Correlation between Programmed Learning and Metacognition: A Study on Experiential Learning Perspectives of Secondary School Teachers

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Abstract

This research investigated the correlation between Programmed Learning and Metacognition of students in secondary schools of Karachi from the perspectives of secondary school teachers. Literature reported that poor academic performance, lack of interest and dis-connectivity with peers among the students was the result of poorly programmed instructions of their teachers. Literature also reported the positive correlation between Programmed Learning and the development of Metacognition of students along with qualitative changes in term of self-regulated learning, social connectivity and problem-solving skills developed for the complex real world. For this quantitative research, a questionnaire bearing 15 items was developed to measure the relationship between Programmed Learning and Metacognition of secondary students from Karachi. In this research, the data was collected from the private English Medium schools of District South and District Center of Karachi. The participants were secondary school males and females teachers teaching different subjects to different age group students at the secondary level. SPSS was used to calculate descriptive statistics, independent sample t-test, correlation and Regression model to predict the relationship between Programmed Learning and Metacognition of students. This study found no significant difference in the opinion of male and female teachers about Programmed Learning and Metacognition. Also, a positive and moderate-high correlation (r = 0.693) was found between Programmed Learning and Metacognition. This research suggested academia in Pakistan to hold more researches on Programmed Learning and Metacognition in the various settings to explore the possible avenue of teaching and learning practices in B.Ed. programs for the next tier of preservice and in-service teachers.

Keywords: *experiential learning, programmed learning, metacognition, self-regulated learning*

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INTRODUCTION

Globally, the major goal of modern (21St century) education is not only to enrich students with an enormous amount of knowledge/facts in a given field of study but also to groom the students to acquire self-regulatory skills required to become self-regulated learners (Wisdom and Emmanuel, 2015, p. 6). The idea of Experiential Learning (Learning by Doing) received immense attention in academia when Dewey in (1897) presented his seminal work "My Pedagogic Creed". Dewey (1897) emphasized initially on the planned instructions (Programmed Learning or Programmed Instruction) in his educative model wherein Dewey promoted the notion of social interaction among learners, minimizing the ideals of individual education and reflection of learners for connecting the thinking process of the individuals with the experiential and instructional models of modern teaching (Asim and Lobo, 2018). The term Metacognition proposed by Flavell (1979) as "…cognition about cognitive phenomena, or thinking about thinking" (p. 906) is the result of experiential learning. The concepts of Programmed Learning and Metacognition emerged and also are linked with the Experiential Learning model as proposed by the Dewey (1897) and Kolb (2014).

Pathak & Chaudhary (2012) reported: "It is claimed that PL [Programmed Learning] originated in the United States of America where the system is known as 'programmed instructions'" (p. 115). Pathak & Chaudhary reported further that Programmed Learning was a 'Learner Oriented System'. The teacher presents the instructional material whether in the printed or electronic form to the students in a sequential format and facilitate learners to set his own pace of learning and helps students to connect their immediate knowledge with their cognitive abilities. These sequential instructions in a format of Programmed Learning are used for "…pairing of an unknown or unfamiliar stimulus with known stimulus…" (p.115) to connect the immediate knowledge of students with their deep thinking process in an outlook of Experiential Learning model.

Markle (1961) explained the concept of Programmed Learning as an instructional event of an organized sequence of learning items to engage students actively for the better exposure of experiential learning. Lockee, Moore & Burton (2004) revised the entire concept of Programmed Learning in the perspective of experiential learning as:

"Instruction (PI) was an integral factor in the evolution of the instructional design process and serves as the foundation for the procedures in which IT professionals now engaged for the development of effective learning environments. In fact, the use of the term programming was applied to the production of learning materials long before it was used to describe the design and creation of computerized outputs. Programmed Instruction (PI) was an integral factor in the evolution of the instructional design process and serves as the foundation for the procedures in which … professionals now engaged for the development of effective learning environments. In fact, the use of the term programming was applied to the production of learning materials long before it was used to describe the design and creation of computerized outputs" (p. 545).

