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RESEARCH PAPER

Metacognitive Skills: Investigating the Effect on Pupil Teachers' Written Task Performance

[1]Dr. Muhammad Shahid Zulfiqar Ali*   [2]Zain Idrees [3]Mamoona Asghar

1. Visiting Lecturer, Division of Education, University of Education, Lahore, Punjab, Pakistan
2. Visiting Lecturer, Department of Education, University of Education, Lahore, Punjab, Pakistan
3. MPhil Scholar, Division of Education, University of Education, Lahore, Punjab, Pakistan

*Corresponding Author   shahidzac@yahoo.com

ABSTRACT

The current study was conducted for investigating the effect of the Metacognitive skills on pupil teachers' written assignment performance. The study was executed while using the Quasi-Experimental nonequivalent pretest-posttest control group design. The two sections of B.Ed (Honors) Semester-I (each consisting of 30 students) were selected conveniently for this study. Before the intervention, both of the selected groups have been pretested and there was no statistical difference found among them concerning their Metacognitive Skills. The intervention (Cooperative Learning approach) was given to the experimental group whereas the controlled group was given the conventional treatment. The intervention duration consisted of one semester only. There were five Metacognitive skills that the researcher intended to develop. The "Planning" and "Information Management" skills were focused during the first two weeks of each month whereas the rest of the skills "Monitoring, "Debugging" and "Evaluation" were focused during the last two weeks. The researcher used a performance test named "Metacognitive Skills Assessment Tool" (MSAT) adapted from (Ali, Siddiqui, & Tatlah, 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, Siddiqui, & Tatlah, 2020). On the other hand, the pupil teachers' written assignment performance has been measured with the help of the "Assessment Criteria for Report Writing (ACRW)" developed by (Siddiqui, 2016). Base on the results taken from Pearson's r and Linear Regression analysis, it has been concluded that the Metacognitive skills have a statistically significantly high effect on prospective teachers' Metacognitive skills development.

| **KEYWORDS** | Metacognition, Metacognitive Skills, Prospective Teachers, Written Assignment Performance |

Introduction

Cognition is concerned with "thinking" and "knowing things". One engages oneself in the process of thinking while obtaining information followed by its processing and storage (Bayne, 2019). On the other hand, Metacognition is "thinking about thinking" and knowing the things known by someone (Azizah & Nasrudin, 2018). Both of the abovementioned definitions show a clear difference between Cognition and Metacognition. It can be seen as Cognition is the initial process after which there comes the turn for Metacognition if one gets involved in the later on.

Gama (2004) referred to that Cognition aims at problem-solving whereas Metacognition monitors that how one solves the concerned problem. For example, one is given the task of solving a maths sum, one thinks about the sum and solves it. It is the function of Cognition. On the other hand, when one thinks about how did one solve the sum? How was the used strategy or method etc? this is the function of Metacognition.

It can be concluded with the help of the above mentioned that Cognition and Metacognition both are different from each other undoubtedly. The former is utilized for task completion whereas the later one regulates the task completion. 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).

Metacognitive skills are important in any individual's learning as well as task performance. These skills do not influence only one's learning but   these are life skills too as these facilitate one for problem-solving. Rehman (2011) stated that if the learners have no awareness of their Metacognitive skills, the teachers' efforts would not bore the desired fruit. On the other hand, students could not monitor and evaluate their thinking and task performance. Similarly, Ali et al. (2020) also stated that teacher's struggles cannot be successful unless the students are not aware of their Metacognitive skills. In such a case those students will be like the travelers lacking the direction and endeavoring for a blind quest.

While thinking about the development of Metacognitive skills, the first thing which comes in the mind is that either these skills are supposed to be developed in any individual or not? The second question which arises to mind is that what is the age span where these skills are supposed to be developed in someone? Either in the childhood/young age alone or can be developed in adulthood too? Let's quest for the answers to the above-mentioned questions while reviewing the literature.

