## Abstract

The purpose of the study was to determine how the understanding of moment of force and its applications can be improved by developing and evaluating a teaching-learning sequence on the moment of force in physiotherapy training. In the study an eight lesson teaching-learning sequence was designed and consequently tested and developed in two pilot studies and two teaching experiments, by using the model of educational reconstruction.

Evaluation of the implementation of the teaching-learning sequence was based on how teachers who were not involved in the design of the teaching-learning sequence were able to follow the guidance notes and guidance of talk types, and what kind of teacher talk types they used in different teaching situations. Considering the implementation of the teaching-learning sequence, the development can be regarded as successful, as both transfer teachers followed the guidance notes and the guidance of the teacher talk quite well.

Teachers and students that participated in the teaching experiments were satisfied with the teaching-learning sequence, especially the teaching methods. According to the teachers, the lesson materials and guidance notes helped them to piece together the teaching-learning sequence as a whole, to use different teaching methods and to emphasize the most important parts of the teaching-learning sequence.

Students' results support the success of development of the teaching-learning sequence. The levels of understanding of seven topics related to the concept of moment of force were defined for every student before and after the teaching-learning sequence. The students' understanding of the topics was categorized by five levels of understanding.

In the second teaching experiment, the implementation of the teaching-learning sequence and students' learning was studied by choosing six critical episodes of the teaching-learning sequence. In this study the critical episode was identified as a period of teaching that is important from the perspective of aims and implementation of the teaching-learning sequence and from the perspective of students' learning. Collectively, the critical episodes formed a diverse entity that in their aims and methods represent the whole teaching-learning sequence. The aim was to determine how the choice of critical episodes can be applied in designing, developing and implementing the teaching-learning sequence.

The results of this study can be applied in physics teaching in different school levels. The model of developing the research-based teaching-learning sequence, choosing and analysing the critical episodes and the study of the teacher talk is meaningful from the perspective of teaching and research into teaching.