The academic model of Secondary Education in Karachi, Pakistan is currently experiencing transformation from Idealism to Pragmatism. In this transformation, the focus is given to "Self-regulated Learning and Readiness of school" (Eisenberg, Valiente & Eggum, 2010, 681) for innovative ideas and for the application of Experiential Learning of students through

Programmed Learning (PL). Rahman et al. (2010) observed that conventional styles of teaching, instructional planning and organizational barriers significantly impacted on the Metacognitive development of students which were correlated with their academic success. Asim and Lobo (2018) in research in Karachi found that secondary school teachers who were bearing the professional degree of B.Ed. and M.Ed. programs were unsuccessful to develop the reflective skills and metacognition of their students while using conventional methods of teaching (Chalk and Talk method). This situation is heading toward the poor academic performance of students with surface learning of academic content. This research study investigates the correlation between Programmed Learning and Metacognition of students at secondary schools of Karachi from the experiential learning perspectives of secondary teachers.

This research also investigates how Metacognition among students can be fostered through the application of Programmed Learning by the teachers at secondary schools in Karachi. The purpose of the research is to define the quantitative relationship between Programmed Learning and Metacognition in contrast of the academic literature which proposed the qualitative relationship between the Programmed Learning and Metacognition of learners (Hennessey, 1999). The prime significance of this research is to identify how teachers can apply the idea of Programmed Learning in their current teaching scenarios in Karachi to motivate their students and contribute their role in the development of Metacognition of their students through Experiential Learning Model. This research may also helpful for the Higher Education Institutions working in the current model of B.Ed. the program across the country in order to develop a better teaching line of teachers.

Research Question

What is the correlation between Programmed Learning and Metacognition of students existing in secondary schools of Karachi in the opinion of teachers?

Research Hypothesis

H_1: There is a significant difference of opinion between male and female teachers regarding the application of Programmed Learning and the development of Metacognition of students at secondary schools of Karachi.

H_1: $\mu_m \neq \mu_f$

REVIEW OF LITERATURE

Touq & Mokbel (1977) in an experimental study found that low achievers had received more benefit of Programmed Instruction as compared to the regular English teaching classrooms in Jordon. Touq & Mokbel also observed that structuring the planned instructional process and planned learning situation helped students to connect themselves with immediate academic knowledge which was missing in a regular teaching process. Flavell (1979) in another research stated that Programmed Learning was an eased for an individual learner to achieve high intellectual cognitive enterprise. Flavell suggested that "Research is needed to describe and explain spontaneous developmental acquisitions in this area and to find effective ways of teaching related to Metacognitive knowledge and cognitive monitoring skills" (p. 906) of the learners. Yussen and Bird (1979) studied the awareness of Metacognition in memory,

communication and attention through programmed learning. Yussen and Bird observed three cognitive actions of 6 and 4-years old children through Programmed Learning. Yussen and Bird (1979) found 6 year-olds were more precise in answering than the 4 year-olds. This study proved that programmed learning and age refined the Meta-cognitive experiences of young children.

Haller et al. (1988) documented three clumps of cognitive activities which were consist of awareness, monitoring and regulating to enhance Metacognition abilities of reading comprehension from the instructional planning perspective. According to this study programmed instructions facilitated teachers to monitor the comprehension development of their students by planning the learning schema, activating previous knowledge, and reviewing learned knowledge of students. This research concluded that Programmed Learning was positively correlated with Metacognitive abilities of students. Cross and Paris (1988) investigated techniques to improve Metacognitive skills and reading comprehension skills in two different age groups. Children have uncovered Informed Strategies for Learning, designed to improve awareness and utilize effective reading strategies. The research evaluated that students in both grades enhanced their awareness about reading by significant Programmed Learning.

Schraw and Moshman (1995) in the research study described the correlation between cognitive knowledge and cognitive regulation in the Metacognition theories. Schraw and Moshman differentiated between "…metacognitive knowledge (i.e., what one knows about cognition) and metacognitive control processes (i.e., how one uses that knowledge to regulate cognition)" (p. 352). Schraw and Moshman critiqued that conventional learning theories were formulated to process cognitive activities and merely focused on how to organize cognitive knowledge related to Metacognition of students. These implied theories consisted of discontinuous knowledge and failed to change the common perception of instructional programming from the outlook of Experiential Learning Theory. Schraw and Moshman (1995) stated the following:

"One criticism of traditional instruction is that it encourages passive rather than active learning and thus may lead to inert knowledge structures. Many recent instructional programs have sought to improve learning by encouraging students to be more active and constructive and by providing greater opportunities for peer interaction. For example, a number of programs designed to improve reading provide explicit and sustained strategy instruction in skills such as predicting and summarizing (Brown and Palincsar, 1989) and encourage discussions designed to increase metacognitive awareness about those strategies" (p. 367).

