PERSONALIZED VIRTUAL LEARNING ENVIRONMENT FROM THE DETECTION OF LEARNING STYLES

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ABSTRACT

Through the previous detection of existing learning styles in a classroom, a Virtual Learning Environment (VLE) has been designed for students of several Engineering degrees, using the Learning Management System (LMS) utilized in the University of Jaen, ILIAS. Learning styles of three different Knowledge Areas; Chemical Engineering, Materials Science and Environment Technology, have been analyzed. From learning styles detected in the classroom, the introduction of optional and compulsory activities to be developed by the student permits to develop the VLE. In this "optionality", the student can choose the activities more suitable to his learning style. As a consequence of the implementation of the virtual learning style, the assessment results must improve, as well as the students' motivation because they are selecting their particular learning way.

KEYWORDS

Learning styles, e-learning, virtual learning environment

1. INTRODUCTION

In the context of the European Higher Education Area (EHEA) an important change in the way of carrying out the teaching-learning process is necessary. So that the virtual learning plays a primordial role making possible the following of the subject in case of the student cannot attend to the class, at the time as it involves a valuable complement during the class.

Learning styles represent the personal way that each person has in order to acquire learning. The detection of them in the class is going to allow us to design a virtual learning environment where the considered activities were oriented to the detected styles, basically. This fact has to have positive effects in the assessment outcomes of the students and in the process of knowledge acquisition [1].

2. DEVELOP

The learning styles analysis has been realized in three Engineering subjects belonging to the Knowledge Areas of Chemical Engineering, Material Science and Environment Technology in the Higher Polytechnical School of Linares, corresponding to the degrees of Chemical Engineering, Mechanical Engineering and Mining Engineering, respectively.

The learning management system ILIAS is available for all students registered for this University, in this VLE is used to distribute contents of the subjects and to propose the different activities. It is used as a mean of on-line collection of the proposed activities, as a mean of evaluation through on-line test and as a mean of communication between students and lecturer and among students. Both a complement of classroom teaching and in distance learning course, the use of this learning management system supposes a fundamental tool to develop the VLEs.

2.1 Detection

The detection process of learning styles has been done using the Honey-Alonso Learning Styles Survey [2] based on the learning styles classification of Honey and Mumford [3] where four styles have been defined: activist, reflector, theorist and pragmatic.

The Table 1 shows the activities to which the student will react positively from the general behavior expected for each type of learning styles [4], considering the personal characteristics of the student. Besides, the list of proposed activities in the virtual learning environment designed.

Table 1. Suitable activities for each learning style and proposed activities

Learning Style	Activity types	React positively to:	Proposed activities
Activist	Activities that demand a prompt solution (e.g., solving problems)	▪ Action learning ▪ Business game simulations ▪ Job rotation ▪ Discussion in small groups ▪ Role playing ▪ Training others ▪ Out door activities	• Provide the student specific information: facts, data, results • Provide industry media abstract concepts: principles, theories, mathematical models • Methods of resolution of practical problems, with an emphasis on understanding the same • Observation of surroundings, empirical experimentation, attention to detail.
Reflector	Activities to think before acting (e.g., developing a project)	▪ E-learning ▪ Learning reviews ▪ Listening to lectures or presentations ▪ Observing role plays ▪ Reading ▪ Self-study/self-directed learning	• Provide concrete examples of the phenomena the theory describes or predicts • Application of theoretical models • Using diagrams, graphics, pictures, sketches, films; before, during and after the presentation of verbal material • Provide demonstrations. • Use computer-assisted instruction
Theorist	Activities with clear objectives and relative to a schema (e.g. searching of information or interpretation of a theory)	▪ Analytical reviewing ▪ Exercises with a right answer ▪ Listening to lectures ▪ Self-study/self-directed learning ▪ Solo exercises ▪ Watching 'talking head' videos	• Assign some drill exercises to provide practice in the basic methods being taught but do not overdo them and some open-ended problems • Motivate learning. Talks and conferences with graduates, which allow you to view the implementation of studies. • Theoretical models applications • Practical troubleshooting methods with an emphasis on understanding the same • Empirical experimentation
Pragmatist	Activities with practical applications (e.g. laboratory sessions).	▪ Action learning ▪ Discussion about work problems in the organisation ▪ Discussion in small groups ▪ Problem-solving workshops ▪ Group work with tasks where learning is applied ▪ Project work	• Provide intervals for students to think about what they have been told. • Assign some drill exercises to provide practice in the basic methods being taught but do not overdo them and some open-ended problems • Given students the option of cooperating on homework assignments to the greatest possible extent. • Theoretical models applications

2.2 Results

After carrying out the analysis of results in each one of the classrooms, it has been observed that although every learning styles are present, only two styles prevails over the rest; the theorist and reflector styles. Figure 1 shows the distribution of different learning styles in a classroom corresponding to the Knowledge Area of Environmental Technology, it is possible to see some isolated cases of predominance of activist and pragmatic styles, but theorist and reflector styles are more important. This behavior also has been observed in the others engineering class studied (Mechanical, Chemical and Mining Engineering).

