

Mind Mapping as Support for Economic Studies E-learning

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Abstract

The web 2.0.-era education is in a continuous reformation and evolution. Nowadays, information technologies are developed and widespread impetuously. Thus, digital mind maps are becoming more and more popular but little is known about the use of this subject and its application in the economic academic field. This paper aims to offer some results in mind mapping applied to a course from the higher education in the economic area by using a mixed research methodology. Thus, we combined a survey and a participant observation, aimed to illustrate the way in which we projected, implemented and used the Web2 instruments with mind mapping. On the one hand, this framework is useful for measuring the students' attitude towards traditional teaching with WEB 2.0 instruments with mind mapping. On the other hand, we want to check if the engagement of the students will increase. So, our study will provide conclusions in the field of research related to the measurement of students' attitudes and engagement in teaching-learning in the economic field, in a period in which all those involved are working to increase the degree of digitization of the university education. The outcome of this study can be considered favorable on "our framework" implementation to the digitalization area of the economic academic field.

Keywords: Mind Mapping, Web 2.0, Social Learning Environment, Teaching/Learning Methods.

1. Introduction

Nowadays, education worldwide has become the core from which all the other systems emerge like in a network. Changes in education today are determined mainly by the necessity of establishing a functional relationship between demand and supply in education. The fast pace of changes in society determines the integration of the educational system in an era of continuous reformation. At the end of the twenty-first century, according to (Conole & Alevizou, 2010), the main goal of education in higher education is to develop new skills to expand the capabilities of

learners in order to prepare them for a world in a continuous change while the acquisition of new knowledge becomes a secondary objective. The immediate effect of these changes was to reconsider the theories and the learning styles along three major axes: associative (learning is done through structured tasks, essentially the behavioral approach adapted to the reality of digitization), cognitive (learning by understanding and reflecting on individual types of learning - metacognition Mind-Mapping tools) and situational (learning as a social practice that confers constructivism and connectivity to the foreground, developing the communities of practitioners). On the basis of these theorems of the necessary changes imposed in higher education, it is observed that in Romania, the current period is defined by attempts to find the methods that offer flexible features to the educational system, oriented more on research and at the same time on the needs of the market in accordance with the policies of the Bologna system.

From the documents Europe 2020 strategy, the Partnership for 21st Century Skills we can see that all the changes in higher education are to eliminate the gap between education and labor market. This gap was generated by the changes imposed by the omnipresence of the Internet in the human life. In addition to knowing the discipline and the professional skills, employers emphasize that students as potential employees need to develop the skills for "teamwork, problem solving, self-management, business knowledge, ICT knowledge, good interpersonal skills and communication, ability to use their own initiative, but also to follow the instructions, "leadership skills" (Lowden et. al., 2011). In the process of integrating hiring skills, teachers can create more reflective environments oriented to learners (Berdrow & Evers, 2011) and become facilitators of self-development and learning abilities (Yorke & Knight, 2004). So, in terms of critical competencies, early 21st century policies followed by our country state that "critical thinking, generalist (broad) competencies, ICT competencies enabling expert work, decision-making, handling of dynamic situations, working as a member of a team, and communicating effectively" (Seitzinger, 2006) are required of active members of present-day society. In developing countries such as Romania, the current period is defined by attempts of changing higher education into a more flexible system, more research oriented and, at the same time, meeting the needs of the labor market. Considering these reference points, an idea has emerged that students should improve their digital and critical (analysis and synthesis) skills during college. Digital skills are defined as a series of knowledge, abilities, and attitudes which should be formed by the end of compulsory education (Cohen-Scali, 2012). Structuring these key competences is made at the crossroads of several educational paradigms which refer both to "academic" fields and inter and trans-disciplinary meta-cognitive aspects, achieved through the effort of several curricular areas. Through critical competences, the student is endowed with "general critical thinking, TIC competences which will allow him to do expert work, decision making, and the management of dynamic situations, teamwork and effective communication" (Sackman, 1970).

The digital and critical competences and skills (Cohen-Scali, 2012) "are necessary for all the active members of current societies". In other words, the teaching methods represent an adaptation of present methods to technology in (Popescu & Cioiu, 2011; Robins et. al., 2003; Rusk et. al., 2008) referring to digital teaching and learning which can be better adapted to each student's needs. Another advantage of the new methods is the easiness with which one can record, analyze and maintain in time the students' progress, enabling teachers to offer customized feedback in less time, identifying the areas in which the student needs more support. In this context, our paper will complete the research about applying different teaching methods conceived around TIC instruments such as: wiki, blogs, podcasts, social media, Moodle platform in order to increase students' involvement in the course. The paper presents a course framework combining traditional learning methods with web 2.0 tools and visual thinking and learning theories built on mind-mapping in order to offer relevant results to TEL (Technology Enhanced Learning). The results are related to prototypes of high-technology teaching and learning needed in higher education to synchronize with the documents *Europe 2020 Strategy, the Partnership for 21st Century Skills*. The relatively new element introduced in our experiments in Technology Enhanced Learning (TEL) is a mind-mapping

tool. Mind-mapping in our experiment is used to measure the degree of association between the way in which the teacher elaborates the whole teaching-learning approach and the student participates, engages and offers feedback. The student's feedback in this experiment includes his behavior within the WEB2.0 wiki platform and in physical space. The feedback thus interpreted becomes a typology of matter approach that can be illustrated by mind-mapping tools on the basis of which the teacher is offered all the tools necessary to reorganize the matter so as to deliver knowledge in the optimum way of the process. The article is structured on the following three sections: the next section refers to an overview of the relevant literature, then it presents the teaching/learning scenario created by teachers which is centered on wiki and visual learning techniques, more exactly mind mapping; a quantitative analysis to measure students' attitude towards the introduction of visual learning techniques and last, but not least, the conclusions referring to the student's availability to increase his engagement level due to the introduction of the new visual methods.