The father of Metacognition, Flavell believed that Cognitive Regulation Skills (Metacognitive skills) can be taught through the appropriate teaching method(s). Although he was not sure about the teaching method at that time when he proposed his "Model of Cognitive Monitoring" in 1979. However, he stated that the aforementioned skills can be developed in both children and adults (Flavell, 1979).

Similarly, Schraw (1998) stated that Metacognitive skills can be developed in both the children as well as the adults with the help of teaching. Chatzipantelia et al. (2013) also stated that Metacognitive skills can be developed with the help of Metacognitive Skills development strategies like Modeling, Scaffolding, etc. Shen & Liu (2011) also referred that Metacognitive skills can be developed with the help of suitable teaching methods. Evangeline (2016) argued that Metacognition skills can be taught while making them realize that their mind is not fixed, rather it can grow. Rahman, Yasin, & Hayati (2010) also stated that Metacognitive skills can be developed in individuals while teaching and directing them about the ways to think overthinking. Likewise, Lai (2011) stated that Metacognitive skills can be developed in an adult individual while teaching that individual with the help of appropriate strategies.

In the light of the above-mentioned literature review, the question "Either Metacognitive skills can be developed or not?" has been answered and the debate is ended. Now the endeavor will be to explore the Metacognitive skills development in children followed by adults.

The question arises in the mind that either the metacognitive skills develop in the children or not? If they are developed in the children, what is the age span till that the skills are developed or keep on developing? The endeavor was made by the researcher for getting answers to the aforementioned questions. During the literature review, it came to known that Metacognitive skills are developed in children when they are provided the opportunities to work in groups. It has been stated by Flavell (2000) that the development

of the "theory of mind" begins before the child reaches the age of one year. The child also becomes able to understand the mental states like their own intentions and desires. When the children get four years old, the understanding of the knowledge is developed in them. This is part of the information processing system by which the children become able to prioritize among the pieces of information regarding their importance. The children also become able to differentiate between the pieces of information that are required for knowledge attainment as well as that irrelevant piece of information. Chatzipanteli et al. (2013) stated that the children's' Metacognitive skills improve during their pre-schooling. Furthermore, Schneider & Lockl (2002) stated that a child becomes able to apply limited mental procedures at the age of four years. These include "Metacognitive knowledge". Whereas, they stated that the "Monitoring" of the task also develops during the age of three to four years. However, this Metacognitive skill is found to be limited during this age. Similarly, Whitebread, et al. (2009) stated that when children aged three to four years are assigned any task/ problem, they exhibit Metacognitive behavior (including the verbal as well as the non-verbal aspects) while trying to solve the given problem or completing the assigned task.

The aforementioned skills were observed to be developed in children aged five years when they were exposed to collaborative learning (Larkin, 2006). It has also been found out by Flavell (2004) that the said skills are developed in children up to the age of five. In light of the abovementioned literature, it is established that Metacognitive skills develop during the age of five years. However, other researchers concluded that the development of Metacognitive skills doesn't stop at five years. Rather these keep on developing till eight to 10 years of an individual's age (Berk, 2003; Veenman & Spaans, 2005). However, Chatzipanteli et al. (2013) stated that the children become able to apply their Metacognitive skills when they turned to be four years old. However, their Metacognition regulation remains limited till this age which gets accuracy when they reach the age of six years.

On the other hand, Bavendiek (2005) stated that that the Metacognitive skills are developed in the children when they were taught with such methods providing them the opportunity to interact with their peers. They were given the study material and required to discuss it with their peers. The interviews were conducted (twice a month) to get in-depth exploration about either the skills are being developed or not which revealed positive results.

While thinking about the development of Metacognitive skills in adults, it arises in the mind that either the Metacognitive skills develop in adults or not? In case they are developed in the adults, either they develop till a certain age span of adulthood or they keep on developing throughout one's whole life? The answers to the aforementioned questions have been given from the studies by (Ali, et al., 2020; Siddiqui, 2016; Veenman 2005). The findings of these studies show that Metacognitive skills keep on developing throughout one's life if proper strategies to develop the skills are used. However, some skills are supposed to be developed in the children including planning skills whereas the skills like Monitoring and Evaluation are those skills that keep on developing throughout one's whole life (Coutinho, 2007). On the other hand, it depends on the individual/ adult that either the later skills (Monitoring and Evaluation) are developed good or poor. It also came to be known that these skills can be strengthened while using the appropriate strategies to develop metacognitive skills.

