

An adaptive teaching integrating learning styles: model and experiment

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Summary

In the traditional classroom training a great deal of students are evaluated in terms of their failure which is not necessarily due to their performance. The way they perceive information has a great impact on their learning. This paper suggests other alternatives that could be used to adapt distance education to the failing students, learning styles.

This case study aims at finding an appropriate distance learning style that could make the students, who have difficulty in the traditional classroom perform better. The study has been experimented and results are encouraging.

Key words:

learning style, online teaching, failure,, the MBTI model, traditional classroom training.

1. Introduction

Is there a course that could be adapted to all learners? If there was, it would be the key to success. Finding this kind of course depends on the course itself, the learning environment and the individual characteristics of learners. Early research stated that individualizing learning was cognitive. It took into consideration the knowledge that is to be transmitted to learners. Nowadays, however, there are more and more emotional individualization models that take into account the learners emotions and their way of learning. [1] stated that « Personalization is the dynamic adaptation of the content or the services offered by a system in order to improve the quality of interaction between the user and the system ».

The traditional classroom training doesn't allow the individualization of learning. The learner / instructor contact is achieved collectively, rather than individually, which explains why a lot of students fail to adapt to this kind of learning style. [2] suggests creating an adaptation between the learning environment so as to satisfy the learners subjectivity, their learning speed and efficiency and their performance. That is the reason why this research is mainly concerned with the learning style.

In the psycho-pedagogical disciplinary field, learning style is considered to be one of the main individual differences that affects learning. It could shed light on the

preferences linked to perception the input and organization of information.

In fact [3] define the learning style as such :

« The learning style is defined as (or stands for) the distinctive behaviors with cognitive emotional, psychological and sociological plans, these behaviors serve as relatively permanent indicators of the way an individual perceives and deals with information, the way he or she reacts and responds to the learning environment ».

2. Objective and context:

The course taught at BTS (Brevet de Technicien superieur) is in a traditional classroom environment. The action research carried out presents an online course that aims at determining the contribution that distance education can offer to traditional classroom failing students.

First, instructors were asked to fill in a form in which they had to evaluate and determine their students level. Next, these students had to complete a form that would show their learning styles, after which they took an online course « Introduction to ULM, » followed by an evaluation of the course.

The purpose of this research is to evaluate the contribution of the learning styles as an important criteria for course adaptation, and to answer the following questions:

- Will a student who fails at learning in an informal classroom manage to do better in online virtual classes?
- Does the success of the online teaching depend on the learners' learning style?
- Do traditional classroom failing students who excel in online class have a specific.
- If the answer is yes, what kind of learning style is it?

2. Learning style

[4] define learning style as follows : « It stands for the distinctive behaviors with cognitive, emotional, psychological and sociological plans; these behaviors serve as relatively permanent indicators of the way an individual perceives and deals with information. The way he or she reacts and responds to the learning environment ». to

describe a student's learning style many types have been elaborated.

2.1. Types of learning styles:

[5] have subdivided learning style types into 3 categories.

- those which are interested in teaching and learning conditions Ex Grasha and Reichmann [6].
- Those interested in the way learners deal with info in terms of means.
Ex : [7], [8] and [9].
- Those more concerned with the personality of the learner : Ex [10] , [11] and [12]

2.2. Some examples of systems based on learning styles.

For the conception of adaptive hypermedia systems, many works have proposed systems based on learning styles. [13] identified a set of this kind of systems: « CS383 [14], TANGOW [15] Heritage Alive Learning System [16] and those which were developed in [17] and Graf [18] .These systems use Silverman and Felder's model, which consists of four dimensions (sensing/ intuitive, visual/ verbal, sequential/ global, active/ reflective).

There's also the weaver system [19] that uses the Dunn and Dunn model. [20] which contains perception preferences (impulsive, reflective, global, analytical).

Where as the INSPIRE system [21] uses the Honey and Munford model. Which consists of four learning styles: (active, reflective, theorist , pragmatic) [13] .

For our study, we're rather interested in the Myers. Briggs type Indicator (MBTI) model. In fact Myers Briggs test Inventory is one of the most used and validated personality inventory in the world (4 to 5 million test Inventory a years) [22].

