



RESEARCH PAPER

Metacognitive Skills Development: Investigating the Role in Prospective Teachers' Academic Achievement

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ABSTRACT

This study has been conducted to investigate the role of Metacognitive Skills development in prospective teachers' academic achievement. Two sections of B. Ed (Honors) Semester-I (each of 30 students) taken from a public university based in Lahore were selected conveniently for this study. Both of the selected groups have been pretested before the intervention (Cooperative Learning approach) and there was no statistical difference found among them concerning their Metacognitive Skills. The researcher used a performance test named "Metacognitive Skills Assessment Tool" (MSAT) adapted from (Ali et al., 2020) comprising 14 items (representing Metacognitive skills) and Rubrics for Metacognitive Skills Assessment Tool (RMSAT) to measure the prospective teachers' skills. On the other hand, the prospective teachers' marks in General Methods of Teaching subject were used to measure their achievement. Base on the results, it has been concluded that the Metacognitive skills have a statistically significantly moderate effect on prospective teachers' academic achievement.

KEYWORDS Metacognition, Metacognitive Skills, Prospective Teachers Academic Achievement

Introduction

Metacognition is a process in which one involves oneself to think over own thinking. The term Metacognition has come from the Greek word "Meta" which means "beyond". So it can be said that Metacognition is thinking beyond the usual thinking in which one thinks over own thinking (Ali et al., 2020). Metacognition involves one being aware of own thinking followed by learning. The individuals think about the process and product of their own thinking. It is also said to be the planning, monitoring, and evaluation of individuals' cognitive processes (Cubukcu, 2009).

Metacognition is concerned with one's information and cognitive process. It has concerned with the knowledge of an individual's thinking as well as the organization of own cognitive structures (Akturk & Sahin, 2011). Metacognition is referred to be a process by which one endeavors to instruct oneself to think over-thinking and perform a task (Ozturk, 2015). Similarly, it is stated to be constructive as one endeavors to think over own thinking. It is a process by which one engages oneself to monitor one's own thinking and behavior (Adnan & Bahri, 2018).

The roots of Metacognition can be found in Aristotle's "On the Soul" and the "Parva Naturalia" where he discussed the "higher level of thinking". However, Flavell (1976) gave this the name "Metacognition". Flavell stated it as "knowledge about and control of own cognition" (Akturk & Sahin, 2011).

Flavell was not alone who studied and researched the concept of Metacognition. Rather Brown also researched in 1978 on the thinking process and one's awareness to own thinking process. Similarly, Wellman defined Metacognition in 1985 as an individuals'

cognition about own cognition (Amzil et al., 2013). On the other hand, Schraw and Dennison proposed the concept of Metacognition in 1994 as a process in which one gets self-awareness regarding own learning. For this purpose, one involves oneself in activities like planning, information management followed by monitoring, debugging and evaluation, etc (Siddiqui, 2016).

Although, different researchers and psychologists have defined "Metacognition" differently. But if we see for its main theme or origin, it would come to known that "higher thinking or thinking over-thinking" is found in all of the definitions since 4th century BC up to the day. Even being such an older concept, Metacognition is still an underdeveloped concept that is being researched until now.

The students' learning is appraised with the help of Metacognitive skills development. The more one's Metacognitive skills are developed, the more one's learning would be in control. Efficient problem solving also depends upon the level of Metacognitive skills (Chatzipantelia et al., 2013). Metacognitive skills help one in the assessment of one's learning along with the performance. On the other hand, these are the absolute goal for which one is instructed as the purpose of education is not to memorize the given knowledge but also to use that in a real-life situation which requires Metacognitive thinking (Shen & Liu, 2011).

Metacognitive skills not only affect one's learning alone but also one's problem solving and critical thinking are affected by them. These also improve one's personality and enable one to control the learning followed by better performance (Evangeline, 2016). One's learning is formed and regulated by one with the help of Metacognitive skills. One becomes a better planner, monitor and evaluator of one's learning and performance with the help of Metacognitive skills development (Veenman, 2013). It has been revealed by the study that Metacognitive skills have a positive effect on one's learning. The more one is at the higher level of metacognitive skills, the more one would be good in the regulation of one's learning (Adnan & Bahri, 2018).

Similarly, it has been stated that one is helped out by the Metacognitive skills development in planning the task along with its monitoring, taking corrective decisions and also in evaluating it. The sum of the aforementioned is that Metacognitive skills not enable one to perform better but also keep on improving performance (Priya, 2012).

