Effect of Mind Mapping Technique on Student Intrinsic Motivation at Higher Education Level

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The objectives of the research were to explore the level of student's intrinsic motivation; to assess the effect of mind mapping technique on student's intrinsic motivation; and to assess the difference in the use of mind mapping technique by students and in the level of student's intrinsic motivation on the basis of gender and age. The research was quantitative in nature. All the 2889 students, from 6 different departments of social sciences, enrolled in spring 2018 at Islamabad campus of a public university of Pakistan were considered as a population of the study, and data were collected from 600 students through two structured questionnaires. Both descriptive (percentage and correlation) and inferential statistics (test, ANOVA and regression) were used to address the objectives. Main findings indicate that the independent variable (mind mapping technique) had a 30% effect on the dependent variable (student motivation), and this effect was statistically significant at 99.9% level of confidence. A statistically significant difference was found in the use of mind mapping technique on the basis of gender, female students were more frequently using it as compared to male students. Majority of students had above average to the excellent level of intrinsic motivation, however, no significant difference was found in the student intrinsic motivation on the basis of gender.

Keywords: *Mind mapping technique, Intrinsic motivation, Higher education context.*

Introduction

Mind mapping is one of the latest techniques of teaching ideas in the form of diagrams, shapes and linkages. Mind mapping is a graphic presentation of the concepts that link the ideas and concepts to enhance student's motivation level and help them to improve in the study (Muraya and Kimamo, 2011). In this approach, the student learns to link their ideas and represent them in the form of a diagram which is easy to understand and retain in memory (Buzan, 2000). Mind mapping improves the cognitive ability of students and helps them in reasoning and understanding the things logically. Mind

maps are also called visual images that improve the student's understanding, studying at any level, to the higher level. It also allows students to create an association among their daily life routines and learning activities in order to make their future realistic. Mind maps are the best tools which help the student to think and learn. This technique also encourages healthy inter-relationship among students (Keraro, Wachanga & Orora, 2007). It is the human nature that we learn by association. The human brain learns things by associating new things with the previously learnt concepts (Trochim, 2006). In this way, the mind develops the mental blocks. These

blocks are actually the initial stage of mental maps. That is the reason that if teaching will be designed according to the functioning of the human mind, it would be more effective. The mind maps provide a visual image to the theoretical concept. In this way, a boring concept takes the shape of a colourful image that sticks within the mind for a long period of time (Muraya and Kimamo, 2011). The important thing about this technique is that it is helpful with almost all type of subjects and is economical with reference to resources. There are multiple types of concept webs and maps available and can be generated so according to the need of the subject and these maps can be used as required. According to Wachanga and Mwangi (2004) as a collaborative activity, it can be a very effective technique to ask the student to discuss and create the concept webs jointly on the paper. They would learn not only the theoretical part in this way but also the collaboration and social skills as well. One of the very useful points about mind mapping is that it is a tool which encourages creative thinking and offers creative solutions to the problems. Mind maps are diagrams which help the learner to understand the difficult concept in a simple way of information retrieval (Buzan, 2000). This is a meaningful application that it also increases the motivation level of students. The studies show that the students

take more interest when they are shown pictures and maps rather than only text from the books and other sources. It takes less time to explain and conveys a large quantity of information in a quick manner (Nelson and Debacker, 2000).

Through mind mapping technique student's knowledge promotes and their memory's capability enhance. Namasaka (2009) also said that the visual images help the students to learn better and remember the things for a longer period of time. Mind maps enable teachers and students to transfer their ideas and thoughts in the form of images and graphics concisely; therefore it also helps both in learning and assessment. In this technique, the teacher can develop their own practices before applying it in the classroom. However, it demands teacher to plan activities for using maps in a simple way so that students can follow and develop mind map (Buzan, 2000). This technique is one of the economical options that a teacher can have in the classroom because it needs just a creative mind, organizational and drawing skills and a board that usually every classroom has (Nelson and Debacker, 2000). The concept mapping is relatively a new technique in Pakistan and most of the teachers and students are not aware of this technique. Perhaps that is why it is not under practice as such and Pakistani educational researchers are also not

considering it in their research endeavours. This research will focus the nexus between mind mapping technique and student's intrinsic motivation.

