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ORIGINAL

SIMULATION OF PROFESSIONAL PERFORMANCE, DIDACTIC TOOL IN TEACHING SPORTS SCIENCES

SIMULACIÓN DEL DESEMPEÑO PROFESIONAL, RECURSO DIDÁCTICO EN DOCENCIA DE CIENCIAS DEL DEPORTE

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ABSTRACT

The implantation of the European Higher Education Area and its linkage with the future job of the student has permitted the application of a methodology based on the simulation of professional skills, which offers the possibility not only to acquire knowledge but also to apply, analyze and take decisions practicing. Students, through a methodology consisting of five sequential phases in situations close to the professional reality, have built their own learning, have designed new teaching approaches and finally shared their results. The results show the implication of students on the learning process by connecting practical applications and possible future professional reality. The simulation has allowed students to acquire skills in the design and analysis of applied proposals and the development of generic skills related to decision making, autonomous and team work, determining factors in the career success of future graduates.

KEY WORDS: Employability, Biomechanics, Teaching, European Higher Education Area.

RESUMEN

La implantación del Espacio Europeo de Educación Superior y su vinculación con la actividad laboral, ha permitido la aplicación de una metodología basada en la simulación del desempeño profesional, que ofrece la posibilidad no sólo de adquirir conocimientos, sino también aplicarlos, analizarlos y tomar decisiones practicando. El alumnado mediante una metodología constituida en cinco etapas secuenciales, diseñadas para la inmersión en situaciones cercanas a la realidad profesional, ha construido sus propios aprendizajes, ha diseñado nuevos planteamientos didácticos y finalmente ha realizado una puesta en común. Los resultados muestran la implicación del alumnado y la adquisición de aprendizajes mediante la conexión entre las aplicaciones prácticas y la posible futura realidad profesional. La simulación ha permitido adquirir competencias en la elaboración y análisis de propuestas aplicadas y el desarrollo de competencias transversales relacionadas con toma de decisiones, trabajo autónomo y en equipo, aspectos determinantes en el éxito profesional de los futuros egresados.

PALABRAS CLAVE: Empleabilidad, Biomecánica, Docencia, Espacio Europeo Educación Superior.

INTRODUCTION

The link between university education and a student's future professional performance has been driven by the European Higher Education Area (EHEA). The Ministry of Education has already made the intentions of the EHEA clear: "Study plans leading to a degree must… allow students to acquire skills in their study centre, expanding on, without excluding, the traditional approach based on content and academic hours. This new teaching organization will increase the employability of graduates…" (Spanish Royal Decree 1393/2007).

At the same time, the labor market has started to value, through selection processes, other elements and other circumstances of the graduate's curriculum, besides his/her degree, such as proven work experience, personal and social skills that can be demonstrated or the use of other resources, such as the use of technologies, decision making or language (Valero-Osuna, 2013). Besides this, the structure of the possible labor activity has changed, so that stability has made way to mobility and specialty to flexibility. An example of the new labor situation is the continued appearance of new sports in physical activity and health centers, or the new professional figure of the physical rehabilitation therapist in professional football teams (Campos and Lalín, 2012) which require the graduate to apply their knowledge based on the analysis of movement and decision making, adaptability, motivation and the ability to express their knowledge. Because of this, the bases that control movement from the different scientific perspectives should be interdisciplinarily integrated in the different subjects (Gregor, 2008).

This cross-curricular integration will offer graduate students more possibilities to face new situations, because throughout the development of their professional career it is likely that they will change occupations several times, so they should be prepared for these changes, adapting to the different labor realities which study plans cannot immediately adapt to (Echeverría, 2008; Van der Hofstadt and Gómez, 2006).

Faced with the new regulatory context of the EHEA, the new demand of the professional market and the above considerations, university professors should reflect on the following question: is the training received by students sufficient in order to carry out the roles demanded by the labor market? Universities, as trainers of future professionals, adapt to this necessity, responding with educational measures that qualify future employees, allowing them to gain both the knowledge and labor skills required so that future graduates are more successful in employment.

Practical preparation and the link with the professional world is an imperative objective which is embodied, not only in the new study plans, but also in the actual teaching guides of subjects. The connection between the training received by students and the development of professional skills has narrowed with the EHEA, allowing students to have a clear idea of how useful the knowledge acquired will be in professional activity, while they are still training. (Álvarez, González and López, 2009).

