P-ISSN 2708-6453	Pakistan Languages and Humanities Review	Oct-Dec 2022, Vol. 6, No. 4
O-ISSN 2708-6461	http://doi.org/10.47205/plhr.2022(6-IV)14	[139-148]

Pakistan Languages and Humanities Review
www.plhr.org.pk

RESEARCH PAPER

Cooperative Learning: Investigating the Effect on Prospective Teachers' Metacognitive Skills Development

Dr. Muhammad Shahid Zulfiqar Ali*[1] Suneeta Asghar[2] Sohrab Khan[3]

1. Visiting Lecturer, Division of Education, University of Education, Lahore, Punjab, Pakistan
2. MPhil Scholar, Division of Education, University of Education, Lahore, Punjab, Pakistan
3. Associate Professor, Department of Computer Systems Engineering and Sciences, Balochistan University of Engineering and Technology, Khuzdar, Balochistan, Pakistan

***Corresponding Author** shahidzac@yahoo.com

ABSTRACT

The current study was conducted to investigate the effect of the "Cooperative Learning enhanced with Metacognitive skills development strategy" on prospective teachers' "Metacognitive skills". 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 Enhanced with Metacognitive skills development strategy) was given to the experimental group whereas the controlled group received the conventional treatment. The intervention duration consisted of one semester only. The researcher used a performance test named "Metacognitive Skills Assessment Tool" (MSAT) was adapted, 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. Descriptive Statistics (Mean Scores) and Inferential Statistics (Independent Sample t-test and Paired Sample t-test) were applied to the collected quantitative data. Base on the results, it has been revealed that the intervention have a significant effect on prospective teachers' Metacognitive skills development. So, it is recommended that the teacher educators should use Metacognitive development strategies to develop these skills in prospective teachers.

KEYWORDS Metacognition, Metacognitive Skills, Prospective Teachers, Skills Development

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.

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.

Metacognition helps us in evaluating the circumstances, using the relevant knowledge for the solution of a problem and then evaluating for the purpose of improvement. The learners are helped by Metacognition regarding the selection of appropriate strategies for improving learning (Gama, 2004). It is considered to be an instrument that students can get help from. The help is taken to get the awareness of one's self along with the regulation of one's learning. One is enabled by Metacognitive skills in controlling one's learning as well as improving performance. The more Metacognitive skills are improved, the more learning and performance are improved (Schraw & Dennison, 1994).

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).

In the whole world, different researches have been done related to Metacognition and Metacognitive skills including the research conducted by Adnan & Bahri (2018) who developed Metacognitive skills while using the guided theory. Similarly, Azizah & Nasrudin (2018) developed the aforementioned skills with the help of self-developed instructional material. Erdoğan & Şengül (2017) also developed these skills while teaching the students by utilizing the Cooperative learning strategy enhanced with the Metacognitive strategies. Eskandari et al (2020) also investigated the effect of Metacognitive skills on the students' motivation along with their achievement. 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' Metacognitive skills".

Material and Methods

The current study was conducted for Metacognitive skills development in prospective teachers. The quantitative research was conducted under the Positivist paradigm. The independent variable for this study was "Cooperative Learning enhanced with Metacognitive skills development strategy" whereas the dependent variable was prospective teachers' "Metacognitive skills". 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 Enhanced with Metacognitive skills development strategy) was given to the experimental group whereas the controlled group received 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).

Results and Discussion

Descriptive Statistics (Mean Scores) and Inferential Statistics (Independent Sample *t*-test and Paired Sample *t*-test) were applied to the collected quantitative 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 MSAT

	M	SD	Skewness	Kurtosis
Planning	5.73	2.00	.17	-1.67
Information Management	7.73	2.96	.22	-1.51
Monitoring	5.63	2.05	.23	-1.40
Debugging	1.88	.95	.24	-1.90
Evaluation	5.60	2.20	.27	-1.45
Total MSAT	26.58	9.42	.15	-1.72

Note. N = 60

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

Ho: There is no significant effect of the intervention on prospective teachers' Metacognitive skills.

