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A Cross-Sectional Study of Assessing Metacognitive Knowledge and Metacognitive Regulatory Skills among Prospective Teachers and Its Relation to their Academic Achievement

Aroona Hashmi*, Mubasihra Khalid** and Almas Shoaib***

Abstract

Metacognitive skills are amongst the striking concept since a couple of decades, when Flavell, (1979) first introduced it. This concept is multidimensional in nature. Metacognition is a higher-order thinking skill. Therefore, the main purpose of this study was to assess metacognitive awareness in prospective teachers and to find out how much our teacher training institutions are successfully contributing to developing such awareness in prospective teachers. This study is descriptive in nature. It is a situational analysis for the concept of metacognition in the prevailing teacher education system by doing co-relational and cross-sectional study. The instrument of this study is the metacognitive awareness inventory (MAI) developed by the Schraw and Dennison (1994). The validity and reliably of this instrument in the Pakistani context were ensured. Independent samples t-test and Pearson correlation coefficient (r) were used. Findings of the study showed positively strong and significant relationship between prospective teachers' metacognitive knowledge and metacognitive self-regulatory skills in teacher training institutions, but it was also revealed from the results that there was a negatively weak relationship between prospective teachers' academic achievement (GPA) with their metacognitive knowledge and metacognitive regulatory skills. Moreover, there was an insignificant difference in prospective teachers' metacognitive knowledge and metacognitive self-regulatory skills in teachers training institutions based on demographic variables (i.e. age, gender, and university type).

Keywords: Metacognitive skills, metacognitive knowledge, metacognitive regulatory

*Assistant Professor of Education, Institute of Education and Research, University of the Punjab, Lahore. Pakistan. Email: aroona.ier@pu.edu.pk
** Assistant Professor of Education, Institute of Education and Research, University of the Punjab, Lahore. Pakistan. Email: mubashirakhalid@yahoo.com
*** PhD Scholar, Institute of Education and Research, University of the Punjab, Lahore.
Email: almas.phd.ier@pu.edu.pk

Introduction

Metacognition has been discussed as the regulation and control of cognitive strategies for learning. It is defined as thinking about thinking (Yzerbyt, Lories, & Dardenne, 1998). In addition to this, metacognition includes the knowledge and epistemological beliefs of an individual that related to his/her own cognitive processes, and the arrangement of these cognitive processes (Ormrod, 2006). Research has shown that epistemological assumptions refer to the students' perspectives about instructional practices. Individual beliefs about knowledge are known as personal epistemology that is different according to the learners' willingness and engagement in the learning process. Therefore, students have their own certain perceptions about how to relate testing, interactivity, academic tasks, choices of textbooks and the structure of the classroom, etc. with the acquisition of knowledge (Hofer, 2004). The way how the learner connects themselves in learning activity is determined by personal epistemology. This proceeds to regulatory and control elements of metacognition.

Metacognition has become the most attractive domain for both Psychologists and Philosophers as well. Researchers agree at the point that both personal epistemology and self-regulation have an effect on learning. It was discovered by Young and Fry (2008) understanding of metacognitive skills was significantly correlated with the grades of college students. Schraw and Dennison (1994) developed MAI and discovered no significant difference in the metacognitive knowledge skills of adults, but the difference in metacognitive regulatory skills. They also identified the significant correlation between metacognitive knowledge and metacognitive regulation with test performance.

Researchers of this era seem more interested to study one's own cognition. Cognition explains the mental processes involved in transforming, coding, storing and retrieving information. Researchers categorize metacognition in the same pattern i.e. into two main domains i.e. Knowing about own cognition (Personal epistemology) and regulation of cognition (self-regulation). According to Schommer-Aikins (2004), the term Personal epistemology is associated with Perry and often recognized as the door opener for this decisive area of study.

Gender difference in metacognition has been a controversial issue. Previous researches have shown inconsistent results regarding the differences in metacognitive skills of male and female students. The previous studies reveal that there are not any differences between male and female students regarding metacognitive awareness and metacognitive self-regulation skills (Berkant, 2009; Hashempour, Ghonsooly & Ghanizadeh 2015; Liliana, & Lavinia, 2011; Logan & Johnston, 2010; Ozkan & Hatice, 2013;Topçu & Yilmaz-Tüzün, 2009; Ur-Rahman, Jumani, Chaudry, Chisti, & Abbasi, 2010; Vianty, 2007; Zulkiply, Kabit, &Ghani, 2000).