In the university field, teaching methods have evolved alongside the improvement experienced by the new technologies in teaching. The progressive increase in the use of virtual teaching and learning environments in university education has led to a wide range of possibilities for didactic processes using technologies, favoring the acquisition of subject content, as well as generic skills related to social skills, autonomous work, decision making and research (Arias, Haro, Romerosa and Navarro-Paule, 2010; Imbernón, Silva and Gúzman, 2011; Uceda and Senén, 2010).

At the time of their creation, virtual platforms were used as a mere course administration resource, subsequently evolving towards a higher interaction between professors and students and amongst students themselves (Salinas, 2009). Virtual environments, such as the one presented in this study, should mainly be used for building knowledge from the information given by teaching staff, in which the student aims to form new applied solutions, from the professional performance activities material for graduates in teaching courses specialized in Physical Education. The information presented, the knowledge acquired and the documentary sources consulted by the student, make up the so-called Personal Knowledge Networks (Salinas, 2009).

With regard to the application methods of simulation in the teaching and learning process, there are different methods documented in the literature regarding the use and implementation of simulators in teaching and learning processes. Due to the nature of simulation, three different models can be distinguished (Arias-Aranda, et al., 2010): (1) Simulation through games and adventure for intuitive knowledge development (Leemkuil and De Jong, 2004), (2) Simulation through expression of knowledge and experimentation models (Jackson, Stratford, Krajcik and Soloway, 1996; Van Joolingen, de Jong, Lazonder, Savelsbergh, and Manlove, 2005) and (3) Cooperative learning through simulation and construction of new tasks (Gijlers, 2005).

All of these models are based on the use of computers as a means to obtain, evaluate, store, produce, present and exchange information and communicate and participate in cooperation networks in the teaching and learning process through the Internet. Although the advantages of these technologies are widely known, the use of simulators in teaching is not without limitations. While technological development and internships have allowed for the increase in precision and realism, there are still differences, especially emotional ones, between simulation and reality, as there is less risk of making mistakes, which could lead to making more risky decisions than would be made in reality (Arias et al., 2010).

The objective of this study is to analyze a simulation methodology aimed at students from the subjects of Didactics of Team Sports and Mechanical Bases of Physical Education, in which the basic sports biomechanics knowledge, given during lectures, is interdisciplinarily integrated with the sequential simulation offered in the Didactics of Team Sports classes. The aim is to improve the connection between the university education received by students and their future professional performance.

METHOD

Participants were made up of 197 students, belonging to the Physical Education Teaching Course of the Faculty of Education Sciences of the University of Granada. These students have taken the subjects of Mechanical Bases of Physical Activity and Didactics of Team Sports in one of the three academic years in which this methodology was applied. The students signed their informed consent following the guidelines of the University's Ethics Committee.

The development of the intragroup design of this teaching innovation methodology has been carried out through the Mechanical Bases of Physical Activity participative theory classes taken in the first semester. Using the knowledge acquired, 12 applied sessions were developed in the second semester, in five sequential phases, which favored the immersion in the professional reality simulation in the Didactics of Team Sports classes. The Web Platform for Teaching Support (SWAD) was the telematics platform established in the University of Granada allowing for dynamic information management.

This IT support, which is made up of video recordings, is based on simulation, promoting a practical training with effective feedback between knowledge and know-how that we think, as does Echeverría (2008), could be the key to a truly vocational training. Simulation allows us to observe a student's behavior in situations close to reality, where decision making and the variability of applications substantially improves learning of the Mechanical Bases of Physical Activity subject content, which is applied in the subject Didactics of Team Sports. Below, we will detail the phases according to the instructional design and the organization of individual and team tasks which complete the learning process:

First phase: Theory, documentation and analysis (first week, two sessions)

In this first phase we set out the theoretical foundations which support the design of the tasks and the decision making process. The students researched with the provided bibliography, answering a series of questions making up the self-evaluation of the student and showing them their level of acquisition of knowledge, based on qualitative biomechanics (Hamill, 2007; Knudson, 2007). The evaluation was based on the Biomechanics Concept Inventory (BCI), (Knudson et al., 2003), through 24 multiple choice questions regarding general sports biomechanics content.

During this phase each student designed an observation and record sheet in order to analyze the mechanical factors in the following teaching phases.

Second phase: practical: Applied analysis, concrete problems. (second week, two sessions)

During this phase students carried out movement analysis case studies and calculus problems applied to sports teaching, encouraging them to describe, examine, evaluate and show examples of their knowledge, through video recordings of their teaching activity in Didactics of Team Sports in schools.

