

# **A TEACHING MODEL APPLIED TO FUNCTIONAL ASSESSMENT CLASSES IN PHYSIOTHERAPY**

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## **ABSTRACT**

Understanding the musculoskeletal functional assessment process is crucial for Physiotherapy students. Although new teaching methods have emerged, an effective model for teaching Functional Assessment in Physiotherapy is still needed. The goal of this study was to describe the proposal of a teaching framework in the Functional Assessment course for Physiotherapy students. This is a design-implement experience conducted with 22 fourth-semester Physiotherapy students between March and July 2025. Students were assessed using different strategies, including role-playing, clinical cases, seminars, descriptive scripts, and presentation of scientific work. The results achieved by the course were evaluated via an electronic form. The results showed that the clinical reasoning method was favorable (90.9%), facilitating the development of the professional skills required in the course (77.3%). As negative points for the implementation of the proposal, students mainly pointed to the infrastructure and the course workload. It is concluded that the integration of the proposed framework improved essential clinical reasoning skills in Physiotherapy students. However, more research is needed to optimize the acquisition of theoretical knowledge in this area.

## **KEYWORDS**

Physiotherapy, functional assessment, professional skills, student assessment, Standards: 7, 8.

## INTRODUCTION

CDIO, which stands for Conceive, Design, Implement, and Operate, is an initiative towards keeping high quality standards in higher education programs worldwide. The CDIO framework promotes active, project-based learning experiences that integrate theoretical and practical knowledge, overcoming traditional passive learning methods. It emphasizes the active role of students in their education, fostering creativity and initiative in a collaborative environment, while instructors act as facilitators, not as primary sources of information (Chen *et al.*, 2024). The CDIO framework, originally developed for engineering fields, has been applied in various health areas, such as medicine and nursing (Dong *et al.*, 2023), however, its application in Physiotherapy is not clearly detailed in the literature.

As a collaborative proposal, this work presents a design-implement experience inspired by Standards 7 and 8 about Active learning and Integrated learning for teaching and evaluation of a course module in Functional Assessment given to second-year Physiotherapy students at the Federal University of Goiás (UFG). The study introduces methodological approaches that help to overcome limitations in the traditional model of teaching in Physiotherapy, enabling the active involvement of students. More specifically, the experience describes the process of constructing the clinical reasoning model (Bachkaniwala & Ramanandi, 2023) for assessing the musculoskeletal functionality of patients with diverse health conditions, based on three stages: the first being the construction of the proposal; the second stage the development of theoretical and practical classes combined with assessments; and the final stage the results achieved in the discipline, whose model has the potential to stimulate academic thought and discussion.

Physiotherapy is part of the health field responsible for applying approaches and techniques to promote the recovery, prevention, and improvement of physical-functional function, body mobility, and quality of life of people with varying health conditions. Its actions focus on the assessment, diagnosis, prevention, and treatment of movement and functionality disorders of the human body (COFFITO, 2026). In Brazil, the expansion of undergraduate courses in recent decades reflects not only the growing demand for physiotherapists, but also the challenge of ensuring standards of excellence in teaching and qualified professional training (Gonçalves *et al.*, 2017).

## BACKGROUND INFORMATION

### ***The CDIO framework***

The CDIO framework consists of four main components (Crawley *et al.*, 2014).:

- Characterization of the role of a professional.
- Formulation of the goals for the knowledge and skills required to act in that role. This can be done using the CDIO Syllabus.
- Formulation of what is needed from the educational program for the program to enable the students to reach their goals.
- Various methods and tools for developing the educational program.

Several healthcare courses have reported the application of the CDIO framework. In nursing education, Su et al. (2023) showed that students in the intervention group who received instruction using the CDIO framework showed significant improvements in clinical practice skills, critical thinking, autonomous learning skills, and theoretical and practical performance, as well as higher assessments of the quality of clinical teaching compared to the control group (all  $p < 0.05$ ). Another study by Dong et al. (2023) used an online training course based on the CDIO framework for nursing students. The results demonstrated that the framework enhanced interactivity and collaboration within the course, which was crucial for improving students' learning experiences and outcomes.

## **THE CONTEXT OF THE DESIGN-IMPLEMENT EXPERIENCE**

### ***The Federal University of Goiás***

The Federal University of Goiás (UFG) is the largest public university in the Central-West region of Brazil, located in Goiânia, Goiás. The Physiotherapy program is located at the Institute of Tropical Pathology and Public Health (IPTSP). The course has 133 students out of a total of 150, divided into five classes (17 students dropped out of the university). At the end of 2026, the course will graduate its first class of students.

