

Relationship between Meta-cognition and Academic Achievement of University Students in Punjab

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ABSTRACT

The present study was designed to explore the relationship between meta-cognition and academic achievement in universities in the Punjab Province of the Pakistan. In this article, the main aims of the current research were (1) to assess meta-cognition of university students, (2) to find out the academic achievement of chemistry students, and (3) to investigate the relationship of meta-cognition with learning success. Population was comprised of the students (males 70 and females 148) of chemistry department of four universities of Punjab province. This study followed the quantitative study approach. The participants were included through purposive sampling technique. The study adopted correlation design, and utilized questionnaire to collect data. The data was analyzed statistically by using frequency, percentage, mean, Pearson's 'r', and alpha coefficient via Statistical Packages for Social Science (SPSS) statistical software version 23. The results revealed that there was no statistically significant correlation between meta-cognition and academic achievement at university level. From these findings, it is recommended that the university professors may plan classroom activities, presentations and research papers in the manner those students that encourage use of meta-cognition that has an effective impact on the academic achievement. Therefore, it is advisable for the educator the curriculum for higher studies in chemistry may be design in such a way which requisitions implication of meta-cognition. Moreover, future research studies in other science subjects are recommended to look into closely the relationship of meta-cognition with academic achievement.

KEYWORDS

Meta-cognition, Academic Achievement, Statistical Packages for Social Science (SPSS)

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INTRODUCTION

Meta-cognition or "thought about thought" refers to the structures, understanding, and thought processes that control, change, regulate and explicate thinking and cognition of the people the way conceive about certain circumstance around them. Meta-cognition is a fundamental constituent of effectual learning and students who use meta-cognition tend to become academically successful. In higher learning, there has been a push to make stronger students' meta-cognitive competencies as factors which affect academic achievement of university students.

Meta-cognitive factors indicate the way human consciousness gets involved in learning. These factors involve knowledge about learning techniques. These factors apply individually and in combination to effect learners' behavior. There are many meta-cognitive factors which affect academic process. The first crucial factor of meta-cognition is the nature of the learning process. Learning is a natural process and it is active, and interiorly mediated; it is the process of discovery and build meaning from information and experience, filtered through the student's unique perceptions, thinking, and feelings (APA, 1993). Another significant meta-cognitive factor is the goals of the learning process. Suárez Reveiro et al. (2001) indicated that learners adopt of different intents or standards permit them to contrive their learning and make it more flexible, so that they are able to attune their conduct optimum to the work and gain effective outcomes. The construction of knowledge is another prime mover. The learner constructs meaning by linking or connecting new information with present knowledge in uniquely meaningful ways (APA, 1993). Next fundamental constituent that is strategic thinking. Strategic thinking gets created in someone's brain (Duggan, 2014). Thinking about thinking (higher level thinking) is another meta-cognitive factor, it is subdivided in to meta-cognition and critical thinking.

Meta-cognition concedes three fundamental constituents of this process-first is establishing a plan of action, second is observing the plan, and the third is the appraisal of that plan (Sternberg, 1998). Halpern (1989) claims critical thinking as thought that is determined, rational and intent directed. The final meta-cognitive factor is classroom environment. Learning is affected by different environmental factors including culture, technology, and instructional or facilitator practices (Lambert & McCombs, 1997, p.18). Culture is another key and uppermost indicator linked in the process of learning. In this regard, it is evident that organization's culture that positively affects student achievement (Fullan, 1998). Technology integration-any learning experience where technology is used by educators and/or students within the context of an education method and in a certain sense that amplify the experience and/or outcome. Atkinson (1968) and Suppes (1968) are among the first



researchers to study the computer technologies as intensification instrument for learning and comprehension. Instructional practices are used as a tool for teachers that support and promote learning. Classroom practices had the considerable influence on learner achievement (Wenglinsky, 2001). Consequently, meta-cognitive factors have the power to create student learning and performance. Meta-cognition is a crucial feature of successful learning for all students. Learner academic attainment is promoted only when they engage in meta-cognition when they think about their thinking, they have self-control or persevere their understanding. It self-regulates or acclimates their learning. Earlier researches confirmed that meta-cognitive skills have a significant effect on learners' achievement (Zulkiply et al., 2008). Furthermore, meta-cognition is essential for successful learning because it enables learners to better regulate their cognitive competencies. It determines weaknesses that can be rectified by creating new cognitive skills (Schraw, 1998). The underlying goal of most academic institutions is to produce competent and successful learners. A successful student may be a competent and successful learner. But it is important for a competent and successful learner to have meta-cognition skill. Meta-cognition is used for recognition, understanding and control of one's own thought and learning process. The main intent of this research was to investigate the relationship between meta-cognition and academic achievement of university students in Punjab.