The Independent Sample *t*-test and Paired Sample *t*-test have been used to address the abovementioned null hypothesis. The Independent Sample *t*-test has been used to find out the difference concerning mean scores between the Experimental and Controlled groups whereas the Paired Sample *t*-test has been used to find out the difference of mean scores within the same group (separately for the Experimental as well as the Controlled group). The detail of the outcomes is as under:

Table 2
Comparison of Pre-test scores attained by Controlled and Experimental Group Participants

	Control Group N=30		Experimental Group N=30					
	M	SD	M	SD	*df*	*t*	*p*	*d*
Planning	3.76	0.67	4.00	0.83	58	1.19	0.23	0.31
Information Management	5.56	1.07	5.66	1.42	58	0.30	0.76	0.07

Monitoring	4.13	1.04	4.30	0.83	58	0.68	0.49	0.18
Debugging	1.26	0.52	1.20	0.48	58	-0.51	0.61	0.11
Evaluation	3.63	0.92	3.73	0.94	58	0.41	0.68	0.10
Total Metacognitive Skills	18.3	2.60	18.9	3.11	58	0.72	0.47	0.20

The outcome of the Independent Sample *t*-test depicted in Table 2 shows that the Controlled group participants attained M=3.76, SD= 0.67 against "Planning" which is not statistically significantly lower than M=4.00, SD= 0.83 attained by the Experimental group as *t*= 1.19, *p*=0.23 and d=0.31 (Small Effect Size). Similarly, the Controlled group obtained M=5.56, SD= 1.07 against "Information Management" which also is not statistically significantly higher than M=5.66, SD= 1.42 obtained by the Experimental Group as *t*= 0.30, *p*=0.76 and d=0.07 (Small Effect Size). On the same pattern, The Controlled group Scored M= 4.13, SD= 1.04 against "Monitoring" which is is not statistically significantly lower than M=4.30, SD= 0.83 scored by the Experimental group as *t*= 0.68, *p*=0.49 and d=0.18 (Small Effect Size). The Scores obtained by the Controlled group on "Debugging" are M= 1.26, SD= 0.52 is not statistically significantly higher than the scores obtained by the Experimental group which are M= 1.20, SD= 0.48 *t*= -0.51, *p*=0.61 and d=0.11 (Small Effect Size). The scores M= 3.63, SD= 0.92 attained by the Controlled group against "Evaluation" are also not statistically significantly lower than M= 3.73, SD= 0.94 attained by the Experimental group as *t*= 0.41, *p*=0.68 and d=0.10 (Small Effect Size). Similarly, the M=18.3, SD= 2.60 attained by the Controlled group against "Total Metacognitive Skills" is not statistically significantly different to the M= 18.9, SD= 3.11 scored by the Experimental group as *t*= 0.72, *p*=0.47 and d=0.20 (Small Effect Size).

Table 3
Comparison of Post-test scores between both Groups

	Control Group N=30		**Experimental Group N=30**					
	M	**SD**	**M**	**SD**	***df***	***t***	***p***	***D***
Planning	4.00	0.64	7.46	1.25	58	13.48	.000	3.48
Information Management	5.10	0.95	10.36	1.60	58	15.40	.000	3.99
Monitoring	3.90	0.80	7.36	1.32	58	12.25	.000	3.17
Debugging	1.10	0.30	2.66	0.71	58	11.08	.000	2.86
Evaluation	3.76	0.85	7.43	1.47	58	11.74	.000	3.05
Total Metacognitive Skills	17.86	2.31	35.30	4.25	58	19.72	.000	5.09

Table 3 shows the outcome of the Independent Sample *t*-test which has been applied to the data to find out the significant difference between the mean scores of Controlled and Experimental participants that they have attained on the Post-test of MSAT. The results show that the Controlled group participants attained M=4.00, SD= 0.64 against "Planning" which is statistically significantly lower than M=7.46, SD= 1.25 attained by the Experimental group as *t*= 13.48, *p*=.000 and d=3.48 (Small Effect Size). Similarly, the Controlled group obtained M=5.10, SD= 0.95 against "Information Management" which is also statistically significantly lower than M=10.36, SD= 1.60 obtained by the Experimental Group as *t*= 15.40, *p*=.000 and d=3.99 (Small Effect Size). On the same pattern, the Controlled group Scored M= 3.90, SD= 0.80 against "Monitoring" which is statistically

significantly lower than M=7.36, SD= 1.32 scored by the Experimental group as *t*= 12.25, *p*=.000 and d=3.17 (Small Effect Size). The Scores obtained by the Controlled group on "Debugging" are M= 1.10, SD= 0.30 is also statistically significantly lower than the scores obtained by the Experimental group which are M= 2.66, SD= 0.71 *t*= -11.08, *p*=.000 and d=2.86 (Small Effect Size). The scores M= 3.76, SD= 0.85 attained by the Controlled group against "Evaluation" are statistically significantly lower on the same pattern than M= 7.43, SD= 1.47 attained by the Experimental group as *t*= 11.74, *p*=.000 and d=3.05 (Small Effect Size). Similarly, the M=17.86, SD= 2.31 attained by the Controlled group against "Total Metacognitive Skills" is also statistically significantly different to the M= 35.30, SD= 4.25 scored by the Experimental group as *t*= 19.72, *p*=.000 and d=5.09 (Small Effect Size).