### ***The undergraduate course in Physiotherapy (Bachelor's degree)***

This is a recent program, started at UFG in 2022, with a duration of 10 semesters (5 years), a total workload of 4,004 hours, and offering 30 places for students annually. The main goal of the program is to train professionals capable of working in the functional health of human beings, based on the best scientific and intellectual evidence and technological advancements, from a multi-professional and interprofessional perspective, sensitive to the health problems of society (UFG, 2022). The proposed teaching model is based on active methodologies, favoring the individual autonomy of the student and their connection with the collective, stimulating protagonism in the learning process, critical thinking and problem-solving. The Pedagogical Project of the course follows the recommendations of the National Education Council of Brazil, considering the student as the subject of learning and supported by the instructor as a facilitator and mediator of the teaching, research, and extension process (Brazilian Ministry of Education, 2022).

The quality of higher education in Physiotherapy in Brazil is a determining factor for the technical, ethical, and critical competence of professionals, which is measured by the National Student Performance Examination (ENADE). Internationally, the European Network of Physiotherapy in Higher Education (ENPHE) and guidelines from the World Confederation for Physical Therapy (WCPT) highlight the importance of developing clinical competencies, critical reasoning, and interprofessional integration from the first years of student training (ENPHE, 2022; WHO, 2010). The integration of active methodologies and evidence-based practice (EBP) in curricula is strongly recommended in Physiotherapy courses, which are associated with better clinical outcomes and greater employability of graduates. This approach, although present in Brazil, still faces structural, pedagogical, and cultural barriers that hinder its full implementation.

## ***The Functional Assessment module***

The Functional Assessment module is part of the mandatory core curriculum offered in the second year of undergraduate studies, with a workload of 64 hours, comprising 32 hours of theory and 32 hours of practice. The pedagogical principles of this module are related to the theoretical and practical teaching of methods and techniques for physical-functional assessment in Physiotherapy based on the International Classification of Functioning, Disability and Health (ICF), including the functional analysis of people with different age groups and health conditions.

Expected competencies in this course include interpersonal relationships, listening and therapeutic communication, clinical reasoning, detailed application of musculoskeletal functional assessment in patients with diverse health conditions, and the development of a kinesiological-functional diagnosis. Many teaching methodologies are strongly recommended in Physiotherapy education, such as problem-based learning (PBL), evidence-based learning (EBL), role-playing, and clinical simulation, which have demonstrated a positive impact on motivation and academic performance (Lennon *et al.*, 2019). Furthermore, hands-on learning in real-world settings allows students to immerse themselves in the reality of work, developing communication, listening, and decision-making skills when dealing with patients with delicate health conditions, as well as experiencing work with a multidisciplinary team, defining the professional's role.

Although new teaching methods have emerged, especially for the development of clinical reasoning in Physiotherapy (Bachkaniwala & Ramanandi, 2023), it is necessary to develop an effective model for Functional Assessment in Physiotherapy, considering some limitations particular to the Brazilian teaching scenario, such as instructor training and infrastructure. In this sense, the CDIO framework is indicated for promoting proven active learning experiences that are used in other health areas such as nursing (Dong *et al.*, 2023; Chen *et al.*, 2024), but which need to be better documented in Physiotherapy. Thus, the goal of this study was to propose a design-build experience in the Functional Assessment course module for Physiotherapy students based on Standards 7 and 8 about Active learning and Integrated learning. The CDIO Syllabus was originally developed for engineering education, but the structure is very general, starting with Section 1 about subject knowledge and ending with Section 4 connected to the intended role of the graduate. Adapting the entire document to new education programs is a huge task. The learning activity described below is based on Section 4, which deals with the skills needed to perform the professional role.

## **METHODOLOGICAL PATH FOR TEACHING THE FUNCTIONAL ASSESSMENT MODULE IN THE PHYSIOTHERAPY COURSE AT UFG**

The Functional Assessment module is based on the patient evaluation process. In it, the instructor aims to teach and evaluate the clinical reasoning of the Physiotherapy student in the face of different musculoskeletal functional conditions of patients. Clinical reasoning is defined as the cognitive process in the evaluation and treatment of the patient (Bachkaniwala & Ramanandi, 2023). Unlike the medical field, which emphasizes diagnosis, the physiotherapist performs a kinesiological-functional diagnosis, focusing on human functionality. Throughout the module, the student learns to communicate with the patient, to recognize the source of signs and symptoms, the contributing factors associated with the

symptoms (environmental, behavioral, emotional, physical, or biomechanical factors), and after receiving all the necessary information, performs a functional assessment focused on the patient's complaints.