LITERATURE REVIEW

Meta-cognition is one of the influential conceptions in the area of pedagogical psychological. Meta-cognition as a term was used as first "meta-memory" by (Flavell, 1976). Meta-cognition contains two dissimilar elements namely knowledge (realization) of cognition and regimentation (adjustment/control) of cognition. Three different kinds of knowledge of cognition such as content perception, task perception and strategic knowledge, whereas the regimentation assimilates three subcategories such as plan, monitor and evaluate. In higher education, there has been a push to strengthen students' meta-cognitive skills as factors which affect academic achievement of university students.

Meta-cognitive factors as the rudimentary learning constituents which play more dominant role than intelligence and inherent skills or talents. The meta-cognition factors (thought processes) of the learning are: nature of the learning process, goals of the learning process, the construction of knowledge, strategic thinking, thinking about thinking, and educational context of the learning. The first necessary meta-cognitive factor that is nature of the learning process during which learners use their sensations and to making their meaning. Learning is a vigorous and effective way, in which the student crucial role to play in creating his/her own studying expertise (Duffy & Jonassen, 1992), constructing learning in a zestful way (Bretz, 2001).

Next consideration that is goals of the learning process students allocate their own goals for learning and can formulate certain plan of actions to achieve those goals. Two foremost categories of attainment targets: task targets and outperforming targets (Dweck & Leggett, 1988). Next fundamental aspect is the construction of knowledge. In this, the learner recognizes the creation of new comprehension as a combination of previous learning, new information, and readiness to learn. Strategic thinking is another important factor that helps the learner to work on complicated endeavors for which success is unresolved but not uncertain. Another momentous factor that is thinking about thinking. Two forms of thinking about thinking: meta-cognition and critical thinking. Meta-cognition is the capability to observe, modulate, and guide any mental enterprise (Flavell, 1993). Meta-cognition is based on interior capabilities and individual information that concentrates on the decision or strategic method of what to contain, exclude, change or look up in an endeavor to fulfill a function or other process. Critical thinking is an analytical process that directed on inbound knowledge and give back on what is provided as abatement proof and comprises how that consciousness could be corroborated. Last factor that is educational context of the learning including culture, technology, and instructional practice. Culture is the invisible glue (Kuhn & Whitt, 1988) that hold organizations together by contributing a common base and a shared interpretation and understanding of incidents and actions. Technology is a great tool to enhance student achievement. Educators could find ways to actively engage students in learning by means of technology (Tucker, 2006). Instructional practices are those learning tools, programs or materials they can be implemented to the educational and learning method, can assist learners gain a deeper understanding of course material. Meta-cognition is essential for learner success. In short, researchers have confirmed that academic performances linked to meta-cognition.

Meta-cognitive is the intellectual capacities of learners and its elements deserve attention at a university, knowing which one is likely matter more important in learning attainment (Dweck et al., 2011). The meta-cognition factors of the learning are:

1. The Nature of the Learning Process

Intellect is a dynamic way during which the student utilizes multiple sensorial inputs and forging meaning out of the knowledge. It is student-focused approach used as effective engagement of all learners. For the effectual knowledge, there are broad range of options, such as: group work, project method, activity-based learning, technology-based learning, etc. Thus, learning is a method that altered or modifies knowledge or behavior in consequence of experience.

2. Goals of the learning Process

Students establish their goals for learning and formulate plans to achieve those goals. In addition, they also classify learning goals into two main types: short-term and long-term. At early stage, students set short-term goals. Short term goals

might be book reading and gathering of information on the achievement of higher level goals. Learning is possible only when teachers help students in developing meaningful learning goals.

3. The Construction of Knowledge

Knowledge is expanded by linking between prior learning and new learning. The student links new information to previous schemas in meaningful manner (Piaget, 1974). The new learning remains deserted and does not proceed to new realities unless present knowledge gets related with the previous learned knowledge. By a number of appropriate techniques teacher can help learners in acquiring and integrating knowledge. When learners are capable of acclimatize the new information to their old schemas, they will be capable to utilize their schemas.

