Teaching systems in occupational medicine

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European Higher Education Area includes standards for graduate and postgraduate teaching, as well as a psycho-pedagogy framework. Improving learning strategies of students in occupational medicine, from the teachers point of view, deals fundamentally with improving learning environment. The goal of the present study is to assess and profile learning strategies in occupational medicine teaching modules. A sample with 53 undergraduate students who were enrolled in occupational health classes participate in the study. The students filled the Study Process Questionnaire (R-SPQ-2F). Strategies used by students were related with the learning assessment performed at the end of the teaching term. Students expressed a significantly higher use of deep strategies (16±4) than surface strategies (14±2). Regarding performance, there was a direct relationship between deep strategies score and the learning assessment results. The findings support that, in occupational medicine, knowledge of learning strategies profiles will help to improve education. In order to improve teaching standards it is advisable applying assessment systems that allow adapting teaching methods to students' profiles.

Keywords: Occupational medicine, students' assessment, Study Process Questionnaire.

Sistemas docentes en Medicina del Trabajo. El Espacio Europeo de Educación incluye la enseñanza de grado y posgrado, así como un marco psico-pedagógico. Las estrategias de aprendizaje de los estudiantes en medicina del trabajo, tal como las conocen los docentes, se fundamentan en mejorar el ambiente de aprendizaje. El objetivo del presente estudio es evaluar los perfiles y estrategias de aprendizaje en módulos de medicina del trabajo. Una muestra de 53 estudiantes de pregrado inscritos en temas de salud ocupacional participaron en el estudio. Cumplimentaron el Study Process Questionnaire (R-SPQ-2F). Las estrategias utilizadas por los estudiantes se relacionaron con la evaluación realizada al final del periodo de enseñanza. Los estudiantes expresaron un uso significativamente mayor de estrategias profundas (16±4) que de estrategias superficiales (14±2). En relación con el desempeño, hubo una relación directa entre la puntuación de las estrategias profundas y los resultados de la evaluación. Los hallazgos apoyan que en medicina del trabajo el conocimiento del perfil de estrategias de aprendizaje ayudará a mejorar la educación. Para incrementar los estándares de enseñanza, se recomienda aplicar sistemas de evaluación para adaptar los métodos de enseñanza a los perfiles de los estudiantes.

Palabras clave: Medicina del trabajo, evaluación de alumnos, cuestionario de proceso de estudio.

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It is essential in many academic disciplines related to health sciences, and in special in occupational medicine that teachers know the learning strategies of students in order to improve their competencies and standards. If teachers know students profiles, they should be able either to adapt their teaching methods for a better learning or stablish closer follow-ups of those students that do not use strategies as expected. Different research groups have worked the long time known concepts of deep and surface learning. Surface learning refers to the use of memory and rote learning to learn concepts. Deep learning refers to the approach done to understand and to know as a global logical entity the concepts to be assimilated. Some studies have performed qualitative approaches, but others have chosen quantitative research lines, including the development and use of questionnaires (Kember, Biggs, & Leung, 2004; Akerjordet & Severinsson, 2007; Joshi et al., 2017). Both are considered as two different approaches, and in general it is recognized that they are complementary research lines. In general, deep learning is associated with acquisition of knowledge of higher quality than that of surface learning. In fields of study concerning applied knowledge, it is a requirement to know what underlies the concepts. Consequently concepts can be managed with adequacy in different circumstances, and the learning experience places the meaning in the appropriate context (Burgess, Roberts, van Diggele, & Mellis, 2017).

Teaching methods related to the learning experience are of new interest in problem based learning as well as in inverted class teaching systems (Bråten & Strømsø, 2005; Tiwari et al., 2006; Betihavas, Bridgman, Kornhaber, & Cross, 2016; Gillispie, 2016; Herbert, Velan, Pryor, & Kumar, 2017; Ramnanan & Pound, 2017; Van Raemdonck, Aerenhouts, Monsieurs, & De Martelaer, 2017; Ward, Knowlton, & Laney, 2018). This is the case in applied health sciences, such is the case when teaching occupational medicine topics (Ellis, Goodyear, Brillant, & Prosser, 2008; Chen, 2017).

On the other side, the way the students are assessed should capture the performed learning. This is of relevance inside the European Space of Education, that including graduate and postgraduate teaching, also considers a psycho-pedagogy framework for intervention. Exploring the assessment systems, teachers in occupational medicine may have an approach to the strategies used by students. Examinations form part of the assessments at the University. Consequently the inclusion of items in an examination should take into account how the students learning experience has been working on them either by concepts comprehension, understanding their meaning, or just memorizing them. (Cano, 2005; DeBacker & Crowson, 2006; Pickering & Roberts, 2018). With the help of the assessment results, the use of both kinds of learning procedures can be somehow compared. It can be done taking into account those questions that include concept comprehension, if afterwards the scores are compared and related with both strategies. Some previous studies have considered this relationship (Mattick, Dennis, & Bligh, 2004; Gijbels & Dochy, 2006; Lo, Hew, & Chen, 2017; Guy, Byrne, & Dobos,

2018). However, up to date there are not studies that have performed these comparisons in occupational medicine areas.

If an adequate relationship can be done between learning strategies profiles and academic scores, the teaching systems can be reformulated accordingly. The modifications may follow two main tracks, either to adapt the teaching to the specific learning strategies of students, or to promote a different learning for those students that mainly use a surface approach (Phan, 2007; Nasiri, Pour-Safar, Taheri, Sedighi Pashaky, & Asadi Louyeh, 2017). Different questionnaires have been used to assess learning strategies. The Study Process Questionnaire is one of the most used, and it has been validated, being also reliable (Biggs, Kember, & Leung, 2001).