Analyses were carried out from a static, cinematic, dynamic and energy movement point of view.

Simulation was carried out through the analysis of sports initiation games and the development of intuitive knowledge, (Leemkuil y De Jong, 2004). Students sent the results of their task analyses on line, through the telematics platform SWAD, so they could be evaluated by the teaching staff.

Third phase: Discover and detail practical cases provided by the professor (third week, three sessions)

A guided discovery of practical cases with a high analysis complexity, based on exercises developed in class and didactic progressions based on mechanical factors and others related to the complexity of the task such as number of participants, rules and material.

The simulation was based on the evaluation of teaching tasks and their more complex variants with regard to the previous phase. The difficulty to detect the differences in biomechanical factors was increased, with contradictions between the mechanical, performance and risk factors in the tasks. Besides, a higher precision with regard to the expression of knowledge was required. Students evaluated their activities in pairs through reciprocal teaching.

Fourth phase: Design, build and elaborate didactic approaches (fourth week, three sessions).

Using the knowledge acquired in the previous phases, students were able to propose new exercises, design variants and plan physical activity sessions using mechanical principles applied to physical activity and sport, so that the concepts were understood and used in their future professional development.

This phase was based on collaborative learning through simulation in specific educational contexts (Gijlers, 2005), the choice of a team sport and the application of certain content to a specific group. Students designed and selected the tasks appropriate to the progression characteristics and motor skills of trainees. Students were grouped according to the chosen sport, creating an on-line forum or discussion group. The groups of students sent their proposals to the platform and, after the supervision of the teaching staff, they gave an oral presentation in the third session with the results of the simulation, evaluating the mechanical factors of the tasks and proposing possible variants.

Fifth phase. Proposal discussion (Fifth week, two sessions).

Students and teaching staff shared the results of the experience, debating the possible variants of the physical activity depending on the characteristics of the participating sample. In this final phase a questionnaire regarding the experience was also completed using the Likert scale of 1 to 5, in order to analyze the learning process, the acquisition of skills and its link with the possible future professional performance.

Teaching staff then evaluated the experience along with the objectives and competences detailed for each phase. The time and effort required by the students in each phase was then analyzed in the EHEA context, considering class hours and time for autonomous and team work. At the start of each phase a questionnaire was filled out with open questions regarding positive and negative aspects of the previous phase, in order to complete the teaching staff's evaluation of each phase and adjust the teaching content of Didactics of Group Sports.

RESULTS

The results obtained are related to the methodology evaluation questionnaire filled out by students after completing the simulation process (Table 1). These results show some very high scores in the evaluation of the connection between the practical applications developed and the possible future professional reality, in the contribution of the project to the promotion of autonomous work and in the student's level of satisfaction with the use of professional reality simulation. Lower scores were recorded in the comprehension of biomechanical knowledge from the Mechanical Bases of Physical Activity classes given prior to the application of this teaching innovation experience. The time needed for the project, counting both on and off campus activity, was the aspect most poorly evaluated by students, as it has demanded more dedication and engagement in the creation of their own learning.

Table 1 shows the results obtained in the different aspects considered in the teaching and learning experience evaluation questionnaire, completed in the fifth phase of this teaching innovation study.

Table I.- Results of the different aspects evaluated by students using the Likert scale from 1 to 5.

Scale , to be scored from 0 to 5 points	Average	Standard deviation
Evaluation of the connection between the biomechanical knowledge taught and the application classes given	4,21	0,44
Evaluation of the connection between the practical applications developed and the future professional reality	4,66	0,37
Comprehension of biomechanical knowledge through the Mechanical Bases of Physical Activity classes	3,30	0,82
Comprehension of biomechanical knowledge in the practical applications developed	4,36	0,32
Student's level of satisfaction with the use of professional reality simulation	4,58	0,51
Student's level of satisfaction with the project's organization and content	4,25	0,78
Student's level of satisfaction with the learning outcomes	4,10	0,37
Time needed for the project	2,8	0,94
Contribution of the project to the promotion of team work	3,81	0,18
Contribution of the project to the promotion of decision making	4,23	0,25
Contribution of the project to the promotion of autonomous work	4,56	0,24
Capacity of the methods used to motivate students in class	4,14	0,69
Promotion of scientifically documented critique	4,35	0,32
The grade obtained is consistent with the knowledge of the students	3,71	0,96
Global level of student satisfaction with the use and operation of the simulator	4,23	0,46

DISCUSSION

The global analysis of data allows us to establish excellent results regarding the motivation of students towards the application of the Mechanical Bases of Physical Activity in the Didactics of Team Sports subject. It has shown the satisfaction of students in the evaluation of the connection between the practical applications developed and the possible future reality (4,66). This aspect confirms the results obtained by Arias et al., (2010), and it shows us that the simulation and autonomous work of the student have achieved, with a high score, the objective proposed in this teaching innovation experience. This was based on the acquisition of professional skills related to movement analysis from a biomechanical point of view, in this case applied to the teaching of team sports.