The teachers' training programs aim for preparing prospective teachers to study and research contemporary issues in the field of education (Prospectus 2018, 2019). However, it is seen that the prospective teachers face great trouble while task performing like problem solving and conduction of research as they don't involve themselves in Metacognitive thinking (Adnan & Bahri, 2018). The prospective teachers' academic task performance and academic achievement can be enhanced while developing their Metacognitive skills (Siddiqui, 2016). So, here emerged the need for Metacognitive skills development in prospective teachers through inducting such teaching-learning activities which proved to help promote Metacognitive skills. So, this study intended to answer that is there any significant effect of Metacognitive skills on prospective teachers' academic achievement?

The related past researches are stated below:

Cubukcu (2009) conducted quantitative research to examine the difference between the university students' usage of Metacognitive skills regarding the learning in their mother tongue Turkish and secondary language English. It has been revealed through the results that university students use the same frequency of Metacognitive skills while learning in both their mother tongue and the English language.

Rahman et al. (2010) conducted a study in which the effect of Metacognitive awareness was investigated on learners' achievement. It was a survey study in which 900

students of class 10th were included. The results revealed that Metacognitive skills awareness was highly correlated with the students' performance. Those students who had a higher level of Metacognitive awareness showed high performance.

Akturk & Sahin (2011) conducted a quantitative study and investigated the effect of Metacognitive skills on learners' performance. The results revealed that those students whose teachers have taught them to use the Metacognitive skills had a higher level of academic achievement as compared to those students who have not been taught to use the Metacognitive skills. Those students who have the Metacognition knowledge could regulate the metacognition more finely.

Rahman (2011) examined the teachers' Metacognitive awareness and its effect on their pupils' achievement in academics. It has been revealed by the results that those students taught by the teachers possessing higher Metacognitive skills awareness, showed better performance in academics. On the other hand, students who performed low in academics who were taught by the teachers with less awareness of Metacognitive skills.

Jabeili (2012) conducted a study to examine the effect of cooperative learning embedded with Metacognitive skills development strategy. The experiment was conducted on 5th-grade students. It has been concluded from the results that students from the experimental group performed higher than the others.

Azmil & Stine-Merrow (2013) investigated the students' Metacognitive skills and then their correlation with their achievement through a survey. It has been exhibited by the results that Metacognitive skills are good predictors of students' achievement. The more students involved the monitoring and control over own learning the more they performed better in academics.

Vijayakumari and D'Souza (2013) conducted an experimental study to develop Metacognitive skills in secondary level students. For this, they used the Metacognitive-Cooperative learning approach in which the Metacognitive skills development strategies were used together with cooperative learning. The results revealed that Metacognitive cooperative learning has a significant effect on students' Metacognitive skills development.

Ozturk (2015) studied the effect of learners' Metacognitive skills on their reading performance. For this purpose, the researcher has experimented while giving the intervention of Scaffolding to the experimental group. It has come into light by the results that the student's performance in reading has been improved after getting the training of using Metacognitive skills.

There is a lot of research that has been conducted related to Metacognition, however, there is a lack of researches within Pakistani context. Therefore, this study has been investigated.

Hypothesis of the study was:

Ho: There was no significant effect of Metacognitive skills development on prospective teachers' academic achievement.

Material and Methods

This study has been conducted to investigate the role of Metacognitive Skills development in prospective teachers' academic achievement. "Metacognitive skills" were the independent variable whereas prospective teachers' "academic achievement" was the dependent variable. Quasi-Experimental nonequivalent pretest-posttest control group design has been used for this study. Two sections of B.Ed (Honors) Semester-I (each consisting of 30 students) were selected conveniently for this study. These groups were taken from a public sector university based in Lahore. Both of the selected groups have been

pretested before the intervention and there was no statistical difference found among them concerning their Metacognitive Skills. The intervention (Cooperative Learning approach enhanced with Metacognitive skills development strategy) was given to the experimental group whereas the controlled group was given the conventional treatment. The intervention duration consisted of one semester only. The researcher used a performance test named "Metacognitive Skills Assessment Tool" (MSAT) adapted from (Ali et al., 2020) comprising 14 items (representing Metacognitive skills) to measure the prospective teachers' skills. Furthermore, the Rubrics for Metacognitive Skills Assessment Tool (RMSAT) were used to rate the prospective teachers' performance taken on MSAT. These were also adopted from (Ali et al., 2020). On the other hand, the prospective teachers' marks in General Methods of Teaching subject were used to measure their achievement. Base on the results, it has been concluded that the Metacognitive skills have a statistically significantly high effect on prospective teachers' academic achievement. Therefore, it is recommended that the teacher educators should use Metacognitive development strategies to develop these skills in prospective teachers so that their academic achievement could be higher.

