

# TRACING THE EFFECTS OF STUDENTS' CENTERED TEACHERS' PEDAGOGICAL APPROACHES ON LEARNERS' EDUCATIONAL GAINS: CASE OF PUBLIC SECTOR SECONDARY SCHOOLS

**Mehboob Ul Hassan, Razaqat Ali Akbar**

University of the Punjab, Lahore, Pakistan

E-mail: hassanbhattig@hotmail.com, razaqat.ier@pu.edu.pk

## Abstract

*Applications of teachers' pedagogical approaches for learners' educational gains have been remained one of the educational debates since ago. Teachers transfer chunk of information among students through implementing techniques to strengthen teaching learning process. Relevance of ground-breaking instructional strategies put concrete effect on students' entire academic success. Present quantitative research was conducted to explore the effect of teachers' usage of students' centered teachers' pedagogical approaches on students' educational gains. Researchers adopted ex-post-fact research design on sample of 800 respondents; 400 urban and 400 rural students randomly selected from public sector secondary schools of District Kasur Punjab-Province of Pakistan. Data were collected by administering self-constructed questionnaire mode of 5-point Likert type options. Validity of the instrument was confirmed from experts and Cronbach's Alpha was applied to ensure instrument's reliability scores; .864. Learners' educational gains of science and arts students were obtained from gazette of Board of Intermediate and Secondary Education, Lahore. Results of independent sample t-test and regression analysis ascertained that teachers' centered students' pedagogical approaches effect 58% on learners' educational gains whereas brainstorming 43%, inquiry 57%, problem solving 54% and cooperative technique effect 50% on learners' educational gains. Science teachers were making more use of brainstorming, inquiry, problem solving, and cooperative teaching as compared to arts teachers. Study recommends that Govt. may train heads of the institutions on students' centered teachers' pedagogical approaches and bound them to implement with true spirit and vigor through teachers to overcome science and specially arts students' declining level of educational gains; stakeholders' cause for concern.*

**Keywords:** *brainstorming, cooperative teaching, inquiry base, learners' educational gains, problem solving.*

## Introduction

International dilemma regarding students' absenteeism and poor educational gains is going to be increased with the passage of time (Wijnen et al., 2017). Alarming position can be conquered by usage of instructional strategies from chalk and talk method to students' physical and mental classroom participation; major paradigm shift in 21st century. This changing

pattern is due to teachers' right selection of teaching methods in promoting effective teaching learning process (Hosal-Akman & Sigma-Mugan, 2010; Filgona et al., 2016; Martínez-Clares & González-Morga, 2018). Teachers have the potential to change poor teaching method into the attractive one (Rahman et al., 2011). Students entirely concentrate on their studies, contribute to their talent and participate efficiently in teaching learning process (Liu, 2011; Sadaf et al., 2012). Usages of instructional strategies have been remaining core concerns of stakeholders for the sake of students' better educational gains (Filgona et al., 2016). Teachers use innovative methods for students' better understanding, effective teaching, to make students creative and enhance students' educational gains (Khurshid & Ansari, 2012) and improve their understanding level (Boud & Feletti, 1997) working in educational institutions.

Problem solving extends learners' thinking, collaborating and synthesizing capabilities to sort answer pertaining individual, interpersonal, professional and academic learning experiences of real-world dilemma (McDonald & Ogden-Barnes, 2013). It not only identify students' practical ability but also reinforce their personal and social skills (Nielsen et al., 2010), arouse learners' potential to viaduct assumption and authenticity gap (Cojanu et al., 2010) and use as gauge that remains effectual to measure students' educational gains more precisely (McKendree, 2010; Pease & Kuhn, 2011). Brainstorming is teachers' modern instructional strategy exercise to solve burning dilemmas applying learners' brain to storm the redundant situations (Al-Khatib, 2012; Filgona et al., 2016; Jarwan, 2005). It improves students' cognitive skills and strengthens students' potential towards generating innovative thoughts (Gultom & Gurning, 2014). Strategy engages multiple thinking processes that revolves round bursting of ideas, formation of inventive connections, widens knowledge boundaries and arrival of astonishing thoughts (Honig, 2001). Inquiry is seeking of information through hands on experiences, hand on and cognitive. It is an important technique use to acquire students' educational gains, encourages students' active involvement and ensures teachers' previous knowledge with latest information during teaching learning process (Ozmon & Craver, 2008). Strategy undertook individual's entire involvement towards factual and realistic inquiry and also bestowed motivated and student-centered environment (Miller, 2014). However, there is dearth of literature regarding application of inquiry learning for the sake of students' educational gains (Larkin et al., 2009). Roots of cooperative learning connected with the idea of Levi, Vygotsky and Piaget who reported that learners are factory of knowledge construction living in social perspectives (Nnorom, 2015). Teachers use strategy to make students in different small clusters working together to strengthen teaching learning process (Igboanugo, 2013). Continuous usage of cooperative teaching enhances peers' performance, arouses intellectual cognitive thoughts, directs students' confidence, motivates students' learning and develops their constructive attitudes towards goal educational gains (Igboanugo, 2013; John et al., 2014; Kolawole, 2007; Nnorom, 2015; Nwachukwu, 2008; Ogbonne & Offorma, 2013; Samba et al., 2010).