Dawson (2008) stated that Metacognitive skills can be taught to and developed in adults. However, a failure in using the Monitoring skill has been experienced by them often. At the same time, it is also argued by him that Metacognitive skills can be improved while teaching these. If the adults are given the training regarding the development of Metacognitive skills development, they can develop these skills on their own. Imel & Susan (2002) argued that Metacognitive skills can be developed in adults. However, the concerned

teacher must be aware of own Metacognitive skills and then teach the students that how to develop these skills in them.

Another study conducted by Idawati et al. (2020) also threw light on Metacognitive skills development in adults positively. It has been concluded that these skills can be developed in adults by adapting the conventional instructions and making them crafted with those of the strategies helpful for the development of skills.

So, in view of the aforementioned studies, it can be concluded that there is no age limit for the development of Metacognitive skills. They can be developed at any age. Thus the need is to use the appropriate strategy for developing metacognitive skills. However, it has been stated by the researchers that it is difficult to measure children's metacognitive skills as compared to adults.

The educational institutions evaluate the students' efforts regarding their learning in terms of their academic performance. The more one is learned, the more scores would be secured by one regarding academic performance (ALshammari, 2015). There is a range of measurement tools used by educational institutions to evaluate students' academic performance. Regardless of their nature, more or less all of these measure the students' performance (Gama, 2004). On the other hand, all of these engage the students in different types of activities either cognitive or psychomotor. And such activities require one to think and then perform (Amzil & Stine-Morrow, 2013). During these activities, one is engaged in the Metacognitive regulation/ Metacognitive skills to perform the planning and information management related to the given task followed by the monitoring of the task (Hassan & Ahmed, 2015). This is not it, one needs to be engaged in the debugging and evaluation of the task too for the successful conduction. So, in this way, no one can stay away from Metacognitive skills at all. More or less, one tends to be involved in Metacognitive regulation. However, the usage of such skills has variation. Here, the distinction occurs that the more one tends to use Metacognitive skills successfully, the more successfully one tends to perform the concerned task (Ali et al., 2020).

In the whole world, different researches have been done related to Metacognition and Metacognitive skills however, there is a lack of the related researches in Pakistan. Therefore, the current research has been conducted to fill in the gap and to address the grey area.

The hypothesis of the study was "Ho: There is no significant effect of the intervention on prospective teachers' written assignments performance."

Material and Methods

The current study was conducted for investigating the effect of the Metacognitive skills on pupil teachers' written assignment performance. The quantitative research was conducted under the Positivist paradigm. The independent variable for this study was "Metacognitive skills" whereas the dependent variable was prospective teachers' "written assignment task performance". The study was executed while using the Quasi-Experimental nonequivalent pretest-posttest control group design. The two sections of B. Ed (Honors) Semester-I (each consisting of 30 students) were selected conveniently for this study. One of them was considered as an experimental group whereas the other was a controlled group. These groups were taken from a public sector university based in Lahore. Before the intervention, both of the selected groups have been pretested and there was no statistical difference found among them concerning their Metacognitive Skills. The intervention (Cooperative Learning approach) was given to the experimental group whereas the controlled group was given the conventional treatment. The intervention duration consisted of one semester only. There were five Metacognitive skills that the researcher intended to develop. The "Planning" and "Information Management" skills were focused during the first two weeks of each month whereas the rest of the skills "Monitoring, "Debugging" and

