The 4MAT system applied to a blended-learning scenario

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Abstract

The 4MAT system has proved to be an effective implementation to engage different kinds of learning styles, based on the Kolb proposal of this kind of styles. Most of these implementations have been done with traditional courses, but today a new kind of learning environments are present, we have on-line, virtual or blended instruction. The present work shows the use of the 4MAT System applied with blended learning. The experiment showed that college students felt more comfortable and we obtain a considerable advantage respect to a traditional blended learning instruction.

Keywords: 4MAT System, Blended Learning, Learning Styles, College Students.

Resumen

El sistema 4MAT ha demostrado ser una implementación eficaz de conseguir diferentes tipos de estilos de aprendizaje, basado en la propuesta de Kolb de este tipo de estilos. La mayoría de estas implementaciones se han hecho con los cursos tradicionales, pero en la actualidad un nuevo tipo de ambientes de aprendizaje están presentes, tenemos la instrucción en línea, virtual o mezclado. El presente trabajo muestra el uso del Sistema de 4MAT aplicado con aprendizaje mixto. El experimento demostró que los estudiantes universitarios se sintieron más cómodos y se obtiene una ventaja considerable respecto a una instrucción de blended learning tradicional.

Palabras clave: Sistema 4 MAT, Aprendizaje mezclado, Estilos de aprendizaje, Estudiantes universitarios.

I. INTRODUCTION

Physics is a science that has greater difficulty in understanding by students; this difficulty is evident in the low rate of adoption of this discipline in schools at different educational levels where it is taught. On the other hand, educational researchers have shown that introducing the theories of learning styles in teaching various disciplines has improved the performance of students increased their understanding and critical in their questioning [1].

The ways of perceiving and processing information from students have been analyzed by theories of learning in which t assumptions it is argued that learning style is the sum of the ways in which the brain to perceive experience and favorite ways to an individual to act on it.

McCarthy studied the different learning styles and brain hemisphere theory proposed by Kolb 4MAT to develop his system, his model is a cycle of eight steps conceptualized as a natural cycle of learning, and following this sequence any content or process can be taught [2] (Fig. 1).
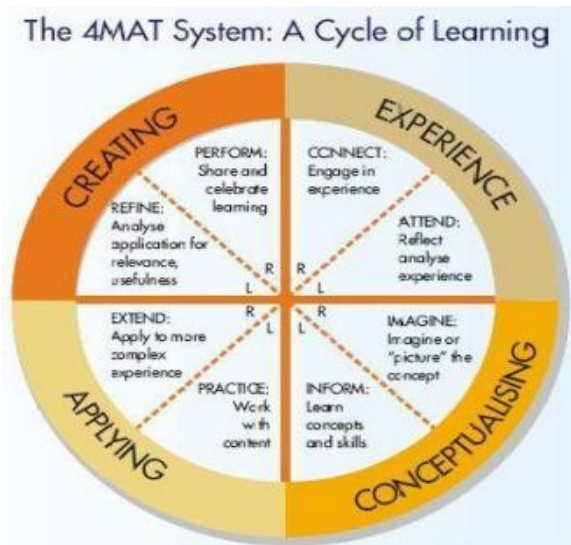

FIGURE 1. Cycle of Learning.

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The 4MAT system is a strategy for dealing with individual differences is to develop or modify the events of instruction so that they specifically address individual differences.

The integration and adoption of online education mode, with its subsequent possibilities in education causes controversy in the world of education actors. Its versatility has a capacity for change which tends to break traditional patterns of teaching-learning process [3].

If to-face activity is added to complement the instruction results in what is known as blended-learning or B-Learning, this model combines the best of classroom learning with the functionality E -learning to potentiate the strengths of both approaches [4].

This research was conducted at the University of SABES (System for Advanced High School and Higher Education) campus Pénjamo of the State of Guanajuato, in a blended course.

II. THE 4MAT SYSTEM

4MAT System is the result of the superposition of descriptions of learning styles of Kolb's model (1984) [5]. This model is based on the assumption of the existence of factors responsible for the generation of learning styles. According to Kolb (1984) [5] students learn according to how they prefer to receive information from the teacher (instructional preferences) by concrete experience, reflective observation, abstract conceptualization and active experimentation.