On the other hand, it was found from the researches that females showed more confidence inability to self-regulate their learning tasks as compared to males, which reflect on their higher metacognitive ability. They are aware of the role of thinking in the self-regulation of learning. They displayed more goal setting, planning strategies, and self-monitoring than males and surpassed them in their ability to structure their environment for optimal learning. They used more cognitive and metacognitive strategies and displayed better strategic management (Boulware-Gooden, Carreker, Thornhill, & Joshi, 2007; Huff & Nietfeld, 2009; Pajares & Valiante, 2002; Shen & Liu, 2011). In addition, Miller (2000) found that female students have more metacognitive skills in Mathematics compared to male students.

Schommer-Aikins (2004) said that researchers have argued on the investigation regarding the importance of the relationship between these two psychological constructs i.e. metacognitive and metacognitive knowledge to understand more efficiently the nature of students' learning. All over the world, major contributions regarding metacognition for adults are being recognized in every facet of teaching and learning situation. However, in Pakistan, this concept is still in its infant stage. Now it is the need of the time to investigate this phenomenon in Pakistan, due to the knowledge gap between theory and practice in education. People are incapable to apply and relate their knowledge (learning during course work of the academic year) in their respective fields. Students join the institutions to learn the professional skills but in fact, they just memorize theories and passing out with degrees in their hands to certify them. But in real life, they are having fewer professional skills and unable to prove them as professionals.

Prospective teachers are those who are the future nation builder and effective teachers lead to effective learners. Thus, if teachers are competent enough to think metacognitively and are well informed of their own meta-cognitive knowledge as well as metacognitive regulatory skills then they may be transferring the concepts properly to their students in the future. Therefore, it is vital to discover the patterns of both metacognitive knowledge and skills and their relationship to prospective teachers' academic achievement. In this way, the importance of metacognition in teaching and learning process could be highlighted in Pakistan.

It is essential to identify the prospective teachers' metacognitive knowledge and metacognitive regulatory skills. Similarly, assessing the associations between the mega and the sub-factors of the metacognitive awareness with academic achievement (GPA) that, it is essential to make this research worthwhile and to fulfill the requirements of correlational studies at this initial level. So, the researchers investigated the relationship between metacognitive regulation and metacognitive knowledge. As a contribution to literature, researchers have investigated the influence of various demographical variables like age, gender and university types on metacognitive knowledge and metacognitive regulation.

Objectives of the Study

The objectives of the study were to:

1. Examine the prospective teachers' metacognitive knowledge and metacognitive self-regulatory skills.
2. Find out the relationship between prospective teachers' metacognitive knowledge and metacognitive self-regulatory skills with their academic achievement (GPA).
3. Investigate the difference in prospective teachers' metacognitive knowledge and metacognitive self-regulatory skills based on demographic variables.

Research Methodology

The study was quantitative in nature. The purpose of this research was to investigate the relationship between metacognitive awareness of prospective teachers and their academic achievement. Therefore, correlational research design was used.

Participants of the study

The population comprised of all the prospective teachers enrolled in Public Universities of Punjab (teacher training institutions) for the master's program. There are only 11 Public Universities of Punjab (teacher training institutions) who offered two years master's program and approximately 2222 prospective teachers are enrolled in the master's program in these Public universities (Higher Education Commission, 2018). Two Public universities were selected randomly. There are 1376 prospective teachers (session 2018-2020) enrolled in the masters' program in two selected public universities i.e. university X & university Y. According to Gay, Mills, and Airasian (2009) for the population of 1500 respondents, the sample of 306 is required at 95% confidential interval. So, 200 prospective teachers were selected from each selected university. Therefore, a total of 400 prospective teachers were selected as part of this research.

Research Instrumentation

Metacognitive Awareness Inventory (MAI), which was developed by Schraw and Dennison (1994), was used to assess metacognitive awareness. There are 52 items loading two factors with eight subscales. The two factors are parallel with the components of traditional metacognition theories: (1) Knowledge of Cognition; (2) Regulation of Cognition. Correspondingly, to identified prospective teachers' academic achievement GPA were collected from their preceding semester's results.

Moreover, the validity and reliability of this instrument were also checked in the Pakistani context. The validity was ensured from the four experts of assessment and evaluation field and the reliability was confirmed by Cronbach's alpha which was as follows: knowledge of cognition $\alpha = 0.839$; regulation of cognition $\alpha = 0.876$ and overall instrument $\alpha = 0.920$. According to Cortina (1993) and Taber (2018), the reliability value of $\alpha > 0.70$ is acceptable.

Data Analysis and Interpretation

Descriptive statistics [i.e. Frequency distribution (in percentage), mean and standard deviation] and inferential statistics [i.e. independent samples t-test and Pearson product-moment correlation (Pearson r)] were applied to investigate the variation based on demographical variables and relationship in prospective teachers' metacognitive knowledge, metacognitive regulatory skills, and academic achievement.