Table 4
Comparison of Pre & Post-test scores attained by Experimental Group

	Pre Test N=30		Post Test N=30						
	M	SD	M	SD	*df*	MD	*t*	*p*	*d*
Planning	4.00	0.83	7.46	1.25	29	-3.46	-11.77	.000	3.26
Information Management	5.66	1.42	10.36	1.60	29	-4.70	-11.23	.000	3.10
Monitoring	4.30	0.83	7.36	1.32	29	-3.06	-11.89	.000	2.77
Debugging	1.20	0.48	2.66	0.71	29	-1.46	-10.35	.000	2.40
Evaluation	3.73	0.94	7.43	1.47	29	-3.70	-13.82	.000	2.99
Total Metacognitive Skills	18.9	3.11	35.30	4.25	29	-16.40	-18.32	.000	4.40

Table 4 shows the outcome of Paired Sample *t*-test which was applied on the data to find out the significant difference between the mean scores of Pre and Post-test scores of MSAT attained by the Experimental group participants. The results show that the Experimental group participants attained M=4.00, SD= 0.83 against "Planning" on the Pre-test of MSAT which is statistically significantly lower than M=7.46, SD= 1.25 attained on Post-test as *t*= -11.77, *p*=.000 and d=3.26 (Small Effect Size). Similarly, the Experimental group participants attained M=5.66, SD= 1.42 against "Information Management" on the Pre-test of MSAT which is statistically significantly lower than M=10.36, SD= 1.60 attained on Post-test as *t*= -11.23, *p*=.000 and d=3.10 (Small Effect Size). On the same pattern, the Experimental group participants attained M=4.30, SD= 0.83 against "Monitoring" on the Pre-test of MSAT which is statistically significantly lower than M=7.36, SD= 1.32 attained on Post-test as *t*= -11.89, *p*=.000 and d=2.77 (Small Effect Size). Similarly, the Experimental group participants attained M=1.20, SD= 0.48 against "Debugging" on the Pre-test of MSAT which is statistically significantly lower than M=2.66, SD= 0.71 attained on Post-test as *t*= -10.35, *p*=.000 and d=2.40 (Small Effect Size). On the same pattern, the Experimental group participants attained M=3.73, SD= 0.94 against "Evaluation" on the Pre-test of MSAT which is statistically significantly lower than M=7.43, SD= 1.47 attained on Post-test as *t*= -13.82, *p*=.000 and d=2.99 (Small Effect Size). Similar to as above mentioned, the Experimental group participants attained M=18.9, SD= 3.11 against "Total Metacognitive Skills" on the Pre-test of MSAT which is statistically significantly lower than M=35.30, SD= 4.25 attained on Post-test as *t*= -18.32, *p*=.000 and d=4.40 (Small Effect Size).

Table 5
Comparison of Pre & Post-test scores attained by Controlled Group

	Pre Test N=30		Post test N=30						
	M	SD	M	SD	*df*	MD	*t*	*p*	*d*

Planning	3.76	0.67	4.00	0.64	29	-.23	-1.42	0.16	0.36
Information Management	5.56	1.07	5.10	0.95	29	0.46	2.19	0.03	0.45
Monitoring	4.13	1.04	3.90	0.80	29	0.23	1.27	0.21	0.24
Debugging	1.26	0.52	1.10	0.30	29	0.16	1.72	0.09	0.37
Evaluation	3.63	0.92	3.76	0.85	29	-.13	-.68	0.50	0.14
Total Metacognitive Skills	18.36	2.60	17.86	2.31	29	0.50	1.27	0.21	0.20