"Evaluation" were focused during the last two weeks. While studying the given topic(s) with Metacognitive skills development strategy (Self-Assessment), the prospective teachers used to complete the given worksheet reflecting indicators of the above-mentioned skills so that their progress regarding skills development could be checked right after each session. These worksheets were assessed with the Worksheet Assessment Rubrics (WAR) developed by the researcher. The researcher used a performance test named "Metacognitive Skills Assessment Tool" (MSAT) adapted from (Ali, Siddiqui, & Tatlah, 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, Siddiqui, & Tatlah, 2020). On the other hand, the pupil teachers' written assignment performance has been measured with the help of the *"Assessment Criteria for Report Writing (ACRW)"* developed by (Siddiqui, 2016). It comprises eight items. The ACRW was also adopted by the researcher and it had already been validated by the developer while taking the experts' opinion. Similarly, the concerning instrument was used in the same native context. So there was no need for it's re-validation at all.

Results and Discussion

Descriptive Statistics (Mean Scores) and Inferential Statistics (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 Written Assignment Scores

	M	SD	Skewness	Kurtosis
Presentation	2.65	.98	-.10	-1.00
Components of Assignment	2.75	.81	.30	-1.06
Introduction & Discussion	2.83	.74	.27	-1.10
Content Organization	2.90	.83	-.16	-.82
Format	2.66	.91	-.24	-.67
Grammatical Errors	2.70	.72	.24	-.56
Conclusion	2.91	.80	-.04	-1.01
Exclusion of Non-essential Infromation	2.70	.78	-.48	.04
Total Written Assignment Scores	22.11	5.00	-.12	-1.26

Note. N = 60

Table 1 represents the mean, standard deviation, Skewness and Kurtosis of the Written Assignment and its factors. Based on the results, it is revealed that the data is normally distributed as the skewness and kurtosis values of the Overall Written Assignment Scores as well as factors are within the acceptable range (±2).

Ho: There is no significant effect of the intervention on prospective teachers' written assignments performance.

Similar to the previous, the Independent Sample *t*-test, Pearson's r correlation and the 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' Written Assignment scores. The results are as under:

Table 2
Comparison of Written Assignment Scores obtained by Controlled & Experimental Group

	Control Group N=30		Experimental Group N=30						
	M	SD	M	SD	df	MD	t	p	d
Presentation	1.96	0.80	3.33	0.60	58	1.36	7.40	.000	1.93
Components of Assignment	2.23	0.62	3.26	0.63	58	1.03	6.32	.000	1.64
Introduction & Discussion	2.43	0.56	3.23	0.67	58	0.80	4.94	.000	1.29
Content Organization	2.40	0.77	3.40	0.56	58	1.00	5.74	.000	1.48
Format	2.13	0.89	3.20	0.55	58	1.06	5.53	.000	1.44
Grammatical Errors	2.36	0.71	3.03	0.55	58	0.66	4.01	.000	1.05
Conclusion	2.46	0.73	3.36	0.61	58	0.90	5.16	.000	1.33
Exclusion of Non-essential Infromation	2.26	0.82	3.13	0.43	58	0.86	5.07	.000	1.32
Total Written Assignment	18.26	4.23	25.96	1.54	58	7.70	9.36	.000	2.41

