Integrate the Digital Mindmapping into Teaching and Learning Psychology

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Abstract

The aim of this paper is to examine the effects of digital mind mapping over paper-based mind mapping and conventional teaching method on students' academic achievement and attitudes in teaching and learning Psychology. For the study, 90 students of first year students of Thai Nguyen Teacher Training Institute, Vietnam were selected. The participants were randomly allocated to three groups: experimental group, control group 1 and control group 2. The teaching method used for the experimental group was digital mind mapping, conventional method for control group 1, and paper-based mind mapping method for control group 2 respectively. A pre-test and post-test control group research design was used. Findings showed that there was a significant positive difference in students' academic achievement and attitudes toward learning Psychology through the computer-based mind mapping teaching and learning method.

Introduction

Psychology is a required subject in the social science curriculum in any teacher training institution in Vietnam. In the broadest sense, psychology is commonly defined as "the scientific study of mind and behavior" (Statt, 1998, p.110). Educational psychology is primarily concerned with cognitive development, the dynamics of pupil behavior, psychological atmosphere of the classroom (Strickland, 2001). Similarly, in the course of Psychology taught at Thai Nguyen Teacher Training Institution, Vietnam students are introduced to the theories on cognitive development and different psychological aspects of the classroom, and then apply these to educational practices such as designing teaching syllabi, developing teaching materials, evaluating teaching methods or investigating how children of different ages learn. As the learning process is heavily characterized by cognitive strategies for knowledge retention, cooperative and collaborative learning, problem-solving, critical thinking and transformative learning, it is evident that many teachers and students are facing with difficulties in teaching and learning the course in an effective way.

As the characteristics of the subject show, an adoption of a constructivist learning approach tends to be consistent. For "the constructivist learning approach, which makes special emphasizes on the active learning, individuals form and construct knowledge by attributing personal meanings to it after analyzing their experience, observations and logical inferences" (Akinoglu & Yasar 2007, p.34). Drawing on the constructivist leaning theory, Liu, Ma, Ru, Guo & Ma (2009, p.226) propose four general principles to create a learning environment: (1) Emphasis on learner's central role, (2) Stressing the important function of the "situation" in the building of the meaning, (3) Stressing the crucial role of the "collaborative learning" in the building of the meaning, and (4) Emphasis on the use of various information resources to support the "learning" (but not to support the "teaching"). Once the approach is adopted, it is "obvious that the achievement of these conditions for learning in the classroom and by

course books only would not be possible" (Can, 2009, p.65). He further asserts, "employing technologies like the Internet, websites and the virtual learning environments, creating 'microworlds' and 'hypermedia' designs for learning, applying collaborative learning, problem-based learning and goal-based scenarios […] could serve to implementing the multiple constructive conditions for learning" (p.65).

When a constructivist approach is adopted, mind mapping and concept mapping prove to be effective tools in facilitating meaningful learning (Akinoglu & Yasar, 2007, Buzan, 1996, Erdogan, 2008, Riley & Ahlberg, 2004). According to Buzan (1996, p.59), the mind map is defined as "an expression of Radiant Thinking and is therefore a function of the human mind. It is a powerful graphic technique which provides a universal key to unlocking the potential of the brain". The mind map has four essential characteristics:

> The subject attention is crystallized in a central image.
>
> The main themes of the subject radiate from the central image as branches.
>
> Branches comprise a key image or key word printed on an associated line. Topics of lesser importance are also presented as branches attached to higher level braches.
>
> The braches form a connected nodal structure.

The use of mind mapping can be assisted with "the adoption of colors, images, codes, and multi-dimensional approaches to help human memory, so that one could concentrate the mind on the central part, which is, the crucial subject" (Chen, 2008, p.1034).

Mind mapping is similar to concept mapping, which has recently become a popular technique used adult education as well as other fields, including psychology, sociology, pharmacy, nursing and medicine (Hill, 2006). A concept map shows how knowledge is constructed in people's mind (Novak et al., 1984). Simply put, concept mapping is a tool for representing the interrelationships among concepts in and integrated, hierarchical manner (Chularut & DeBacker, 2004). In concept maps, students only focus on the definition of the concept, learn the connections of this concepts with other concepts. In mind maps, however, students make learning more effective by connecting the main concept to other concepts by means of various symbols and images so as to facilitate recall of all these connections (Akinoglu & Yasar, 2007).