Educational gains are students' gadgets and instructional objectives. They are sole concepts used to measure learners' entire performance that shows how students achieve exact goals (Shepherd et al., 2006). These are short term or long term particular educational goals of any student, teacher and educational institution (Adeyinka et al., 2011; El-Anzi, 2005). There are no general agreements to measure students' procedural knowledge; expertise and declarative knowledge; realities. Students' achieve better educational gains by trusting and supporting one another, accurate communication and resolving conflicts constructively (Johnson & Johnson, 2002).

Khurshid and Ansari (2012) ascertained strong relationship between innovative teaching methods and students' educational gains. Hosal-Akman and Sigma-Mugan (2010) explored the effect of teaching methods on learners' educational gains. Findings revealed no significant difference between treatment and control group and learners' educational gains. Martínez-Clares and González-Morga (2018) planned research to find out relationships between teaching methods and teachers improved transversal proficiencies in Murcia University of Spain. Findings revealed strong positive relationship between teaching methods and teachers' different transversal proficiencies. Empirically literature reported that brainstorming, inquiry problem solving and

cooperative teaching are teachers' versatile teaching approaches used in schools to enhance students' educational gains (Daluba & Mama, 2012; Ifeanyi-Uche & Chima, 2013; Hassan, 2020; Maxwell et al., 2015; Odoh, 2013; Rizi et al., 2013; Tran, 2014; Zakaria et al., 2013).

Odoh (2013) reported that brainstorming has significant effects on students' educational gains,  $t(154) = 14.61, p < .01$ , gender wise students' educational gains,  $t(154) = 14.68, p < .05$ ; male students had better educational gains, ( $M = 72.21$ ) as compared to female students ( $M = 61.56$ ) and locality,  $t(154) = 14.57, p < .01$ ; urban students had better educational gains ( $M = 78.25$ ) as compared to rural students ( $M = 58.34$ ).

Rizi et al., (2013) conducted a quantitative study to explore the effect of brainstorming on learners' educational gains on sample of one teacher and 60 male students selected by applying cluster sampling technique. Data were collected by administering self-constructed educational test based on 20-items focusing on students' cognitive level, knowledge, evaluation and combination. Initial questionnaire was pilot tested to confirm Cronbach's Alpha reliability Scores; .790. Results declared significant difference between brainstorming and students' educational gains,  $t(58) = 14.13, p < .01$ ; students of brainstorming obtained better educational gains ( $M = 14.83, SD = 3.17$ ) as compared to students of traditional teaching methods ( $M = 13.13, SD = 3.94$ ).

Maxwell et al., (2015) conducted a quantitative study to investigate the effect of inquiry on learners' educational gains on sample of conveniently selected 42 male and female students. Data were collected by administering *Physical Science Knowledge Assessment, Survey of Science Attitude* and *Students Classroom Engagement Checklist*. Results show that students of the inquiry possessed constructive attitudes towards science and were more engaged in classroom as compared to students of conventional teaching method.

Ifeanyi-Uche and Chima (2013) planned a quantitative study on randomly selected sample of 80 students to explore the impact of inquiry on learners' educational gains. Data were collected by administering *Home economics Educational Test* consisting of 35-Likert type responses. Instrument's reliability was confirmed by calculating Cronbach's Alpha score; .89. Findings revealed that inquiry is an effectual technique that arouses students' critical thinking, problem solving skills, enhances teaching learning process and significantly effects on learners' educational gains.