Making use of this questionnaire, the aim of this study has been to assess learning strategy profiles in occupational medicine modules. The strategies used by students have been also related to the performed assessment at the end of the teaching term.

METHOD

Participants

Fifty three university students participated in the study (48 females and 5 males). Their age ranged from 20 to 26 years old (Median=20.03; *S.D*=1.11). They belonged to the Complutense University of Madrid, learning in health sciences disciplines. They were involved in an occupational medicine module of active learning. The teaching was inside a required topic for most students, majoring in Occupational Therapy, being elective for the others. The module, focused on the age group of workers, and mainly included disease therapy. Most of the teaching included active learning procedures - participative learning groups-.

Instruments

The original version of the *Study Process Questionnaire* had 42 items scored in a scale of five points in the four sub-scales in 2001. The questionnaire was modified to reach the revised version, used in the present study, being one of the most studied measures of approaches to learning (strategies and motives). It includes 20 items, and differentiates Surface and Deep learning styles in four subscales: Deep Motive, Deep Strategy, Surface Motive, and Surface Strategy, and there are versions in Spanish. It includes items with responses in a five-point Likert scale ranging from high disagreement to high agreement.

Procedure

The study was conducted during the 2017-18 course period. The translated questionnaire was distributed to the students during the teaching term. The study was part

of a broader research programme concerning teaching and learning innovation procedures. The students participated voluntarily. They were explained the test questionnaire procedures and goals, as well as they signed and informed consent. They were fully free to ask doubts or retire from the study whenever they wanted. Each participant had assigned an aleatory code, in order to anonymize data, for following use of filled documents and the study questionnaire. In this way the assessment of results is blind, without subject identification.

Data analysis

Concerning the Study Process Questionnaire scores, assessed for the purpose of exploring learning strategies of students, mean Likert values for each item were calculated. Items were grouped according to the learning styles and subscales: Deep Motive, Deep Strategy, Surface Motive, and Surface Strategy. The analysis focused on the Study Process Questionnaire strategies, which were compared with Wilcoxon sign rank test. The relationship between the assessment scores at the end of the term and the Study Process Questionnaire scores was analysed with the Pearson correlation coefficient (Pearson's *r*). Descriptive data are showed as means and standard deviations (*S.D*). All statistical analyses were performed with the SPSS-23 for Windows.

RESULTS

All students filled the questionnaire. Concerning the Study Process Questionnaire scores, students expressed a significantly higher use of deep strategies (16±4) than surface strategies (14±2). The differences were significant ($Z=-2.7$, $p<0.05$; Wilcoxon sign Rank test). The students took advantage of using deep strategies, but the difference with surface strategies use is moderate. This shows a special use of strategies that explains that students applied both strategies to manage concepts. The topics that students had to learn comprised occupational medicine components of both logic understanding and also memorization. Both scores were high, and most students primed strategies that used comprehension. It should be reminded that in some cases there were also low scores of both deep and surface strategies.

Overall there were more students that showed more deep strategies, focused on meaning than learning based in memory (surface) strategies, although both strategies can be found in the same subjects.

Success, with respect to performance results, has shown a higher rate for questions related to reasoning (68%), than related to memory (64%). There has been a relationship between the learning approach and the degree of success at the examinations as shown by the direct relationship between deep strategies score and results in the

academic assessment (R^2=0.27), and a smaller relationship between surface strategies score and academic results (R^2=0.21).

DISCUSSION AND CONCLUSIONS

In the present study there has been a higher score for deep strategy than for surface strategy. The study has shown a relationship between the strategy scores and the academic achievement. The fact that there is a relationship between deep strategies and academic results has been previously shown in other academic fields. There are similarities with previous studies such as that of Leung and Kember (Leung & Kember, 2003).

It can be considered that to improve pedagogical efficiency teachers in occupational medicine should know the learning strategies profile of their students. They should recognize the relative weight that logic and memory have in the transfer of knowledge to students, how the learning experience is affected and accordingly the adaptation of their training tools. It has been recognized by the European Commission when focusing on new modes of learning and teaching in higher education. It is recommended to implement assessment systems to adapt teaching methods to resulting students' profiles and promote, as in the present case, deep strategies (Hattie & Donoghue, 2016). Teachers should have a special focus on those students that use surface strategies in those topics that require mainly the use of logic (to provide them with pedagogical support).

The intermediate goal is to modify the pedagogic system, to improve the learning of students, shifting approaches to deep learning in the same group or for another group in the next term. A change in learning environment may be required, as already recommended (Hall, Ramsay, & Raven, 2004). It is also advised to implement an assessment of students in practical cases in such a way that they can understand in which learning modules the surface approach is not of much interest, and focus on deep strategies instead. This will have a special interest in applied fields (Soderstrom & Bjork, 2015) such is the case in occupational medicine.

The findings support that in occupational medicine the knowledge of learning strategies profile will help to improve education. To increment teaching standards it is advised to apply assessment systems to adapt teaching methods to students' profiles. It is advised that the characteristics of the students should be taken into account, as well as the assessment systems that are to be used (Donker, de Boer, Kostons, Dignath van Ewijk, & van der Werf, 2014). It might be of added interest to take into account, that for some topics in preclinical areas, students consider of high relevance the use of memory to learn, and for clinical areas it seems that they shift to deep learning strategies.

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