Results and Discussion

Descriptive Statistics (Mean Scores) and Inferential Statistics (Independent Sample *t*-test, Pearson's *r* and Linear Regression analysis) were applied to the collected data. The descriptive statistics were used to measure the Central tendency followed by the dispersion of the concerning data. The normality of the data has been found out while applying the skewness and kurtosis tests on the data. The acceptable range for the aforementioned is +2 to -2 (George & Mallery, 2016). The detail is as under:

Table 1
Descriptive Statistics of Academic Achievement

	M	SD	Skewness	Kurtosis
Total MSAT	26.58	9.42	.15	-1.72
Academic Achievement	74.40	8.72	.03	-1.01

Note. N = 60

Table 1 represents the mean, standard deviation, Skewness and Kurtosis of the MSAT and Academic Achievement. Based on the results, it is revealed that the data is normally distributed as the skewness and kurtosis values of the Overall Oral Task Performance scores as well as factors are within the acceptable range (± 2).

Ho: There is no significant effect of the intervention on prospective teachers' academic achievement.

The Independent Sample *t*-test, Pearson's *r* correlation and Linear regression analysis have been used to address the abovementioned null hypothesis. The Independent Sample *t*-test was used to find out the difference of concerning mean scores between the Experimental and Controlled groups whereas Pearson's *r* was used as an initial step towards the Regression analysis. Although the Independent Sample *t*-test was sufficient to determine the difference of mean scores attained by both of the Experimental and Controlled groups. However, the Linear Regression was used to determine/ anticipate the effect of the Metacognitive Skills development training (intervention) on the prospective teachers' Oral Presentation scores. The results are as under:

Table 2
Comparison of Academic Achievement of Controlled & Experimental Group

Control Group N=30		Experimental Group N=30		df	MD	<i>t</i>	<i>p</i>	<i>d</i>
M	SD	M	SD					

Academic Achievement	70.00	8.08	78.80	7.03	58	8.80	4.49	.000	1.16
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Table 2 shows that the Controlled group participants attained $M=70.00$, $SD= 8.08$ against "Academic Achievement" which is statistically significantly lower than $M=78.80$, $SD= 7.03$ attained by the Experimental group as $t= 4.49$, $p=.000$ and $d=1.16$ (Small Effect Size).

Therefore, "Ho: There is no significant effect of the intervention on prospective teachers' academic achievement" is rejected based on the concerning results.

Table 3
Correlation of MSAT Scores with Academic Achievement

	MSAT Scores	Academic Achievement
MSAT Scores	1	.46
Academic Achievement		1

Note: $N=60$; $p < 0.05$; Correlation is significant at the 0.01 level (2-tailed)

The results taken from the table 3 shows that there is a positive, moderate and significant correlation between the prospective teachers' Scores on MSAT and Academic Achievement as $r= .64$ along with the $p<0.05$.

Table 4
Regression Analysis Model Summary

R	R Square	Adjusted R Square	df	F	Sig
.467	.218	.204	1	16.14	.000

Based on the results of Table 4, the Linear regression analysis was conducted to further investigate the effect of the intervention on Academic Achievement. The results reveal that there is a 21% variance in the prospective teachers' Academic Achievement with reference to the calculated variation in MSAT Scores. Whereas $F= 16.14$ and $p<0.05$ ($p=.000$) which is the evidence of the fitness of the model.

Table 5
Coefficient Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	62.91	3.03		20.76	.000
MSAT Scores	.43	.10	.46	4.01	.000

The values for the Academic Achievement (Independent variable) and MSAT Scores (Dependent variable) have been depicted in Table 4.23. The Beta value $\beta^{\wedge}= .46$ and $p<0.05$ ($p=.000$) shows that the intervention (MSAT Scores) has a moderately positive effect on the prospective teachers' Academic Achievement. So the aforementioned results confirm the rejection of "Ho: there is no significant effect of the intervention on prospective teachers' Academic Achievement.

The Histogram as well as the P-P plot (given below) have been used to represent the normal distribution followed by its linear relationship of the concerned data.