This achievement is consistent with the aspects that have received a high score, in particular the student's level of satisfaction with the use of professional reality (4,58). It has been demonstrated that the application of the presented didactic resource is ideal in the university context of the EHEA, in which the student starts to carry out the role which society may demand in the future in the actual subject and with autonomous work (4,56). Therefore, the student's level of preparation to face the transition process from University to employment is improved with the implementation of the simulation phases in the subjects.

Corroborating the findings of Echeverría (2008), future expectations and above all those that are related to professional development are an important motivation element for students, as is reflected in the global level of satisfaction of students with the use and operation of this teaching innovation experience. The fact that several students go to university without a clear idea in mind, and without knowing what objectives they wish to achieve, means that their implication in the learning and teaching process deteriorates, which is minimized with the methodology presented. However, in Physical Education Teaching Courses, the dropout rate is already quite low due to the teaching vocation of students and the affinity between the teaching activities with the actual nature of the young students.

Moreover, amongst the aspects receiving a lower evaluation is the comprehension of biomechanical knowledge through the Mechanical Bases classes (3,30). This result has led us to emphasize the need to make theory and practical content more similar to professional realities so that students can contrast the use of their knowledge, as the explanation of content seems insufficient in order for students to acquire and comprehend the applied knowledge. Traditionally this aspect has not been considered, as also stated by Hamill (2007) and Gregor (2008). The comprehension of biomechanical knowledge in the practical applications developed has increased considerably (4,36) with regard to the participative theory classes, improving the acquisition of skills in autonomous work and decision making which derive from the high scores obtained in these questions. As a result, we have confirmed the need to adapt theory content to new technologies, if possible under the limitations, which can also be used as a means of communication amongst students, professors and the actual content of subjects.

The aspect with the lowest score was the time dedicated by students in the development of this process (2,8). The time needed for studying, comprehending concepts, questionnaires, decision making, tutorials, group meetings and practical applications was more than initially expected, requiring more implication by the student in the subject. This should be considered as a limitation in the application of this methodology, as the high number of subjects and their dispersed schedule prevents students from decisively committing to teaching innovations that require a temporary additional effort for just one subject.

The implementation of this teaching innovation experience has contributed to a new line of collaboration between subjects. Without a doubt this has been of great benefit for students, as they have been able to apply, analyze and debate their knowledge in situations similar to their future professional activity. However, we must bear in mind that it has required considerable effort by teaching staff, not only with regard to the implementation of new planning and coordination methodologies between different subjects, but also in teaching theory and practical groups with excessively high numbers of students. The introduction of the EHEA was supposed to be an opportunity to increase teaching resources, but the current economic situation has implied a drop in the quality of our university education, and the student/professor ratio is increasing more and more and personalized attention towards students is decreasing. This aspect constitutes the principal limitation in the implementation of new teaching methodologies which imply activities with more autonomous work for students and more tutoring time for teaching staff. However, according to Garceau, Ebben and Knudson (2012), the creation of virtual teaching communication networks could in part minimize this limitation.

The use of this teaching experience also has the limitation proposed by Arias et., (2010), in which, although the development of virtual platforms, on line communication and internships have allowed for the increase in realism, there are big differences, especially emotional ones and other contextual aspects, between simulation and professional reality. These differences mark the ecological validity of the simulation. The activity proposed in this simulation, besides encouraging the comprehension of the subject's theory content, offers a possible solution to professional performance simulation, as the current overcrowding of universities prevents the development of internships for all students and academic practicum also have limitations regarding tutoring, follow-up and supervision in the organizations or firms.

In future investigations the use of platforms could be implemented with the integrated participation of other subjects in order to offer students a global sports movement analysis, from several mechanical, physiological and behavioral perspectives. This way we could ease the difficulty suffered by students with regard to the temporary limitations in the study and comprehension of the theory basis of physical activity analysis.

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