This work, in the form of a design-build experience, describes the process of constructing a clinical reasoning model (Bachkaniwala & Ramanandi, 2023) for assessing musculoskeletal functionality in patients with diverse health conditions. The proposed model was divided into three stages: the first being the construction of the proposal; the second stage the development of theoretical and practical classes combined with assessments; and the final stage the results achieved in the module, a model with the potential to stimulate academic thought and discussion.

**Scenario, teaching strategies and resources used in the module**

The teaching setting consisted of 22 Physiotherapy students enrolled in the module, all in their second year. Classes were conducted in person, mediated by the instructor in charge and a physiotherapist monitor who was also a master's student. Theoretical and practical classes took place in the Physiotherapy Practice Laboratory at UFG and the Family Health Unit (USF) linked to the Brazilian Public Health System (SUS).

The course was designed to allow for a progressive method of clinical reasoning in Physiotherapy. It emphasized interpersonal relationships between therapist and patient, communication and therapeutic listening, and the construction of a musculoskeletal functional assessment protocol, which was the expected final product of the module, establishing all stages of the musculoskeletal functional assessment process. Furthermore, the theoretical-practical evaluation criteria qualified for the students' actions throughout the module.

The teaching strategies were designed for individual student activities, as well as pair work and the organization of five working groups (WGs), which were particularly important for the development of practical tasks and assessments in the subject. Theoretical classes adopted a format of interactive lectures with the instructor in charge, teaching assistant, and guest professionals, in addition to the study of scientific articles and videos, group dynamics, and seminar presentations. Practical classes consisted of supervised individual, paired, and work group scenarios, as well as problem sets and seminars.

**Teaching methods**

The content taught in the module was organized in an expository, dialogical, and problem-solving manner, in order to allow students to develop clinical reasoning based on the construction of a progressive musculoskeletal functional assessment protocol, built week by week, containing all the steps that should be evaluated in a patient. In relation to the content taught, different clinical cases were used, involving hypothetical and real patients of different ages and health conditions, as detailed in Table 1.

Table 1. Summary of the methodology used in the module on a weekly basis

| Week                                  | Content | Teaching strategies |                   |
|---------------------------------------|---------|---------------------|-------------------|
|                                       |         | Theoretical lessons | Practical lessons |
| <b>Stage 1 – Proposal development</b> |         |                     |                   |

|   |  |  |   |
|---|--|--|---|
| Week 1  | Presentation of the Study Plan   | Lecture and discussion   | Problem-based learningk and simulation between pairs of students                                      |
| <b>Stage 2 – Development of theoretical and practical lessons combined with assessments</b> |  |  |   |
| Week 2  | Therapist-patient relationship Communication and therapeutic listening | Lecture and discussion session   | Dramatization of clinical cases among five working groups   |
| Week 3  | Application of the ICF in functional assessment                        | Lecture and discussion session with guest speaker                              | Individual problem-solving exercises  |
| Week 4  | Vital signs and pain assessment  | Lecture and discussion session with guest speaker                              | Simulation in pairs of students   |
| Week 5  |  | Construction of stage #1 of the musculoskeletal functional assessment protocol | Initial contact with patients Practical assessment of vital signs and pain with patients by the 5 WGs |
| Week 6  | Spinal goniometry  | Lecture and discussion session   | Individual and paired simulations   |
| Week 7  | Upper and lower limb goniometry  | Lecture and discussion session with monitor                                    | Paired simulations  |
| Week 8  |  | Construction of stage #2 of the musculoskeletal functional assessment protocol | Practical goniometry assessment with patients by the 5 WGs  |
| Week 9  | Spinal muscle function tests   | Lecture and discussion session with guest speaker                              | Individual and paired simulations<br>Evidence-based learning  |
| Week 10   | Upper and lower limb muscle function tests                             | Construction of stage #3 of the musculoskeletal functional assessment protocol | Practical assessment of muscle function tests with patients by the 5 WGs                              |
| Week 11   | Segmental osteomyoarticular assessment and functional tests            | Directed study - Reading of scientific articles                                | Discussion of clinical cases - Problem-based learning   |
| Week 12   | Segmental osteomyoarticular assessment and functional tests            | Directed study - Reading of scientific articles                                | Discussion of clinical cases - Problem-based learning   |
| Week 13   | Sensitivity, reflexes, and motor coordination                          | Presentation of theoretical-practical seminars by the 5 working groups         |   |
| Week 14   | Postural assessment and gait assessment                                |  |   |

|   |                          |   |   |
|---|--------------------------|---|---|
| Week 15   |                          | Construction of stage #4<br>- Final product of the musculoskeletal functional assessment protocol | Practical assessment of sensitivity, reflexes, motor coordination, posture, and gait with patients by the 5 WGs   |
| <b>Stage 3 – Results achieved in the module</b> |                          |   |   |
| Week 16   | End of the course module | Course conclusion<br>Application of a form for analyzing the results achieved in the module       | Presentation of five papers at a scientific congress by the WGs, resulting from the development of musculoskeletal assessment protocols and patient assessments |

Source: (from Authors', 2025).