3. MBTI model :

In the field of analytical psychology, there have been some theoretical elements in the psychological types. This was Carl Gustav Jung's invention in the thirties. (1875 – 1961). Then many researches have been carried out by Isabel Briggs Myers (1897 – 1979) and by her mother Katherine Cook Briggs who had worked on aspects of that theory for 40 years. Their work led to the creation of Myers – Briggs Type Indicator MBTI. This indicator identifies 16 big personality types starting from the two possible preferences on each of the four dimensions below. It's about individual preferences:

TABLE 1 INDIVIDUAL PREFERENCES OF MBTI

<i>Dimensions</i>	<i>Préférences</i>	
Favorite world:	E Extraversion	I Introversion
perceiving:	S Sensing	N Intuition
judging:	T Thinking	F Feeling
Lifestyle:	J Judging	P Perceiving

The following chart summarizes the main characteristics of each preference

Table 2 Main characteristics of each preference

Extraversion Prefers brining energy outside oneself, at others	Introversion Prefers getting energy from the inside world of ideas, emotions, feelings
Sensing Prefers concentrating on the information obtained from the five senses and the practical applications	Intuition Prefers concentrating on the structure, the rapports and the possible meanings
Thinking Prefers making decisions based on logic and on the objective analysis of causes and effects	Feeling Prefers making decisions based on appreciation progress, and taking into consideration what is important for people.
Judging Appreciates a planned and organized approach to life. It prefers decisions– making.	Perceiving Appreciates a flexible and spontaneous approach, and prefers keeping options.

Some forms are one the internet (payment/free). They allow you to identify your MBTI.

4. Experimentation

4.1.Experiments

For a diplomatic training of BTS students (the INTIC (Informatique et Nouvelles Techniques de l'Information et de la Communication) branch) in Morocco, 30 students have taken an online course on the introduction to UML. (It is a course that does not exempt in regular classes). Students have been evaluated afterwards.

Before they started their e-course, they had completed a form so as to determine their learning styles, thus showing the pedagogical preferences. (It is the MBTI test which we'll explain later on)

After that each student followed the steps of the e-course individually at his or her own pace.

An evaluation had to be done to determine student's level of assimilation.

The pedagogical approach has to be built on 3 pillars: (objectives, concepts and pedagogical materials or resources [23] (figure 1)

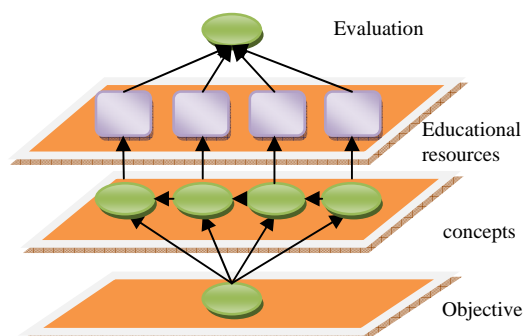


Figure 1. Training content outline form at 3 levels

To illustrate each concept, the pedagogical resources are presented to students in a linear form. It starts with a introduction followed by a concept presentation with some examples and exercises figure 2.

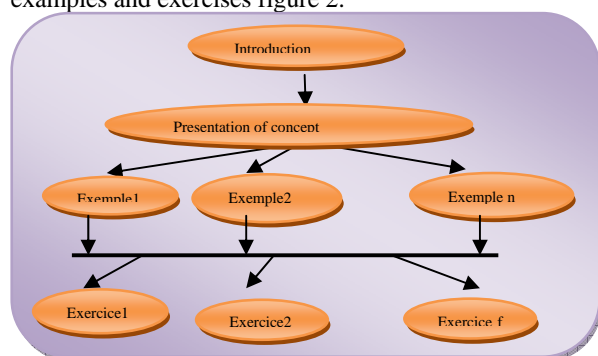


Figure 2. structure of Educational Resources dealing a concept

The course structure, as it was presented, is known as “the theorist line” by [13]. It is a line that gives importance to the coherence in the organization of new knowledge favoring the analytical, synthetic and objective mind [8].

4.2.Presentation of results:

The MBTI preferences, the online course and the final assessment have been carried out by 30 students; but only 26 have been admitted. The other four students have either badly filled their forms or been absent during the assessment. As for two regular classroom teachers assessment, the flowing hypothesis has been set: a student is evaluated with a letter S (Success) if he is admitted or with the letter F (Failure) if he isn't.

The MBTI test result, the teacher's evaluation in the traditional classroom and the result of the final online evaluation were both published on table 3.