Hennessey (1999) in a study found that those students who participated in designed science activities explored and developed their conceptions about the nature of science which were based on the development of their Metacognition. Hennessey (1999) acknowledged the importance of teachers' instructions to clarify the misconceptions of students related to scientific concepts and promoted their Metacognition. This study reported that students exhibited qualitative changes in their Metacognition skills over a period of a year through Programmed Learning. Kuhn (2000) in a different study described the distinctive nature of the development of Metacognition. Kuhn found that Metacognition potential significantly improved with the age of students through the continuous process of Programmed Learning exposure offered by the teachers. Hartman (2001) described that strategy, skills and Metacognition produced better results and proficiency in students' academic achievement. Hartman proposed that deliberate

use of a specific method where skills were developed and refined, the guidance of information control and regulated opinions of students was the result of programmed learning which were directly correlated to the high achievement of students. Breault & Breault (2005) indicated that active experiential learning built cognitive knowledge in students and experiential learning may be maximized through Programmed Learning (PL). Vincent & Kenneth (2002) noted in research that self-explanation could be enhanced through programmed instructional treatment. This study reported that students who explained their steps during problem-solving practice with a cognitive tutor learned with a greater understanding as compared to the students who did not explain their steps of problem-solving skills.

Kuhn & Dean (2004) reported that Metacognition served as a bridge between psychology and educational practices. Kuhn and Dean suggested that "Given its growing importance in studies of cognition and learning, teachers would benefit from an understanding of the mechanisms involved in metacognition and how best to foster it." (p.268) through programmed Learning. Schneider (2008) studied the relationship between theory of mind and development of meta-memory in the different age group of students. The study evaluated the part of language ability in the development of meta-memory. The study found a strong relationship between language ability and both ToM and meta-memory.

"Whereas the findings for declarative metacognitive knowledge show steady improvement through childhood and adolescence, mainly due to increases in knowledge about strategies, the results are not similarly clear-cut for procedural metacognition. Age trends observed for this component of metacognition are significant for self-control activities but not pronounced for monitoring abilities. These findings have important implications for education, emphasizing the role of strategy training procedures in different instructional domains and illustrating teachers' potential impact on the improvement of monitoring and control processes" (p.114).

Eisenberg (2010) studied on children's emotion-related to self-regulation, dispositional substrate and effortful control on metacognition. This study reported the impact of emotions and motivation on the academic progress of learners. Moreover, this emotion-related self-regulation program was directly involved in the functioning of Metacognition and it was based on effective instructional programs. Khalid and Azeem (2012) in a research study conducted in Lahore Pakistan stated that student-teachers are trained with the traditional approach of teaching. This convention model ignored many aspects such as students' disposition, subject needs and "the mental level of interest of the students" (p. 170) from an instructional point of view. Khalid and Azeem claimed Teacher Education Programs and its core models in practice in Pakistan did not prepare student-teachers to implement the basic idea of programmed learning. Hence, the majority of graduates in B.Ed. programs were not effectively prepared for the real classroom situation and were unable to develop the metacognition of their students in their routine classroom activities. Khalid and Azeem stated that constructivism should be promoted via planned instruction from a behaviourist point of view of teachers. Khalid and Azeem suggested that modern and programmed instructional techniques and strategies were essential in English Communication of B.Ed. program to train new teaching generation to address the learning needs of students.

Gul and Shahzad (2012) in a research study on Metacognition process stated that Metacognition process was self-monetary and helped students to find out about their strategies

of learning. Metacognition helped students to gain academic success which was the result of effective instructional program design by the teachers. "The results showed that there was a moderate relationship between metacognition and goal orientation and academic achievement but week relation was found between metacognition and achievement" (p. 1864) in the perspective of programmed learning. Kolb (2014) stated that Experiential Learning was an effective approach of teaching and learning that was "based on incontrovertible reality people learn best through experience" (p.iii). Kolb in his own words reflected that his metacognition as a teacher and researcher was influenced through the application of Experiential Learning theory. Kolb stated the following:

"The reward of this long involvement [with ELT] have been multifaceted, ranging from the discovery of intellectual perspective on human learning and development that is at once pragmatic and humanistic, to techniques of experience-based education that have added validity to my teaching and to perspective on adult development that has influenced my own personal growth and development as well as others" (p. x).

