technological resources, and the essential skills of competencies outlined by both the DCN and CanMEDS. Finally, "learning" and "acting" highlight continuous learning and competence through the ability to act, reflecting the profile of the medical professional as a lifelong learner and an active agent in the health system.

In order to perform the similarity analysis in Figure 2 and to correlate the elements of the CanMEDS and the DCN to the stages of medical training, it was first necessary to understand the concept of this similarity analysis. This analysis sought to identify patterns of proximity among concepts, ideas or words, usually represented in a conceptual or semantic map, where clusters or groupings are formed. The links among these clusters indicate relationships of similarity or functional association. The stronger the connection or the closer the location, the greater the similarity or relationship among the concepts.

To perform the similarity analysis presented in Figure 2 and correlate the elements of CanMEDS and the DCNs with stages of medical education, it was then essential to understand the concept behind this methodology. The purpose of similarity analysis is to identify patterns of proximity among concepts, ideas, or words, typically visualized through a conceptual or semantic map where clusters or groupings are formed. The connections among these clusters indicate similarities or functional associations. The strength and proximity of these connections reflect the degree of similarity or relationship among the concepts—stronger links or closer locations suggest a higher degree of correspondence or integration among the analyzed elements.

The analysis of Figure 2 reveals that the blue cluster, in which the word "perform" occupies a central position, groups verbs associated with action and practice, such as "understand", "attend", "accompany", "learn", "create" and "encircle". This cluster reflects the operational core of medical practice, representing essential competencies for healthcare professionals who are required to intervene, act, and execute effectively in clinical settings.

Moreover, the cluster emphasizes the importance of practical competence and action, aligning with the "does" level of Miller's pyramid, which refers to the physician's ability to demonstrate expected behaviors and skills consciously in professional practice. In this way, the grouping suggests the articulation of competencies related to effective performance, highlighting the transition from theoretical knowledge to practical execution—a fundamental characteristic of competency-based medical education.

This blue cluster not only symbolizes action, but also intertwines with other aspects of medical education, reflecting the multifaceted nature of the physician as a communicator, collaborator, leader, healthcare professional, student, and lifelong learner, as described by CanMEDS. For example, the link to the purple cluster, containing "guide" and "identify," aligns with the "knows how" competency of Miller's pyramid, whereby the physician knows when and how to apply the appropriate behaviors and knowledge.

The main link between "performing" and the clusters of "recognizing" (green) and "developing" (light orange) indicates a strong correlation between practice (performing), the identification of health conditions (acknowledging) and continuous professional improvement (developing). In the context of CanMEDS, this can be seen in the combination of the competencies of a medical expert and a

lifelong learner, highlighting the need for practical, theoretical and continuous development skills.

The analysis suggests a progression from competence to performance and action, consistent with the transition from "knows how" to "shows how" and "does" levels in Miller's pyramid. This progression highlights the physician's ongoing development, from acquiring knowledge to practical application and adopting conscientious professional behavior.

The proposal to add a fifth level to Miller's model, "is", which reflects professional identity, is echoed in Figure 2, where the ability to "value" and "respect" in the pink cluster can be seen as part of the formation of professional identity, where the physician incorporates values and attitudes in patient care.