The literature so far primarily focuses on the two main positive outcomes of mind mapping, which are on students' academic achievement and attitudes. Mind mapping is "a creativity and productivity enhancing technique that can improve the learning and efficiency of individuals and organizations" (Mento, Martinelli & Jones, 1999, p.391). As mind maps function like our mind on the principle of *radiant thinking* (Buzan, 1996), they allow the user to connect each new thought to the ones that have come before. A mind map also allows the user to record a great deal of information on one page, and to show relationships among various concepts and ideas (Mento et al., 1999). Mind maps are used to form,

visualize, conceive and classify thoughts in educational fields, organizational activities and problem-solving and decision-making processes (Akinoglu & Yasar, 2007). According to Farrand, Hussain & Hennessy (2002), study techniques which have incorporated imagery, color or the visual-spatial arrangement of key words significantly improve memory for information when compared with simple note taking or rote rehearsal. Like concept mapping, mind mapping promotes critical and transformational learning when the technique provides learners with opportunities to articulate their current knowledge, critique it, and view how their meanings and values have changed over time (Hill, 2006). In addition, mind mapping "brings a renewed sense of enthusiasm to the classroom because it tends to increase one's sense of competence in mastering the assigned materials" (Mento et al., 1999, p.405). They added, "in effect, mind mapping serves the purpose of enhancing one's intrinsic motivation" (p.405).

Regarding integration of different Information Communication Technology (ICT) tools in education in Vietnam, since the Master Plan For Information Technology in Education for the period 2001-2005 by Vietnamese Ministry of Education and Training (MOET), the integration of ICT has been considered "a priority task in the socio-economic development strategy"(Government, 2000, p.3). In education, the MOET requires all teaching institutions to apply ICT in teaching and learning to change the pedagogy from traditional teacher-centered to more student-centered. ICT is regarded an effective tool to improve the quality of education. The MOET emphasizes teachers "to reasonably use ICT in every subject, avoid ICT abuse" (MOET, 2008, p.3). Especially, the school year 2008 was launched "The year of ICT".

In the line with ICT guidelines of the MOET Vietnam, in the education programme of the Flemish Association for Development Cooperation and Technical Assistance (VVOB), different ICT tools among which is digital mind mapping are introduced to about 150 teachers in different teaching institutions, aiming at improving the quality of education towards Active Teaching and Learning (ATL). In our previous survey with 84 teaching lecturers in 5 teaching institutes in Vietnam, 95.2% perceived the computer-based mind mapping very helpful. Computer-based mind mapping is a tool for students to conceptualize the knowledge, brainstorm and categorize the ideas, construct knowledge, and address the problems more logically. It is a tool to activate the students, stimulate their creativity and collaboration, and improve their confidence in contributing ideas in class.

The aim of this paper is to examine the effects of digital mind mapping over paper-based mind mapping and conventional teaching method on students' academic achievement and attitudes in teaching and learning Psychology. Therefore, this study seeks to answer the following research questions:

1. Does the use of mind mapping make more significant difference on students' academic achievement in learning Psychology when compared to paper-based mind mapping and conventional teaching method?

2. Does the use of mind mapping positively change student's attitudes toward the Psychology classes conducted at Thai Nguyen Teacher Training Institution, Vietnam?

Methods

Participants

The participants in this study were 90 first year students in Teaching Institute of Thai Nguyen, Vietnam. These students were divided into 3 groups randomly. Each group includes 30 students. One group was assigned as the experimental group, the other groups were the control group 1 and control group 2. The experimental group utilised the computer-based (digital) mind mapping tools in teaching and learning. The control group 1 followed the conventonial methods, without mind mapping tool. The control group 2 used the mind mapping techniques (without computer support). Lecturers, the textbooks and contents for three groups were the same.

Research model

The pre-test and post-test were used to all groups to assess the student's achievement. The pre-test (01, 02, 03) for the experimental group, control group 1 and control group 2 respectively, and the post-test (04, 05, 06) as it follows

Groups	Pre-test	Activities	Post-test
Experimental group (E)	01	Teaching and learning with support of computer-based mind mapping	04
Control group 1 (E1)	02	Teaching and learning conventionally without support of mindmapping	05
Control group 2 (E2)	03	Teaching and learning with support of paper-based mindmapping	06

Table1 . Research groups at a glance

The pre-test was implemented after the students studied the first chapter of the course, named 'Psychology is a science' to test the similar level of all groups

The post-test was implemented after the students completed the course to assess the differences between the experimental groups and the control groups.

Instruments

The tools employed in this study were the writing test and multiple choice test from the Teaching Institute Test Bank which is used to assess the students in the course. It is tested the validity and reliability by lecturers in the school. Therefore the tests meet the reliability and validity.