Daluba and Mama (2012) conducted a quantitative study to explore the effect of problem solving on learners' educational gains on sample of purposively selected one teacher and 240 male and female students. Researchers used a self-constructed *Agriculture Science Educational Test* to collect data from students. Instrument was validated from experts and reliability was confirmed by calculating Kuder-Richardson formula; .79. Results ascertained that students of problem solving obtained better educational gains ( $M = 72.27, SD = 7.54$ ) as compared to students of conventional method ( $M = 66.57, SD = 7.75$ ).

Zakaria et al., (2013) found out the influence of cooperative teaching on learners' educational gains in Indonesia. Sample consisted of one teacher and 61 students. Single teacher was arranged to impart instructions among students during classroom. Self-constructed *Mathematics Educational Test; MAT* was used to collect data from respondents. Questionnaire was validated from experts and pilot tested to ensure its Kuder-Richardson reliability statistics; .81. Results ascertained that cooperative teaching enabled students towards better educational gains ( $M = 55.19, SD = 11.62$ ) as compared to traditional teaching ( $M = 47.47, SD = 15.10$ ).

Tran (2014) planned a quantitative study in Vietnam to explore the influence of cooperative learning on learners' educational gains and their knowledge retention on sample of 110 respondents selected from Giang University. Self-constructed questionnaire was administered to collect students' educational gains. Questionnaire was validated by experts and after pilot testing Cronbach's alpha reliability was calculated; .90. Findings revealed that cooperative put significant influence on students' knowledge retention and learners' educational gains ( $M = 77.36, SD = 4.52$ ) as compared to conventional method ( $M = 67.00, SD = 6.60$ ).

Students' deprived educational performance was assumed as scrupulous dimension among stakeholders (Adekoya & Olatoye, 2011). Teachers play their worthwhile role to overcome burning educational dilemmas since ago. Applications of appropriate teaching methods act as

appetizers that strengthen teaching learning process and have a significant effect on students' educational gains (Khurshid & Ansari, 2012; Nwagbo & Chikelu, 2011). Innovative teaching methods enable students to remain active during the teaching learning process (Usmani & Dawani, 2013). There is already reported positive correlation between teachers' use of innovative teaching methodologies on students' educational gains (Martínez-Clares & González-Morga, 2018). Teachers made countless efforts for students' educational gain to pursue better education. Their pedagogical and professional traits have a significant effect on students' educational performance. Present research was conducted to explore the effect of teachers' use of innovative methods for students' educational gains enrolled in secondary schools of the Punjab Province of Pakistan. Researcher is eager to figure out current alarming situations happening in male public sector secondary schools of urban and rural areas of Punjab-Pakistan. Ultimate purpose of this study was to explore the effect of students' centered teachers' pedagogical approaches on science and arts learners' educational gains enrolled in public sector secondary schools of Kasur of Punjab-Pakistan.

## Research Methodology

### *General Background*

Present research was conducted to explore the effect of secondary school teachers' brainstorming, inquiry, problem solving and cooperative teaching on science and arts learners' educational gains enrolled in public sector schools of district Kasur. Study was quantitative in nature and *ex-post-facto* design was applied. Current design explores the effect of independent variables on dependent variables. Independent variable is the cause of change on dependent variables (Cohen et al., 2007; Fraenkel & Wallen, 2009; Fraenkel et al., 2012).