Kolb argued that his cyclic model of Experiential Learning Theory (ELT) was the sophisticated blend of Programmed Instructions by the teachers and the development of metacognition of students through reflection on their own actions during and after the learning process. Kolb urged that the best Experiential Learning could be possible if abstract ideas and concrete experiences of students should be connected through effective planning from an instructional point of view.
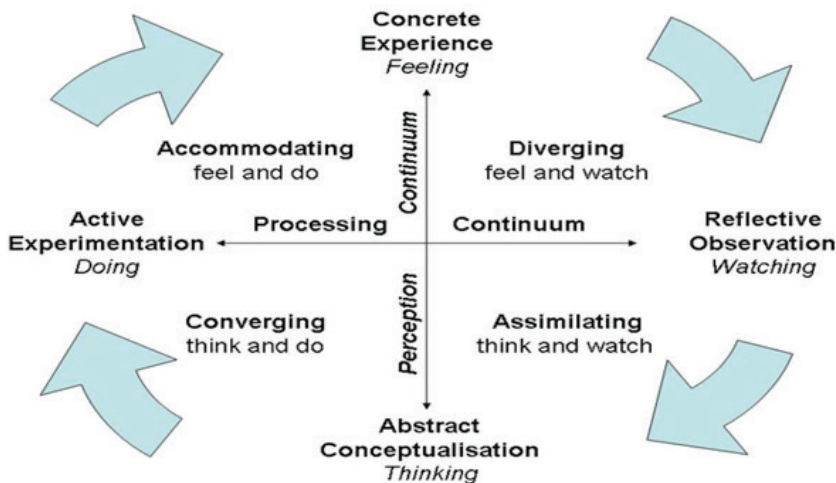

Figure 1. The Experiential Learning Model by Kolb
Source: https://www.simplypsychology.org/learning-kolb.html

Horlacher (2015) stated that teachers were the target audience of the concept of Programmed Learning. Horlacher also stated the following:

"Thus, experimental psychology not only promised a better basic understanding of learning and teaching processes but also—when paired with appropriate pedagogical programming and teaching methods—offered the possibility of more fully satisfying the ever-growing demands of modern society.

Enhanced knowledge of the learning and teaching process would make classroom instruction more efficient in general, thereby also solving the problem posed by student population that was outgrowing the number of qualified teachers" (p.115).

"Programmed Learning was not meant to be used merely as test preparation but also intended to understand the mean of education, or Bildung, itself (Horlacher in press). The method had even produced positive results in "alleviating neurotic disturbances" and had demonstrated some success—in so-called problem children and children with brain injuries" (p.117).

"…programmed learning might be explained, "through praxis and psychology of the classroom (p.1) as well, with the categorization of educational content, student empowerment, immediate feedback and personalization of the learning process" (p.117).

"Programmed Learning beyond offering an alternative to the previously dominant model of teacher-centred instruction, was to supplement rather than replace the personal student-teacher relationship, and it became clear that students, too, needed to get acquainted with the new methods to effectively utilize all that they had to offer" (p. 117).

"Programmed learning did not make the mindless machine of students and teachers. The primacy of pedagogy in the curricula and the school remained intact, and technology functioned to serve pedagogy rather than overrule it" (p.119).

Wisdom & Emmanuel (2015) investigated the research contrivances in the perspective of Programmed Instruction on a sample of 600 students "1-Meta-cognitive awareness inventory; 2- Attitude probe" (p.6). "Results showed that both metacognition and attitude correlate significantly with academic achievement. However, attitude strongly predicts academic achievement more than metacognition" (p.6).