4. Strategic Thinking

Strategic thinking is a constructive and useful instrument. It is necessary and vital for students, professionals and organizations. Strategic thinking provides a structure for the cognitive, self-worth and motivational areas. Educationists acknowledge that the development of most significant or psychological capabilities is of utmost importance for decisive thinking. It is fundamental to both individual achievement and nationwide requirements (Paul, 2004, p. 2). It is essential for students and professionals to develop the strategic thinking skills. Consequently, the students will be skilful to use the understanding they acquired.

5. Thinking about Thinking

Thinking about thinking can be either meta-cognition or critical thinking. Meta cognition is an important part of learning that is different from critical thinking. It is a critical approach that based on the learner's thinking inside of interior and makes the student an functioning agent of his or her own education. On the contrary, critical thinking is a logic method that directs the learner's thinking outside or exterior towards a proof of the knowledge provided. Teachers can make the students more independent and self-directed learners. This makes the students creative and critical thinkers.

6. Educational Context of the Learning

Learning is active process that takes place everywhere but not exists in a vacuum. Learning environment is a learning program and particular content. There are three key factors which may affected the learning environment. These are as follows: culture, technology, and instructional practice. One of the most representatives that influence the learning environment that is the culture, which is elucidated as the believes, the moral principles or accepted standards, customs, ethics, and rituals that affect the academic achievement in universities. Another factor that is technology based on actually tools and ideas to mark directions for educational needs, and goals. The instructional practices as the teachers' activities such as task activity, giving answer, modeling, questioning, feedback, practical activities and challenging, use to help their pupils. Thus, classroom environment can also have important influence or effect on pupil education.

7. Meta-cognition and Academic Achievement

Meta-cognition is basically believed to be an intricate form (Schraw, 1994). Meta-cognition contributes an fundamental function in education because it encourages students to be skilful of establishing a roadmap, observe and appraisal how long it is efficacious, which insinuates that meta-cognition facilitates the pupil with greater commitment in educational path (Costa & Kellick, 2001). A variety of investigations delineate that learners with excellent meta-cognition reveal good successful outcome contrasted to pupils with extremely low meta-cognition, they think about meta-cognition as a persuasive factor of learning achievement (Dunning, Johnson, Erlanger & Kruger, 2003; Sperling et.al, 2004).

OBJECTIVES

1. to assess meta-cognition of university students from department of chemistry
2. to find out the academic achievement of chemistry students at university level
3. To explore the relationship of meta-cognition with academic achievement of university students
4. To find out relationship of meta-cognition with academic achievement of university students with respect to demographic variables

STATEMENT OF THE PROBLEM

Meta-cognition refers generally to an individual's knowledge or understanding and control over one's own cognitive processes. Meta-cognition and learning achievement are subjects of fundamental concern in universities today. University students face a difficulty in understanding of facts regarding 'thinking about thinking'. For this reason, this research is planned to discover the correlation of meta-cognition with academic achievement of university students in Punjab Province Pakistan.

METHOD

POPULATION

This study was descriptive in nature and survey method was used to collect data. The researcher selected students of universities and department of chemistry as the population. The purposeful sampling technique was used to select sample. The sample comprised of 218 students (M.Sc. chemistry 2nd semester) enrolled in public sector universities of Punjab province, such as Punjab University Lahore, Baha-ud-din Zakariya University Multan, Islamia University Bahawalpur, and Pir Mehar Ali Shah Arid Agricultural University Rawalpindi. Gender wise, the breakup consisted of 70 males and 148 females. The age range for participants was between 21-24 years.

INSTRUMENT

The tool adopted in the investigation was a questionnaire. A questionnaire was prepared by the researchers, depicted to assess the impact of meta-cognition on the outcome of learners in government sector of the Punjab Province universities. This questionnaire consists of hundred items graded on a five point likert scale. It covers eight constructs or factors: the nature of the learning process, goals of the learning process, the construction of knowledge, strategic thinking, thinking about thinking it is subdivided in to meta-cognition and critical thinking and educational context of the learning it is further divided in to technology and culture. In order to implement validity following steps were followed: (1) face validity, (2) pilot testing and (3) check internal consistency. The internal consistency reliability (Cronbach's α) of the questionnaire was 0.974.