### *Population*

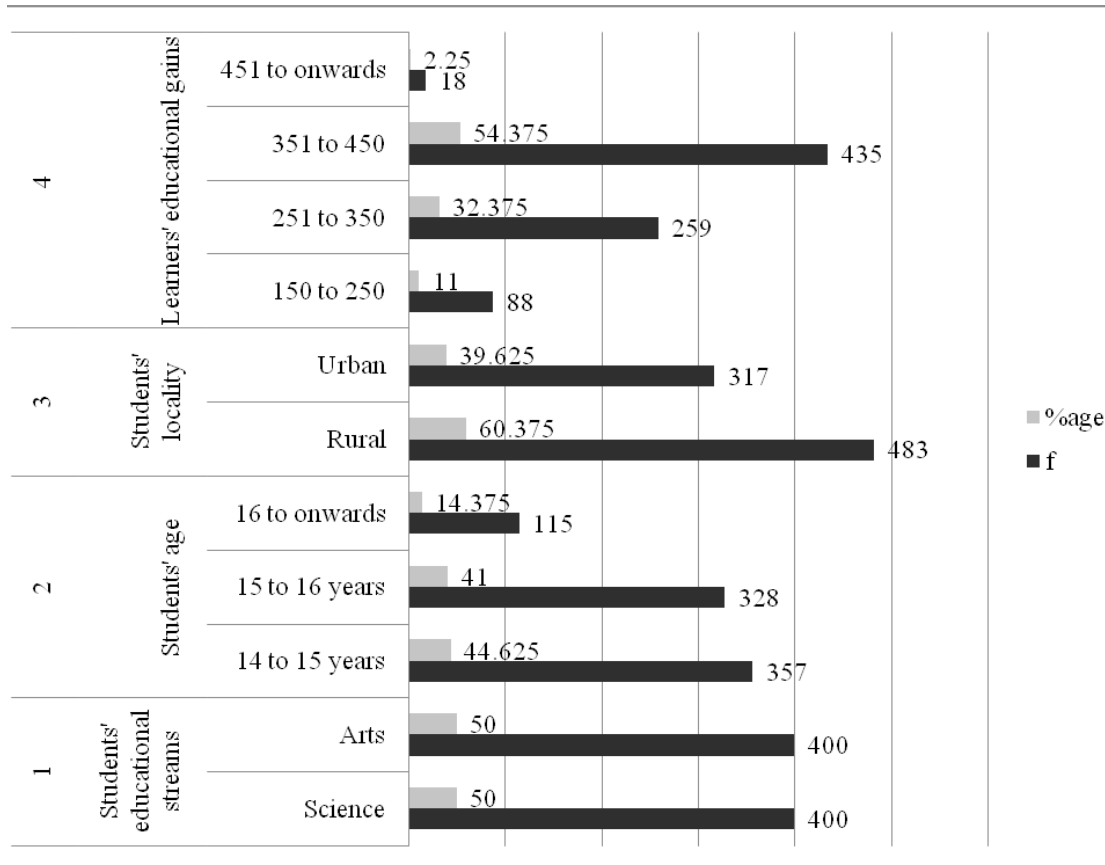
Population of the research consisted of enrolled secondary school students of 10th grade in male public sector secondary schools of rural and urban areas of District Kasur. Currently 9750 students of 10th grade are enrolled in science and arts streams. Inhabitants of District Kasur are mother tongue speakers 88%, ratio of learners' enrollment is 68.02%, learners' educational gains ratio is 56.48%, rate of retention is 70% with 72.70% literacy rate and fall 19th position in all 37th District wise ranking of Punjab-Province (District Census Report of Kasur, 2000; Hassan & Akbar, 2020; Pakistan District Education Ranking, 2016). District Kasur is one of the historical, political and educational cities of Punjab-Province, administratively divided in nine divisions: Dera Ghazi Khan, Multan, Bahawalpure, Sahiwal, Sargodha, Lahore, Gujranwala, Faisalabad and Rawalpindi (Pakistan District Education Ranking, 2016). District Kasur is constituted under Lahore Board of Intermediate and Secondary Education.

### *Sample*

Sample of the study consisted of randomly selected 800 secondary school students conveniently selected from public sector schools of Punjab province. Researchers selected students as they are best observers and eyewitnesses regarding their teachers' teaching pedagogical approaches used in classrooms (Van der Zouwen, 2000). They provide real picture of real situations happening in classroom teaching. Head teachers and teachers were ensured ethical issues: anonymity, confidentiality, volunteer participation and no physical and psychological harm. Literature reveals that 10-30% sample is appropriate from target population (Mugenda & Mugenda, 2003; Tashakkori & Teddlie, 2003; Van Belle, 2011).

**Figure 1**

*Students' sample with demographic information*



Pakistani Public sector secondary schools are offering science, arts and computer science streams (Government of Pakistan, 2013; Iqbal et al., 2009; Hassan. 2020) in which schools' administration enrolled rural and urban students having 14 to 18 of years to get them education. Researchers selected sample of 10th grade students who passed their 9th grade annual examination conducted by Board of Intermediate and Secondary Education, Lahore-Punjab, Province of Pakistan. Teachers working in secondary schools are providing their services to enhance students' social, educational and cognitive abilities (Aslam et al., 2019; Government of Pakistan, 2013).