Part a: Descriptive Statistics

This section provides the analysis of the statements regarding metacognitive knowledge and metacognitive regulatory skills of prospective teachers by using descriptive statistics.

Frequency distribution of metacognitive knowledge i.e. 'Knowledge of Cognition'

The Knowledge of cognition consisted of three sub-components that are 1) Declarative knowledge, 2) Procedural knowledge, and 3) Conditional knowledge.

Table 1

Frequency distribution (in percentage) of Declarative Knowledge

		Never	Rarely	Sometimes	Frequently	Always
1	I am quite able to know my intellectual weaknesses and strengths.	7.0	13.8	27.5	25.0	26.8
2	I am aware of the information that is important to learn.	14.0	15.0	19.5	26.3	25.3
3	I can organize the information very well.	13.3	18.3	26.2	26.2	16.0
4	I know what to learn as per teachers' expectations.	13.8	11.8	18.3	24.8	31.5
5	I can remember information quite well.	11.0	11.0	34.8	24.0	19.3
6	I know how to control what I have learned.	7.0	16.3	23.0	31.8	22.0
7	I can judge how well I comprehend something	13.0	18.8	26.3	24.0	18.0
8	I learn better when I find the topic interesting.	12.0	14.5	27.5	20.8	25.3

The table 1 shows that prospective teachers' declarative knowledge has 8 statements. In response to the first statement, 26.8 % of respondents said that they are always able to know their intellectual weaknesses and strengths. Whereas 27.5% of respondents said that they sometimes understand their intellectual strengths and weaknesses. The response of the second statement shows that 26.3% frequently and 25.3% respondents said that they always know the information that is important to learn. On the other hand, there is the same response against the third statement's two options i.e. sometimes and frequently. The table shows that 26.2% of respondents said that they can organize information well. In response to the next statement, only 31.5% of respondents said always they learn according to their teachers' expectations. Moreover, 34.8% of respondents said that sometimes they can remember the information quite well. Table 1 also shows that 31.8 of respondents always have controlled learning. And 26.3% of respondents said that sometimes they can judge how well they comprehend something. In response to the last statement that 27.5 % of respondents said sometimes that they learn better when they find the topic interesting.

Table 2

Frequency distribution (in percentage) of procedural knowledge

		Never	Rarely	Sometimes	Frequently	Always
1	I try to work on the strategies that I have used in the past.	8.5	13.8	24.3	31.8	21.8
2	I use the strategy with a particular purpose.	13.0	12.5	26.0	21.0	27.5
3	I know which strategy is best to use while studying.	20.3	16.5	23.3	23.8	16.3
4	I find myself using helpful learning strategies automatically	15.0	13.0	25.0	31.0	16.0

The table 2 shows that procedural knowledge has 4 statements. In response to the first statement, 31.8 % of respondents said that they frequently try to work on strategies that have used in the past. Whereas 27.5% of respondents said that they always use the strategy with a purpose. The response of the next statement shows that 26.8% of respondents said that they are frequently known which strategy is best to use while studying. In response to the last statement that 31% of respondents said that frequently they find themselves uses helpful learning strategies automatically.

Table 3

Frequency distribution (in percentage) of conditional knowledge

		Never	Rarely	Sometimes	Frequently	Always
1	I learn best when I have previous knowledge about the topic.	10.3	12.3	16.3	30.8	30.5
2	I work on different learning strategies according to the situation.	7.5	9.3	24.0	34.0	25.3
3	I feel motivated whenever I want to learn.	14.5	9.0	20.5	30.5	25.5
4	I balance my weaknesses by using my intellectual strengths.	18.3	10.3	32.3	24.8	14.5
5	I know which the most effective strategy to use is.	12.3	16.0	21.5	31.5	18.8

The above table 3 shows that conditional knowledge has 5 statements. The first statement shows that 30.5% of respondents said that they always learn best when they have previous knowledge about the topic. In response to the second statement, 34.0% of respondents said that they frequently work on different learning strategies according to the situation. Similarly, 30.5% of respondents said that frequently feel motivated whenever they want to learn. On the other hand, 32.3% of respondents said that sometimes they balance their weaknesses by using their intellectual strengths. In response to the last statement that 31.5 % of respondents said that frequently they know which the most effective strategy is.

Frequency distribution of factor metacognitive regulatory skills i.e. 'Regulationof Cognition'

There are 5 sub-components in metacognitive regulatory skills 'Regulation of Cognition'; they are 1) planning, 2) information management strategies, 3) comprehension monitoring, 4) debugging strategies, and 5) evaluation.