## RESULTS ACHIEVED BY THE CLINICAL REASONING MODEL IN THE FUNCTIONAL ASSESSMENT MODULE

### Assessment

The evaluation criteria were progressively guided by different assessment experiences. The first assessment aspect (9.0 points out of a total of 10.0 points) corresponded to a set of activities carried out individually, in pairs, or collectively by the five working groups (Table 2).

Table 2. Scoring of assessments performed individually, in pairs, or in groups

| Assessment activity  | Student composition | Grade      |
|--|---------------------|------------|
| Dramatization of clinical cases                                | WG                  | 0.5 points |
| List of exercises  | Individual          | 0.5 points |
| Practical simulations  | Individual / Pairs  | 0.5 points |
| Clinical case with patient                                     | WG                  | 3.0 points |
| Seminar  | WG                  | 1.0 points |
| Musculoskeletal functional assessment protocol                 | Individual          | 3.0 points |
| Organization and presentation of work at a scientific congress | WG                  | 1.5 points |

Legend: WG (working group). The students enrolled in the course were divided into five WGs.

Source: (from Authors', 2025).

### Course evaluation

In Week 16, students were asked to evaluate the clinical reasoning method used in the Functional Assessment module. The results were collected via an electronic form, completed by all 22 students. This activity was worth 1.0 points out of a total of 10.0 points.

The electronic form also provided a space for students to comment on what they liked most about the model implemented in the course, in addition to the positive and negative points in the teaching-learning-assessment process of the course, with some reports being presented:

#### **What did you like most about the subject?**

*"Practical classes thoroughly exploring the topics covered, guest lecturers"*

*"Understanding how the clinical reasoning of Functional Assessment can transform rehabilitation and make patient care much more effective and individualized"*

*"The dynamic format of the assessments and the practical way of learning. That's why I remember almost everything. And the professor's commitment and dedication in having guest lecturers is a unique aspect. And the professor did her best to deliver all the necessary content, even if it took longer."*

**What did I like least about the subject:**

*"More practical experience outside the University would be interesting."*

*"The limited number of tables for practice, and I feel that if the course's workload were greater, we could take even more advantage of the content and practical experiences."*

*"The workload is insufficient to present the content in depth."*

Some observations and lessons learned can be summarized at the end of the activity:

- Based on the Standards 7 and 8 about Active learning and Integrated learning, establishing the developmental stages of the discipline for building clinical reasoning in Physiotherapy students favored learning, as indicated by 90.9% of the students.
- The development of the expected competencies in the discipline was considered positive by 77.3% of the students; however, 9.1% disagreed and 13.6% preferred not to comment. This suggests that the model still needs to be thoroughly discussed and revised by experts in the CDIO framework.
- The assessment strategies in the module were considered adequate (81.8%).
- Students felt confident applying clinical reasoning in patient care, which also demonstrated the student's understanding of Functional Assessment as a topic studied.
- In addition to theoretical classes, practical classes are fundamental to the teaching-learning process in Physiotherapy and are highly recommended by the students who participated in the course module.

## **CONCLUSION AND FUTURE WORK**

Given the above, this work, in the form of a design-build experience, described the process of constructing a clinical reasoning model for the functional assessment of patients with diverse health conditions. The proposed model was divided into three stages: the construction of the proposal; the development of theoretical and practical classes combined with assessments; and the results achieved in the course module, whose model has the potential to stimulate academic thought and discussion.

The results showed that students pointed to the clinical reasoning method as favorable, facilitating the development of the professional skills required in the discipline, feeling confident in conducting the method in real care scenarios. As negative points for the implementation of the proposal, students pointed to the infrastructure available in the course, the time that should be increased for the more in-depth development of the content, and the

association of theoretical and practical classes on the same day, as well as the availability of modules with similar characteristics offered in summer to complement the knowledge.

Finally, it is worth noting that the next step of the Functional Assessment course module will be to incorporate a system that will use IMU sensors and computer vision in the functional assessment process. This initiative is being developed thanks to partnerships established with researchers from the Schools of Artificial Intelligence (INF) and Medical Physics (IF), linked to interprofessional research and outreach projects.

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