### *Instrumentation and Procedure*

After review of literature, meetings with curriculum experts and focusing guidelines stated in national curriculum 2006, researcher self-constructed questionnaire was used to collect data from respondents. Initial questionnaire was categorized in 4 subscales; problem solving 3 items, brainstorming 4 items, inquiry 6 items and cooperative teaching consisted of 3 items having 5-point Likert type options already used in other studies (Vagias, 2006; Hass, 2014). Self-constructed questionnaire was validated from experts. Validity is categorized in: *construct validity*; ensures the nature and characteristics of measurable constructs of self-constructed instrument; *face validity*; means outlook of evaluating construct, mainly opinioned as individuals' "common-sense" evaluation has strong roots with humans' factual information regarding their feedback and ordinary pitfall during construction of questionnaire, *criterion validity / predict validity*; researchers' prediction towards successful gains of respondents, *concurrent validity*; forecasts the consequences of self-constructed instrument with the results of standardized established measures and; *Content validity*; the necessary part that covers all required features of questionnaire and in some extend it

measures entire component of determined variables (Aray et al., 2010; Cohen et al., 2007; Dira-Smolleck, 2004; Fraenkel et al., 2012; Leedy & Ormrod, 2005; Pallant, 2010; Gay et al., 2006; Singh, 2007). Experts provide their maximum output in this regard. Reliability of the questionnaire was confirmed by calculating Cronbach's alpha gains; .86 in SPSS. Final instrument was distributed among students to perceive their teachers' teaching methods used in classrooms after ensuring ethical consideration; informed consent, volunteer participations, no physical and psychological harm and ensured that collected data will be used for research purpose only (Beskow et al., 2004; Beebe & Smith, 2008). Researchers personally explained the purpose of study, guided and motivated to fill the questionnaire. Collected data were entered in SPSS for smooth analysis applying parametric tests, simple and multiple linear regression techniques. Applications of parametric test provide concrete responses against respondents' activities that are measured by the researchers (Corder & Foreman, 2009; Singh & Masuku, 2014). Students' educational gains were obtained from Board of Intermediate and Secondary Education Lahore after ensuring students' enrollment during data collection from teachers.

### Data Analysis

Data were analyzed in SPSS through applying simple and multiple regression analysis techniques. Smooth analysis of data is the representation of actual inductive and deductive facts regarding respondents' activities (Best & Kahn, 2006). There were 16-items in questionnaire mode of 5-point Likert type options.

### Research Results

Regression analysis technique was applied to explore the effect of teachers' brainstorming, inquiry, problem solving and cooperative teaching on students' educational gains. Comparisons on science and arts students' educational gains were made through applying regression analysis techniques and independent sample t-test.

**Table 1**

*Effect of teaching methods on learners' educational gains*

<i>Variables</i>	<i>B</i>	<i>SE</i>	<i>β</i>	<i>t</i>	<i>p</i>
SAS	617.052	7.764		79.472	.01
Pedagogical approaches	3.623	.110	.759	32.962	.01

*Note: R = .759<sup>a</sup>, R<sup>2</sup> = .576; (F (1, 799) = 1086.00, p < .05<sup>a</sup>)*

As ascertained in Table 1, linear regression was applied to explore the effect of teaching methods on students' educational gains. Results ascertained formation of significant equation, ( $F(1, 799) = 1086.000, p < .01$ ) having .576 value of  $R^2$  with 57.60% explained variations were seen with standardized regression coefficient ( $\beta = .759$ ). Focusing output of regression coefficient, interpretation of independent sample t-test established that teachers' pedagogical approaches were significant predictors on students' educational gains,  $t(798) = 32.962, p < .01$ . Learners' predicted educational gains were equal to 617.052+3.623 scores whereas teachers' pedagogical approaches were measured in account of their teaching potential used in classroom during teaching. It is concluded that students' educational gains were increased to 3.623 by applying students' centered teachers' pedagogical approaches on students for better educational gains.

**Table 2**

*Effect of brainstorming, inquiry, problem solving and cooperative method on learners' educational gains*

No	Model	F	R	R <sup>2</sup>	B	SE	β	t	p
	(Constant) SEG				616.399	7.749		79.544	.01
1	Brainstorming	593.841	.653a	.426	1.129	.457	.653	24.369	.01
2	Inquiry base	1038.000	.752a	.565	9.146	.284	.752	32.212	.01
3	Problem solving	925.965	.733a	.537	17.983	.591	.733	30.430	.01
4	Cooperative	795.783	.706a	.499	17.127	.607	.706	28.210	.01

Note: R = .711<sup>a</sup>, R<sup>2</sup> = .507, β = .711, (F (4, 796) = 838.397, p < .05<sup>a</sup>)