Rolandsson (2015) reported the gap between the intersection between technology, curriculum and teachers intentions. Teachers were mainly interested in re-discovering of new teaching methods and instructional techniques related to the cognitive abilities of students. Rolandsson (2015) reported the following:

"Data concerning teachers' beliefs about teaching and learning programming unravels an instructional dependence among today's teachers where students' logical and analytical abilities (even before the courses start) are considered crucial to students' learning, while teachers question the importance of their pedagogy. The thesis also discovers two types of instruction; a large group putting emphasis on the syntax of programming languages, and a smaller group putting emphasis on the students' experiences of learning concepts of computer science (not necessarily to do with syntax). In summary, the thesis depicts an instructional tradition based on teachers' beliefs where the historical development of the subject sets the framework for the teaching. Directly and indirectly, the historical development and related traditions govern what programming teachers in upper secondary school will/ are able to present to their students. From deploying two theoretical approaches, phenomenography and logic of events, upon teacher's cases it is shown that the intended object of learning (iOoL) is shaped by the teacher's intentions (e.g., balancing the importance of theory and practice, using different learning strategies, encouraging learning by trial-and-error and fostering collaboration between students for a deeper understanding). The teachers also present a diverse picture regarding what theoretical knowledge students will reach for" (p. ix).

Bogdanovic et al (2015) examined the relationship between student's Metacognition awareness and Physics Programmed Instruction efficiency. The result showed that students can deliberately achieve more efficiency in Physics-learning by getting the awareness of Metacognition through the effective programmed instructional model and metacognitive achievement in physics was not dependent on gender. Safari & Meskini (2015) investigated the relationship between Programmed Learning and student's problem-solving skills as a part of Metacognition. The study resulted that Programmed Learning and Metacognition was correlated. Therefore, the study concluded that Programmed Learning is needed to nourish the problem-solving skills among students while fostering the metacognitive control process. Jaleel (2016) investigated the Metacognition awareness of secondary school students in the context of India. Jaleel critiqued the application of metacognition with respect to the instructional point of view.

"Developing these metacognitive abilities is not simply about becoming reflective learners, but about acquiring specific learning strategies as well. Metacognitive beliefs, metacognitive awareness, metacognitive experiences, metacognitive knowledge, metacognitive skills, executive skills, higher-order skills, metacomponents, metamemory are some of the terms that we are often using in association with metacognition. Metacognitive awareness means being aware of how you think. Metacognition is the awareness of one's thinking and the strategies one is using. It enables students to be more mindful of what they are doing, and why, and of how the skills they are learning might be used differently in different situations" (p.165).

Sarwar, Yousaf, Hussain, & Noreen, (2009) studied the correlation between achievement goals, Metacognition and academic success among Pakistani students. This study reported that in the presence of similar nature of programmed instructions offered by the teachers "The researchers found no significant relationship between Metacognition and academic achievement at all levels and there were no significant gender differences in mastery goals, performance goals and Metacognition" (p. 19). Asim and Lobo (2018) measured the quantitative dimension of experiential learning of private schools of Karachi. Asim and Lobo reported that the current private educational system pushing students to get involved in the experiential learning model in the absence of teachers' readiness from an instructional point of view. However, the factors related to Metacognition such as "learning from experiences, reflective activities" (p.110) and abstract thinking were missing components of teaching at secondary schools in Karachi. Asim and Lobo indicated the incapability of current secondary school system in Karachi while adopting the Experiential Learning model in its full length from an instructional point of view.

It may infer from the above-cited literature that all these researches are indicating the positive correlation between Programmed Learning and Metacognition of students in the perspective of Experiential Learning model. Although some researches indicate and measure the qualitative dimension between Programmed Learning and Metacognition of students in the perspective of the Experiential Learning Model. Hence, there is a need for the quantitative dimension to measure the relationship between Programmed Learning and Metacognition of students. Moreover, the majority of these researches were primarily focused more on the Metacognitive Knowledge Acquisition among students rather than Metacognitive Control Processes from the perspective of the Experiential Learning model. Although many types of research confirmed the relationship between Programmed Learning and Metacognitive but do not provide significant guidance to the teachers related to the application of Programmed

Learning in an outlook of Experiential Learning Model. It was also observed from the review of literature that the United States and European countries investigated the concept of Programmed Learning and the development of Metacognition of the students from the Experiential Learning Model more as compared to the developing countries like. A limited review of literature observes the scarcity of researches in the field of Programmed Learning and the development of Metacognitive Control Process within the context of Pakistan.