PROCEDURE

Researchers made visits to the heads of chemistry departments in four universities. The questionnaires to be filled were provided to the students. These students belonged to the class of M.Sc. in chemistry. Every participant was given the time period of 40 to 45 minutes for the response.

RESULTS

During the research, data were collected and analyzed using frequency, mean, Pearson product-moment correlation coefficient, percent and alpha co-efficient via SPSS (Statistical Package for Social Sciences) statistical software. There were two variables in the study. Meta-cognition was independent variable while the academic achievement was dependent. Therefore, it was determined that there was no significant relationship between overall academic achievement and meta-cognition of university students. Findings are included in this section and are displayed separately.

Table 1. Descriptive Statistics Analysis of Meta-cognition of Learning

S. No.	Factors	Mean	Std. Deviation	N
1.	Over all Meta-cognition of the Learning of Chemistry Students	3.77	.74	218
2.	A-: Nature of the Learning Process	3.70	.65	218
3.	B-: Goals of the Learning Process	3.66	.66	218
4.	C-: Construction of Knowledge	3.77	.74	218
5.	D-: Strategic Thinking	3.71	.74	218
6.	E1-: Thinking about Thinking (Meta-cognition)	3.71	.66	218
7.	E2-: Thinking about Thinking (Critical Thinking)	3.72	.60	218
8.	F1-: Educational Context of the Learning (Technology)	3.75	.74	218
9.	F2-: Educational Context of the Learning (Culture)	3.77	.67	218

Table 1 shows that the mean value of overall meta-cognition of chemistry students of all universities is (M=3.77, SD=.74) which is above average, similarly mean value of all factors of meta-cognition of learning of all students from factor A to F are also above average. It shows a better understanding of all students regarding meta-cognition of learning.

Table 2. Descriptive Statistics of CGPA of Chemistry Students

S. No.	Name of University	Mean Value of CGPA	Std. Deviation	N
1.	BZU Multan	2.87	.39	60
2.	Islamia University Bahawalpur	3.35	.44	65
3.	University of Punjab Lahore	2.82	.37	42
4.	Arid Agriculture University Rawalpindi	3.02	.62	51

Table 2 shows the mean values of CGPA University wise, the mean value of Islamia University Bahawalpur students is higher than others

Table 3. Relationship of Meta-cognition with Academic Achievement

Levels	CGPA of Students
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Over-all Students	Meta-cognition of	Pearson Correlation (r)	.031
		Sig. (2-tailed)	.646
		N	218

Table 3 showed that the Pearson Correlation ($r=.031$) and significant value ($p=.646$) at significance level .05 ($\alpha=.05$). Hence, there was no significant relationship between overall academic achievement and meta-cognition of university students. Thus, null hypothesis was accepted.

Table 4. Relationship of Meta-cognition of with Academic Achievement with respect to Gender

Variables	Levels	CGPA of Students
Over-all Meta-cognition of Students	Pearson Correlation (r)	.047
	Male	Sig. (2-tailed)
		.701
	N	70
	Pearson Correlation (r)	.028
	Female	Sig. (2-tailed)
	.735	
	N	148

Table 4 showed that the Pearson Correlation ($r=.047$) and significant value ($p=.701$) at significance level .05 ($\alpha=.05$) for male. Similarly, Pearson Correlation ($r=.028$) and significant value ($p=.735$) at significance level .05 ($\alpha=.05$) for female. Therefore, there was no significant relationship between overall academic achievement and meta-cognition of male and female.

Table 5. Relationship of Meta-cognition of with Academic Achievement with respect to University

Variables	Levels	CGPA of Students	
Over-all Meta-cognition of Students	Pearson Correlation (r)	.162	
	BZU Multan	Sig. (2-tailed)	
		.215	
		N	
		60	
	Islamia University Bahawalpur	Pearson Correlation (r)	.115
		Sig. (2-tailed)	
		.362	
		N	
		65	
	University of Punjab Lahore	Pearson Correlation (r)	.123
		Sig. (2-tailed)	
	.438		
	N		
	42		
Arid Agriculture University Rawalpindi	Pearson Correlation (r)	.301*	
	Sig. (2-tailed)		
	.032		
	N		
	51		