As delineated in Table 2, multiple regression technique was applied to explore the effect of teachers' brainstorming, inquiry, problem solving and inquiry on students' educational gains. Interpretation shows formation of significant equation ( $F(4, 796) = 838.397, p < .01$ ) showing .507 value of R<sup>2</sup> with 50.70% increased variations were observed with standardized regression coefficient ( $\beta = .711$ ). Results further report formation of significant equation in favor of brainstorming ( $F(4, 796) = 593.841, p < .01$ ) having .426 value of R<sup>2</sup> with 42.60% increased variations were reported with standardized regression coefficient ( $\beta = .653$ ), inquiry method ( $F(4, 796) = 1038.00, p < .01$ ) showing .565 value of R<sup>2</sup> with 56.50% increased variations were seen with standardized regression coefficient ( $\beta = .752$ ), problem solving, ( $F(4, 796) = 925.965, p < .01$ ) reporting .537 value of R<sup>2</sup> establishing 53.70% increased variations were seen with standardized regression coefficient ( $\beta = .733$ ) and cooperative method, ( $F(4, 796) = 795.783, p < .01$ ) with .499 value of R<sup>2</sup> with 49.90% increased variations were seen having standardized regression coefficient ( $\beta = .706$ ). Reporting results of regression coefficient, interpretation of independent sample t-test portray that teachers' brainstorming,  $t(298) = 24.369, p < .01$ , inquiry,  $t(298) = 32.212, p < .01$ , problem solving,  $t(298) = 30.430, p < .01$  and cooperative method,  $t(298) = 28.210, p < .01$  were significant predictors on students' educational gains. Interpretation further reports that students' estimated achievements were equal to 616.399+1.129+9.146+17.983+17.127 gains where teachers' brainstorming, inquiry, problem solving, and cooperative method were measured in account of imparting instructions during classroom teaching. It is concluded that students' educational gains were increased to 45.385 scores by applying students' centered teachers' pedagogical approaches for students' effective learning.

**Table 3**

*Comparison of teachers' teaching methods between science and arts learners' educational gains*

No	Variables	Streams	N	M	SD	df	t	p
1	Brainstorming	Science	400	18.66	1.06	798	26.90	.01
		Arts	400	16.14	1.54			
2	Inquiry	Science	400	28.53	1.03	798	38.28	.01
		Arts	400	24.40	1.89			
3	Problem solving	Science	400	14.31	.47	798	41.16	.01
		Arts	400	12.21	.91			
4	Cooperative	Science	400	14.28	.50	798	37.38	.01
		Arts	400	12.22	.98			

As established in Table 3, independent sample t-test was applied to compare the effect of teachers' brainstorming, inquiry, and problem cooperative on science and arts students' educational gains. Interpretation illustrates significant difference between teachers' usage of: brainstorming,  $t(798) = 26.90, p < .01$ ; science teachers were applying more brainstorming ( $M = 18.66, SD =$

1.06) as compared to arts teachers ( $M = 16.14$ ,  $SD = 1.54$ ); inquiry,  $t(798) = 38.28$ ,  $p < .01$ ; science teachers were applying more inquiry technique ( $M = 28.53$ ,  $SD = 1.03$ ) as compared to arts teachers ( $M = 24.40$ ,  $SD = 1.89$ ), problem solving,  $t(798) = 41.16$ ,  $p < .01$ ; science teachers were applying more problem solving ( $M = 14.31$ ,  $SD = .47$ ) as compared to arts teachers ( $M = 12.21$ ,  $SD = .91$ ) and was also found significant difference between teachers' usage of cooperative teaching,  $t(798) = 37.38$ ,  $p < .01$ ; science teachers were applying more cooperative techniques ( $M = 14.28$ ,  $SD = .50$ ) as compared to arts teachers ( $M = 12.22$ ,  $SD = .98$ ). It is concluded that science teachers were making more use of brainstorming, inquiry, problem solving and cooperative teaching for students' educational gains as compared to arts teachers.

## Discussion

Teachers have the potential to change effective learning environment according to students' need and situations (Rahman et al., 2011). Students learn their lesson proficiently and gain high marks. To achieve students' better educational gains, teachers and students try to know and have to maintain trust with themselves, build strong and clear-cut communication, admit support and solve conflicts towards closing end positively (Amina, 2016; Pinxten et al., 2010). Students concentrate over their studies and work hard to obtain better education (Kalaian & Kasim, 2014). It is a common observation that teachers have the potential to make proper use of innovative teaching methods; brainstorming, inquiry, question answer and cooperative teaching in class to increase students' educational gains.