McCarthy y Mc Carthy (2006) [6], Kolb takes up the scheme, adding the information from the brain research resulting in 4MAT system. The system combines the characteristics of 4MAT shape that represents a combination of preferences. This combination of preferences results in a couple of trends describing four quadrants. In 4MAT system, each of these quadrants becomes a different learning style. Each quadrant and two descriptors describe a set of tendencies and preferences that different individuals may exhibit in their attempts to learn and teach. Each learning style or quadrant is defined by the way students learn (Fig. 2).

FIGURE 2. The 4MAT System.

III. METHOLOGY TO IMPLEMENT THE 4MAT SYSTEM TO B-LEARNING SCENARIO

Prior to publicize the system 4MAT students were invited to answer a test online that they know their learning style and comfort brain, resulting. 62.5% of the group belongs to the learning style type III, 37.5% of the group belongs to the learning style of type II. 22.2% of students have comfort in the right hemisphere and 77.8% in the left hemisphere (Figs. 3 and 4).
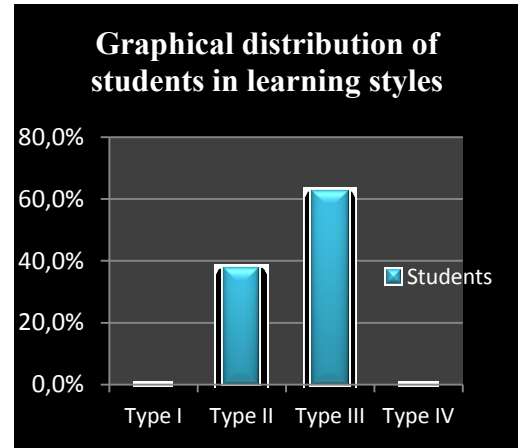
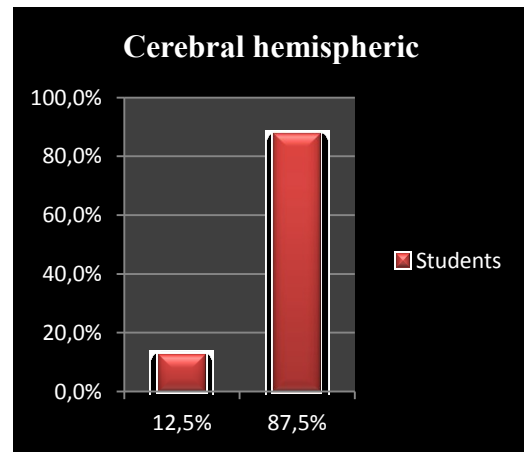

FIGURE 3. Results of learning Styles.

FIGURE 4. Results from the cerebral comfort.

We designed a questionnaire with open questions in concepts contained the module I of course resistance materials as a tool to measure the effectiveness of 4MAT System. This questionnaire was applied to the control group the purpose of determining conceptual change after comparing the class 4MAT interpretation of concepts.

McCarthy and McCarthy say the movement in the cycle represents the very process of learning to design classes 4MAT educational planning were conducted for the 4-week module 1 (4 weeks platform and consulting time and half-

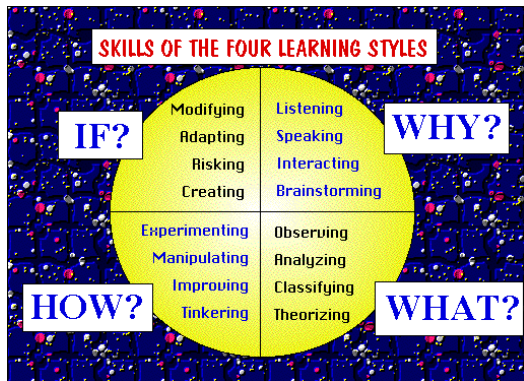day Saturday) with the sequence of the cycle considering the activities proposed in each quadrant (Fig. 5).

FIGURE 5. Activities in each quadrant proposals on Cycle 4MAT.