Procedure

Initially, the lecturers selected some units of knowledge in the course which are appropriate for brainstorming and group work (Chapter 4- Cognition activity). Second, the lesson plans were developed. The lesson plan address different aspects of the lesson such as objectives, proof of assessment and learning activities which support students to achieve the desired outcome. Third, the teacher implemented the lesson in the three groups.

Instruction for the control group 1 (conventional method)

The students in the control group participated in learning and received the instruction in a conventional way. During the lesson, the students did not use or were not instroduced the mind mapping techniques or mind mapping software.

Instruction for the control group 2 (paper-based mind mapping)

The teacher introduced the paper-based mind mapping (concept, principles) to the students before teaching the lesson. Students used paper-based mind mapping for brainstorming and groupwork.

Instruction for the experimental group (computer-based mind mapping)

The students was taught mind mapping techniques and computer-based mind mapping (emindmap software) on concept, principle and application it in teaching and learning. This emindmap serves as a program for mind mapping and brainstorming. This tool allows students to move ideas around, to edit, add, delete the ideas easily. It also allows students to colour the ideas, to insert some pictures and to link to the different resources. Students were provided time for practice with emindmap software.

During the lessons, all the groups were assigned the same tasks with the same amount of time. The evaluation was implemented after each lesson completed.

Snapshot of activity of the experimental groups :

To support the students construct knowledge on the topic ‘Cognition activity’, the lecturers and students worked together to make one mind map with the core concept ‘cognition activity’. Both the teacher and students had to brainstorm the key concepts, and key sub-concepts to form the structure of perception activity. During the activity, the teacher asked the questions for brainstorming ‘Why human has to cognize the world ?’ ‘How human cognize the world ?’ To encourage students to provide the ideas, the teacher suggested students to provide the connections around the core concept. All the ideas in the mind map would become a board of knowledge. In the next step, students discussed in smaller groups of 5 students (each group was provided with a laptop with the emindmap software installed). The task for the small group was to brainstorm the key concepts and key subconcepts based on the developed board of knowledge. The students analyzed, compared and synthesized all ideas and provided adjustment and addition to the mindmap if necessary. In discussion session, students utilized different functions of emindmap to add, remove, collect, and categorize the ideas. At the end of the discussion, each group presented their mind map and their own process of completing the task. During the presentation, each

group was able to supplement ideas and remove the redundant ideas. The final result is one knowledge mind map as it follows

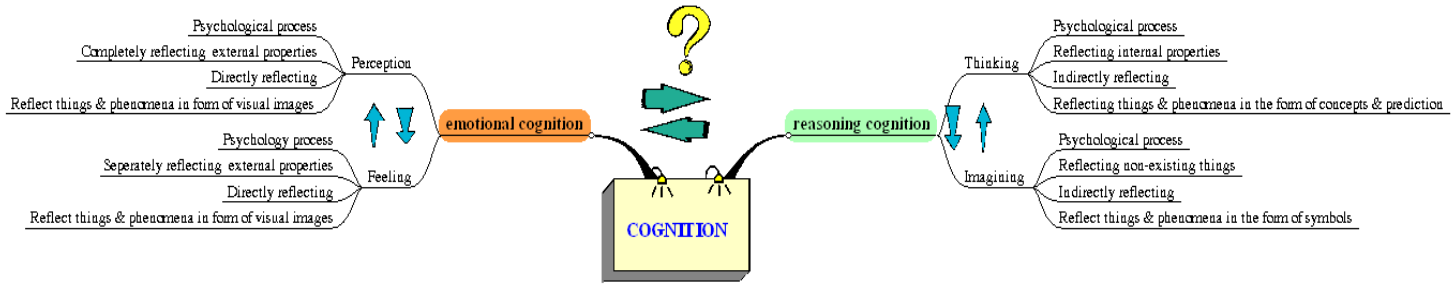

Figure 2 : A knowledge mindmap- Student's outcome

In the process of developing the mindmap, the science concepts (in this case, physical and emotional cognition) were formed by the students. In this study, the mindap was seen as an unconventionally structured lesson. Based on this mind map, the teacher was able to organize different learning activities by continuing making a series of problem-raising questions such as : Is there any relation between the physical and emotional cogntion? If yes, how is this relation ? Between feelings and perception, which one reflects the psychology higher ? Why ? It helps to create a series of subsequent learning situations which requires students to continue solving.