Literature Review

Evidence and educationists' thoughts support that mind mapping is an important active learning plan for students. Mind mapping activities help students in their academic growth and in developing positive understanding about the issues and universe. It also helps to improve critical thinking, logical attitude, conceptual learning, and enhance the dynamic achievement of students (Bojana, 2002). Mind mapping technique is a productive strategy because when it is used by learners, it results in a critical understanding of concepts and effective collaboration among students. It is an admitted fact that mostly those students who are already 25 years old or above prefer to learn about things from their aristocrats and have a high level of understanding and motivation, they can get support to increase their motivational level by using of mind mapping technique in an educational environment (Micheal, 2006). Davies (2011) argues that it is the graphical organizer which creates relationship among different conceptual phrases that tend to have linkages with subtopics, and these subtopics are then linked with main topics, and consequently, it can present the difficult topic in a simple way. It assists

learners to collect information by compiling the data to shape diagrams. Through creating visual images the mind map technique helps learners to achieve the general as well as educational goals (Budd, 2004). In order to link the material and concepts, mind mapping is utilized as a metacognition tool that allows learners to associate the concepts and materials in a meaningful way (Micheal, 2006). Bharambe (2012) contend that by the implementation of mind mapping technique students found their learning materials more productive and efficient in the process of critical thinking. Buzan and Buzan (1993) assert that the mind mapping technique offers various learning benefits including interaction with other students which has several academic and social advantages. Buzan (1993) claims that it is one of the most effective techniques used to help students to present information in a visualized and organized form on the bases of fundamental principles of human brain functioning. In an experimental research, Rooda (1994) introduced to mind mapping technique as learning strategy at higher education level and found that those students who practised this technique were more productive than the ones who did not use it. Boley (2008) highlights that those faculty members who used the technique of mind mapping during teaching/learning process found very satisfactory results and

those who did not use this technique in their teaching/learning process could not get good results from students. The above evidence suggests the use of mind mapping technique in educational settings for the success of learners since it helps the teachers and learners to focus on teaching/learning process in an innovative and more useful manner. Khudhair (2016) claims that due to the lack of practice of mind mapping technique in educational institutions many students remain deficient in developing the skill to organize their ideas in a coherent way. This does not only adds in the academic failure of the students, but it also makes them deficient in their practical life. Wachanga, Githae & Keraro (2015) state that the mind mapping technique is an effective way to develop the relationship between concepts clearly and meaningfully. Sizmurand and Osbourne (1997) argue that students' problem-solving ability can be improved by mind mapping technique. A strong connection exists between motivation, thinking pattern and conceptual clarity and development, therefore students can involve actively in the learning process if they are motivated through the use of mind mapping technique. There are many more studies (Wambugu and Changeiywo, 2008; Taylor and Francis, 2011; Smith, 2010; Qureshi, 2015; Jones, Ruff, Snyder, Petrich & Koonce, 2012) that have useful literature

related to the issue under study, however keeping in view the scope of the paper with reference to the word limit it is not being included here. In conclusion, there are multiple benefits of using concept maps such as it enhances the students' interest, students remember the content for a longer duration, summarizes the content in an eye-catching web that is easy to understand and remember, develops the critical thinking skills among the students and enhances the level of motivation towards studies (Jones, et al., 2012).

Increase in the motivational level of the students is one of the major requirements for the students' learning. Motivation refers to the force that stimulates the desire to do something (Reeve, Deci, & Ryan, 2004). There are two major types of motivation. One is extrinsic and the other is intrinsic. Extrinsic motivation is the force that is generated from the external sources based on the attraction of any kind of reward. While intrinsic motivation is the force that arouses from inside the individual. Intrinsic motivation and its regulators differ in level from student to student. It refers to the internal satisfaction of any internal regulator. It is regulated when the person feels that s/he is getting something that can make her/him happy and comfortable (Vansteenkiste, Niemiec, & Soenens, 2010). It can also be referred to the personal

liking and attraction towards any activity. It is a very common observation that concept mapping technique enhances the interest of the students of all ages and levels. It develops the satisfaction level of the students and helps them to retain the information for a longer period of time (Ryan & Deci, 2000). The main focus of this study is to explore the effect of mind mapping technique on students' intrinsic motivation.