METHODOLOGY

For measuring the opinion of secondary school teachers in connection with Programmed Learning and Metacognitive Control Process the quantitative research method was used. The data was collected from private secondary school teachers in Karachi. These schools were located in District Centre and District South of Karachi. The participants were having a BA to a PhD degree in different academic disciplines and thirty teachers had B.Ed. and M.Ed. degrees. A total of 200 forms were distributed among the teachers. Teachers were selected on the basis of different instructional exposure that was related to the Programmed Learning process in their schools as an inclusion criterion of sampling. One hundred and seventy-seven forms were received from the participants out of 200. SPSS was used to randomly select 150 participants as samples. The questionnaire was developed in light of identified gaps during the review of the literature. The questionnaire was bearing 15 items related to the Programmed Learning of teachers and Metacognitive Control Process of students. The questionnaire was pilot tested for the issues related to face validity. The data obtained from the questionnaire was fed in SPSS for the rigorous statistical treatment in order to interpret the opinion of teachers regarding the relationship between Programmed Learning and Metacognitive Control Process.

For the variable 'Programmed Learning' item numbers 2,3,4,5,6,7 and 11 has been selected from the questionnaire and Cronbach Alpha value for the reliability was .607. For the variable 'Metacognition' item numbers 1,8,9,10,12,13,14 and 15 has been selected and Cronbach Alpha value for the reliability was .655. Descriptive statistic, independent sample t-test, Pearson Correlation and Regression model were applied for measuring the opinion of the participants quantitatively with respect Programmed Learning and Metacognition. In order to make this research process transparent, all ethical principles were followed including the use of pseudonym, fairness and protecting the identity of the research participants by assigning them the codes. All aspects of this research have been disclosed to the participants and no deception was used in this research process.

RESULTS & FINDINGS

Table 1: Descriptive Statistics with respect to Gender on Programmed Learning (PL) and Metacognition (MC)

	Gender	N	M	SD	SEM
PL	*Male*	*61*	*33.44*	*3.14*	*0.40*
	Female	*88*	*33.10*	*3.65*	*0.39*
MC	*Male*	*60*	*29.30*	*3.05*	*0.39*
		88	*28.84*	*2.61*	*0.28*

In Table 1 Descriptive Statistics with respect to Gender on Programmed Learning (PL) and Metacognition (MC) reveals that male participants had higher mean and standard deviation scores on Programmed Learning and Metacognition as compared to female participants.

Table 2: Independent Sample t-test on Programmed Learning (PL) and Metacognition (MC)

	F	**P**	**t**	**Df**	**p**	**MD**	**SED**
PL	*1.19*	*0.28*	*0.59*	*147*	*0.56*	*0.34*	*0.58*
MC	*0.71*	*0.4*	*0.98*	*146*	*0.33*	*0.46*	*0.47*

Table 2 presents that there is no significant difference in opinion of Male and Female teachers in secondary schools of Karachi regarding the Programmed Learning t (147) = 0.59 where p = 0.05 and Metacognition t (146) = 0.98 where p = 0.05.

Table 3: Correlation between Programmed Learning and Metacognition

		PL	**MC**
Programmed Learning	*r*	*1*	
	r²		
	p		
	N	*150*	
Metacognition	*r*	*.639***	*1*
	r²	*40.8321*	
	p	*0.01*	
	N	*149*	*149*

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

Table 3 shows the correlation between the variables Metacognition and Programmed Learning that is positive and moderate-high (r= 0.639) and significant at p= 0.01. The variable Metacognition accounted for 40.83 per cent of the variance in the variable Programmed Learning.

Table 4: Descriptive Statistics for Linear Regression Model between Meta Cognition and Programmed Learning

	M	**SD**	**N**
Metacognition	*29.01*	*2.79*	*149*
Programmed Learning	*33.26*	*3.41*	*149*

Table 5 presents the Enter Method of Regression Model for the variable Programmed Learning and Metacognition. The model is significant in such a way that R = .639, R2 = .41 and F (1, 147) = 101.25 where p = .000. For the model F (1, 147) = 101.25 where p = 0.00.