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

Table 5 represented that

- For BZU, the Pearson Correlation ($r=.162$) and significant value ($p=.215$) at significance level .05 ($\alpha=.05$) show a weak positive correlation between overall meta-cognition and academic achievement.
- For Islamia University Bahawalpur, the Pearson Correlation ($r=.115$) and significant value ($p=.362$) at significance level .05 ($\alpha=.05$) show a weak positive correlation between overall meta-cognition and academic achievement.
- For University of Punjab Lahore, Pearson Correlation ($r=.123$) and significant value ($p=.438$) at significance level .05 ($\alpha=.05$) show a weak positive correlation between overall meta-cognition and academic achievement.
- For Arid Agriculture University Rawalpindi, Pearson Correlation ($r=.301^*$) and significant value ($p=.032$) at significance level .05 ($\alpha=.05$) show a positive significant correlation between overall meta-cognition and academic achievement.

Table 6. Relationship of Meta-cognition of with Academic Achievement with respect to Age of Respondents

Variables	Levels	CGPA of Students
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		Pearson Correlation (r)	.079
Over-all	21-22 Years age	Sig. (2-tailed)	.300
Meta-cognition		N	176
of Students	23-24 Years age	Pearson Correlation (r)	.156
		Sig. (2-tailed)	.357
		N	37

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

Table 6 showed that

- For age group (21-22 years), the Pearson Correlation ($r = .079$) and significant value ($p = .300$) at significance level $.01 (\alpha = .01)$ show no significant correlation between overall meta-cognition and academic achievement.
- For age group (23-24 years), the Pearson Correlation ($r = .156$) and significant value ($p = .357$) at significance level $.01 (\alpha = .01)$ show no significant but positive correlation between overall meta-cognition and academic achievement.

DISCUSSION

Present study was to investigate the relationship between meta-cognition and academic achievement of university students in Punjab. It was found that students possess meta-cognition (Table 1). This finding is according to results of previous researches (Flavell, 1976, 1978, 1979; Wilson, & Bai, 2010).

Results indicated that there was no significant association between overall academic achievement and meta-cognition of university students (Table 3). This result is consistent with other research findings (Garner, 1990; Peverly et al., 2003).

There was no significant relationship between overall academic achievement and meta-cognition of male and female (Table 4). This result is similar to other research findings (Hong, Peng, & Rowell, 2009; Javadi, Keyvanara, Yaghoobbi, Hassanzade & Ebadi, 2010).

Results for BZU show a positive weak correlation between overall meta-cognition and academic achievement. For Islamia University Bahawalpur, show a weak positive correlation between overall meta-cognition and academic achievement. For University of Punjab Lahore, show a weak positive correlation between overall meta-cognition and academic achievement. For Arid Agriculture University Rawalpindi, show a positive significant correlation between overall meta-cognition and academic achievement (Table 5). This result is similar to other research findings (Puzziferro, 2008; Eriyani, 2020).

For the age group (21-22 years), show no significant correlation between overall meta-cognition and academic achievement. For age group (23-24 years), show a weak positive correlation between overall meta-cognition and academic achievement (Table 6). This result is similar to other research findings (Lynch, 2008; Asikainen, & Gijbels, 2017).

RECOMMENDATIONS

It was found that students possess meta-cognition factors but are not using in their learning. Therefore:

1. Faculty/Department may arrange sessions for faculty members to highlight the role of meta-cognition in learning.
2. University teachers may make students aware of their meta-cognition skills.
3. University teachers may design assignments, classroom activities, presentations and papers in such a way that student use meta-cognition
4. Curriculum for higher studies in chemistry may be design in such a way which demands active application of meta-cognition.
5. This research was conducted in chemistry. Further studies in other science subjects are recommended to explore the relationship of meta-cognition with academic achievement.

CREDIT AUTHOR STATEMENT

Abeer Siraj: Writing- Original draft preparation, Data curation, **Dr. Rehmat Ullah Bhatti,** Conceptualization, Methodology, Supervision, Visualization. **Dr. Muhammad Asghar Ali:** Validation, Data Analysis, use of Software, Reviewing and Editing.

ETHICAL STANDARDS:

It is declare that all authors don't have any conflict of interest. It is also declare that this article does not contain any studies with human participants or animals performed by any of the authors. Furthermore, informed consent was obtained from all individual participants included in the study.

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