

Theoretical considerations on the pedagogical competencies of Imaging and Medical Radiophysics teachers

Consideraciones teóricas sobre las competencias pedagógicas de los docentes de Imagenología y Radiofísica Médica

Considerações teóricas sobre as competências pedagógicas dos professores de Imagem e Radiofísica Médica

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ABSTRACT

Introduction: the permanent training of teachers constitutes a constant challenge for universities. Cuban medical education demands the development of pedagogical skills in correspondence with the global panorama. The teachers of the Imaging and Medical Radiophysics career lack pedagogical training in the undergraduate degree that guides them in the conduct of the educational teaching process. **Objective:** to analyze the relevance of the development of the pedagogical competencies of the Imaging and Medical Radiophysics teachers. **Method:** the inductive-deductive method and the analytical-synthetic method were used. A bibliographic review was carried out in journals indexed in PubMed, SciELO, Science Direct, Elsevier, by carrying out three stages: identification of information sources, literature review and extraction and compilation of information. **Results:** the

authors' approach to the theoretical references consulted allowed them to demonstrate the regularities of pedagogical competencies in medical education and the need for their continuous and upward development in the aforementioned teachers. Discussion: medical education faces theoretical and practical challenges that lead to the development of professional and pedagogical skills and the training of human resources in quality health. **Conclusions:** the development of the pedagogical skills of Imaging and Medical Radiophysics teachers is a necessary and urgent process. The ongoing training of teachers is demanded in accordance with the changes that occur internationally in technology, health and education.

Keywords: pedagogical skills; Imaging and Medical Radiophysics; medical education



RESUMEN

Introducción: la formación permanente de los docentes constituye un reto constante para las universidades. La educación médica cubana demanda el desarrollo de competencias pedagógicas en correspondencia con el panorama mundial. Los docentes de la carrera Imagenología y Radiofísica Médica adolecen de formación pedagógica en el pregrado que los oriente en la conducción del proceso docente educativo.

Objetivo: analizar la pertinencia del desarrollo de las competencias pedagógicas de los docentes de Imagenología y Radiofísica Médica. **Método:** se empleó el método inductivo-deductivo y el analítico-sintético. Se realizó una revisión bibliográfica en revistas indexadas en PubMed, SciELO, Science Direct, Elsevier, mediante la ejecución de tres etapas: identificación de las fuentes de información, revisión de la literatura y extracción y la recopilación de la información.

Resultados: el acercamiento de los autores a los referentes teóricos consultados permitió demostrar las regularidades de las competencias pedagógicas en la educación médica y la necesidad del desarrollo continuo y ascendente de las mismas en los referidos docentes. **Discusión:** la educación médica enfrenta desafíos desde lo teórico y práctico que conducen al desarrollo de competencias profesionales, pedagógicas y la formación de recursos humanos en salud de calidad.

Conclusiones: el desarrollo de las competencias pedagógicas de los docentes de Imagenología y Radiofísica Médica es un proceso necesario e impostergable. Se demanda la formación permanente de los docentes en correspondencia con los cambios que se suceden a nivel internacional en lo tecnológico, sanitario y educativo.

Palabras clave: competencias pedagógicas; Imagenología y Radiofísica Médica; educación médica

RESUMO

Introdução: a formação permanente de professores constitui um desafio constante para as universidades. A educação médica cubana exige o desenvolvimento de competências pedagógicas em correspondência com o panorama global. Os professores da carreira de Imagem e Radiofísica Médica carecem de formação pedagógica na graduação que os oriente na condução do processo educativo de ensino. **Objetivo:** analisar a relevância do desenvolvimento das competências pedagógicas dos professores de Imagem e Radiofísica Médica.

Método: foram utilizados o método indutivo-dedutivo e o método analítico-sintético. Foi realizada uma revisão bibliográfica em periódicos indexados no PubMed, SciELO, Science Direct, Elsevier, realizando três etapas: identificação das fontes de informação, revisão da literatura e extração e compilação das informações.

Resultados: a abordagem dos autores aos referenciais teóricos consultados permitiu demonstrar as regularidades das competências pedagógicas na educação médica e a necessidade de seu desenvolvimento contínuo e ascendente nos referidos professores.

Discussão: a educação médica enfrenta desafios teóricos e práticos que levam ao desenvolvimento de competências profissionais e pedagógicas e à formação de recursos humanos em saúde de qualidade. **Conclusões:** o desenvolvimento das competências pedagógicas dos professores de Imagiologia e Radiofísica Médica é um processo necessário e urgente. A formação contínua de professores é exigida de acordo com as mudanças que ocorrem internacionalmente na tecnologia, na saúde e na educação.