Table 4

Frequency distribution (in percentage) of planning

		Never	Rarely	Sometimes	Frequently	Always
1	I learn fast to avail more time.	18.3	18.5	24.5	22.0	16.8
2	I consider what I truly need to learn before I start a task.	8.8	13.3	21.5	29.8	26.8
3	I used to set particular goals before working on a task.	8.3	15.3	30.5	24.5	21.5
4	I used to get into some ideas about the material before I start.	11.0	14.0	23.3	28.8	23.0
5	I used to think of different solutions to a problem and then choose the best one.	16.8	11.0	29.0	24.0	19.3
6	I read guidelines precisely before I start a specific task.	14.8	15.8	34.8	15.8	19.0
7	I know how to organize my time to get done my goals well.	19.3	18.3	27.5	19.5	15.5

Table 4 shows that planning has 7 statements. The first statement shows that 24.5% of respondents said that they learn fast to get more time. In response to the second statement, 29.8% of respondents said that they frequently consider what they truly need to learn before they start a task. On the other hand, 30.5 % of respondents said that sometimes they use to set goals before working on a task. Likewise, 28.8% of respondents said that sometimes they use to get into some ideas about the material before they start. The response for another statement shows that 29 of respondents said that sometimes they use to think of different solutions to a problem and then choose the best one. Similarly, 34.8% of respondents said that sometimes they read guidelines precisely before they start a specific task. In response to the last statement that 27.5% of respondents said that sometimes they know how to organize my time to get done their goals well.

Table 5

Frequency distribution (in percentage) ofinformation management strategies

		Never	Rarely	Sometimes	Frequently	Always
1	I used to slow down my pace when I get to know important information.	6.3	12.8	25.0	33.5	22.5
2	I used to concentrate on important information.	7.0	17.0	22.0	23.5	30.5
3	I concentrate on the meaningfulness and importance of new information.	13.0	14.5	26.5	27.5	18.5
4	I deliver the information by generating my own examples to make it more meaningful.	15.0	13.3	27.3	22.0	22.5
5	I draw pictures or diagrams to understand things during learning.	10.3	14.5	25.8	24.5	25.0
6	I try to use my own words to translate new information.	12.3	12.3	20.5	25.5	29.5
7	I help myself to learn by using the organizational structure of the text.	14.5	13.3	37.5	21.8	13.0
8	I try to relate the reading material with my previous knowledge.	7.8	18.0	30.0	21.3	23.0
9	I try to study by breaking it down into small parts.	21.0	15.0	30.8	20.8	12.5
10	I concentrate on overall meaning rather than specific ones.	18.8	14.5	27.5	22.0	17.3

The above table 5 illustrates that information management strategies have 10 statements. The first statement depicts that 33.3% of respondents said that they frequently use to slow down their pace when they get to know important information. The response of the second statement signifies that 30.5 of respondents said that they use to concentrate on important information. On the other hand, 27.5% of respondents said that frequently they concentrate on the meaningfulness and importance of new information.

Likewise, the next statement shows that 27.3% of respondents said that sometimes they deliver the information by generating their own examples to make it more meaningful. The response to the next statement shows that 25.8% of respondents said that sometimes they draw pictures or diagrams to understand the things during learning. Correspondingly 29.5% of respondents said that always they try to use their own words to translate the new information. In response to the next statement, 37.5% of respondents said that sometimes they help themselves to learn by using the organizational structure of the text. Similarly, 30 of respondents said that sometimes they try to relate the reading material with their previous knowledge. In the same way, 30.8% respondents said that sometimes try to study by breaking it down into small parts. In response to the last statement that 27.5% of respondents said that sometimes they concentrate on overall meaning rather than specific ones.

Table 6

Frequency distribution (in percentage) of comprehension monitoring

		Never	Rarely	Sometimes	Frequently	Always
1	I periodically ask myself whether I am achieving my goals.	10.5	17.3	18.5	29.2	24.5
2	I think about different alternatives to a problem while answering.	7.2	12.0	25.8	29.3	25.7
3	I ask many times to myself whether I considered all options while problem-solving.	9.3	16.8	23.1	26.8	24.0
4	I review periodically to know the important relationships.	13.5	15.8	15.7	33.0	22.0
5	I analyze the effectiveness of strategies during studies.	13.4	20.3	29.5	23.3	13.5
6	I used to take pause to check the comprehension.	9.3	14.0	25.2	32.0	19.5
7	I used to think about how much I am doing well while learning new things.	25.8	10.3	23.0	22.6	18.3

The above table 6 shows the pattern of comprehension monitoring which has 7 statements. It is revealed from the data that 24.5% of respondents said that they periodically ask themselves whether they are achieving their goals. In response to the second statement, 29.3% of respondents said that they frequently think about different alternatives to a problem while answering. On the other hand, 23.1% of respondents said that sometimes they ask themselves whether they considered all options while problem-solving. It is depicting from the table that 13.5% of respondents said that they review periodically to know the important relationships. The response for another statement shows that 29.5% of respondents said that sometimes they analyze the effectiveness of

strategies during studies. Contrary to above, 32.0%, respondents said that frequently they use to take pause to check the comprehension. The response of the last statement shows that 25.8 % of respondents said that they use to think about how much they are doing well while learning new things.