2. Theoretical framework

TEL's applied literature in higher education contains numerous studies that attempt to demonstrate what the most effective teaching methods of learning are in a changing world. Change involves a vast, diversified literature which, depending on the research area, is trying to determine what TEL means (Kirkwood & Price, 2014). Our conclusion is that in nowadays approach, learning mix, metacognitive theories, and successful IT tools are more frequently found. This statement is supported by a radiography of the literature that addresses TEL. TEL, according to (Walker et. al., 2012) means assessing the impact of the technology use in the higher education sector while for (Naismith et. al., 2004; Sim & Hew, 2010; Asztalos, 2014; Felea & Stanca, 2015) means analyzing the impact of a certain Web 2.0 technology used in order to adapt the teaching techniques of a subject and to increase student engagement. In (Novak & Canas, 2006) the Web 2.0, more precisely Wiki is approached as a tool for measuring quantitatively the social teaching process.

According to (Pennington, 2003) Wiki has begun to gain popularity in the field of teaching and computer-mediated (CMC) teaching. According to (Ware & Warschauer, 2006; Purdy, 2009) it is demonstrated that Wiki is a beneficial tool for developing asynchronous communication in order to measure the student's ability to compose contexts and specialist speeches typical of the wiki's compositional principles. (Lundin, 2008) demonstrates that wikis ease the collaboration process, facilitate interactions, and develop the creative ability of the student to write. (Kubincová et. al., 2013) are the promoters of the idea that the involvement in education of social media tools, namely wiki, allows participants to develop technical, linguistic, and skills such as co-operation, organization and planning of collaborative tasks, but also communication skills, critical and analytical thinking, and the ability to express ideas.

In our view, it is necessary to extend the domain with results offered by the dimension studied by (Mezirow, 1996) more precisely "learning is understood as the process of using a prior interpretation to construct a new or revised interpretation of the meaning of one's experience in order to guide future action". According to (Mezirow, 2000) theory, the learning process is formed and circumscribed by a reference framework. In our interpretation, the frame of reference in the process of learning a subject by students is the framework created by the teacher on a subject.

The reference framework of our course is a significance structure (translated by mind-mapping tools) that includes assumptions and expectations that incorporate the teacher's tactile views and influences students' thinking, beliefs and actions. In this context, according to (Novak & Gowin, 1984), mind mapping tools justify their presence by being able to illustrate the significance schemes and the perspectives of significance of the teacher and the student, making the dialogue and the collaboration between the two much easy and directly increasing the quality of the teaching-learning assisted by technology. We support the idea that through the course, the teacher has an impact on the student's significance systems, more precisely he/she will act on the beliefs, values and feelings that reflect the interpretation of the experience accumulated by the subjects involved in an educational act that extends for a 14-week period with medium and long-term impact that can be captured, represented, measured and interpreted by mind-mapping.

The concept of maps used in the teaching-learning process has emerged since the early 1980s (Croasdell et. al., 2003) as a tool for representing a specific type of mental model. In the literature, we can see that (Chang et. al., 2001) used the concept of maps to represent and measure individual knowledge by graphically visualizing the concepts (represented as nodes) and the relationships between them represented as arches. While (Gouli et. al., 2004; Grundspenkis, 2008) used the concept of maps in knowledge assessment and feedback, (Tergan, 2005) considers important that mind mapping should be used in the assessment of knowledge because it allows to identify the cognitive structure of the student's knowledge and in the background, the teacher identifies parts of the course that do not have the expected impact at the moment of their creation.

The results of (Tergan, 2005) show that the conceptual maps, the knowledge assessment system are able to adapt to the level of knowledge of each trainee in the technical field. (Newbern & Dansereau, 1995) demonstrates that conceptual maps have the great potential to promote spatial learning strategies by visualizing the processes of knowledge and support of individual knowledge management, such as the acquisition, organization, representation, evaluation, communication, location and use of knowledge. In addition, (Newbern & Dansereau, 1995) concludes that they have the potential to represent and make available the conceptual and content knowledge of a field being indicated in the design, implementation and testing of e-learning scenarios. (Waterhouse, 2004) have shown that mapping of concepts is rarely used spontaneously by students because it is a demanding cognitive activity. The results of the field are complemented by (Waterhouse, 2004) which demonstrates that the process of map modification can sometimes be messy and cumbersome because it requires both efficient learning strategies and knowledge and information management. (Newbern & Dansereau, 1995) analyzed the digital potential of conceptual maps and concluded that they are needed in the individual knowledge management processes as part of any e-learning scenario in which matrices are to be adapted to each type of learning. These results are added to the results (Novak, 1998) which demonstrated that the roles of the main actors in the teaching and learning process have changed. Teachers in the digital age have a role of guides and trainers while passive learners are starting to become active. These changes are very strongly promoted by continuously upgraded technology so as to facilitate the access to lifelong learning through e-learning and m-learning. According to (Novak & Gowin, 1984) in the field of education, mapping of the mind refers to the development of meaningful learning, i.e. a new piece of knowledge becomes significant for learners if it is built into the knowledge structures they understand. Agreeing to (Kearsley & Schneiderman, 1999), mind mapping is understood to be diagrams expressing significant reciprocal relations between terms in the form of statements. By overlapping (Mezirow, 2000)'s theory with the theory of mind-mapping, in social learning as an integral part of collaborative learning, we decided that these form a mixed one. In our view, (Mezirow, 2000)'s theory of mind-mapping can be used to illustrate the significance schemes and perspectives of significance of the teacher and the student to study the correlation between the two sides, predicting that at the beginning of the course there is a weak correlation and at the end of the 14 weeks, a correlation from average to significant. The use of wiki has enabled us to position ourselves in the area of social learning and we believe that the learning environment created by wiki systems is more suited to teaching computer science with collaborative activities and survey-based activities. Wiki, according to the theory of social learning (McLoughlin & Lee, 2007) is a framework that facilitates the student's knowledge and digital skills (feedback generates commitment (McLoughlin & Lee, 2007) and (self-) evaluation. (Novak & Canas, 2006; McLoughlin & Lee, 2008). The added value of the framework developed by the authors in the experiment is the further development of academic and professional inter-curricular competences (McLoughlin & Lee, 2008; Gardner, 2006) and the inclusion of a new term, visual learning.