There is one study to our knowledge related to the current study carried out in Pakistani school settings. In this experimental study, Qureshi (2015) explored the effectiveness of concept mapping technique with reference to students' learning. However, no relevant study was found in Pakistani higher educational context which is the focus of this study. Moreover, this study has a different aim from Qureshi's (2015) study aim. Therefore, this study may offer an opportunity for the researchers doing research in pedagogy to direct their research endeavour to explore the nexus between mind mapping technique and various other variables such as student's performance, and student's satisfaction in school/college/university in Pakistani societal and organizational settings. This study might provide a better insight for those who are interested in teaching/learning through mind mapping

technique at any level. The findings of the study may guide the teachers specifically to make their classroom teaching more interesting and useful for the students without spending extra on educational resources. On the other hand, the students might get benefit in the form of improved learning through the use of this technique. Keeping in view the above-discussed benefits of the mind mapping technique, research gap and significance of the study, the researcher is interested to investigate the nexus between mind mapping technique and student's intrinsic motivation at the university level in the cultural setting of Pakistan. Therefore, the following research objectives and accordingly null hypotheses are advanced:

Research Objectives

1. To examine the students' practices related to the use of mind mapping technique.
2. To explore the level of student intrinsic motivation.
3. To find out the effect of mind mapping technique on student's intrinsic motivation.
4. To assess the difference in the use of mind mapping technique on the basis of gender.
5. To investigate the difference in the level of intrinsic motivation on the basis of gender.

6. To look at the difference in the use of mind mapping technique on the basis of age.

7. To identify the difference in the level of intrinsic motivation on the basis of age.

Null Hypotheses

Ho.1. There is statistically no significant effect of mind mapping technique on student's intrinsic motivation.

Ho.2. There is statistically no significant difference in the use of mind mapping technique on the basis of gender.

Ho.3. There is statistically no significant difference in the level of intrinsic motivation on the basis of gender.

Ho.4. There is statistically no significant difference in the use of mind mapping technique on the basis of age.

Ho.5. There is statistically no significant difference in the level of intrinsic motivation on the basis of age.

Methodology

The quantitative approach has been used to conduct the study and accordingly the paradigm of the study is post-positivism. More specifically, although the first two objectives of the study are addressed descriptively, however mainly it is correlational. The population of the research comprised on 2889 B.S. and master level students, from 6 departments of social sciences, who got admission in spring 2018 (morning and evening)in Islamabad campus of a public university of Pakistan. The sample comprises on 600 students – 100 from each department. Multistage sampling technique was used to meet the no of 600 students. At the first stage, two classes (one intact B.S. and one intact master) were randomly picked from each social science department and data was collected – this made 572 respondents. In the second attempt, only 28 students were approached conveniently, from those two departments from where responses were less than 100, to meet the no of 100 from each department.

Two structured questionnaires were used to collect quantitative data. One was related to the use of mind mapping technique by the students, so it measured the student's practice of mind mapping technique that students were using by themselves. This tool was developed by the researchers themselves and it had 13 items. The second questionnaire was intrinsic motivation assessment scale that was adapted from the work of Mubeen and Reid (2014) and it had 10 items. Both the questionnaires used 5-point Likert scale (strongly disagree, disagree, neutral, agree strongly agree). The data was collected by the researchers themselves. Pilot testing and expert opinion measures were taken to make the tools

valid. In order to check the construct validity and reliability of the scales, Cronbach alpha and item-total correlation were calculated– (values are presented in the next section). The data were analyzed by using statistical techniques with the help of the Statistical Package for Social Science (SPSS) 20th edition. A statistical technique used to address each objective is presented in table 1.