Palavras-chave: competências pedagógicas; Imagiologia e Radiofísica Médica; educação médica

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INTRODUCTION

The World Conference on Higher Education of the United Nations Educational, Scientific and Cultural Organization (UNESCO) oriented and instructed the relevance of continuing education for university teachers, especially their pedagogical training. In this sense, and from this level, the development of research, updating and renewal of knowledge, as well as the improvement of pedagogical competencies, are considered important. The emphasis is on stimulating the systematic innovation of curricular design, its progress, evaluation and certification.^(1,2,3) The essential interest consists in guaranteeing teaching excellence, the resolution of scientific problems and the maintenance of the quality of pedagogical competencies.^(4,5,6)

Thus, the training of experienced human resources with comprehensive knowledge, skills and attitudes towards life is a social necessity at the global level. The solution of the problems facing humanity today is only possible through analysis and rational decision making, which should lead to coherent actions in the face of different problem situations.

On the other hand, the social demands on the health and education sectors demand excellence in the preparation of professionals. The quality of life of the population, as well as the conception and implementation of healthy lifestyles, will depend to a great extent on it.⁽⁷⁾

Higher medical education requires, particularly from teachers, the development of dynamic pedagogical competencies to sustain its key processes.^(1,8,9) The interest in strengthening the performance of teachers is sometimes limited by the explosion of enrollment. This can have a negative impact on the quality of educational outcomes.

The authors of this research consider that, although in-service education is privileged as a guiding principle, the opportunity to improve pedagogically the professionals working at the different levels of care has been consistent.^(10,11,12) The pedagogical preparation received at the undergraduate level is still insufficient to face the challenges in this regard in medical universities.

At this point, it is necessary to emphasize that this research focuses its interest on graduates in Medical Imaging and Radiophysics (IRFM) who perform teaching functions. This specialist deals with the use of electromagnetic radiations of ionizing or non-ionizing nature, which allow the diagnosis by means of images and the treatment of affections of the human body. The various diagnostic imaging and therapeutic modalities constitute systems of knowledge and procedures of an interdisciplinary nature, which are also multidisciplinary.^(5,6,8,13,14)

Thus, he performs professionally in the management of various technologies that produce medical images depending on the human anatomy linked to physiology. Likewise, professional skills include the interpretation of imaging studies, identification of abnormal radiological signs, application of the principles of radiological protection and safety in Nuclear Medicine (NM), Radiotherapy (RT) and Radiodiagnosis (RxD).



The development of teaching skills in these specialists must be based on the basic functions they perform. These are: assistance, administration, research, special (the fulfillment of those activities mandated by the national health system, particularly for disasters and exceptional situations) and teaching.

With regard to the latter, development in this regard has been limited for the specialty of FMRI as for the rest of the graduates of the health sector; in principle, because the undergraduate training does not sufficiently include pedagogical or didactic-methodological subjects.^(3,5,6,8,11) This limitation leads to a slow development of pedagogical skills.

The authors of this research maintain that for a pertinent performance, teachers must have the necessary pedagogical competencies. Their preparation and improvement must be constantly improved, since they are necessary presuppositions for the quality of the teaching-educational process. The results derived from this process have a significant influence on patient care.

The background of this research is approached for its understanding from the approach made by the authors to the work of several researchers. Thus, the theoretical foundations of the pedagogical competencies required for teachers of medical education, especially those of the IRFM career, are investigated.

Thus, it is interesting that although research on pedagogical competencies in medical education has been conducted according to different approaches,^(8,11,15,16) it is necessary to deepen its contextualization and the relationship with the professionalization of teachers of the FMRI career.

The aforementioned allows the authors to declare as the purpose of the research, to analyze the relevance of the development of the pedagogical competencies of the FMRI teachers in the current context for medical education.

METHOD

To achieve the proposed objective, the authors used inductive-deductive and analytical-synthetic methods. Likewise, they carried out a bibliographic review through the execution of three stages:

1. Identification of information sources. The search for information was directed to electronic journals in the databases PubMed, SciELO, ScienceDirect, Elsevier and doctoral theses published mainly in the last five years. The areas of knowledge on medical education, higher education and development of professional competencies with pedagogical implications in FMRI were determined.
2. Review of the literature. The theoretical contribution of the authors consulted was explored for the discussion of the constructs on which the present research is based, preferably those of medical education and higher education. In addition, authors who propose alternatives for the development of pedagogical competencies in their research were consulted.