Table 2 shows that the Controlled group participants attained M=1.96, SD= 0.80 against "Presentation" which is statistically significantly lower than M=3.33, SD= 0.60 attained by the Experimental group as t= 7.40, p=.000 and d=1.93 (Small Effect Size). Similarly, the Controlled group participants attained M=2.23, SD= 0.62 against "Components of Assignment" which is statistically significantly lower than M=3.26, SD= 0.63 attained by the Experimental group as t= 6.32, p=.000 and d=1.64 (Small Effect Size). On the same pattern, the Controlled group participants attained M=2.43, SD= 0.56 against "Introduction & Discussion" which is statistically significantly lower than M=3.23, SD= 0.67 obtained by the Experimental group participants as t= 4.94, p=.000 and d=1.29 (Small Effect Size). Similarly, the Controlled group participants attained M=2.40, SD= 0.77 against "Content Organization" which is statistically significantly lower than M=3.40, SD= 0.56 attained by the Experimental Group as t= 5.74, p=.000 and d=1.48 (Small Effect Size). On the same pattern, the Controlled group participants attained M=2.13, SD= 0.89 against "Format" which is statistically significantly lower than M=3.20, SD= 0.55 attained by the Experimental group participants as t= 5.53, p=.000 and d=1.44 (Small Effect Size). Similar to as above mentioned, the Controlled group participants attained M=2.36, SD= 0.71 against "Grammatical Errors" which is statistically significantly lower than M=3.03, SD= 0.55 attained by the Experimental group as t=4.01, p=.000 and d=1.05 (Small Effect Size). On the same pattern, the Controlled group participants attained M=2.46, SD= 0.73 against "Conclusion" which is statistically significantly lower than M=3.36, SD= 0.61 attained by the Experimental group as t=5.16, p=.000 and d=1.33 (Small Effect Size). Similarly, the Controlled group participants attained M=2.26, SD= 0.82 against "Exclusion of Non-essential Information" which is statistically significantly lower than M=3.13, SD= 0.43 attained by the Experimental group as t=5.07, p=.000 and d=1.32 (Small Effect Size). Similar to the abovementioned, the Controlled group participants attained M=18.26, SD= 4.23 against "Total Written Assignment scores" which is statistically significantly lower than M=25.96, SD= 1.54 attained by the Experimental group as t=9.36, p=.000 and d=2.41 (Small Effect Size). Based on these results, the "there is no significant effect of the intervention on prospective teachers' written assignment" is rejected.

Table 3
Correlation of MSAT Scores with Written Assignment Scores

	MSAT Scores	Written Assignment Scores
MSAT Scores	1	.72

Written Assignment Scores	1

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

The results of Table 3 show that there is a positive, high and significant correlation between the prospective teachers' Scores on MSAT and Written Assignment scores as r= .72 along with the p<0.05.

Table 4
Regression Analysis Model Summary

R	R Square	Adjusted R Square	*df*	F	Sig
.729	.532	.524	1	65.82	.000

Based on the results of Table 4, the Linear regression analysis was utilized to further investigate the effect of the intervention on Written Assignment scores. The results show that there is 53% variance in the prospective teachers' Written Assignment scores with reference to the calculated variation in MSAT Scores. Whereas F= 65.82 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)	11.82	1.34		8.78	.000
MSAT Scores	.38	.04	.72	8.11	.000

The values for the Written Assignment (Independent variable) and MSAT Scores (Dependent variable) have been presented in Table 5. The Beta value $\beta^{\wedge}$=.72 and *p*<0.05 (*p*=.000) which shows that the intervention (MSAT Scores) has a high positive effect on the prospective teachers' Written Assignment.

So the abovementioned results confirm the rejection of "Ho: there is no significant effect of the intervention on prospective teachers' Written Assignment performance."
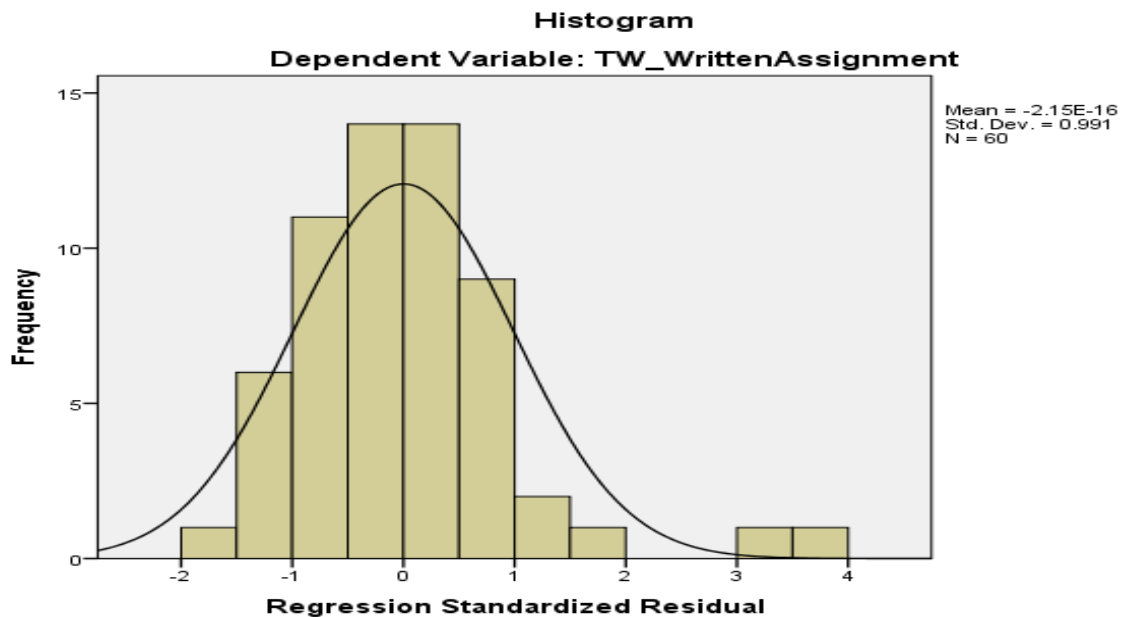