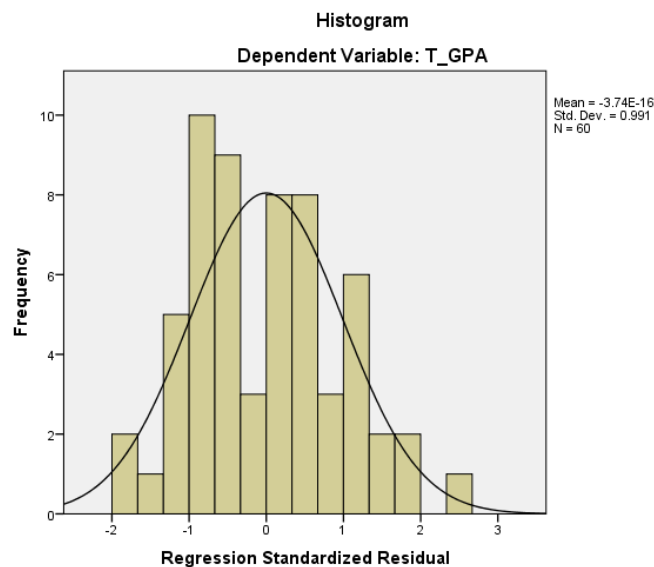


Figure 1. Q-Q plot of Academic Achievement

As per the results portrayed by the Histogram, it has come to known that the data was normally distributed.

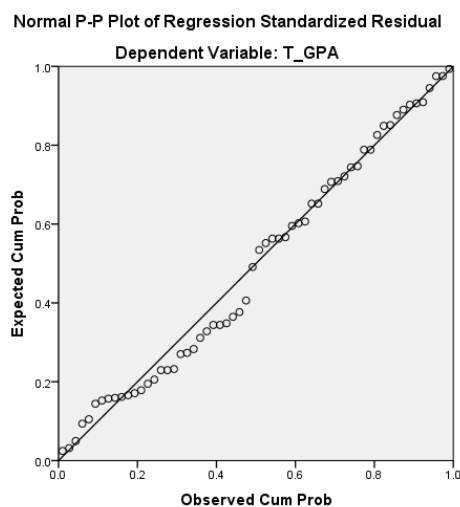


Figure 2. Q-Q plot of Regression Standard Residual

Based on the results taken from the P-P plot, it is revealed that there was a linear relationship between the variables.

Based on the findings, it has been depicted that Metacognitive skills development training was found to be effective and developed Metacognitive skills in the prospective teachers. These results have supported (Chatzipanteli et al., 2013) who concluded that metacognitive skills can be developed as well as improved while teaching the students with the self-check strategies of learning. The same has been concluded by the current study that Metacognitive skills can be developed while teaching with Self-Assessment strategy. Similarly, Ellis et al., (2012) also concluded that metacognitive skills can be developed in the

students as well as the teachers. They also referred that the success of the instruction lies in a phenomenon that the teachers should become active learners. They would be able to teach effectively only if they learn themselves that how to learn which is possible through learning and using Metacognitive skills. The findings of the current study also have validated the findings of Erdoğan & Şengül (2017) who also have used Cooperative Learning enhanced with Metacognitive skills development strategy. They also concluded that the assessment of metacognitive skills has always been a problem for the researchers as they have been using the self-reported Likert's scale for this which has been highly criticized. However, this problem has been addressed by the current study as a performance tool has been developed by the researcher for the assessment of Metacognitive skills.

On the other hand, the study also concluded that Metacognitive skills highly and positively affect the prospective teachers' academic performance. These results have been supported by the (ALshammari, 2015) who conducted a similar study. However, only academic achievement has been focused on by the aforementioned whereas academic achievement is one of the dependent variables that has been studied under the current research study. The aforementioned findings also have supported the results by Rizk, Attia, & Al-Jundi (2017) who also experimented. Their findings were similar to the current study that Metacognitive skills affected the mathematics results positively.

Conclusion

The current study was conducted to investigate the effect of the "Metacognitive Skills on the pupil teachers' academic achievement". The study was conducted while using the Quasi-Experimental nonequivalent pretest-posttest control group design. Base on the results, it has been concluded that the Metacognitive skills have a statistically significantly moderate effect on prospective teachers' academic achievement.

Recommendations

Based on the results, it is recommended that the teacher educators should use Metacognitive development strategies to develop these skills in prospective teachers so that their academic achievement could be higher.