3. Research objectives

3.1. The context of the research

We are talking about a world which is activating, socializing, collaborating, learning and developing in Web 2.0. The basic properties of Web 2.0 are: socializing, collaboration, creativity, authenticity and sharing (Jolly, 1984). In this context there is a new visual learning term which is based

on mind mapping techniques. Mind mapping introduced in the teaching and learning process helps students visualize and externalize concepts (Eppler, 2006), understand connections between different ideas use in presentations, develop their critical thinking, brainstorming and why not, their decision making process and study management. Also, mind mapping (Jolly, 1984; Eppler, 2006) stimulates areas of the symbolical, metaphysical and constructive zone of the human mental, as it is accepted that there are mental representations, fixed images or fluid ones which have the role to allow the teacher to provide the student with information in concrete language. Moreover, the introduction of visual learning techniques of mind mapping type can significantly improve students' learning compared to traditional frontal teaching (Novak & Canas, 2006). In the last decade, it is used largely in primary and secondary education and stimulates critical thinking successfully (Nettleship, 1992) and it is demonstrated that mind mapping matches the cognitive learning theory enabling the creation of knowledge graphs (Eriksson & Hauer, 2004). The literature (Asztalos, 2014; Felea & Stanca, 2015; Lee, 2010; Talbot, 2012; Pinto et. al., 2009; Grossecck & Holotescu, 2012; Bacher et. al., 2004) confirms that the introduction of mind mapping in teaching allowed students to understand, integrate and clarify the studied concepts (in fields such as mathematics, accounting, IT, foreign languages, management, marketing, project management, etc); moreover, students became more involved.

In this context, the present paper intends to present the results obtained by introducing mind mapping besides wiki in the teaching/learning process of making decisions in tourism. We will illustrate the way in which we projected, implemented and used the Web 2.0. Instruments and mind mapping in order to measure students' attitudes towards teaching with the help of Web 2.0. Instruments combined with traditional and mind mapping and on the other hand to check if the format of the new course increases students' engagement. The platform originally aimed at the course management, but we realized that it has become a learning community that aims to support the student involvement through the social wiki features and to promote autonomy and independent work through personal workspaces. In the environment thus created, learning takes place both autonomously and through interaction with colleagues with advanced knowledge in the field of tourism in order to solve tasks with increased difficulty. The role of the teacher implies a careful scheme of activities and adapting the training to the needs, interests and styles of the individual. This creates a community in which the diversity of learning experiences could have an impact on the learners' ability to play in the academic world and on the labor market.

The structure of the platform created according to the teacher's vision is shown in Figure 1.

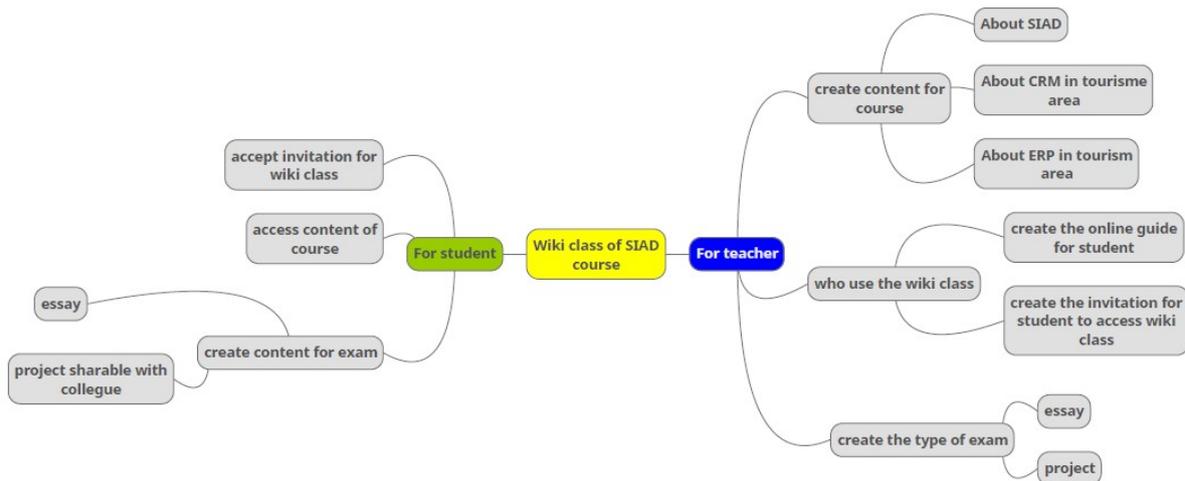


Figure 1. Mindmaps methods

The Wiki platform offers the ability to memorize the student's activity in it. The memorizing process is based on the wiki viewing and editing facilities. The data generated in this way allows us to analyze how students go through the course materials and solve their homework and the degree of involvement in the course. We will extract and translate the log data into a sequence of events in order to analyze whether the teacher's vision of how the design and

implementation of the platform overlaps the way in which the student perceives the matter. In this context, the assumptions of the research are:

1. The developed learning framework fosters the student engagement in the course;
2. The mind mapping of the teacher when developing the course is associated with the mind mapping of the student.