Table 5: Enter Method of Regression Model for Programmed Learning and Metacognition

Model	**R**	**R Square**	**Adjusted R Square**	**SES**	**Change Statistics**				
					R Square Change	**F**	**df1**	**df2**	**p**
1	*.639ª*	*.41*	*.40*	*2.16*	*.41*	*101.25*	*1*	*147*	*.00*

a. Predictors: (Constant), Programmed Learning

b. Dependent Variable: Metacognition

Table 6: Data coefficient model of Programmed Learning and Metacognition

Model		Unstandardized Coefficients		Standardized Coefficients	t	p
		B	SDE	Beta		
1	(Constant)	11.63	1.74		6.70	0.00
	Programmed Learning	0.52	0.05	0.64	10.06	0.00

a. Dependent Variable: Metacognition

MC = .52 PL + 11.63………..(1)

Regression Model predicts for the variables Programmed Learning and Metacognition that increase in .52 unit in Programmed Learning would consequently increase the one unit in the variable Meta-cognitive Control Process as shown in equation (1).

DISCUSSION

It has been stated earlier that researches on Programmed Learning and its effect on Metacognition are not available in the contexts of Pakistan and South Asian countries. Therefore, the findings of this research can be confirmed or refuted from the researches available in the context of the United States of America and European countries. This research reports Gender had no role in shaping the opinion of secondary school teachers about Programmed Learning and Metacognitive Process Control. This research endorses that male and female teachers had no difference in their opinion regarding the Programmed Learning and Metacognition of students at secondary schools in Karachi, Pakistan. This research confirms the research findings of Aleven, & Koedinger (2002), Sarwar et al., (2009) and Bogdanovic et al (2015) who reported that metacognitive achievement highly depended upon the effective instructional model and not dependent on the gender of individuals.

This research found a positive moderate-high correlation between Programmed Learning and Metacognition. The findings from the studies conducted by Coulson (1962) Haller et al. (1988), Hartman (2001), Breault & Breault (2005), Schraw et al. (2006) and Safari & Meskini (2015) also confirms that Programmed Learning is positively correlated with Metacognitive abilities of students and responsible for the higher achievement of students. Hennessey (1999) added that students had acquired and exhibited positive qualitative changes in their Metacognition skills when effective Programmed Learning exposure offered from the teachers. Contrary, Sarwar et al. (2009) found no significant relationship between Metacognition and academic achievements of students in the context of Pakistan.

RECOMMENDATIONS

This research recommends the following to the teachers, parents, the administration of private secondary schools in Karachi and University of Karachi:

1 This research recommends the inclusion of Programmed Learning and Metacognition in the curriculum of current B.Ed. programs and change in the preparation model of the student teachers in the University of Karachi and teacher training

institutes in Pakistan. The graduates of the B. Ed. Programs in the University of Karachi should be provided more opportunities to discover the contemporary concepts of Programmed Learning and Metacognition from a pedagogical point of view during their teaching practicum. The teacher educators at Karachi University should align their courses and instructional practices with Experiential Learning model to link Programmed Learning and Metacognition.

2   This research encourages future researchers in Pakistan to investigate more on the applicability of Programmed Learning and Metacognition in various settings.

3   Department of Teacher Education in Karachi University should extend its cooperation to private secondary schools in Karachi by designing and holding the teacher training workshops on Programmed Learning and Metacognition Process Control of students for in-service teachers to build their capacity and for helping students to achieve a milestone in their academics.

4   It is recommended that Programmed Learning should be introduced by the private school administration at large scale under the auspices of the local government of Karachi. Those private secondary schools where resources are abundant should initiate the process by extending their cooperation to their vicinity schools.

5   This research recommends the change in the current Lesson Planning process to the administration of private schools in Karachi.

CONCLUSION

This research concludes that the variables Programmed Learning and Metacognition process control are positively moderate highly correlated with each other. This research welcomes academia in Pakistan to hold more research from the applicability of Programmed Instruction and the development of Metacognition of students. There is a need to apply Experiential Learning model through Programmed Learning in secondary schools of Karachi and to facilitate students in the development process of Metacognition and cognitive abilities that make each student a self-regulated individual, reflective practitioner, problem solver and socially connected in the complex scenario of the real world. This research suggested the transformation in current instructional practices of teachers in the secondary school of Karachi to facilitate and foster the Metacognitive control process among students to achieve high intellectual milestones in their career.

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