Table 7

Frequency distribution (in percentage) of debugging strategies

		Never	Rarely	Sometimes	Frequently	Always
1	I get help from others when need to understand something.	10.3	13.8	24.3	30.8	21.0
2	I understand the strategies otherwise change them.	6.3	18.0	18.5	31.3	26.0
3	I re-evaluate my assumptions when I get confused.	17.0	23.0	25.5	18.5	16.0
4	I stop and think over other information when it is unclear.	15.3	17.0	33.8	18.8	15.3
5	I stop and read it again if I take it confusing.	29.3	12.0	20.0	13.8	25.0

The pattern of responses regarding debugging strategies shows in 5 statements. The first statement shows that 30.8% of respondents said that they frequently get help from others when need to understand something. The second statement depicts that 31.3% of respondents said that they frequently understand the strategies otherwise change them.

Only 16 % of respondents said that always they re-evaluate their assumptions when they get confused. On the other hand, statement, 33.8% of respondents said that sometimes they stop and think over other information when it is unclear. In response to the last statement that 29.3% of respondents said that they never stop and read it again if they take it confusing.

Table 8

Frequency distribution (in percentage) of evaluation

		Never	Rarely	Sometimes	Frequently	Always
1	I know how well I did once I give a test.	14.5	15.5	20.3	32.3	17.5
2	I try to search for an easier way to do a task after finishing it once.	18.5	13.5	16.5	30.3	21.3
3	I can summarize learned material after completing it.	11.0	19.3	28.8	26.8	14.3
4	I remind how well I get done with my goals after achieving those.	7.8	12.3	26.0	26.0	28.0
5	I rethink after solving a problem whether I considered all alternatives.	10.5	12.3	23.5	27.8	26.0
6	I re-evaluate my learning after completing a task to check how much I learned.	19.0	21.0	30.8	15.5	13.8

Table 8 shows that the evaluation has 6 statements. The first statement shows that 32.3% of respondents said that they frequently they know how well they did once they finish a test. Similarly, the response of the second statement shows that 30.3% of respondents said that they frequently try to search for an easier way to do a task after finishing it once. On the other hand, 28.8% of respondents said that sometimes they can summarize learned material after completing it.

On the other hand, in response to another statement, 28.0% of respondents said that they always remind how well they get done with their goals after achieving those. The response for the next statement shows that 27.8% of respondents said that frequently they rethink after solving a problem whether they considered all alternatives. In response to the last statement that 30.8% of respondents said that sometimes they re-evaluate their learning after completing a task to check how much they learned.

Table 9

Mean Distribution of Metacognitive Knowledge

	M	*SD*
Declarative Knowledge	26.70	5.625
Procedural Knowledge	13.01	3.450
Conditional Knowledge	16.98	4.119

The table shows 9 that students have high declarative knowledge as *M*= 26.70 with *SD*= 5.625 as compare to the other two sub-scales of metacognitive knowledge. On the other hand, students have low procedural knowledge as M= 13.01 with *SD*= 3.450.

Table 10

Mean Distribution of Metacognitive Regulatory Skills

	M	*SD*
Planning	22.48	4.611
Information Management Strategies	32.74	6.716
Comprehension Monitoring	23.07	5.034
Debugging Strategies	15.80	3.724
Evaluation	19.44	4.211

The table 10 shows that students have high knowledge about Information Management Strategies as *M*= 32.74 with *SD*= 6.716 as compare to the other four sub-scales of metacognitive regulatory skills. On the other hand, students have low knowledge about debugging strategies as *M*= 15.80 with *SD*= 3.724.

Part b: Inferential Statistics

This section provides the results of inferential statistics i.e. independent samples t-test and Pearson product-moment correlation. The detail of each inferential statistics is discussed as follows: 1) to investigate the difference in prospective teachers' metacognitive knowledge and metacognitive self-regulatory skills based on demographic variables, independent samples t-test was used;2) and to find out the relationship between prospective teachers' metacognitive knowledge and metacognitive self-regulatory skills with their academic achievement (GPA) Pearson product-moment correlation was applied.