3.2. Methodology

The current research is based on the course named Business support systems from Tourism master program from the Faculty of Economics and Business Administration, Babeş-Bolyai University, Cluj-Napoca. The course takes place during 14 weeks, from October to February and consists of a series of lectures where the information is presented using mind mapping techniques and instructions including topics for individual or group assignments. The course has also assigned a wiki having a support role and being the collaboration environment with the teacher. Both teaching materials and the assignments (requirements and detailed explanations) are available on the wiki. Further, we will explain the wiki structure seen as a ubiquitous dashboard during the 14 weeks of study. The wiki consists of 10 pages, each of them allowing an easy navigation within the other pages. AATCSFSEGA space has the following structure: one guard page (Home) consisting of the general information about the course, the approached topics (each of them displayed on distinct page including teaching materials, tutorials, references, etc.) and the evaluation methods.

This e-learning framework started in the academic year 2016-2017 in order to share the study resources for Business support systems from first year, master program. Finally it became a learning space/environment used during lectures, instructions and individual work based on projects. About wiki: basic notions, Wiki Tutorial, technical issues, online learning advice, course organization and requirements, course's topics and teaching materials for each unit, assignments: instructions – learning materials and assignments, lectures. Wiki registration is made based on an e-mail invitation which must be confirmed by the student. There were 55 enrolled students and each student was registered based on username and password. Students were demanded to use simple and catchy usernames. After registration, for authentication the only things required are the username and the password. Moreover, each student could customize its own profile (using Settings option) by adding the real first name and surname, a picture, etc.

The aim of this section is to present the mind mapping of the teacher who organized the course. We support the idea that during a course design a teacher relies on mind mapping. The teacher's mind mapping assumes that a student who will acquire moderate to excellent knowledge must regularly engage themselves in the coursework, both on the wiki platform and at face-to-face meetings. A regular behavior with good final results was identified by the teacher, and presented below:

Table 1. Example of average values for a regular participation behavior

| Average views/ Month | Average edits/ month | Personal page – edits | Personal page - views | Class Attendance | Wiki Page | Final grade |
|-------------------------|-------------------------|-----------------------|-----------------------|------------------|-----------|-------------|
| 132.3 | 25.6 | 250 | 90.4 | 5 | 5 | 10 |

We can note: Attendance and WikiPage were graded with values in the interval [1,5], where 1 is poor, 2.5 average and 5 is excellent, The final grade was noted with 10, which represents the maximum on a 1 to 10 scale.

Concerning the course we can observe that the students will have to accomplish tasks such as:

- add textual knowledge for objects, for example, by the instrumentality of telling stories or write articles/web pages containing contextual data – it's about contextualization and testing
- collect and propose new topics within teaching materials
- moderation of content for archiving
- add new user – personal information

- view existing traces
- create new account – the user creates an account in order to use all the facilities of the wiki
- synchrony and asynchrony communication with the site administration and/or other users
- delete account – all users categories can delete their own accounts
- ask for additional information – the users or the potential users will be able to ask for information through the contact information from website.

Based on the literature review (Nettleship, 1992; Eriksson & Hauer, 2004; Lee, 2010) each course with all its involved elements/tools is based on the mind mapping of the teacher who designed it. In this context this section's aim is to outline the teacher's mind mapping (see Figure 1). The teacher expects that students respect the behavior designed by the teacher. The justification of this requirement is based on the idea that all the information taught can be assimilated by the student only if the mind mapping of the teacher is respected. In our view, the success of a lecture is measured by the students' degree of engagement, the assimilated information by students, and all of these by the successful instilling of the mind mapping previewed/planned by the teacher at the beginning of course's creation.

Next section introduces the statistical analysis whose aim on one hand is to depict students' attitude with respect to mind mapping utilization during the teaching/learning process and on the other hand validation of our idea according to which the success of a course is provided by the teacher's capacity to instil his mind mapping to students.

4. Results and findings

The analysis is realized on 55 students from first year at Business support systems from Tourism master program. The used sampling method is an empirical one, the sampling approach being purposive (non-probability), more exactly a voluntary sample. Thus, the students voluntarily came both to the presentation having as topic the use of mind mapping in economical universities' education and to fill the survey. The analysis is made based on the students' answers within a survey consisting of 11 questions related to self-efficacy for IT&C in economic fields, IT&C anxiety, digital abilities improvement, student engagement experiences, and to obtain qualitative feedback on the tutorials. The aim of this study is to prove if mind mapping applied on teaching-learning process is a decisional factor in students' desire to course participation and engagement. Achievement was rated on a 5-point scale that varied from 1 = very poorly, 3 = average and 5 = very well. The questionnaire thus resulted in subscales to measure engaging with other students, cognitive engagement, and skill development.

The statistical analysis started with the descriptive analysis followed by the validation analysis and the reliability of questions' scale. For the statistical study, we used SPSS 13.0 and the, Shapiro-Wilks test, Internal Consistency Analysis, Chi-Square Test, N-par Chi-Square, Pearson Chi-Square Kurskal-Wallis test and Marginal Homogeneity Tests. The decision to apply them was based on the results of the Shapiro-Wilks test. We used the TwoStep method according to studies by Gower, 1971; Ichino & Yaguchi, 1994; Cole, 2009) to optimally determine the number of existing clusters in a mixed data set.

The analysis started with the identification of the student whose profile is characterized by a regular commitment to a system created by the teacher, extended by the students as a result of their learning experience during the course. We insist on the fact that participants do not have prior knowledge of wiki usage in the learning process.