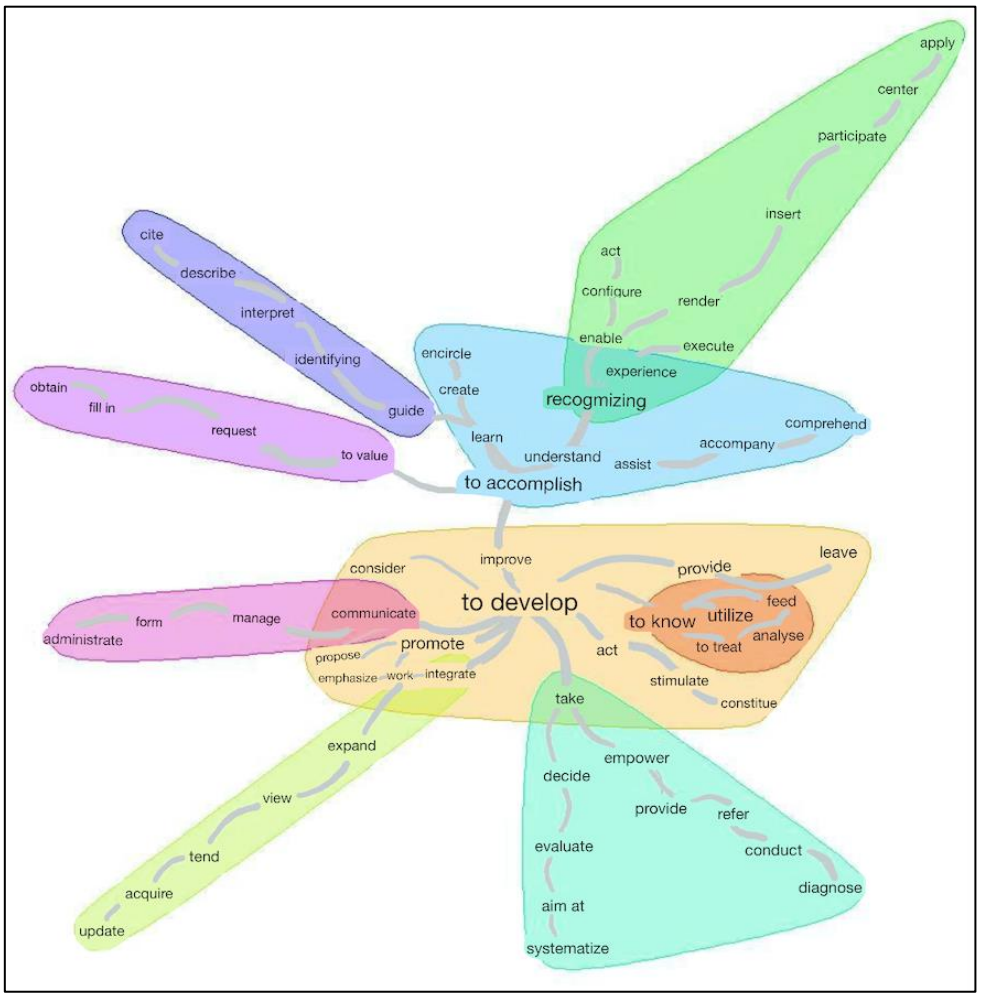

Figure 2: Similarity Analysis

Additional clusters connected to "developing" bring to the fore the nuances of medical practice, such as management and communication (light pink), knowledge acquisition and integration (light green), decision-making and capacity building (teal green), and application of technical knowledge (dark orange). These connections can be interpreted as a reflection of the multiple facets

of the physician, which include being a manager and a public health agent (DCN), as well as the need for continuous updating and applying of technical-scientific knowledge (CanMEDS).

Figure 2, aligned with the concepts of competency-based medical education and the stages of Miller's pyramid, illustrates both the essential competencies for medical practice and the process of developing the professional identity of future physicians. The representation highlights the importance of continuous formative assessment, which supports students throughout their educational journey—from the acquisition of knowledge to its practical application in real-world contexts.

The figure emphasizes the need for an educational process that combines the effective use of knowledge, clear and precise communication, the application of professional attitudes, and the development of technical and scientific skills in clinical practice. When integrated, these elements ensure that medical education not only prepares competent professionals but also promotes a practice committed to caring for both individuals and communities, in alignment with the principles of competency-based medical education.

The descending hierarchical classification (DHC), also known as the Reinert method, is a textual analysis technique that segments data into classes based on the frequency and context of word occurrences. This method allows for the identification of underlying themes and structural patterns within the text by grouping segments that share similar vocabulary and reveal semantic similarities.

The results of this analysis are typically presented through a dendrogram (Figure 3), which provides a visual representation of the identified classes and the relationships among them. Each class reflects a coherent set of concepts or themes, offering deeper insight into the organization and connections among the analyzed elements. This facilitates systematic and well-grounded interpretations of the textual data.