Table 11

Independent samples t-test between metacognitive knowledge and gender

	Male (116)		Female (284)		t	*df*	*p*
	M	*SD*	*M*	*SD*			
Declarative knowledge	26.38	5.973	26.82	5.482	-0.717	398	0.474
Procedural knowledge	13.33	3.356	12.88	3.485	1.168	398	0.244
Conditional knowledge	16.85	4.181	17.04	4.099	-0.400	398	0.689
Overall Knowledge about cognition	56.560	12.2107	56.743	11.3269	-0.143	398	0.886

The independent t-test was used to find any difference in metacognitive knowledge based on gender. Therefore, the table 11 explains that there is an insignificant difference of prospective teachers' metacognitive knowledge (i.e. knowledge about cognition) and its subscales (i.e. declarative knowledge, procedural knowledge, and conditional knowledge) based on gender as p= 0.886, 0.474, 0.244 and 0.689 > 0.05 respectively.

Table 12

Independent samples t-test between metacognitive regulatory skills and gender

	Male (116)		Female (284)		t	*df*	*p*
	M	*SD*	*M*	*SD*			
Planning	22.45	4.908	22.49	4.492	-0.081	398	0.936
Information management strategies	32.63	7.219	32.79	6.513	-0.215	398	0.830
Comprehension monitoring	23.16	5.153	23.03	4.993	0.238	398	0.812
Debugging strategies	15.85	4.101	15.77	3.566	0.181	189.651	0.857
Evaluation	18.84	4.197	19.68	4.199	-1.831	398	0.068
Overall regulation of cognition	112.93	21.425	113.77	19.098	-0.383	398	0.702

The independent t-test was employed to investigate any difference in metacognitive regulatory skills based on gender. The table 12 enlightens that there is an insignificant difference of prospective teachers' metacognitive regulatory skills (i.e. regulation of cognition) and its subscales (i.e. planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation) based on gender as p= 0.702, 0.936, 0.830, 0.812, 0.857 and 0.068 > 0.05 respectively.

Table 13

Independent samples t-test between metacognitive knowledge and teachers training institutions

	University A (200)		University B (200)		t	*df*	*p*
	M	*SD*	*M*	*SD*			
Declarative knowledge	26.30	5.396	27.09	5.832	-1.406	398	0.160
Procedural knowledge	13.12	2.935	12.91	3.902	0.594	369.569	0.553
Conditional knowledge	16.82	3.873	17.15	4.354	-0.789	398	0.431
Overall Knowledge about cognition	56.235	10.4833	57.145	12.5824	-0.786	385.440	0.432

The table 13 illustrates that there is the insignificant difference in prospective teachers' metacognitive knowledge (i.e. knowledge about cognition) and its subscales (i.e. declarative knowledge, procedural knowledge, and conditional knowledge) among universities (i.e. teachers training institutions) as p= 0.432, 0.160, 0.553 and 0.431 > 0.05 respectively.

Table 14

Independent samples t-test between metacognitive regulatory skillsandteachers training institutions

	University A		University B		t	*df*	*p*
	M	*SD*	*M*	*SD*			
Planning	22.68	4.827	22.28	4.387	0.856	398	0.392
Information management strategies	32.94	6.914	32.55	6.524	0.573	398	0.567
Comprehension monitoring	22.22	4.678	23.93	5.239	-3.443	398	0.001*
Debugging strategies	16.52	4.000	15.08	3.283	3.922	383.417	0.000*
Evaluation	18.86	3.977	20.02	4.366	-2.766	398	0.006*
Overall regulation of cognition	113.20	20.693	113.85	18.863	-0.328	398	0.743

Note= * shows significant at 0.05

The table 14 clarifies that there is an insignificant difference of prospective teachers' metacognitive regulatory skills (i.e. regulation of cognition) and its subscales (i.e. planning and information management strategies) among universities (i.e. teacher training institutions) as p= 0.743, 0.393 and 0.567 > 0.05 respectively. Contrary to this result table also shows that there is a significant difference in prospective teachers' comprehension monitoring, debugging strategies, and evaluation skills among universities as p= 0.001, 0.000 and 0.006< 0.05 respectively.

Table 15

Independent samples t-test between prospective teachers' metacognitive knowledge and their ages (in years)

	19-21 years (282)		22-25 years (118)		t	*df*	*p*
	M	*SD*	*M*	*SD*			
Declarative knowledge	26.92	5.295	26.16	6.338	1.142	188.609	0.255
Procedural knowledge	13.03	3.349	12.97	3.694	0.142	398	0.887
Conditional knowledge	17.13	3.996	16.62	4.395	1.143	398	0.254
Overall Knowledge about cognition	57.082	10.9100	55.754	13.0298	1.046	398	0.296

Table 15 gives details that there is an insignificant difference in prospective teachers' metacognitive knowledge (i.e. knowledge about cognition) and its subscales (i.e. declarative knowledge, procedural knowledge, and conditional knowledge) based on their ages (in years) as p= 0.296, 0.255, 0.887 and 0.254> 0.05 respectively.