The student profile was built by studying the relationships between the attributes: class participation ([0.1] -42.46%, [1; 2.5] -31%, [2.5, 5]- 27%) , personal wiki pages ([1; 2.5] -69%, [2.5; 4] -25.39%; [4.5] -7.50%), page changes ([0; 15.6]- 90] represents 33% interaction, where access was measured by the number of views for all wiki pages, including personal pages, and self-employment, measured by the number of edits on the personal pages, representing user-generated content produced by students' response to various activities offered by the teacher.

We identified the student profile based on the data collected through an online questionnaire at the beginning of the academic year. Based on the results obtained in terms of age, the participants are divided into two groups: the majority (74.3%) are aged between 18 and 21; 25.7% are aged between 22 and 30 years. As for sex, the majority (79%) are women.

Most students studied ICT between 5 and 8 years- 20% and the remaining 80% studied 1 to 4 years. Similarly, their interest in assimilating the computer literacy in the field of tourism is quite high, 48.7% being very interested, 33% interested and 18.3% relatively interested. Furthermore, we considered it necessary to find out whether the interest in ICT is or not correlated with the number of years of study. After applying the Pearson Chi-Square test ($\chi^2 = 23.504$, $p = 0.04$), it resulted that there is a correlation between the number of years of study and the interest in ICT, and according to the Kendall index tau-b = -2.163, $p = 0.03$ there is a linear indirect correlation, i.e. people with a high interest have studied for a longer period. Finally, the prior use of students' e-learning platforms was considered and the results identified three major groups: 23.5% never used, 48.2% used little and 28.3% had had previous experience in e-learning platforms.

The study's hypothesis is unilateral according to the result of the analysis of different groups and interaction effect with the tool made with Anova (Chi-Square=75, p-value=0.000), there are differences between the survey's items generated by students' answers. The survey can differentiate students' attitudes toward Mind Mapping use within teaching-learning depending on their reactions. The hypothesis of the study is unilateral according to the analysis of the differences between groups and the interaction effect with the Anova instrument there are differences between the items of the questionnaire generated by the students' responses.

The analysis continued with factor analysis. The first step in such a study is to eliminate items which show the correlation smaller 0.3. Within the study there were no such items. Factor analysis is appropriate for our model, confirmed by the result of Kaiser-Meyer-Olkin, test which specifies how data variability is caused by the tool. The value of the Kaiser-Meyer-Olkin test is 0.443 so, the factor analysis in this case is indicated to be done. The result of the Bartlett test $p=0.000$ indicates that the factor analysis is useful with the given data.

According to Kaiser's criterion (from communalities the values must be higher than 0.4) the latent root is made of the following items: the level of using social networks generally; the level of using social networks for one's own education; the presentation made on the topic of using mind mapping in education can help you get an idea about the course; the course convinced you to use mind mapping in the teaching/learning process; mind mapping will help you systematize the course; mind mapping is relevant in learning motivation; do you consider that it is timely to introduce this new method in teaching at FSEGA; do you consider that using a new instrument in your preparation will increase your engagement level in the course.

In this context the study continued by testing the hypothesis not null. There is not a set of restricted items but this hypothesis in our study is rejected and we accept the alternative one that, there is a restricted set of items which determines the validity of the instrument in a proportion of 73.321% (in addition, the second null hypothesis is rejected, the alternative one is accepted according to which there are items which correlate moderately in the study). The statistics continued with testing the hypothesis according to which the proportion of the answers pro-using mind mapping in the teaching/learning process is equal with the proportion of the answers against it. The testing of this hypothesis imposed the use of the N-par Chi-Square test according to which, after the experiment, the students have an attitude of accepting mind mapping in education which results from:

- the level of using social networks generally is identical among the students from the study so it did not generate statistical differences (Chi-Square=3.901, p-value=0.543);
- the students from the study use social networks for their own education;
- the students are familiar with the mind mapping concept and accept it as being useful (Chi-Square=26.327, p-value=0.000);

- the presentations exposed during the course using mind mapping techniques help them assimilate the knowledge (Chi-Square=39.091,p-value=0.000);
- the course convinced them to use mind mapping in taking notes (Chi-Square=20.909,p-value=0.000);
- mind mapping helps them systematize the course (Chi-Square=23.909,p-value=0.000);
- the presentation of the mind mapping techniques increased the motivation in participating at the learning process (Chi-Square=98.327,p-value=0.000);
- the course presentation through the mind mapping techniques - that is a necessary ingredient in generating the increase of the participant number in the teaching/learning process (Chi-Square=72.255,p-value=0.000);
- accept that it is timely to introduce this new method in teaching at FSEGA (Chi-Square=139,818,p-value=0.000);
- assert that using a new instrument (MM) in your preparation will generate an increase of the engagement in the course activities (Chi-Square=20.909,p-value=0.000);
- the digital skills acquired in high school and in the first year are not considered enough in using MM instruments (Chi-Square=3.309,p-value=0.191).

The study continued by testing the hypothesis according to which the teacher's mind mapping when creating the course was not assimilated by the students. The validation of this hypothesis was made on the basis of view and collected publishing houses from wiki. In this process the first step was applying the Shapiro-Wilks test, according to which ($p=0.000<0.05$), data were not normally distributed. So, to check the statistical hypothesis we applied the Kurskal-Wallis test for independent and unequal samples. The result of Kurskal-Wallis test for view (Chi-Square=69.253,p-value=0.000) and for publishing houses (Chi-Square=53.475,p-value=0.000) imposes the rejection of the null hypothesis and accepting the alternative one. The conclusion is that students have different levels of engagement from one month to another in the course activity. In this context we continued the study by testing the following null hypothesis: students do not have a homogeneous behavior during the semester. The alternative hypothesis is students have a homogeneous hypothesis during the semester.