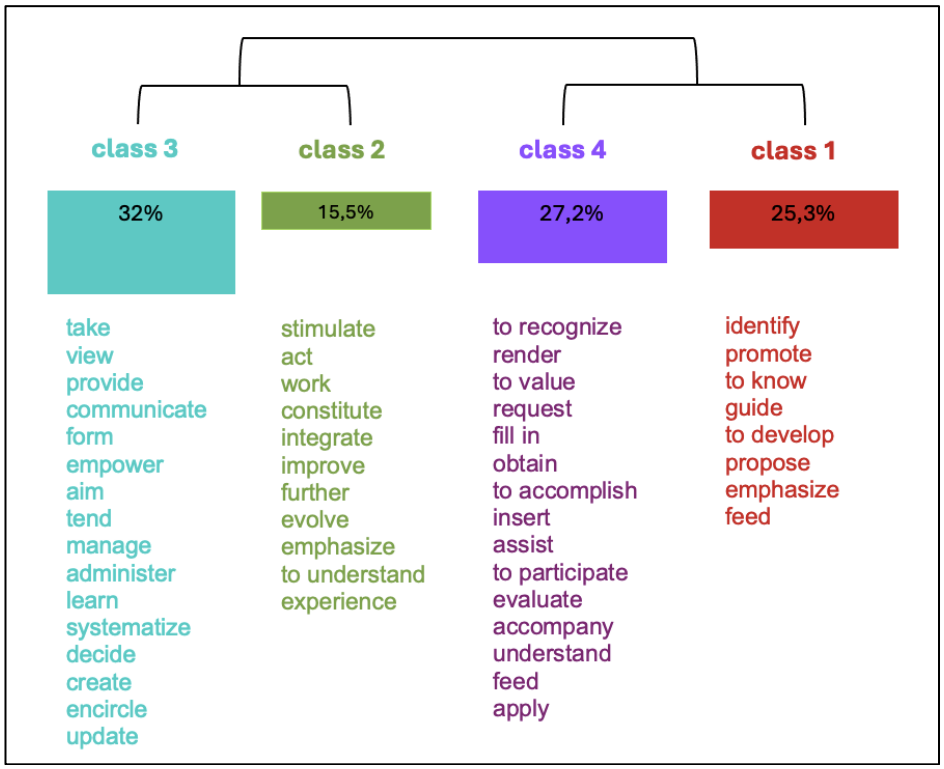

Figure 3: Dendrogram

An analysis of the dendrogram results reveals that Class 1 reflects a focus on actions such as identifying health needs, promoting education and skills development, and guiding medical practice. This class resonates with CanMEDS when it comes to competency-based medical education, where the identification and development of skills is essential.

Class 2 highlights actions such as stimulating learning, working as a team and integrating health services, aligning with the DCN with regard to interdisciplinary training and health management, as well as with the role of collaborator and leader of CanMEDS.

Class 3 focuses on managerial and decision-making skills such as managing resources, making informed decisions, and communicating effectively. This is consistent with the health management and health care areas of the DCN, as well as with the roles of leader and communicator in CanMEDS.

Class 4 emphasizes the practical application of competencies in performing procedures, valuing professional ethics, and active participation in the health system. These actions find parallels in the attention to individual health needs of the DCN and in the role of expert physician of CanMEDS.

The dendrogram reveals that Classes 1 and 4, with a practical focus and oriented towards the application of knowledge, skills and attitudes, are connected. This suggests a transition from learning and developing competencies to their application in clinical practice. Similarly, Classes 2 and 3 are interconnected,

indicating the importance of collaboration and leadership in health care management and education.

When analyzing the learning objectives section individually in the teaching plans of the HEIs, it is observed that most of the curricula of the medical courses are in line with the curricular competencies recommended by the DCN and CanMEDS. The exception is one HEI that does not have the learning objectives section in its teaching plan; it only outlines the competencies in the form of contents.

The analysis suggests that medical programs grounded in the DCNs and CanMEDS frameworks share essential principles such as effective communication, competent management, continuous education, and the practical application of knowledge. Both frameworks emphasize the importance of an integrated and multidisciplinary approach in medical education, focusing on the development of professional competencies, collaboration, and leadership.

These elements highlight the importance of a robust curricular design capable of preparing future physicians to meet the growing and complex demands of public health. Integrating these principles into medical curricula is essential to ensure comprehensive training, equipping professionals to perform their roles competently and contribute meaningfully to the well-being of the population.

Based on the results obtained through content analysis, the discussion can be expanded by considering that the design of a medical program curriculum goes beyond the mere allocation of disciplines. The development of teaching plans requires a clear and precise identification of the essential competencies to be cultivated throughout professional training (Souza & Negro-Dellacqua, 2021). This approach ensures that the curriculum aligns with educational and professional objectives, promoting training oriented toward the development of the skills, attitudes, and knowledge necessary for competent medical practice.

Curricular guidelines, both nationally and internationally, emphasize the importance of integrating content, disciplines, areas, and professions within health curricula, particularly in medical education (Iglésias & Bollela, 2015). However, the curriculum should be understood as more than a simple list of content and learning objectives. It transcends the informative dimension and the intentions expressed in teaching plans, functioning as a strategic pedagogical tool aimed at building essential competencies (Dent et al., 2020). Thus, the curriculum plays a crucial role in articulating knowledge, skills, and attitudes, guiding medical education toward achieving the expected educational and professional outcomes.

Franco et al. (2014) reflect that, when analyzing teaching plans, the absence of competencies recommended for medical education is noted frequently. However, this does not mean that they are necessarily absent in teaching, but that for some reason they were not made explicit in the plans. Inevitably, this is owing to the complexity of transposing to a written language, with the competencies being more linked to practical activities and attitudes.

The DCNs of Brazil and the CanMEDS of Canada are two systems designed to guide health education, more specifically in the area of medicine. They reflect the expectations of their respective societies and health systems relating to medical professionals. The relationship between these two sets of guidelines is complex because although they share similar proposals, such as the training of competent physicians who are sensitive to the needs of patients, they emerge from different cultural contexts and health systems, which leads to differences in their approaches and emphases.