Table 16

Independent samples t-test between prospective teachers' metacognitive regulatory skills and their ages (in years)

	19-21 years (282)		22-25 years (118)		t	*df*	*p*
	M	*SD*	*M*	*SD*			
Planning	22.60	4.475	22.19	4.927	0.816	398	0.415
Information management strategies	32.87	6.476	32.43	7.278	0.597	398	0.551
Comprehension monitoring	23.29	4.852	22.53	5.428	1.379	398	0.169
Debugging strategies	15.89	3.651	15.57	3.902	0.798	398	0.426
Evaluation	19.48	4.054	19.34	4.580	0.288	197.451	0.774
Overall regulation of cognition	114.14	18.775	112.06	22.004	0.959	398	0.338

The table 16 demonstrates that there is an insignificant difference in prospective teachers' metacognitive regulatory skills(i.e. regulation of cognition) and its subscales (i.e. planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation) based on their ages (in years) as p= 0.338, 0.415, 0.551, 0.169, 0.426 and 0.774 > 0.05 respectively.

Table 17

Correlation between Metacognitive knowledge and Metacognitive self-regulatory skills of prospective teachers in teachers training institutions

	Metacognitive knowledge	Metacognitive self-regulatory skills
Metacognitive knowledge	1	0.837**
Metacognitive self-regulatory skills	0.837**	1

Note: ** shows significant at < 0.01.

To examine any significant relationship exists between metacognitive knowledge and metacognitive self-regulatory skills of prospective teachers in teachers training institutions Pearson product-moment correlation was applied. It is revealed from the result that there is positively strong and significant relationship exists between metacognitive knowledge and metacognitive self-regulatory skills of prospective teachers in teacher training institutions as $r = 0.837$ and $p=0.000$.

Table 18

Correlation between metacognitive knowledge of prospective teachers with their academic achievement (GPA)

	DK	PK	CK	MK	GPA
DK	1				
PK	0.614**	1			
CK	0.704**	0.599**	1		
MK	0.919**	0.810**	0.876**	1	
GPA	-0.100**	-0.017	-0.056	-0.074	1

Note: **. Correlation is significant at the 0.01 level (2-tailed); DK= Declarative knowledge; PK= Procedural knowledge; CK= Conditional knowledge; KC= Overall Metacognitive knowledge; GPA=academic achievement.

To investigate any significant relationship between metacognitive knowledge of prospective teachers with their academic achievement (GPA), the Pearson product-moment correlation was applied. The table describes that there is negatively weak and insignificant relationship exists between Metacognitive knowledge (i.e. overall metacognitive knowledge and its two subscales i.e. procedural knowledge and conditional knowledge) of prospective teachers with their academic achievement (GPA) as $r = -0.074, -0.017, -0.056$, respectively. The table also shows that there is negatively weak and significant relationship exists between declarative knowledge of prospective teachers with respect to their academic achievement (GPA) as $r = -0.100$.

Table 19

Correlation between metacognitive self-regulatory skills of prospective teachers with academic achievement (GPA)

	Planning	IMS	CM	DS	Evaluation	MSRS	GPA
Planning	1						
IMS	0.630**	1					
CM	0.597**	0.648**	1				
DS	0.577**	0.556**	0.383**	1			
Evaluation	0.581**	0.561**	0.598**	0.499**	1		
MSRS	0.832**	0.876**	0.813**	0.715**	0.785**	1	
GPA	-0.048	-0.058	-0.053	-0.066	-0.071	-0.072	1

Note: **. Correlation is significant at the 0.01 level (2-tailed); IMS= Information Management Strategies; CM= Comprehension Monitoring; DS= Debugging Strategies; MSRS= Overall Metacognitive Self-Regulatory Skills; GPA=academic achievement.

To investigate any significant relationship exists between metacognitive regulatory skills of prospective teachers with academic achievement (GPA), the Pearson product-moment correlation was used. The table portrays that there is negatively weak and insignificant relationship exists between metacognitive regulatory skills (i.e. overall regulation about cognition and its subscales i.e. planning, information management strategies, comprehension monitoring, debugging strategies, evaluation) of prospective teachers with academic achievement (GPA) as r = -0.071, -0.048, -0.058, -0.053, -0.066, and -0.071 respectively.