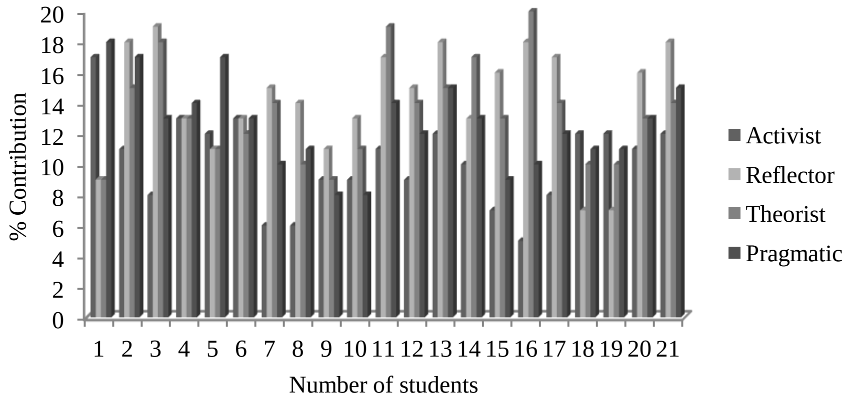

Figure 1. Distribution of different learning styles in a classroom

When the comparison of the learning styles is realized among Knowledge Areas the reflector and theorist styles stand out the others styles (Figure 2). In case of Chemical Engineering students the theorist style is more important, while in Materials Science and Environmental Technology the reflector style prevails.

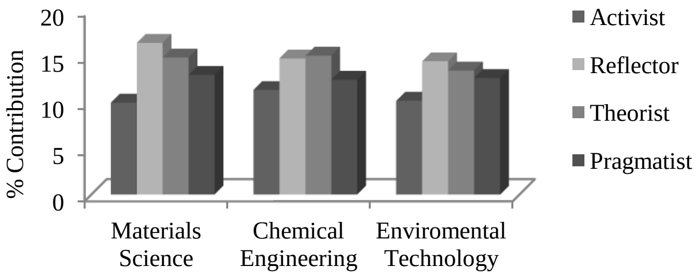

Figure 2. Distribution of different learning styles in each analyzed knowledge area

Considering all evaluated engineering students in the comparison, the reflector styles is the more significant style followed by the theorist style and the activist is the style with less representation. This behavior is shown in Figure 3.

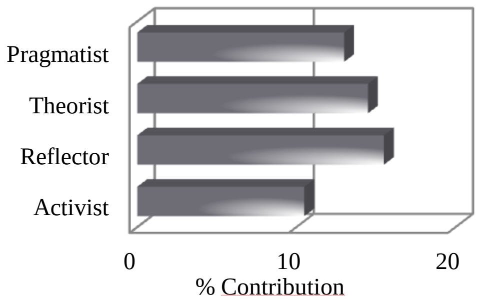

Figure 3. Overall distribution of different learning styles

3. CONCLUSIONS

The four learning styles defined by Honey and Mumford are present in the evaluated classroom, however and the opposite of what it is expected for Engineering students [5] the more significant styles are the reflector and the theorist.

Making the comparison among Knowledge Areas, in Materials Science and Environmental Technology the reflector style is the more widely represented, while the theorist style prevails in case of Chemical Engineering students.

In the Virtual Learning Environment designed, the on-line teaching using the Learning Management System, ILIAS perform a fundamental role as a mean to show contents and activities. The proposed activities must be oriented to the four learning styles, but the activities that involve thinking before acting and activities with clear objectives, more connected with the reflector and the theorist styles, must be more significant.

Considering the characteristics of the taught subjects, it is necessary to raise mandatory activities closer to activist and pragmatic styles, nevertheless in the designed VLE the possibility of choosing others optional activities, adapted to the learning special characteristics of the student, will allow improving the learning and assessment results, unavoidably.

Though the development of a Virtual Learning Environment involves an increase of the teacher work, also implicates an improvement of the motivation and the involvement of the student in their own teaching-learning process. The use of ILIAS makes possible that in this personalized model allow can be translated to any other type of university teaching, both to distance learning and present learning in the classroom.

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REFERENCES

[1] Martínez Cartas, M. L. (2012) “Using an improved virtual learning environment for engineering students”. *Journal of European Engineering Education*, iFirst, pp 1-13.

[2] CHAEA. (2008). Honey-Alonso Learning Styles Survey. http://www.estilosdeaprendizaje. es/chaea/chaea.htm

[3] Honey, P. and Mumford, A., (1986). “The manual of learning styles”. *P. Honey, Ardingly House: Maidenhead, Berkshire.*

[4] Coffield, F., Moseley, D., Hall, E., Ecclestone, K. (2004). “Learning styles and pedagogy in post-16 learning. A systematic and critical review”. *Learning and Skills Research Centre*, London.

[5] Felder, M. F., Silverman, L. K. (1988). “Learning and teaching styles in Engineering Education”. *Journal of Engineering Education*. 78 (7), pp 674-681.