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A Methodology for the Development of Distance Learning Tasks Adaptable to the Student's Learning Style

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Abstract

Today, we are currently experiencing a time of constant evolution in the field of education in which students require more resources and tools to obtain the information and construction of knowledge. One such resource is the use of distance learning environments, where the teacher assigns additional activities for the understanding of the concepts seen before. But there are times when the student does not understand the material because of the form it is represented, making it necessary to have more options to facilitate the understanding of content through different ways that may be more attractive to the student, achieving more active participation in the subject and an affinity that leads to a better learning experience. This is the goal of the present research, which proposes a methodology for designing distance learning tasks adaptable to the student´s learning style.

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Keywords: Distance learning, learning styles, design methodology, online analyser;

1. Introduction

Technology transfer and information sharing from around the world have become increasingly common, most notably in the field of education, where institutions have ventured in the use of digital content to inform and train people, facilitating the use of tools that allow remote access, such as the use of computers and mobile devices among others. This has led to great interest in undertaking new ways of making use of teaching/learning methods, preferably online.

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It is in the area of distance education where there have been major advances in the development of digital content more accessible and understandable to the student, among which is the use of various technologies, including online collaboration. The use of applications for the exchange of information, such as instant messaging or chat, email and social networks has produced an incalculable number of opportunities to ensure that education can be accessible from anywhere in the world. Because of this, there is a gateway to information in which it is no longer necessary to be physically present in order to obtain large collections of data relevant to something someone wants to know.

The vast majority of students who are part of a distance learning process suffer from a loss of interest in certain moments; these moments are marked by the continuous repetition of similar activities that become monotony. Another factor that favours the loss of interest is that in many cases such activities are not attractive to the student; also, because each student has a different learning style, it is necessary to recognize and provide sufficient approach to understand the topics to be addressed in the course so that it suits everyone. For this it is important to establish what teaching style meets the learning style of the student in question and know the educational method with which to try to approach him.

1.1. Learning styles

Because students need activities to stimulate their interest in a certain topic and engage them in the learning process, it is necessary that these activities are according to the nature of behaviour they use to learn. Many students like to read, but what happens to those who are not well suited for this activity. It is necessary to carry out activities in a distance education environment that can cover a wide spectrum based on the different learning styles, each student learns at their own pace and form, so everyone deserves that the information is presented in a form adequate to their needs. We've based on Felder-Silverman model as a tool for teaching courses in science, is currently used worldwide for issues as diverse as language learning and biology, see Fig. 1

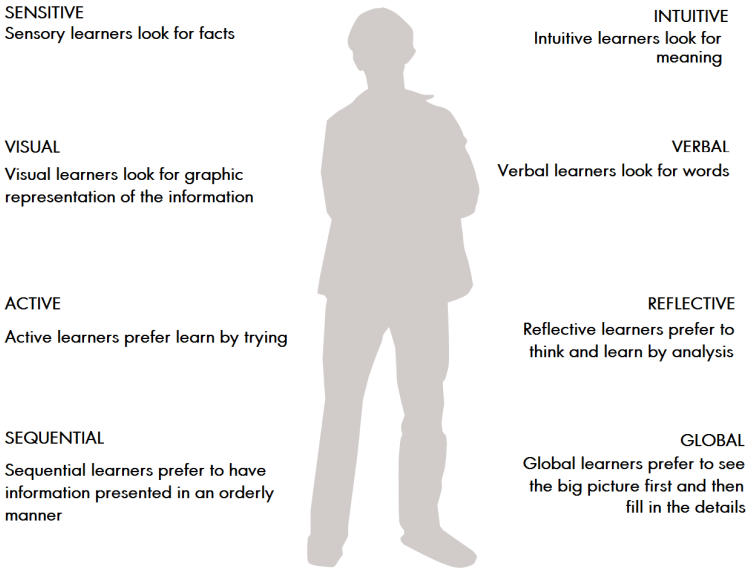

Fig. 1. A deduction method of learning styles based on Felder-Silverman model

2. The design of learning activities

Each learning style corresponds to a teaching style, so this research proposes the following types of activities according to the combination of student learning styles, called dimensions. Such dimensions are:

- Visual sensitive students
- Verbal sensitive students
- Visual intuitive students
- Verbal intuitive students

According to the dimension, the professor must design a learning activity to satisfy the preferences of the student. For example, for a visual intuitive student, the professor can present a scheme for a concept or an image of a principle, see Fig. 2.