References

- Adnan, & Bahri, A. (2018). Beyond effective teaching: Enhancing students' metacognitive skill through guided inquiry. *Journal of Physics*, 954(218) 3. doi:10.1088/1742-6596/954/1/012022
- Akturk, A. O., & Sahin, I. (2011). Literature review on metacognition and its measurement. *Procedia Social and Behavioral Sciences*, 15(2) 3731-3736.
- Ali, M. S., Siddiqui, D. G., & Tatlah, D. I. (2020). Understanding the Effect of the Metacognitive Skills on Pupil Teachers' Task Performance: A Mixed Methods Inquiry. *Pakistan Journal Of Society, Education And Language*, 7(1) 46-51.
- ALshammari, D. M. (2015). The effect of using metacognitive strategies for achievement and the trend toward social studies for intermediate schools students in saudi arabia. *International Journal of Education, Learning and Development*, 3(7) 47-54.
- Amzil, A., & Stine-Morrow, E. A. (2013). Metacognition: Components and relation to academic achievement in college. *Arab World English Journal*, 4(4) 371- 385.
- Chatzipanteli, A., Grammatikopoulosb, V., & Gregoriadisc, A. (2013). Development and evaluation of metacognition in early childhood education. *Early Child Development and Care*, 184(8) 1-10. doi:http://dx.doi.org/10.1080/03004430.2013.861456
- Cubukcu, F. (2009). Metacognition in the classroom. *Procedia Social and Behavioral Sciences*, 1(1) 559-563.
- Ellis, A. K., Bond, J. B., & Denton, D. W. (2012). An analytical literature review of the effects of metacognitive teaching strategies in primary and secondary student populations. *Asia Pacific Journal of Educational Development*, 116(21) 9-23.
- Erdoğan, F., & Şengül, S. (2017). The effect of cooperative learning method enhanced with metacognitive strategies on students' metacognitive skills in math course. *Education and Science*, 42(192) 263-301.
- Evangeline, C. J. (2016). Examining the effects of metacognitive skills on performance of students. *Scholarly research Journal for Huminity Science & English Language*, 18(3) 4054-4058.
- Jabeili, I. (2012). The effect of cooperative learning with metacognitive scaffolding on mathimatics conceptual understanding and procedural fluency. *International Journal for Research in Education* , 9(1) 45-70.
- Ozturk, I. N. (2015). A short review of research on metacognition training wih elementary students. *Journal of Educational and instructional studies in the world*, 5(3) 50-62.
- Priya, P. (2012). *Validation of a learning package based on metacognitive process for enhancing metacognitive skills and achievement in biology at secondary level*. Kotthayam: (Unpublished Doctoral Thesis) School of Pedagogical Sciences mahatma Gandhi University Kotthayam.
- Prospectus. (2019, febraury 28). University of Education: http://ue.edu.pk/admissions/2018/downloads/Prospectus_18.pdf
- Rahman, F. (2011). *Assessment of science teachers metacognitive awareness and its impact on the performance of students*. Lahore: (Unpublished Doctoral Thesis) Allamah Iqbal Open University Lahore.

- Rahman, S., Yasin, R. M., & Hayati, N. (2010). Metacognitive skills and the development of metacognition in the classroom. *Education and educational technology*, 15(3) 347-351.
- Rizk, N. M., Attia, K. A., & Al-Jundi, A. A. (2017). The Impact of Metacognition Strategies in Teaching Mathematics among Innovative Thinking Students in Primary School, Rafha, KSA. *International Journal of English Linguistics*, 7(3) 103-114. doi:10.5539/ijel.v7n3p103
- Shen, C.-Y., & Liu, H.-C. (2011). Metacognitive skills development: a web-based approach in higher education. *The Turkish Online Journal of Educational Technology*, 10(2) 140-150.
- Siddiqui, G. K. (2016). *Development of metacognitive skills in prospective teachers and its relation to their task performance*. (Unpublished Doctoral Thesis) Institute of Education and Research, University of Punjab, Lahore.
- Veenman, M. V., Bavelaar, L., Wolf, L. D., & Haaren, M. G. (2013). The on-line assessment of metacognitive skills in a computerized learning environment. *Learning and Individual Differences*, 29(1) 123-130. doi:http://dx.doi.org/10.1016/j.lindif.2013.01.003
- Vijayakumari, S., & D'Souza, M. J. (2013). Metacognitive - Cooperative learning approach to enhance mathematics achievement. *International Journal of Education and Psychological Research*, 2(2) 111-119.