Results and Educational Implications: The results of this research have a significant impact on the curricular planning of medical schools, both in Brazil and globally. They provide guidelines for selecting learning objectives that inform the development of competency-based teaching plans. These plans reflect the academic preparation of future physicians, aiming to achieve excellence in medical education across institutions. However, neither the DCNs nor the CanMEDS framework should be applied as rigid models; each institution must align these guidelines with its local culture and specific context to ensure updated, critical, and innovative pedagogical projects that engage the regional community.

When considering curricular planning and implementation, competency-based curricula involve three fundamental pedagogical actions: planning, execution, and evaluation. These stages must be carefully developed by faculty and academic committees responsible for curriculum design. It is essential to integrate national and international trends with local realities to ensure that teaching plans reflect the desired professional profile for medical graduates.

Execution and Institutional Identity: The execution of the curriculum reflects the practical aspect of planning, where faculty and students follow the structure outlined in the curriculum matrix and teaching plans. At this stage, the characteristics of pedagogical activities express the identity and uniqueness of each institution, ensuring that classes are planned and conducted according to the learning objectives. This clear alignment facilitates the evaluation of educational outcomes and the development of the expected competencies.

The research demonstrated that the curricula of mandatory internships in medical programs in Mato Grosso do Sul align with both national and international standards for medical education. Through the analysis of learning objectives, it was confirmed that these curricula correspond to the competencies necessary for medical practice, meeting the expectations outlined in both the DCNs and the CanMEDS framework. This alignment highlights the robustness and appropriateness of the teaching plans in preparing professionals to face contemporary healthcare challenges.

As discussed, the integration of competencies in the medical internships of Mato Grosso do Sul follows global trends. The goal of these curricula is to prepare students with specific skills, knowledge, and behaviors through well-defined educational outcomes. Effective integration requires both horizontal integration—

connecting disciplines within the same phase of the program—and vertical integration—linking basic sciences with clinical practice, making learning more relevant and contextualized throughout the various curricular stages.

Challenges and Gaps in Curriculum Alignment: Although alignment was a central focus of the results, it is important to note that in Mato Grosso do Sul, as in other regions, challenges and gaps may arise in fully aligning curricula with national and international regulatory frameworks to meet professional expectations. Schools must ensure that theoretical knowledge is effectively translated into clinical practice through continuous educational planning and pedagogical strategies.

These gaps may arise in areas such as faculty planning, interdisciplinary collaboration, and logistical limitations. For instance, inconsistent faculty training and limited pedagogical resources can hinder the full implementation of competency-based principles, thereby affecting the quality of education. Moreover, some institutions may struggle to create individualized learning pathways and consistent assessments, leading to variations in student outcomes.

Overcoming Gaps and Promoting Reform: To overcome these gaps, it is essential to reflect on and rethink curricular reforms continuously, focusing on ongoing faculty development, using integrated teaching models, and fostering a supportive academic learning environment. Higher education institutions in Brazil and worldwide must adopt innovative pedagogical methods to align with competency standards. This ensures that students are prepared to meet both local and global healthcare demands (Penrabel et al., 2022).

Implementing effective reforms will require strong leadership and coordination among faculty teams to balance regional healthcare needs with international medical education standards. This approach will ensure the training of competent and adaptable professionals ready to address evolving healthcare challenges.

4. Conclusion

This study analyzed the curricula of internships in medical schools in the state of Mato Grosso do Sul, Brazil, based on the learning objectives outlined in their teaching plans. The results demonstrate that these curricula align with the DCNs and the international CanMEDS framework, reflecting coherence between locally defined competencies and the expectations established by the roles described in CanMEDS. This convergence highlights that both frameworks are essential for ensuring CBME, equipping professionals to meet the specific demands of the national context as well as the evolving global challenges in healthcare.

While the DCNs and CanMEDS share common principles—such as effective communication, management, continuous education, and the practical application of knowledge—they exhibit some contextual nuances. The DCNs prioritize education focused on Brazil's social reality and public health, aligning with the principles of the Unified Health System (SUS). In contrast, CanMEDS, with its role-based structure, offers a flexible model adaptable to different

international contexts, providing a broader perspective on how medical education can address both local and global demands.

The analysis of the teaching plans revealed the predominance of learning objectives expressed through verbs such as "know," "develop," and "perform," reflecting the acquisition of knowledge, the development of practical skills, and their application in healthcare delivery, health education, and health management These objectives align with the competencies outlined in the DCNs as well as the roles defined by CanMEDS, covering the dimensions of medical expert, communicator, collaborator, leader, health advocate, scholar, and professional.

The findings suggest that the curricula of mandatory internships in the analyzed medical schools are consistently structured and competency oriented. Furthermore, a clear alignment was identified between the competencies proposed in the local curricula and those recommended by national and international frameworks. As a result, the education provided by these programs prepares qualified professionals to respond effectively to current demands, both within national and international contexts, ensuring the competence and performance required for contemporary medical practice.

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