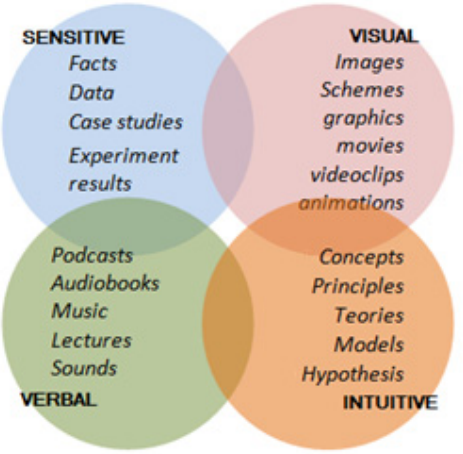

Fig. 2. Proposed learning materials and formats according to the learning dimensions

3. The learning styles analyser

We propose the use of an application (named G-OALS analyser), which consists of a series of exercises presented in random order; each exercise is designed to evaluate the ability of a student to understand the problems at hand, see Fig. 3. One of the methods for the effective deduction of learning styles and preferences is the use of a test (Felder, 1988).

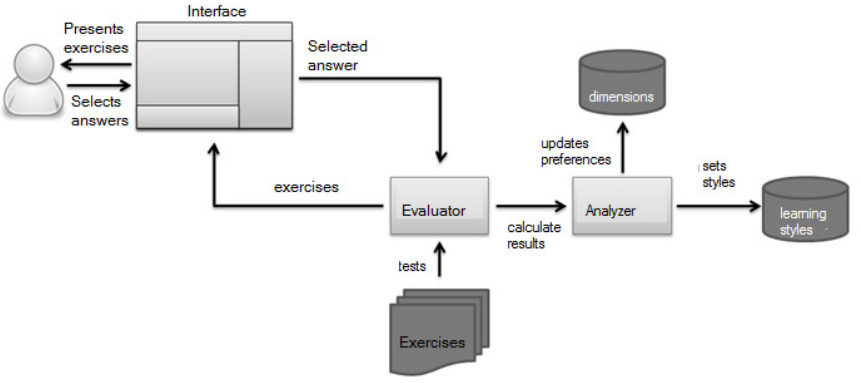

Fig. 3. G-OALS architecture (G-Online Analyser of Learning Styles)

The analyser consists in exercises developed in order to determine the behaviour of an individual compared to another through the measurement of the student's abilities, such as reading, observation, among others skills, depending on the nature that is evaluated, see Fig. 4.

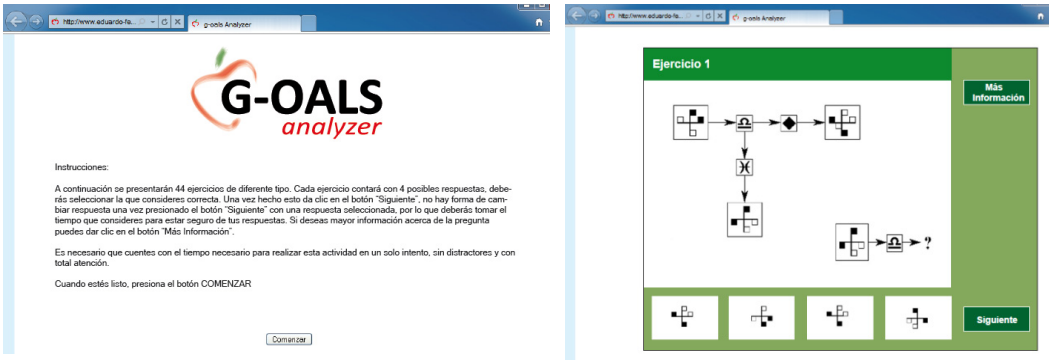

Fig 4. Learning styles analyser

With 44 exercises (see fig. 5), including verbal critical reasoning, diagrammatic abstract reasoning, verbal comprehension and numerical computation problems, G-OALS determines the student's learning style preference using the following formula:

$$Result = time * attempts * complexity \quad (1)$$

SENSITIVE					INTUITIVE				
Exercise	Level of complexity	Time used	Attempts	Result	Result	Attempts	Time used	Level of complexity	Exercise
1	0.2	20	1	4.0	2.0	1	10	0.2	1
2	0.2	10	1	2.0	2.2	1	11	0.2	2
3	0.3	15	1	4.5	4.5	1	15	0.3	3
4	0.3	34	2	20.4	4.2	1	14	0.3	4
5	0.5	45	1	22.5	24.0	2	24	0.5	5
6	0.5	47	1	23.5	14.5	1	29	0.5	6
7	0.8	56	2	89.6	26.4	1	33	0.8	7
8	0.8	63	3	151.2	59.2	2	37	0.8	8
9	1.0	70	3	210.0	86.0	2	43	1.0	9
10	1.0	46	2	92.0	129.0	3	43	1.0	10
11	1.0	72	2	144.0	150.0	3	50	1.0	11
Number of exercises with better results than its opposite				4	6	Number of exercises with better results than its opposite			
Difference between the two results applied to the style with the lead					2	Difference between the two results applied to the style with the lead			
				SCORE	SCORE				

Fig. 5. Calculation of learning style preferences: Using the formula mentioned above, a value is calculated for each exercise. By comparing the results in the same row, the lowest value wins. The number of wins is counted and the difference is assigned to the winning preference. In this example, we would say that the student has a "level 2 intuitive preference".