3. Extraction and collection of information. Cardinal information was extracted on the pedagogical competencies of medical education teachers, with emphasis on FMRI. The selection criteria were based on timeliness, relevance, contextualization and levels of professionalization to be developed through advanced education.

RESULTS

The term competency is becoming more and more common nowadays. Although it has different meanings, it refers to the profession or trade that a person performs; to the training for life, to the productive capacity of the individual. It is a term that began to appear strongly in the scientific literature in the 1960s. It is considered to be mostly associated with the terms efficiency and quality in work performance.

There are multiple and varied conceptual approaches to work or professional competence. If at first the definitions were centered on the opinion of experts, today the theoretical framework extends to national training institutions such as: the National Training Authority of Australia, the Ministry of Labor of Chile, the National Qualifications Authority of England, the National Ministry of Education of Brazil, among others.⁽¹⁷⁾

In this way, competencies can be classified from different points of view. The most common is generic and specific, basic and professional. It is also recognized that “they are the knowledge, experience and skills necessary to perform activities or tasks effectively and efficiently”.⁽¹⁸⁾ This argument suggests that, in the first place, they are determining factors in the selection of candidates for certain tasks or areas of knowledge. They are also the basis for evaluating the contribution to the development of an employee's job.

Competencies correspond to know-how in context, in which cognitive resources are mobilized and knowledge, skills and values are integrated. These elements enable individuals to cope with different situations in their professional activities. Thus, competencies show an individual's skills and likelihood of success. These aspects will make it possible to evaluate the quality of a professional.⁽¹⁹⁾

In the educational field, it refers to teaching, pedagogical and didactic competencies. These are aspects that contribute to pedagogical training and the corresponding performance of the teacher. They are elements that coexist as a product of a professionalization process in the pedagogical field.

In the case of university teachers, the study of pedagogical competencies has been developed internationally with the aim of generating teaching profiles. These are to guide teacher training/training and evaluation. Teaching in today's university requires knowledge, skills and attitudes that are different from those needed 20 years ago.^(18,19)



The authors of the present research agree that one of the competencies to be developed should be the investigative one as a way to transform one's own competencies.⁽⁶⁾ What is expressed by Hernández-Navarro⁽⁶⁾ takes into account the set of qualities that make possible the self-regulation of the teacher's behavior for the integration of scientific knowledge, skills and abilities that account for the pedagogical exercise. It unifies in a single term the executive and inductive elements for the creation and self-creation of the pedagogical personality through a self-critical analysis carried out by the university professor.

In this regard, the pedagogical competences of the teacher for this research, transcend the didactic developments as their contribution to the improvement of situations and formative problems whose social impacts are recognized.⁽¹⁶⁾ Similarly, the referred author characterizes a set of dimensions that have to do with the design, development and evaluation; also with the educational management and its pedagogical performance. The authors of this research find the emphasis made by the aforementioned author on the constant need for innovation and research to sustain university pedagogical competencies enriching.

The authors of this research identified the following as regularities of the pedagogical competencies of medical education teachers:

- ✓ The development of pedagogical competencies generates teaching profiles.
- ✓ The pedagogical competencies of teachers in higher medical education reach and sustain their development at the postgraduate level.
- ✓ They contribute to pedagogical training and the corresponding teaching performance.
- ✓ Teaching in higher medical education requires differentiated and innovative skills.
- ✓ From the development of professional competencies inherent to each medical specialty, the development of pedagogical competencies is encouraged and particularized.
- ✓ The development of pedagogical competencies in teachers allows the development of cognitive and intellectual skills in students.
- ✓ The theoretical inquiries of the articles reviewed allow us to point out the following as regularities of medical education teachers.
- ✓ They are not trained as university teachers.
- ✓ They are responsible for the identification, evaluation and control of the inadequacies related to teaching, research, assistance and management functions in students.
- ✓ They are responsible for the training of human resources at the undergraduate and graduate levels.
- ✓ They perform assistance and teaching functions.



DISCUSSION

Medical education faces several challenges. It has the theoretical and practical challenge of training competencies in future professionals. Since many are dedicated to teaching, whether part-time or full-time, they must develop in their own profession and in teaching. It is for this reason that training and developing pedagogical competencies emerges as a necessity for the improvement of the teaching function. It also increases the quality of the professional role in patient care.