Table 1
Data Analysis Framework

Research Objective	Statistical Technique Used
1. To examine the students' practices related to the use of mind mapping technique.	Mean/SD
2. To explore the level of student intrinsic motivation.	Students Individual Score/Percentage
3. To find out the effect of mind mapping technique on student's intrinsic motivation.	Regression Analysis
4. To assess the difference in the use of mind mapping technique on the basis of gender.	*t*-test
5. To investigate the difference in the level of intrinsic motivation on the basis of gender.	*t*-test
6. To look at the difference in the use of mind mapping technique on the basis of age.	ANOVA
7. To identify the difference in the level of intrinsic motivation on the basis of age.	ANOVA

Data Interpretation and Findings

The data presented in table 2 show the values of Cronbach's alpha for both instruments. The data presented in table 3 (a&b) shows the item-total correlation of the used questionnaires. Overall both the tables present the reliability and the strength of the instruments used to carry out this study.

Table 2
Cronbach's Alpha Reliability Analysis (n=600)

Scale	Items	Cronbach's Alpha Value
Mind Mapping Technique Assessment Scale	13	0.79
Intrinsic Motivation Assessment Scale	10	0.70

Table 2 shows that the reliability of both the scales 'mind mapping technique assessment scale' and 'intrinsic motivation assessment scale' used in this research were 0.79 and 0.70 respectively. This shows that these scales are an the acceptable level of reliability and are considered as reliable. This measure increased the confidence in the results of this study.

Table 3a

Item Total Correlation of Mind Mapping Technique Assessment Scale (n=600)

Items	Correlation	Items	Correlation
Mm1	.67**	Mm8	.52**
Mm2	.65**	Mm9	.53*
Mm3	.69**	Mm10	.38**
Mm4	.57**	Mm11	.51**
Mm5	.55**	Mm12	.51**
Mm6	.42**	Mm13	.45**
Mm7	.45**		

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

Table 3b

Item Total Correlation of Intrinsic Motivation Assessment Scale (n=600)

Items	Correlation	Items	Correlation
M1	.49**	M6	.57**
M2	.52**	M7	.52**
M3	.49**	M8	.61**
M4	.50**	M9	.56**
M5	.60**	M10	38**

**Correlation is significant at the 0.01 level (2-tailed)

Table 3a and 3b explain the item-total correlation between the items included in the scales used for data collection in the research and overall strength of the tools. Both the tables show that all the items were statistically significantly correlated with the overall strength of the respective tool. Table 3a shows the correlation between items of mind mapping technique assessment scale and the overall strength of this tool. This table shows that item mm3 had the highest correlation score (.69) and mm10 has the lowest correlation score (.38). The table 3b shows the correlation between the items of intrinsic motivation assessment scale and overall strength of this

tool. This table shows that the highest correlation was of item coded as M8 (.61) while item m10 has the lowest correlation which is .38.Overall data presented in

Table 4

tables 3a &3b highlight that the tools used in this research are credible that enhance the confidence on the results of this study.

Students' Practices of Mind Mapping Techniques (n=600)

Mind Mapping Practices	Mean	Std. Deviation
I believe that the mind mapping technique helps to improve the understanding level of student at a higher level	4.12	.989
I really feel that the mind mapping technique affects the academic efficiency	3.88	.948
I remember more when I see the content in a pictorial form	3.95	1.006
I organize my notes in form of pictures, diagrams and webs	3.87	.953
I try to identify the linkages between the concepts I learn	3.95	.933
I try to memorize the information by developing associations of the sub-concepts	3.87	1.051
I use multiple shapes and colours to differentiate between the concepts and its subparts	3.71	1.072
I split the information into smaller parts to memorize	3.91	.915
I feel that mind maps help to summarize a large amount of information in a single unit	3.79	.909
I understand how to construct mind maps	3.71	.931
I enjoy constructing mind maps	3.77	.956
I like to use different shapes and pictures during my class presentations	3.93	.913
I take interest in mind maps used during the class	3.91	1.012

Table 4 explains the students' practices of mind mapping technique. The mean score highlights that students agreed that they take interest in this technique and were using it as a regular practice for their studies. Students believe that the mind mapping technique helps them in improving the understanding level, academic efficiency and memory, in summarizing information and organizing notes, and in developing linkages and differences among concepts.