Findings

Research question 1:

The findings from the pre-test and post-test results of the experimental group and control groups on students' academic achievement are presented as follows:

Instruments	Experiment Group (E)		Control Group 1 (E1)		Control Group 2 (E2)	
	Mean	SD	Mean	SD	Mean	SD
Pre-test	6,4	1,1	6,2	1,4	6,1	1,4
Post-test	7,9	0,9	6,9	1,0	7,5	0,97

Table 3: Results the pre-test and post-test score differences between the experiment and control groups

As shown in Table 1, when the pre-test scores of the experimental and control groups are compared, the arithmetic mean of the experimental group is 6.4, the arithmetic mean of the control group 1 (E1) is 6.2,

and control group 2 (E2) is 6.1. P value of the t-test is 0.34 and 0.19>0.05. This indicates that there is no significant difference between the pre-test scores of the three groups.

As also indicated in Table 1, the difference between the post-test mean scores of the experimental

group and control groups 1 (E1) and 2 (E2) is 1.0 (7.9 – 6.9) and 0.4 (7.9 – 7.5) respectively. This shows that the experimental group had higher academic achievement than the two control groups. Since P-value of the t-tests is 0.047 and 0.04<0.05, there is a significant difference between the post-test scores of the three groups. This demonstrates that the use of mind mapping plays a critical role in academic achievement. Post-test standard deviation of the control group 1 (E1) is 1.0 and experimental group is 0.9, indicating a more equal performance among the students in the experimental group than in the control group. According to Cohen standard, the difference of 1.0 is significant. The result in Table 1 also reveals that the post-test standard deviation of the experimental group is higher than the control group 2 (E2). The difference is 0.41, which is moderate. The specific result is presented as follows:

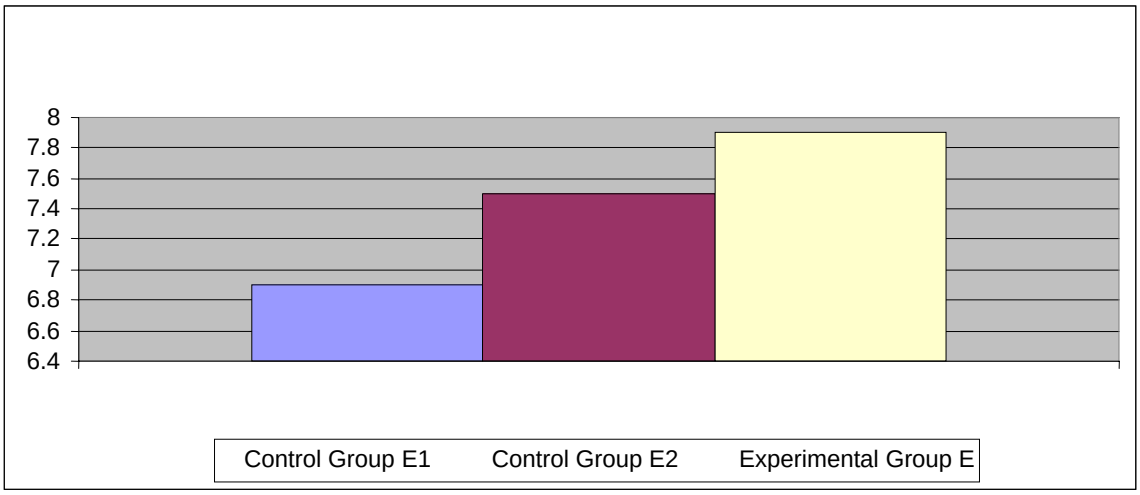

Table 4: Comparison of mean differences between three groups

Comparing the means of post-tests between the experimental group and the control group E1 shows that the use of mind mapping in Psychology classes significantly improved students' academic achievement. It is evident that the use of paper-based mind mapping had critical impact on learning achievement but was not as effective as digital mind mapping. This implies that digital mind mapping produced the best outcomes on learning achievement, especially in the activities like brainstorming and group discussion.

Research question 2:

The second research question focused on the perception of students regarding using mind mapping in learning activities. A questionnaire was used in the experimental group (adopting computer-based mind mapping) and the control group 2 (adopting paper-based mind mapping) (See the annex 1). Most of the

students in two groups see that the mind mapping in general supports them to learn in different ways: brainstorm and categorize ideas, understand the concepts, and work with peers. Compared to the control group 2, the experimental group showed the digital mind mapping supports them to categorize more easily. The explorative research also showed that a number of students of experimental group used the digital mind mapping in the other subjects. However, some students showed it difficult to adapt the mind mapping techniques and especially the digital mind mapping at the starting point.