Table3. MBTI test result, the assessments of teachers in class and Results of the online course evaluation

Students	MBTI Model				Teacher's assessment in the classroom.	Results of the online course evaluation
	Favorite world	Perceiving	Judging	Life style		
Student 1	I	S	T	P	S	S
Student 2	I	N	T	P	S	S
Student 3	I	N	T	P	S	S
Student 4	I	N	F	P	S	S
Student 5	E	N	T	P	S	S
Student 6	E	N	F	J	S	S
Student 7	E	N	F	J	S	S
Student 8	E	N	F	P	S	S
Student 9	E	N	T	J	S	S
Student 10	I	N	F	J	F	S
Student 11	I	N	F	P	F	S
Student 12	I	N	T	J	F	S
Student 13	E	S	F	J	F	S
Student 14	I	N	F	J	F	S
Student 15	E	N	F	P	F	S
Student 16	E	N	F	J	F	S
Student 17	E	N	F	P	F	S
Student 18	E	N	T	P	F	S
Student 19	E	S	F	J	F	S
Student 20	I	N	T	J	F	F
Student 21	E	S	F	P	S	F
Student 22	I	N	F	P	F	F
Student 23	I	N	T	J	F	F
Student 24	I	N	T	P	F	F
Student 25	I	N	F	P	F	F
Student 26	E	S	T	J	F	F

According to the previous, we can draw the following statistics:

19 successful and 7 failing students have been evaluated by their teachers in traditional classroom.

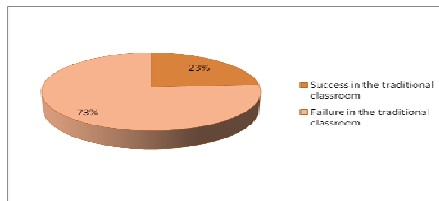


Figure 3. graphic shows the student's distribution in the traditional classroom according to their teacher's evaluation.

The table below contains both the online evaluation results and the distribution of the teachers' assessment in the traditional classroom.

TABLE4: ASSESSMENT OF STUDENTS IN THE TRADITIONAL CLASSROOM AND ONLINE.

Failure in the traditional classroom		Success in the traditional classroom.	
Success Results of the online course evaluation	Failure Results of the online course evaluation	Success Results of the online course evaluation	Failure Results of the online course evaluation
10	6	9	1
16		10	

10 among 16 students success in the online course when they were failed in the traditional classroom according to their teacher's evaluation. These students represent 62% (10/16) students who are failing in the traditional classroom according to their teacher's evaluation.

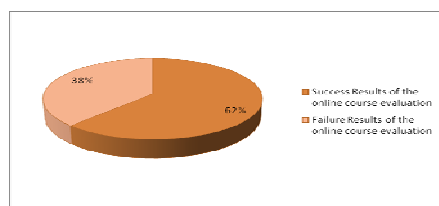


Figure 4. Distribution of the online evaluation of traditional classroom failing students.

These different findings lead to asking the following questions:

Why traditional classroom failing students did do better or pass in the online course?

Is this a connection between the learning styles provides by the MBTI model and the kind of inline course suggested?

In this case study, importance is given rather to students who did better and paused their exams in online classes, and who were assessed as failing by teachers in the traditional classes.

The following chart gathers information on these students who were assessed as failing by teachers in the traditional classes.

TABLE5 INFORMATION ON STUDENTS WHO DID BETTER AND PAUSED THEIR EXAMS IN ONLINE CLASSES, AND WHO WERE ASSESSED AS FAILING BY TEACHERS IN THE TRADITIONAL CLASSES.

Students	MBTI Model				Teacher's assessment in the classroom.	Results of the online course evaluation
	Favorite world	Perceiving	Judging	Life style		
Etudiant 10	I	N	F	J	F	S
Etudiant 11	I	N	F	P	F	S
Etudiant 12	I	N	T	J	F	S
Etudiant 13	E	S	F	J	F	S
Etudiant 14	I	N	F	J	F	S
Etudiant 15	E	N	F	P	F	S
Etudiant 16	E	N	F	J	F	S
Etudiant 17	E	N	F	P	F	S
Etudiant 18	E	N	T	P	F	S
Etudiant 19	E	S	F	J	F	S

5. Results analysis:

The failing learner preferences in regular classes have been gathered on chart 7. It shows the distribution of individual preferences identified by the MBTI.

TABLE 6 DISTRIBUTION OF 16 STUDENT'S MBTI PREFERENCES

Preferences identified by the MBTI.	Distribution of success student	
Favorite world: E Extraversion I Introversion	6 60%	4 40%
perceiving: S Sensing N Intuition	2 20%	8 80%
judging: T Thinking F Feeling	2 20%	8 80%
Lifestyle: J Judging P Perceiving	6 60%	4 40%

According of the results analysis it has been noted that:

- For the Favorite world preference it has been concluded that:

60% have extraversion preference and burn energy outside themselves.

40% have introversion preference and get their energy from there outside world of ideas, emotions, and feelings.

- For the perceiving preference known as “the world perception” it has been concluded that:

20% have sensation preference and prefer to get information from them 5 senses.