IV. DESIGN CLASS 4MAT

Quadrant I: Opening of the learning process in this quadrant with the parameters of concrete experience and reflective observation; recommended activities are listening, speaking, interacting, brainstorming.
Step One:
Quadrant One: Students more comfortable with right hemisphere.
- Immersion experience.
- Teacher's Role: Motivator.
- Method: Discussion.
- Question to be answered: Why?
- "It helps to establish a reason".

For this step was proposed like activity a roundtable where students share experiences in their environment effort, loads, deformation.

The teacher asks questions to activate the knowledge and imagination: How do you imagine and how to explain longitudinal deformation? Why an effort can cause deformation in materials such as a steel rod and do not see at first glance?
Step Two:
Quadrant One students more comfortable with left hemisphere.
- Reflecting on the experience.
- Teacher's Role: Witness.
- Method: Discussion.
- Question to be answered: Why?
- "It helps clarify reasons".

For this step was proposed a forum on the platform (see Fig. 3) for students to make and share a reflection on their experience to be in contact with loads do reflect if their work environment are in contact with any charging device as for example a crane. In a session answering the question for reflection, Have you thought about the design of a crane both in material and dimensions of its components to

withstand certain loads, or any other charging device in your work environment?

Quadrant II: In quadrant the students move from experience to abstract conceptualization and process through reflection. Recommended activities are observing, analyzing, classifying, teorizing.
Step Three:
Quadrant Two. Students more comfortable with right hemisphere.
- Integrating observations within the concepts.
- Teacher Role: Teacher.
- Method: Informational.
- Question to be answered: What?
- "Teaching".

•It was proposed that students prepare a questionnaire determined the subject "Fundamentals of strength of materials" to interact in class, can be found in Chapter 1. Tension, compression and cutting of the book M. Gere, Mechanics of materials which is provided as a digital document scanner. The resources of the platform is complemented by reading online articles on the topic.
Step Four:
Quadrant Two. Students more comfortable with the left hemisphere.
- Classifying concepts
- Teacher Role: Teacher
- Method: Informational
- Question to be answered: What?
- "Teaching".

•It was proposed for this step to open a wiki on the platform where the students build the framework of the subject "Fundamentals of resistance of materials".

Quadrant III: In this quadrant students move from the abstract parameters, perceived through abstract conceptualization and process through active experimentation. Recommended activities are experimenting, manipulating, improving, tinker in.
Step Five:
Quadrant Three. Students more comfortable with the left hemisphere.
- Building on the concepts defined (Reinforcement and handling).
- Teacher's Role: Coach.
- Method: Facilitation.
- Question to be answered: How does it work?
- "Let them try".

• It is proposed to explain this step and make the subject application exercises during the class induces reflection concepts to understand the solution of exercises in the same way in class no forms are used.
Step Six:
Quadrant Three. Students more comfortable with right hemisphere.
- Adding something for themselves.
- Teacher's Role: Coach.
- Method: Facilitation.
- Question to be answered: How does it work?
- "Let them try".

• It is proposed to application exercises as homework and class where a fellow goes to the blackboard and all partners participate in explaining the solution methodology.

Quadrant IV: Students will now move from perception to reflection, conceptualizing and adapting the way the brain works, according to its rightful place in the cycle. Recommended activities are modifying, adapting, risking, creating.

Step Seven:

Quadrant Four. Students more comfortable with the left hemisphere.

- Evaluating and synthesizing to use or apply.
- Role of the Teacher: Evaluator/Remedy.
- Method: Self Discovery.
- Question to be answered: If all this fits, what does?
- "Let them teach themselves and others".

• This step is proposed to teams and to present a related experiment with the subject, and explain to classmates. They can also submit video and post the link on forum to share with colleagues, for this activity, students can see an example blog: http://claussspace.blogspot.com. Should be considered in the experiment, the density of the material of the bar that supports the load.

Step Eight:

Quadrant Four. Students more comfortable with the left hemisphere.

- Doing it for themselves and show what they do to others. Role of the Teacher: Evaluator/Remedy.
- Method: Self Discovery.
- Question to be answered: How I can apply this? What can make this?
- "Let them teach themselves.