Figure 1. Q-Q plot of Written Assignment Scores

As per the results portrayed by the Histogram, it is came to known that the data was normally distributed.
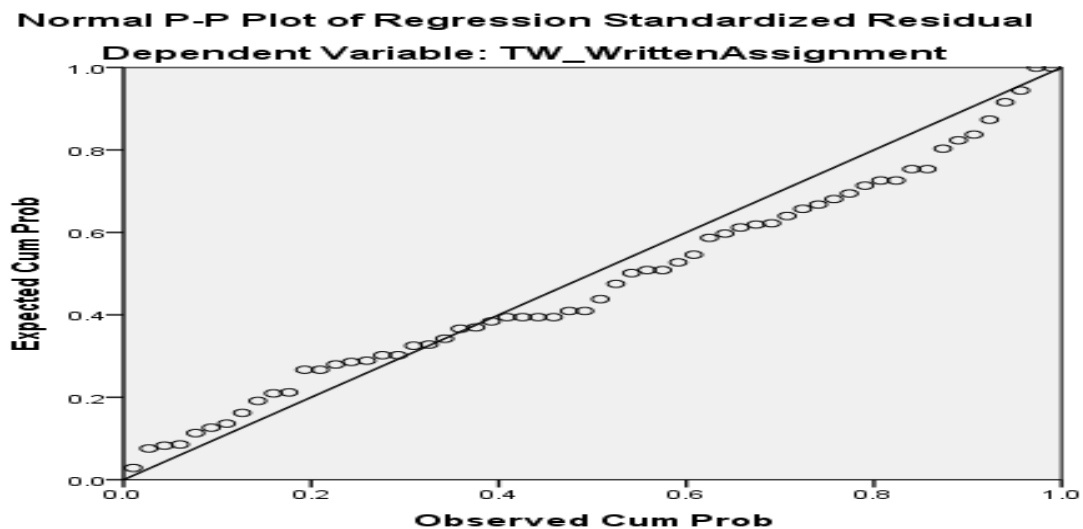
Figure 2. Q-Q plot of Regression Standard Residual

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

Discussion

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. The findings of the current study are also in support with the prior studies including (Lovett, 2012; Schneider & Lockl, 2008; Shen & Liu, 2011; Siddiqui, 2016; Tian et al., 2018; Vallin, 2019; Veenman et al., 2006; Vijayakumari & D‟Souza, 2013) who all concluded that Metacognitive skills are developed while using Metacognitive skills development strategies including thinking aloud, self-assessment, scaffolding, cooperative learning approach enhanced with Metacognitive skills development strategy, etc.

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.

Conclusion

The current study was conducted to investigate the effect of the "Metacognitive Skills on the pupil teachers' written assignments performance". The study was executed 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 high effect on prospective teachers' written task performance.

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 written task performance could be enhanced.

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