The same principle applies to the other three dimensions (see fig. 6), all information is stored in a database to be used later use by the learning styles recognizer.

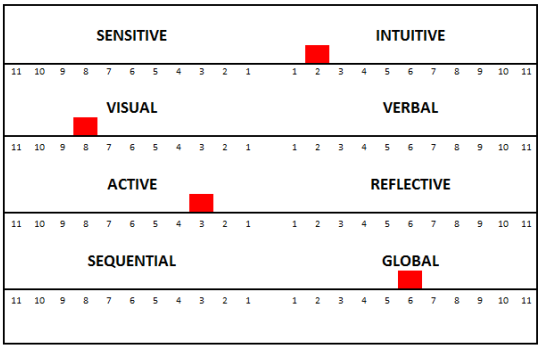

Fig. 6. Learning styles preferences of a student

4. The learning styles recognizer

Once the student has taken the test G-OAL analyser, he/she can access to G-OALS recognizer. The recognizer will obtain the learning styles preferences from the student's database and display only those educational materials whose representation matches the student's preferred style, see fig 7.

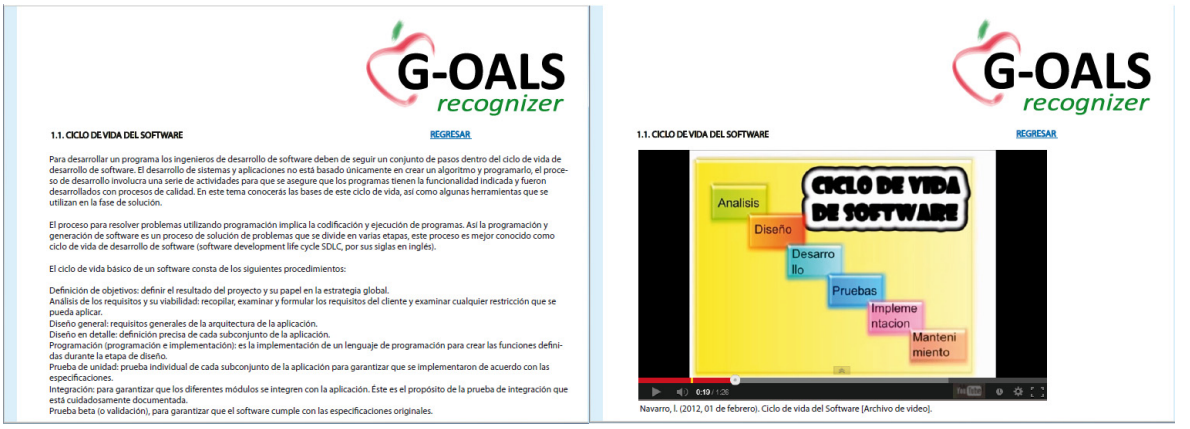

Fig 7. (left) Main access to the G-OALS recognizer site (right) Index of activities available to the student

5. Evaluation

The methodology has been evaluated in two phases, with representative users in order to provide feedback on their experience with the methodology. On phase one, a total 27 university professors took part in the evaluation, which consisted in the submission of pre-questionnaires and post-questionnaires. These questionnaires are used to have a reference of the users' familiarity with the subject of this research and to analyse the users' perception of the methodology.

Table 1. Reviewer comments about the methodology

Positive aspects	Negative aspects
• Consider a great tool to know the student • Adaptivity must consider the learning styles. • Represents a practical guide for the developmen of learning activities. • The architecture and software components are very clear.	• prepare activities for each style can be a hard work for the professor • need to be a long-time professor of the course in question to engage in activities for each learning style • The information design process is not detailed.

It was also suggested to broaden the methodology to cover a wider range of courses and perhaps create an online community among professors to share learning activities through repositories.

6. Conclusions

The student must not adapt to the learning activity, the learning activity must adapt to the student. This adaptation implies the design of learning activities with the same learning objective but with different representation, according to the student's preferred style.

With G-OALS analyser, the student's preferences can be known and for the first time offer a viable alternative to the presentation of information that is understandable from the point of view of what the student wants to see and how he want to see it.

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