Table 5
Level of Student Intrinsic Motivation (n=600)

Level	Score Range	Student Number	Percentage

Poor	10- 20	60	10
Below Average	21- 30	104	17
Above Average	31- 40	288	48
Excellent	41- 50	148	25

Table5 shows that almost half of the sampled students (288 – 48%) have above average level of motivation and their obtained scores fall in the score range of 31 - 40. Moreover, 148 students that make 25 per cent of the sampled students obtained scores that fall in the score range of 41-50, that means these students have an excellent level of motivation. Overall 73% of the students have either above the average or excellent level of students, 17% have below average and 10% have a poor level of intrinsic motivation.

Table 6
Effect of Mind Mapping Technique on Intrinsic Motivation (n=600)

	B	Standard Error	β	t	P	r	R
Constant	17.218	2.679		6.428	.000	.54	-
Mind Mapping	.420	.053	.548	7.962	.000		.54
R= .54 R²=.30							
F =63.39 p=.0.00							

Table 6 shows that the independent variable (mind mapping technique) has a 30% effect on the dependent variable (intrinsic motivation). This effect is statistically significant (β=42) at 99.9%, because the *t* test statistics for the β is 7.96 and the associated *p*-value is 0.00 which is less than 0.001. Thus the null hypothesis 1 "there is statistically no significant effect of mind mapping technique on student's intrinsic motivation" is rejected. In other words, Research hypothesis "there is sta atistically significant effect of mind mapping technique on student's intrinsic motivation" is accepted. It may be inferred that if there is one unit increase in the practice of independent variable (mind mapping technique) it will cause 30a % variance in the dependent variable (intrinsic motivation).

Table 7
The difference in the use of Mind Mapping Technique on the basis of Gender (n=600)

Variable	Group	N	Mean	t	df	Sig.

Mind Mapping Technique	Male	246	48.70	2.52	598	0.01
	Female	354	51.48			

p=0.01

Table 7 shows that there is a statistically significant difference (*t*=2.52) at 99% confidence level between the male and female respondents regarding the use of mind mapping technique because the *p*-value is 0.01 which is equal to 0.01 - the predefined value of *p*. The female students are more frequently using the mind mapping technique as compared to the male students. Thus the null hypothesis 2 "there is statistically no significant difference in the use of mind mapping technique on the basis of gender" is rejected as well, and research hypothesis "there is a statistically significant difference in the use of mind mapping technique on the basis of gender" is accepted.

Table 8

The difference in the Level of Motivation on the basis of Gender (n=600)

Variable	Group	N	Mean	*t*	df	Sig.
Intrinsic Motivation	Male	246	37.62	1.45	598	0.14
	Female	354	38.87			

p=0.01

Table 8 shows that there is statistically no significant difference (*t*=1.45) between the male and female respondents regarding their intrinsic motivation because the *p*-value is 0.14 which is greater than 0.01 - the predefined value of *p*. Therefore, the null hypothesis 3 "there is statistically no significant difference in the level of student's intrinsic motivation on the basis of gender" is accepted; and accordingly the research hypothesis "there is a statistically significant difference in the level of student's intrinsic motivation on the basis of gender" is rejected.

Table 9

Comparison of the use of Mind Mapping Technique on the basis of Age (n=600)

Variable	Age	N	Mean	*F*	df	Sig.
	21 to 30	300	50.67	0.56	598	0.63

Mind Mapping Technique	31to40	240	49.98			
	51to50	48	49.25			
	51or above	12	54.33			

p=0.01

Table 9 shows that there is statistically no significant difference ($F=0.56$) in the use of mind mapping technique by participants on the basis of age because p-value is 0.63 which is greater than 0.01 - the predefined value of p. Thus the null hypothesis 4 "there is statistically no significant difference in the use of mind mapping technique on the basis of age" is accepted, and related research hypothesis "there is a statistically significant difference in the use of mind mapping technique on the basis of age" is rejected.