• For that step it is proposed to make a Power Point presentation containing images (can be for them to take photographs or images obtained from the web) where the application is made evident in the industry effort to prismatic bars with a given load and consider the material which is formed the structure.

In the last part of the development of research, we proceeded to test the application of the module which was in the same test used as a tool to measure the gain once the conceptual module, the post-test also contains exercises for implementing subject is considered to have clear concepts the students are able to solve applications the post-test contains in addition application exercises, is considered to have clear concepts the students are able to solve applications.

V. RESULTS

We present the results of the pretest and posttest for students in terms of percentage rightly considered that the post has a section on application of concepts to solve problems (Fig. 6).
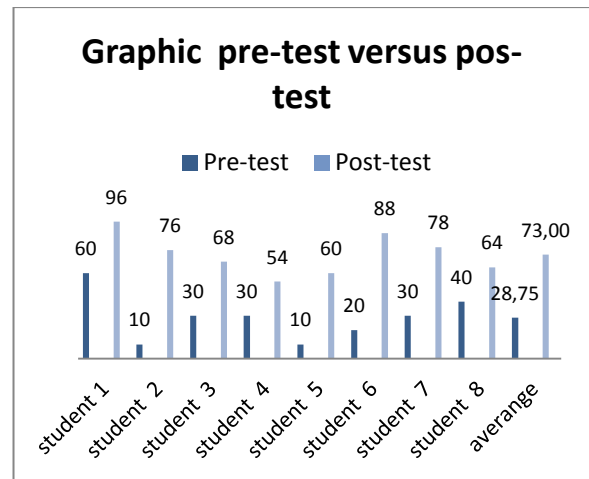

FIGURE 6. Percentage of successful student pre-test and post-test f.

Interpretation of evaluation results facilitates the calculation of profit, also known as relative gain of conceptual learning or Hake factor [7].

The gain is defined by

$$g = \frac{S_f - S_i}{100 - S_i}.$$

S_f are the successes in the post-test and the successes in pre-test are S_i. The proceeded to the evaluation of the test questions where scores were obtained percentage of pre-test and post-test for application to the equation of Hake, interpretation was taken for the categorization of calls results in areas of profit [6].

1. Low income area. Gain value less than 0.3(g≤0.3).
2. Zone average profit. Gain value in the range 0.3 ≤ g ≤ 0.7.
3. High-profit zone. Gain value greater than 0.7(g≥0.7).

The results obtained by students in conceptual terms of gain are presented below: Fig. 7.
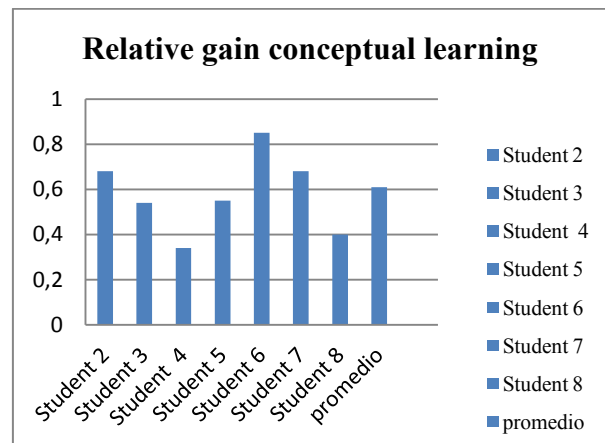

FIGURE 7. Relative gain conceptual learning.

VI. CONCLUSIONS

• You can implement educational platform favorably, the 4MAT system model is compatible with Moodle platform (platform that the University has the know) which is friendly to conduct forums, wikis, submit assignments, make glossaries, quizzes online, placing links to the web allows us to link videos and information provided by other universities, link to blogs of people who share their knowledge of the subject as well as programs where students can manipulate variables in understanding the concepts, representations various photographic images and graphics, online books, magazines access to the latest articles on the research topic.

• 8 steps taken by the MAT system 4 are fully compatible not only with the use of web tools are convenient but also to provide a wider range of activities outside the sessions.

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