80% have the intuition preference and prefer to get information from their 6th sense.

- For the judging preference, it’s been noted that:

20% have the thought preference and like organizing and structuring information by objective and logical decision – making.

80% have the feeling preference and like organizing and structuring information in terms of values and feelings.

- For the Lifestyle preference known as “structure” it’s been noted that:

40% have judgment preference and live to live in a planned organized way.

60% have the perception preference and prefer to live in a spontaneous and flexible way.

The figure below shows the percentage of preferences of those students who passed their online class but failed in the traditional class.

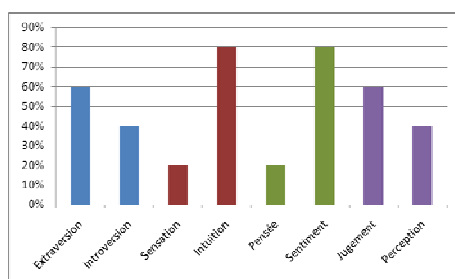


Figure 5. Histogram showing the percentage of learners who did better in the online course according to their preferences.

80% of learning who did better in the online class have these preferences: feeling or intuition. The first stands for judging and perceiving preference. The last one is an important criterion in the learning process. It is an indicator of the way the learner perceives and deals with information. So it would be right to insist more the perceiving preference which affects the learning process rather than the judging preference.

These results show that the majority of students having the intuitive learning style preference do much better than the sensitive style students during the online course.

In fact, due to their imaginative and creative tendency, students are inclined to look for new knowledge and

eventually new ways of getting info, which is in a way very possible to do with the online course that offers a different way of learning.

[] suggests that online learning offers unlimited possibilities to the intuitive learner so that he or she could explore his or her intuitions, especially because in the learning process, the online course includes other concepts non available in the traditional classes: multiple – choice questions, animation, audio-visual, documents, screen simulation and soon.

All these activities and interactions stimulate students’ willingness and desire to change the intuitive students’ desire to change them way of learning, which this allows them to find a type of education adapted to their learning style. [El Bachari and al, 2009] have suggested learning, situations according to the learners preference. They suggested a different pedagogy for the Intuition preference: Creativity, discovery and projects.

Conclusion and perspective:

Distance learning or online learning offers many opportunities and many challenges. It responds to the learners diversity. In online classes the instructor is faced with many questions such as the integration and adaptation of traditional pedagogical methods in the online learning with all the different possibilities that the TIC offers From the results of this study, it could be noted that there is a significant correlation between the individual preferences provides by the MBTI indicator and the outcome of the online class students. In fact a bi percentage of low – achievers in the tradition classes, were able to succeed in the online course, eve, if them regular school teachers didn’t provide positive assessment.

This experience shows that the intuitive preference students can better adapt to online education: the sense of searching, the creativity and the tendency to communicate, which are their main characteristics, are the reasons why their favorite learning style is the one that relies on personalized means, something that the online education perfectly provides.

Mean while it’s been noted that students with different MBTI have failed their online tests. This leads to answering the following questions.

- Is the online course taken by failing students adapted to each one of them?
- Is it necessary to find another course syllabi for those students.
- Is it necessary to create as many course syllabi as the numbers of students’ preferences?
- Is it necessary to adapt the course content to the learning style?
- Can the adaptive hypermedia contribute to improving students’ achievement?

Finally, it would be unfair to believe in the magical, predictive power of the MBTI on the magical, predictive power of the MBTI on the school success. Yet, it is useful

to know the learners' preferences and orientate the pedagogical approach so that it would better adapt to their learning style.