The teacher practicing in medical education is considered a university professor, whatever graduated in Medicine, Stomatology, Nursing or Health Technologies; he also requires specific and systematic training and updating.

Consequently, teachers in these fields should include in their professional profile not only scientific and methodological competencies, but also specific competencies for teaching work: disciplinary, research,⁽⁶⁾ psycho-pedagogical, communicative, academic, administrative and humanistic; these in turn, provide a comprehensive training.^(5,8,9,10,12) They also define the ideal teacher of medical education in today's society.⁽¹⁻⁵⁾

From a global perspective of education in all its scenarios, the teacher's methods help to build significant and concrete knowledge.⁽²⁰⁾ According to several authors, they are also those that allow students to develop their cognitive and intellectual abilities in a specific way.^(12,19,20)

From the above point of view, the authors of this research agree with Paricio⁽²¹⁾ when he states that higher education contributes to the integral formation of professionals. For such purposes, one of the ways is through postgraduate programs that will be in correspondence with the scientific and technological evolution of the teaching-educational process, in this respect, in medical education as a result of globalization.^(1,5,7)

On the other hand, the authors of the present research point out that, sometimes, the curricular designs of university careers do not meet the expectations for which they were created.^(3,4,8,11) This is the main reason for the successive changes in the study plans in order to update them, the unavoidable contextualization. Curricular modifications must correspond to the social and economic needs of the country; the inadequacies resulting from their design and application must be solved through postgraduate studies.

Consequently, actions in this sense should be developed with a transforming character, which integrates and enhances pedagogical competencies for educational management; in addition to guidance, research and educational communication with the observance and fulfillment of the ethical principles of the professional of higher medical education.⁽²²⁾

Similarly, the authors of the present research point out the need for a program for the development of the pedagogical competencies of university teachers. In this sense, they agree with Machado⁽²²⁾ who proposes a model for the improvement of the pedagogical competencies of FMRI teachers.



This process conceives a structure that goes from the teaching profile to the support resources; likewise, it includes in its description the role and types of competencies to be developed, among other structural constructs. In describing the pedagogical competencies, the development of ethical behaviors in students and didactic management is taken into account, nuanced by the use of technology in the management of the teaching-educational process in a continuous and bottom-up manner.

Thus, the authors of the present research take advantage of what has been analyzed to confirm the transcendence of the pedagogical competencies that the medical education teacher must possess. He/she is a professional who diagnoses and solves problems of didactic, communicative, managerial, orientative and investigative nature; constantly attached to the fulfillment of norms and ethical principles. However, due to the nature of medical education in Cuba, educational spaces can be found in universities and health care centers, which distinguish Cuban medical education.

In line with the above, it should be noted that it is a limitation of this research to limit itself to FMRI. Most of the curricula of careers and training programs that contribute to medical education lack subjects that prepare the graduate to fulfill the teaching function. Consequently, the authors recommend the development of similar research in which competencies, dimensions, links and forms of professional development related to the particularities of each specialty are identified.

The integration of the professional competencies inherent to the imaging specialist with the pedagogical competencies to be maintained by the teachers of this specialty constitutes an indispensable resource, in our opinion, for their professional development or professionalization. This integration thus depends on updating, sustained research and the use of the potentialities developed to transform personal pedagogical resources into social benefits.

These profiles guide the development of pedagogical competencies in accordance with the use of advanced technologies in many cases; an aspect that, according to the authors' criteria, makes the aforementioned pedagogical competencies more complex. It is not a matter of technological mastery per se, but of how to convert this knowledge for teaching and learning.

CONCLUSIONS

The integration of the professional competencies inherent to the imaging specialist with the pedagogical competencies to be maintained by the teachers of this specialty constitutes an indispensable resource, in our opinion, for their professional development or professionalization. This integration thus depends on updating, sustained research and the use of the potentialities developed to transform personal pedagogical resources into social benefits.



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Conflicts of interest:

The authors declare that there are no conflicts of interest.

Authors' contribution:

Fernando Machado Acuña: conceptualization, formal analysis, research, methodology, supervision, validation, writing preparation of the original draft, writing-revision and editing.

Geovanis Olivares Paizan: formal analysis, methodology, writing-revision and editing.

Marhyam Solano Pérez: data curation, writing-revision and editing.

Susel Moll Varela: data curation, writing-revising and editing.

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