Table 10

Comparison of the Level of Intrinsic Motivation on the basis of Age (n=600)

Variable	Age	N	Mean	*F*	df	Sig.
Intrinsic Motivation	21 to 30	300	38.36			
	31to40	240	38.40			
	51to50	48	36.92	1.24	598	0.29
	51or above	12	43.33			

p=0.01

Table 10 shows that there is statistically no significant difference ($F= 1.24$) in the intrinsic motivation of students on the basis of age, because p-value is 0.29 which is greater than 0.01 - the predefined value of p. Therefore, the null hypothesis 5 "there is statistically no significant difference in the level of student's intrinsic motivation on the basis of age" is accepted; and related research hypothesis "there is a statistically significant difference in the level of student's intrinsic motivation on the basis of age" is accepted.

Discussion

In this section findings of the current study are compared and contrasted with previous research findings. Moreover, some discussion is based on the researchers' personal experience as university faculty members in the subject of education. The research findings revealed that the students were taking interest in mind mapping technique and were using it as a regular practice for their studies. Students believe that the mind mapping technique helps them in improving the understanding level,

academic efficiency and memory, in summarizing information and organizing notes, and in developing linkages and identifying differences among concepts. It can be inferred that the mind mapping technique was working as an internal regulator for students' intrinsic motivation, and in turn, was helping students to achieve all that. These findings are in agreement with the personal observation of the researchers as teacher educators at the university level. Moreover, previous researches also endorse these findings (Ryan, & La Guardia, 1999; Tremblay, Blanchard, Taylor, Pelletier, and Villeneuve, 2009). Further, the findings highlight that the majority of the students have good to an excellent level in their intrinsic motivation. Muraya and Kimamo (2011) assert that mind mapping is a graphic presentation of the concepts that link the ideas and concepts and enhance the student's motivation level and help them to improve in the study. Many other studies also support this finding indirectly by arguing that when students use the mind mapping technique in their study they get good result, save time, improve their social relationship with other students, and improve their critical and problem solving skill that in turn motivate them internally (Buzan, 2000; Keraro, Wachanga & Orora, 2007; Muraya and Kimamo, 2011; Wachanga and Mwangi, 2004). Moreover,

the study found that there is a statistically significant effect of the mind mapping technique on students' intrinsic motivation. Many researchers from different contexts and settings support this finding directly For example Edward (2011) said that mind mapping technique helps learners to organize the thoughts, improve learning, enhance memory, and to improve the creative performance that in turn motivate the students internally. The study also found that female students are more frequently using the mind mapping technique as compared to the male students. However, there is no statistically significant difference in the use of mind mapping technique with reference to age. Finally, no statistically significant difference was found in the motivation level with reference to gender and age. The patterns of these findings highlight that the use of mind mapping technique and related student's intrinsic motivation level have no important link as such with students' age and gender. Future studies may ignore these demographic variables. We took these variables in this study because there was no previous evidence in our knowledge with reference to the nexus between these demographic variables and other chosen variables, and we were interested to investigate what empirical evidence says in this regard.

Generally, it is observed that whenever a teaching method, assessment technique, A.V. aid, and reinforcement strategy is used or any other kind of measure is taken that is helpful in students' learning, students' motivation level increases. The present research findings highlight that mind mapping technique has a statistically significant effect on students' intrinsic motivation. So, if the general observation presented above is applied on the findings of this study, it can be inferred that the use of mind mapping technique by the university students positively influenced their performance/learning that in turn increased their intrinsic motivation level.

Recommendations

1. The study recommends that the mind mapping technique may be used in higher educational institutions both by the teachers and students during the teaching/learning process.

2. The training regarding the use of this technique needs to be included in the faculty's training programs.

3. Training workshops/seminars can be organized to make the university students aware of the benefits and use of mind mapping technique.

4. Moreover, students can be trained in the use of mind mapping technique through offering exercises on this technique in a group or individually within the class.

5. Mind mapping technique might be included in the list of recommended teaching methodologies mentioned in the course outlines.

6. Future researchers may extend this research to other departments beyond social sciences of the selected university, and this can be further extended to other higher education institutions.

7. Moreover, this research needs to be extended to college and school settings as well.

8. Furthermore, the effect of the use of this technique by the faculty members on students' motivation and performance can be investigated.

9. Future studies may ignore the demographic variables (age and gender) while investigating the nexus between mind mapping technique and students' intrinsic motivation in Pakistani higher education context.

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