Discussion and conclusion

The goal of this study was to determine whether the integration of digital mind mapping in teaching and learning Psychology produced better impacts on students' academic achievement and attitude than the use of paper-based mind mapping and conventional teaching method. The results indicate that digital mind mapping produced the best outcomes on academic achievement in the three teaching methods tested. The findings of the study also showed that students expressed their preference for mind mapping to be used by the teacher in Psychology classes, and therefore motivated them more to learn the subject.

The findings on effects of mind mapping on academic achievement are in agreement with those of previous studies (Akinoglu & Yasar, 2007, Buzan, 1996, Chiou, 2008, Erdogan, 2008, Farrand et al. 2002, Riley & Ahlberg, 2004). The study confirms that mind mapping is the computer-based tool which is critically effective for conceptualizing ideas, making connections between concepts, categorizing ideas and building new knowledge, problem-solving, critical thinking and collaborative learning. The mind map facilitates students' interaction and freedom to express their creative thinking. With these useful features, the mind map helped students improve their learning achievement more than they did in the conventional classes.

In the study, students in the experimental group had higher achievement scores than those in the control group 1 and 2. The improved achievement can be explained by the findings in similar studies on ICT-based mind mapping/ concept mapping that "the use of ICT-based concept mapping produced a wide range of graphic organization strategies, from mind mapping to concept mapping" (Riley & Ahlberg, 2004, p.253), "ICT capacity enables storage and revisiting of mapping and automatic functions, and creating concepts and vectors enable immediate linking and labeling that increase the ease and speed of mapping" (Riley & Ahlberg, 2004, p.253), and "ICT can be used to promote collaborative learning in group projects and new approaches to working, learning and interacting" (Scardamalia & Bereiter, 1994, Forcheri & Molfino, 2000, cited in Riley & Ahlberg, 2004, p.246).

Another positive outcome of integrating digital mind mapping into teaching and learning psychology is that students did not only use the mind map effectively in Psychology but also were able to actively use them later in learning other subjects such as Philosophy, English as a foreign language and literature.

In addition to the positive impact on academic achievement, the results confirmed that the use of mind mapping increased student's motivation and interests toward learning Psychology. Since the tool enabled the students to achieve their learning outcomes more easily, they had more confidence and interests in

learning the subject. Besides, they believed the mind mapping can be easily adopted the learning other subjects.

In this study of mind mapping, this tool can be used by teachers to structure the lessons. The mind map enables teachers to plan, develop and conduct the procedure of teaching effectively. It is however important to point out that mind mapping should not be an ideal tool for all the knowledge content of the subject. It is the teacher's task to determine what activities can be assisted with the use of mind mapping to ensure the best learning outcomes.

The findings also showed that a small number of students in the experiment found it difficult to adapt quickly to the use of mind mapping. Lack of familiarity with the mindmapping techniques could cause the frustration in students. Therefore, it is proposed that the initial instruction of the teacher on mindmapping techniques and digital mindmapping should be clearer. In addition, the teacher should use the scaffolding technique to support student in teaching and learning with mindmapping.

The results also showed that reasonable integration of ICT in teaching and learning will improve the quality of education in general and the pedagogy in particular. However, in the case of lacking modern facilities, the teacher is able to use mindmapping technique as a modern methodology to improve the lesson.

Digital mindmapping is a helpful tool to study. However, when this study complete, whether students of the experimental group continue using digital mindmapping in learning activities? There should be further research on this issue.

Annex 3:

1. **What do mindmapping support you**

brainstorm ideas
categorize ideas
understand concepts in depth
work with peers
more interested in studying Psychology
more interested in studying other subjects
Others…

2. **What extent do you agree with the following statement**

1	2	3	4	5
Totally disagree	**Partly disagree**	**Neutral**	**Agree**	**Totally agree**

2.1 I think mindmapping can be applied in different subjects	**1**	**2**	**3**	**4**	**5**
2.2 I think mindmapping is user-friendly	**1**	**2**	**3**	**4**	**5**
2.3 I am confident in using mindmapping	**1**	**2**	**3**	**4**	**5**

3. **Open question**

To the control group 2: Using paper-based mindmapping

3.1.1 What's the added value of paper-based mindmapping to your studying?
3.1.2.What difficulties you meet when you use paper-based mindmapping ?

To the experimental group: Using computer-based mindmapping

3.1.3 What's the added value of computer-based mindmapping to your studying?
3.1.4 What difficulties you meet when you use computer-based mindmapping ?
3.1.5 Compared to paper-based mindmapping, which functions of computer-based mindmapping makes your study easier, to what aspect?

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