The result of the Marginal Homogeneity Mean MH test Statistic= 1295,500, p-value=0.002. The test imposes the rejection of the null hypothesis and accepting the alternative one.

In this context, we continued the analysis by using the TwoStep method to find the number of clusters that exists in a sum of different types of data. The null hypothesis of this stage is the following: there is no association between mind student mapping and teachers in the process of learning and teaching ITC in assisting decisions in the tourism field.

In order to validate/invalidate this hypothesis, we applied the cluster analysis based on the variables studied. The null hypothesis is rejected, and the result demonstrates that students group themselves in two clusters based on the studied attributes. These groups are characterized by the fact that the in-class inertia value significantly exceeds the values of inertia within the same class. The participants' interest rate was measured on the basis of these variables: view (with $F = 116.129$; $p = 0.005$) and edits (with $F = 64.677$; $p = 0.03$).

The result of the cluster analysis (K-means method) based on the variables studied, demonstrates that students can be grouped in two clusters based on the attributes studied, as it follows:

1. The first cluster of students (- 64%) includes people with a mind-mapping that is poorly associated with the ITC teacher of tourism decision-making, while the number of people with a high level of interest is very low. Participation/involvement in the theoretical and practical activities of the course is below the average attendance expected by the teacher considered necessary to assimilate the knowledge provided by the course. The scores obtained by participants vary from one extreme to another, from 10 to 7 and even lower than 6.

2. The second cluster of students (36%) includes people with a mind-mapping that is poorly associated with the teacher's. Participation/involvement in theoretical and practical activities is constant throughout the semester and is above the expected attendance of the teacher as necessary to assimilate the knowledge provided by the course. The scores obtained by participants are between 8 and 10.

To summarize, the results of the analysis are the follows: students accept the use of mind mapping in teaching and consider it is the necessary ingredient for increasing students' engagement by using mind mapping in teaching. The student's non-homogeneous behavior in the wiki is one which we consider as normal because only 65% of the students managed to understand the teacher's mind mapping from the moment of the course creation. The conclusions of the study justify the students' behavioral characteristics who accept the use of the mind mapping techniques in the teaching/learning process and consider that, based on that, the students' level of engagement during the course will increase because they know how to follow the course, can assimilate the necessary resources for participating to the course, attend the course, with the final aim (motivation, desire) to assimilate knowledge.

On the basis of the analysis we can make the following statements:

1. There is a small proportion of students who have a constant involvement in the theoretical and practical activities of the course, and the assimilated knowledge of the course is that predicted by the teacher when implementing the wiki, their mind-mapping is associated with the mind mapping of the teacher;

2. The conclusion drawn from the study is that the involvement of the young specialist in the development of a basic subject at the required level of 2017 remains in most cases fluctuating with a different level of attention/involvement, generating a difficult student profile, hard to track;

3. Students' willingness and motivation to learn through the use of all the media at their disposal is low without an external stimulus;

4. Introducing a framework containing mind-mapping, web 2.0 technologies and traditional teaching methods have the direct effect of changing the passive approach to university courses in a committed and collaborative approach. To this is added the fact that the results of the statistical analysis presented in this paper validate our idea that the success of a course is ensured both by the teacher's ability to inspire the cartography of the minds of the students participating in the course and the existence of some students presenting a mind-mapping similar to that of the teacher;

5. The creation of a web 2.0-assisted course is made as a mix of (Mezirow, 2000)'s classical theory with the theory of mind-mapping, in the social learning process, as an integral part of the collaborative learning, resulting in a new concept of significant learning validating the results from the works of (Newbern & Dansereau, 1995).

In (Kirkwood & Price, 2014; Novak & Gowin, 1984; Chang et. al., 2001) consider the ITC tools and learning theories together mix the areas of the symbolic, metaphysical and constructive areas of human mental, there are mental representations, fixed images or fluid ones that have the role of allowing the teacher to provide the student with information in concrete language. From our study and from (Lee, 2010), it is clear that the wiki use in teaching/learning is generally positive, generating an improvement in the quality of the student work by assimilating and developing professional student skills.

Moreover, the study supports the results (Talbot, 2012), according to which the teacher should guide the students, provide them with suggestions and tips for the efficient use of their materials and their tasks. On the basis of the results, we can conclude, as well as other specialists in the domain (Popescu & Cioiu, 2011; Felea & Stanca, 2015; Talbot, 2012; Pinto et. al., 2009) that a wiki helps both to develop formative and informative valences, critical thinking and creativity of the participants as well as the development / improvement of digital competences at individual and group level.

Wiki allows students to practice the most important competence which allows them to work in today's knowledge-based society, namely content-making. From the experiment we made by

introducing the wiki-mapping alongside wiki, we found that the latter tool involves visual intelligence and provides a way to navigate in a much larger space of ideas in a smaller visual field; furthermore, it allows work teams in the wiki to achieve a much higher level of productivity. Mind-mapping is not fully utilized in its use alongside wiki, due to its limitations; in wiki, one person can change the page at a time and save it for others to see your changes.

5. Conclusion

Higher education is a trendy topic both in Romania and worldwide. ITC technologies influence more and more education at any level (primary, secondary, tertiary) and type (formal, informal and non-formal). The study fundamentals the need of implementing mind-mapping combined with wiki in the teaching-learning relation at academic level. In Romanian education web 2.0 by wiki started to be promoted at high-school level, but also at faculty level in subjects such as computer science and language teaching, respectively. Our experiment is the first of this type in Romanian literature and puts together the two instruments: wiki and mind mapping learning.