Table 5 shows the outcome of Paired Sample *t*-test which was applied on the data to find out the significant difference between the mean scores of Pre and Post-test scores of MSAT attained by the Controlled group participants. The results show that the Controlled group participants attained M=3.76, SD= 0.67 against "Planning" on Pre-test of MSAT which is not statistically significantly lower than M=4.00, SD= 0.64 attained on Post-test as *t*= -1.42, *p*=0.16 and d=0.36 (Small Effect Size). However, the Controlled group participants attained M=5.56, SD= 1.07 against "Information Management" on Pre-test of MSAT which is statistically significantly higher than M=5.10, SD= 0.95 attained on Post-test as *t*= 2.19, *p*=0.03 and d=0.45 (Small Effect Size). On the other hand, the Controlled group participants attained M=4.13, SD= 1.04 against "Monitoring" on Pre-test of MSAT which is not statistically significantly higher than M=3.90, SD= 0.80 attained on Post-test as *t*= 1.27, *p*=0.21 and d=0.24 (Small Effect Size). Similarly, the Controlled group participants attained M=1.26, SD= 0.52 against "Debugging" on Pre-test of MSAT which is not statistically significantly higher than M=1.10, SD= 0.30 attained on Post-test as *t*= 1.72, *p*=0.09 and d=0.37 (Small Effect Size). On the same pattern, the Controlled group participants attained M=3.63, SD= 0.92 against "Evaluation" on Pre-test of MSAT which is not statistically significantly lower than M=3.76, SD= 0.85 attained on Post-test as *t*= -.68, *p*=0.50 and d=0.14 (Small Effect Size). Similar to as above mentioned, the Controlled group participants attained M=18.36, SD= 2.60 against "Total Metacognitive Skills" on Pre-test of MSAT which is not statistically significantly higher than M=17.86, SD= 2.31 attained on Post-test as *t*= 1.27, *p*=0.21 and d=0.20 (Small Effect Size).

In view of the results portrayed in Table 1 to 5, it is revealed that the "*Ho: There is no significant effect of the intervention on prospective teachers' Metacognitive skills.*" is rejected as $p>0.05$ ($p=0.47$) for Table 4.8 which shows that there is no significant difference of mean scores between the Experimental and Controlled group regarding pre-test scores. However, $p<0.05$ ($p=.000$) for Table 4.9 which shows that there is a significant difference of mean scores between the Experimental and Controlled group regarding post-test scores. Similarly, it is found that $p<0.05$ ($p=.000$) for Table 4.10 which shows that there is a significant difference of mean scores attained by the Experimental group on pre and post-test scores. On the other hand, it is found that $p>0.05$ ($p=0.21$) for Table 4.11 which shows that there is no significant difference of mean scores attained by the Controlled group on pre and post-test scores.

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.

Conclusion

The current study was conducted to investigate the effect of the "Cooperative Learning enhanced with Metacognitive skills development strategy" on prospective teachers' "Metacognitive skills". The study was executed while using the Quasi-Experimental nonequivalent pretest-posttest control group design. Base on the results, it has been revealed that the intervention have a significant effect on prospective teachers' Metacognitive skills development.

Recommendations

Based on the results, it is recommended that the teacher educators should use Metacognitive development strategies to develop these skills in prospective teachers.

References

Adnan, & Bahri, A. (2018). Beyond effective teaching: Enhancing students' metacognitive skill through guided inquiry. *Journal of Physics*, 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*, vol *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.

Amzil, A., & Stine-Morrow, E. A. (2013). Metacognition: Components and relation to academic achievement in college. *Arab World English Journal*, *4*(4) 371- 385.

Azizah, U., & Nasrudin, H. (2018). Empowerment of Metacognitive Skills through Development of Instructional Materials on the Topic of Hydrolysis and Buffer Solutions. *Journal of Physics*, 1-8. doi:10.1088/1742-6596/953/1/012199

Chatzipantelia, A., Grammatikopoulos, V., & Gregoriadis, 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

Cognifit. (2019, March 3). *Cognition and cognitive Science*. Cognifit: https://www.cognifit.com/cognition

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.

Eskandari, M., Amini, M., Delavari, S., Mokhtarpour, S., & Jaafari, M. (2020). The effect of metacognitive skills and academic motivation on academic performance. *Research Sqaure*, 1-10. doi:https://doi.org/10.21203/rs.2.20995/v1

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.

Flavell, J. (1979). Metacognition and cognitive monitoring a new area of cognitive—developmental Inquiry. *American Psychologist*, *34*(10) 906-911.

Gama, C. A. (2004). *Environments, integrating metacognition instruction in interactive learning.* (Unpublished Doctoral Thesis) University of Sussex.

George, & Mallery. (2016). *IBM SPSS statistics 23 step by step: A simple guide and reference (14th ed.).* New York: Routledge.

Ozturk, I. N. (2015). A short review of research on metacognition training wih elementary students. *Journal of Educational and instructional studies in the world*, 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.

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.

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology*, *19*(4) 460-475.

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

Zimmerman, B. J. (2010). Self-regulation involves more than metacognition: A social cognitive perspective. *Educational Psychologist, 30*(4) 217-221.