Discussion

The results indicated a strong correlation between metacognitive awareness and teaching performance for prospective teachers. These results also provided support for the validity of (MAI) as it relates to academic achievement. This result agreed with the finding of studies by Ndidiamaka (2010); Young and Fry (2008); and Coutinhu (2007). The research Abdellah (2015) also indicated that there was a positively strong and significant relationship exists between metacognitive knowledge and metacognitive self-regulatory skills of prospective teachers in teacher training institutions.

Prospective teachers who got the high score in MAI total and metacognitive regulation were at high levels of teaching performance. They were very good at planning and organizing their teaching materials, more socially with their students during practice teaching, using different teaching strategies and capable of controlling their lesson time, and these finding share in line with the research of studies (Crowther & Cannon, 2004; Ozan, Gundogdu, Bay, & Celkan, 2012). The results of this study emphasize the positive correlation between the MAI and academic achievement as it was also concluded in research by (Abdellah, 2015) and showed positive correlation as well as of their teaching performance.

The result showed that there is an insignificant difference in prospective teachers' metacognitive regulatory skills (i.e. regulation of cognition) and its subscales (i.e. planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation) due to their ages (in years). A study by Ur-Rahman, Jumani, Chaudry, Chisti, and Abbasi (2010) supported the findings of the present study indicate that there was no significant difference between the metacognition of male and female science students. For instance, Topçu and Yilmaz-Tüzün, (2009) investigated the gender differences in metacognitive skills (knowledge of cognition and regulation of cognition) and revealed insignificant gender differences. This finding was also matched with the findings of different researches (Berkant, 2009; Hashempour, Ghonsooly, & Ghanizadeh 2015; Liliana, & Lavinia, 2011; Logan & Johnston, 2010; Ozkan & Hatice, 2013).

Females displayed more goal setting, planning strategies, and self-monitoring than males and surpassed them in their ability to structure their environment for optimal learning. This finding was contradicted with Pajares and Valiante (2002), in their study on academic achievement among adolescents, found females showed more confidence inability to self-regulate their learning tasks which reflect on their higher metacognitive ability. Boulware-Gooden, Carreker, Thornhill, and Joshi, (2007) found that females were more aware of the role of thinking in self-regulation of learning. They used more metacognitive strategies and were motivated than males to express feelings related to learning. Similarly, Shen and Liu (2011) interviewed the students of eleventh grades to study gender differences in the use of self-regulated learning strategies. Further, Huff and Nietfeld (2009) instigate that females used more cognitive and metacognitive strategies and displayed better strategic management.

Conclusion

It has been concluded when the findings of the study were analyzed that the Metacognition refers to higher-order thinking which involves active control over the cognitive processes engaged in learning. Activities such as planning, how to approach a given learning task, monitoring comprehension, and evaluating progress towards the completion of a task are metacognitive in nature. Metacognition plays a significant role in successful learning, so it is very important to develop metacognition skills in prospective teachers, and that is the role of teacher educators only to encourage them to use academically and socially, etc.

It was revealed from the results that prospective teachers have high declarative knowledge and information management strategies skills among all subcomponents. Correspondingly, there was a positively strong and significant relationship exists between metacognitive knowledge and metacognitive self-regulatory skills of prospective teachers in teacher training institutions. Although it was also revealed from the results that there was negatively weak relationship exists between metacognitive knowledge and metacognitive regulatory skills of prospective teachers with respect to their achievement scores. The results of this study highlight that there was positively strong and significant relationship exists between metacognitive knowledge and metacognitive self-regulatory skills of prospective teachers in teacher training institutions. Although it was also concluded from the results that there was negatively weak relationship exists between metacognitive knowledge and metacognitive regulatory skills of prospective teachers with their academic achievement (GPA).

It was also concluded from the results that there is no impact of demographical variables on the prospective teachers' metacognitive knowledge and metacognitive self-regulatory skills of in teacher training institutions. Contrary to this result it was also concluded that prospective teachers of university y have more knowledge about the comprehension monitoring, debugging strategies, and evaluation skills as compare to prospective teachers of university x.

Recommendations

This study recommends that teacher educators may adopt such a teaching methodology that encourages the use of metacognitive skills. Furthermore the assessment should provide practices to use such skill. The policymakers may include metacognitive courses in teacher training programs for prospective teachers which has an empirical association with academic achievement and future teaching performance. Furthermore, the MAI may be used as an instrument to predict prospective teachers' performance if it is administered with entry tests in teacher education institutes. This may provide instructors with a strong and reliable tool to anticipate students' low performance and remedy. Future research may use experimentation to examine effective methods of prospective students' metacognitive skills that link to academic achievement.

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