The results of this experimental study demonstrate that mind mapping raises interest among students to exploit its potential in their own academic education after understanding the role and relevance of MM as study methods and learning strategy. Moreover, it illustrates the types of engagement behaviors of the students in the economic field, tourism, in the teaching-learning process with ITC help, demonstrates that the students who know what they want and how to get the information having a well-defined purpose at the beginning of the course are actually the students who understand the teacher's mind mapping and implicitly are considerably more engaged. Through this article we bring a counter argument to the conclusions of the specialists in the field 44,15,16,46 where it is sustained that only by constraint can students participate in the education process but we continue to support in this study the affirmations of those studies according to which wiki can help: develop formative and informative valences, critical thinking and creativity; developing digital competences individually and in group, students practice the most important competence in our contemporary society and that is content creation; participative learning and discovering the on-line environment.

The article is among the articles which analyze the current discussions about this mind mapping method and it refers to its integration in a component of the teaching and evaluation strategy for students in economics in web 2.0 era. The results obtained in the article bring arguments in favor of the idea that teachers must think differently in order to offer students the chance to access new learning methods, new ways of finding information and collaborating, as these are considered key elements in modern pedagogical practice. Moreover, the article demonstrates the advantages of using MM in teaching and evaluation, emphasizing the role of this method in facilitating the assimilation of information in short time. In the authors' vision the mind mapping techniques have a high potential in offering students a strategy for retaining information, integrating critical thinking and problem solving. The authors demonstrated in the article that mind mapping is useful both individually and for group activity, so mind mapping needs to be introduced in training and development processes, especially in the learning/accumulation stage.

This research has certain limitations. Firstly, the results may be a consequence of the organization of our faculty. Secondly, the small number of students used in the research as well as the period under analysis. Thirdly, it is unclear whether Wiki and mind-mapping can be used to promote student engagement or create student-driven course content suitable for assessment.

In our future research we will analyze the engagement of economics students to create a picture/map of their digital knowledge anchored in their economic knowledge with a clear result, the development of the prototype of student skills in the digital era as the basis for the process of developing a curriculum anchored in the digitization era.

References

Asztalos, R. (2014). The use of a wiki at a college in Hungary as a tool to enhance personal learning. In S. Jager, L. Bradley, E. J. Meima, & S. Thouésny (Eds), *CALL Design*:

- Principles and Practice; Proceedings of the 2014 EUROCALL Conference, Groningen, The Netherlands (pp. 18-22). Dublin: Researchpublishing.net. doi:10.14705/rpnet.2014.000188.
- Bacher, J., Wenzig, K., & Vogler, M. (2004). SPSS TwoStep cluster a first evaluation, Available: <http://www.statisticalinnovations.com/products/twostep.pdf> [05 may 2017].
- Berdrow, I., & Evers, F. T. (2011). Bases of competence: A framework for facilitating reflective learner -centered educational environments, *Journal of Management Education*, 35(3), pp.406-427.
- Chang, K. E., Sung, Y. T., & Chen, S. F. (2001). Learning Through Computer-Based Concept Mapping with Scaffolding Aid. *Journal of Computer Assisted Learning*, Vol. 17, pp. 21-33.
- Cohen-Scali, V. (2012). Competence and competence development, Budrich Academic Barbara Budrich Publishers, Budrich UniPress Ltd. Stauffenbergstr.
- Cole, M. (2009). Using Wiki technology to support student engagement: Lessons from the trenches. *Computers & Education* 52, pp. 141-146.
- Conole, G., & Alevizou, P. (2010). A literature review of the use of Web 2.0 tools in Higher Education. HEA Academy, York, UK.
- Croasdell, David T., Freeman, Lee A., & Urbaczewski, A. (2003). Concept Maps for Teaching and Assessment, *Communications of the Association for Information Systems: Vol. 12*, pp. 396-405.
- Eppler, M. J. (2006). A comparison between concept maps, mind maps, conceptual diagrams, and visual metaphors as complementary tools for knowledge construction and sharing, in *Inf Visualization*, 5, pp.202-210.
- Eriksson, L. T., & Hauer, A. M. (2004). Mind mapping marketing: A creative approach in developing marketing skills, in *Journal of Marketing Education*, 26(2), pp.74-187.
- Felea, C., & Stanca, L. (2015). Wiki Tools in Teaching English for Academic Purposes - An Analysis of Student Learning Behaviour Pattern, in "CAROL I" National Defence University Publishing House. Vol. 1, pp.82-91.
- Gardner, H. (2006). *The Development and Education of the Mind: The Selected Works of Howard Gardner*, New York : Routledge.
- Gouli, E. et al. (2004). COMPASS: an Adaptive Web-Based Concept Map Assessment Tool. *Proceedings of the First International Conference on Concept Mapping 2004*.
- Gower, J. C. (1971). A general coefficient of similarity and some of its properties, *Biometrics*, 27, 857–872.
- Grundspenkis, J. (2008). Development Of Concept Map Based Adaptive Knowledge Assessment System. In *e-Learning*, pp. 395-402.
- Grossec, G., & Holotescu, C. (2012). An empirical analysis of the educational effects of Social Media in universities and colleges, in *The 8th International Scientific Conference eLearning and Software for Education, Volume I*, pp. 156-164.
- Ichino, M., & Yaguchi, H. (1994). Generalized Minkowski metrics for mixed feature-type data analysis. *IEEE Transactions on Systems, Man and Cybernetics*, 24, 698–708.
- Jolly, D. (1984). *Writing Task*, in New York: Cambridge University.
- Kearsley G., & Schneiderman B. (1999). *Engagement Theory: A framework for technology-based teaching and learning*. Naval Seas System Command.
- Kirkwood, A., & Price, L. (2014). Technology-enhanced learning and teaching in higher education: what is 'enhanced' and how do we know? A critical literature review. *Learning, Media and Technology*, 39(1) pp. 6–36.
- Kubincová Z., Homola, M., & Bejdová, V. (2013). Motivational Effect of Peer Review in Blog-Based Activities, *Advances in Web-Based Learning – ICWL 2013, Lecture Notes in Computer Science Volume 8167*, 2013, pp 194-203.
- Lee L. (2010). Exploring Wiki-Mediated Collaborative Writing: A Case Study in an Elementary Spanish Course, *CALICO Journal*, 27.