Références

- [1] [Stewart et al ,2004] : Stewart, A., Niederee, C. & Metha, B. (2004). State of the art in user modeling for personalization in content, service and interaction. NSF/DELOS Report on Personalization, 2004. ipsi.fraunhofer.de.
- [2] Popescu, E. (2008). Dynamic adaptive hypermedia systems for e-learning. Thèse de doctorat non publiée, Université de Technologie de Compiègne,
- [3] France.Sauvé, L., Nadeau, J.-R. et Leclerc, G. (1993). Le profil d'apprentissage des étudiants inscrits dans un certificat de cycle offert à distance et sur campus : une étude comparative. *Revue de l'enseignement à distance*, 8(2), 19-35. Récupéré du site de la Revue : <http://www.jofde.ca/index.php/jde/article/view/218/627>.
- [4] Sauvé, L., Nadeau, J.-R. et Leclerc, G. (1993). Le profil d'apprentissage des étudiants inscrits dans un certificat de cycle offert à distance et sur campus : une étude comparative. *Revue de l'enseignement à distance*, 8(2), 19-35. Récupéré du site de la Revue : <http://www.jofde.ca/index.php/jde/article/view/218/627>.
- [5] Curry, L. (1983). An organization of learning style theory and constructs. Dans L. Curry (dir.), *Learning style in continuing medical education* (p. 115-123). Ottawa, Canada : Council on Medical Education, Canadian Medical Association.
- [6] Grasha, A. F. et Riechman, S. W. (1975). Student learning styles questionnaire. Cincinnati, O H : University of Cincinnati, Faculty Resource Center.
- [7] Gregorc, A. F. (1979). Learning/teaching styles: Potent forces behind them. *Educational Leadership*, 36(4), 234-236.
- [8] Honey, P. et Mumford, A. (2000). The learning styles helper's guide. Maidenhead, Royaume-Uni : Peter
- [9] Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ : Prentice Hall.
- [10] Kagan, J., Rosman, B. L., Day, D., Alpert, J. et Phillips, W. (1964). Information processing in the child: Significance of analytic and reflective attitudes. *Psychological Monographs: General and Applied*, 78(1).
- [11] Myers, I. et Briggs, K. (1962). The Myers-Briggs type indicator. Princeton, NJ : Educational Testing Services.
- [12] Witkin, H. A. (1976). Cognitive style in academic performance and in teacher-student relations. Dans S. Messick and Associates (dir.), *Individuality in learning: Implications of cognitive style and creativity for human development* (p. 38-72). San Francisco, CA : Jossey-Bass.
- [13] Aziz Dahbi, Najib El kamoun, Abdelghafour Berraissoul, 2009, « Conception d'un système hypermédia d'enseignement adaptatif centré sur les styles d'apprentissage : modèle et expérience », *International Journal of Technologies in Higher Education*, 6(1), lien : www.ritpu.org
- [14] Carver, C. A., Howard, R. A. et Lane, W. D. (1999). Enhancing student learning through hypermedia courseware and incorporation of student learning styles. *IEEE Transactions on Education*, 42, 33-38.
- [15] Paredes, P. et Rodriguez, P. (2004). A mixed approach to modelling learning styles in adaptive educational hypermedia. *Advanced Technology for Learning*, 1(4), 210-215.
- [16] Cha, H. J., Kim, Y. S., Park, S. H., Yoon, T. B., Jung, Y. M. et Lee, J. H. (2006, juin). Learning styles diagnosis based on user interface behaviors for the customization of learning interfaces in an intelligent tutoring system. Communication présentée à la 8th International Conference on Intelligent Tutoring Systems (ITS 2006), Jhongli, Taiwan.
- [17] Sangineto, E., Capuano, N., Gaeta, M. et Micarelli, A. (2007). Adaptive course generation through learning styles representation. *Universal Access in the Information Society*, 7(1-2), 1-23.
- [18] Graf, S. (2007). Adaptivity in learning management systems focusing on learning styles. Thèse de doctorat non publiée, Vienna University of Technology, Autriche.
- [19] Wolf, C. (2002). iWeaver: Towards an interactive Web-based adaptive learning environment to address individual learning styles. Dans M. Auer (dir.), *Blended learning: International workshop – Interactive Computer Aided Learning (ICL) 2002*. Kassel, Germany : Kassel University Press.
- [20] Dunn, R. (2003). The Dunn and Dunn learning styles model and its theoretical cornerstone. Dans R. Dunn et S. Griggs (dir.), *Synthesis of the Dunn and Dunn learning styles model research: Who, what, when, where and so what* (p. 1-6). New York, NY : St. John's University.
- [21] Papanikolaou, K. A., Grigoriadou, M., Kornilakis, H. et Magoulas, G. D. (2003). Personalizing the interaction in a Web-based educational hypermedia system: The case of INSPIRE. *User Modeling and User-Adapted Interaction*, 13(3), 213-267.
- [22] <http://www.opp.eu.com/uk>
- [23] Papanikolaou, K. A., Grigoriadou, M., Kornilakis, H. et Magoulas, G. D. (2003). Personalizing the interaction in a Web-based educational hypermedia system: The case of INSPIRE. *User Modeling and User-Adapted Interaction*, 13(3), 213-267.
- [24] [Carolyn Soles et al, 2009] *IJET Articles* (January, 2001) - v2,n2 [ISSN 1327-7308]
- [25] [El bachari et al, 2009] 4^{ème} conférence Internationale Consacrée aux TIC appliquées au Développement, à l'Enseignement et à la Formation (mai, 2009) - [ISBN 978-3-941055-04-9]

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