- Lowden, K., Hall, S., Elliot, D., & Lewin, J. (2011). Employers' perceptions of the employability skills of new graduates, London: Edge Foundation.
- Lundin, R. W. (2008). Teaching with wikis: Toward a networked pedagogy. *Computers and Composition*, 25, pp.432-448.
- McLoughlin C., & Lee M. J. (2007). Social software and participatory learning: Pedagogical choices with technology affordances in the Web 2.0 era. In *ICT: Providing choices for learners and learning. Proceedings Ascilite Singapore*, pp.664-675.
- McLoughlin C., & Lee M. J. (2008). Mapping the digital terrain: New media and social software as catalysts for pedagogical change", *Proceedings Ascilite Melbourne*, pp. 564-575.
- Mezirow, J. (1996). Contemporary paradigms of learning. *Adult Education Quarterly*, 46(3), pp.158-173.
- Mezirow, J. (2000). Learning to think like an adult: Core concepts of transformation theory. In J. Mezirow & Associates (Eds.), *Learning as transformation*, pp. 3-34.
- Naismith, L., Lonsdale, P., Vavoula, G., & Sharples, M. (2004). Literature review in mobile technologies and learning. NESTA Futurelab Report 11. Bristol.
- Nettleship, J. (1992). Active learning in economics: Mind maps and wall charts In *Economics*, 28, 1992, pp.69-71.
- Newbern, D., & Dansereau, D. F. (1995). Knowledge Maps for knowledge management. In K.M. Wiig (Ed.), *Knowledge management methods: Practical approaches to managing knowledge*, Volume 3 of Knowledge Management Series.
- Novak, J. D., & Canas, A. J. (2006). The theory underlying concept maps and how to construct them, in Technical Report IHMC, <http://cmap.ihmc.us/Publication/ResearchPapers>.
- Novak, J. D., & Gowin, D. B. (1984). *Learning how to learn*. New York: Cambridge University Press.
- Novak, J. (1998). *Learning, creating and using knowledge. Concept Maps™ as facilitative tools in schools and in corporations*. London: Lawrence Erlbaum.
- Pennington, M. (2003). The impact of the computer in second language writing. In B. Kroll, *Exploring the dynamics of second language writing* pp. 287-310.
- Pinto Zipp, G., Maher, C., & D'Antoni, A.V. (2009). Mind maps: Useful schematic tool for organizing and integrating concepts of complex patient care in the clinic and classroom, in *Journal of College Teaching and Learning*, 6(2), pp. 59-68.
- Purdy, J. P. (2009). When the tenets of composition go public: A study of writing in Wikipedia. *College Composition and Communication*, 61(2), pp.351-373.
- Popescu, E., & Cioiu, D. (2011). Integrating Web 2.0 Tools in a Social Learning Environment, *Advances in Web-Based Learning, Lecture Notes in Computer Science Volume 7048*, pp 41-50.
- Robins, A., Rountree, J., & Rountree, N. (2003). Learning and teaching programming: A review and discussion. In *Computer Science Education*, vol. 13, no. 2, pp. 137-72.
- Rusk, N., Resnick, M., Berg, R., & Pezalla-Granlund, M. (2008). New Pathways into Robotics: Strategies for Broadening Participation, *Journal of Science Education and Technology*, vol. 17, no. 1.
- Seitzinger, J. (2006). Be constructive: Blogs, podcasts, and wikis as constructivist learning tools, *Learning Solutions e-Magazine*. <http://www.elearningguild.com/pdf/2/073106DES.pdf>.
- Sackman, H. (1970). Man-computer problem solving: experimental evaluation of time-sharing and batch processing in Auerbach, Princeton, NJ.
- Sim, J. W. S., & Hew, K. F. (2010). The Use of Weblogs in Higher Education Settings: A Review of Empirical Research. *Educational Research Review*, 5(2), 151-163.
- Talbot M. (2012). The use of Wikis to Enhance Student Learning in Tourism Education: Presented at the Association for Tourism in Higher Education Annual Conference, Cambridge, UK.
- Tergan S. O. (2005). Digital Concept Maps for Managing Knowledge and Information. In: Tergan SO., Keller T. (eds) *Knowledge and Information Visualization. Lecture Notes in Computer Science*, vol 3426. Springer, Berlin, Heidelberg.

- Walker, R., Voce, J., & Ahmed, J. (2012). Survey of technology enhanced learning for higher education in the UK, Oxford: Universities and Colleges Information Systems Association. Accessed January 18, 2013.
- Ware, P. D., & Warschauer, M. (2006). Electronic feedback and second language writing. In K. Hyland & F. Hyland. Feedback in second language writing: Contexts and issues, pp. 105-122.
- Waterhouse S. (2004). Deviant and non-deviant identities in the classroom: patrolling the boundaries of the normal social world. European Journal of Special Needs Education. 2004 pp.69-84.
- Yorke, M., & Knight, P. T. (2004). Learning & Employability. Embedding employability into the curriculum, London: Routledge Falmer.



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