Teachers used innovative students' centered teachers' pedagogical approaches in classrooms to indulge students in conducting educational activities that strengthen students' mental level and to become their problem solver, critical thinker and social activist. Continuous usage of innovative approaches put significant effect on students' educational gains (Khurshid & Ansari, 2012; Mehmood & Rehman, 2011; Taylor et al., 2003). Results of present study ascertained that teachers' teaching methods have an effect 58% on students' educational gains with formation of significant equation, ( $F(1, 799) = 1086.00$ ,  $p < .01$ ) that support with the results of other studies conducted in the USA (Haas, 2002), Nepal, (Kumar, 2003), Turkey, (Hosal-Akman & Sigma-Mugan, 2010), Australia (Varughese, 2010), Macedonia (Veselinovska, Gudeva & Djokic, 2011), Iran (Rizi et al., 2013), South Africa (Ganyaupfu, 2013), France (Martínez-Clares & González-Morga, 2018) and in Pakistan (Khurshid & Ansari, 2012; Nafees et al., 2012; Rahman et al., 2011; Usmani & Dawani, 2013).

Brainstorming is teachers' strategy that extracts students' higher order thinking skills, arouses their core concerns towards problem solving by means of synthesizing, application and evaluation towards wrapping up (Filgona et al., 2016). Results of present study declared that teachers apply brainstorming technique that 42.60% affects students' educational gains. Results of current study showed that brainstorming had a significant effect on science and arts students' educational gains,  $t(798) = 26.90$ ,  $p < .05$  that align with the findings of the study conducted by Odoh (2013) to explore the effect of brainstorming on students' educational gains on randomly selected 156 male female students enrolled in rural and urban schools. Results declared that brainstorming significantly affected students' educational gains,  $t(154) = 14.61$ ,  $p < .01$ . Findings of the present study also support with the results of other studies as well (Al-Khatib, 2012; Filgona et al., 2016; Hassan, 2020; Malkawi, & Smadi, 2018; Mohammad, 2016; Odoh, 2013; Rizi et al., 2013).

Inquiry is extending its worth for stakeholders and diversity of curricula. It supports individual's cognitive abilities towards scientific progress on states (Pedaste et al., 2015). Teachers fully involve students in application of inquiry learning in classroom applying their educational and social experiences (Abd-Hamid et al., 2012; Hassan, 2020). Findings of present study revealed that teachers apply inquiry technique that 57% significantly affects the learners' educational gains. Results of present study support with the findings of other studies (Abdi, 2014; Miller, 2014; Hassan, 2020). Pakistani secondary schools' teachers impart instructions on science and arts students enrolled in public and private secondary schools located in urban and rural areas. Study further ascertained a significant difference between teachers' usage of inquiry technique,  $t(798) = 38.28$ ,



$p < .01$ ; both rural and urban teachers apply the technique to strengthen students' inquiry that is congruent with the findings of the study conducted by Ugwuadu (2012) to explore the effect of inquiry on learners' educational gains in Nigeria on sample of purposively selected 407 respondents administering *Biology Educational Test*; BAT among students and preparing lesson planning on the subject of biology. Results ascertained a significant effect of inquiry on students' educational gains,  $t(405) = 106.55, p < .01$  that also support with the current study. Teachers' used technique to promote students' critical thinking and scientific investigation techniques (Adams & Chiappetta, 2004; Hassan, 2020).

Problem solving ensures students' active and social participation that supports teaching learning process. Researchers more concentrate students' learning by means of problem solving (Abdelkhalik et al., 2010; Hassan, 2020). Results of present study declared that teachers use 53.70% of problem solving during teaching that put significant influence on students' educational gains that support with the results of the study conducted by Akmoğlu and Tandoğan (2007) to investigate the effect of problem solving teaching on students' attitudes, conceptual understanding and students' educational gains on sample of 50 respondents; 20 male and 30 female selected from public sector school of Istanbul, Turkey. Results ascertained a significant difference between problem solving method and conventional method and post-test students' academic educational gains,  $t(48) = -2.273, p < .01$  that contradicts with the results of present study which reveals no significant difference between teachers' use of problem solving technique on science and arts students' educational gains,  $t(798) = 41.16, p < .01$ ; science teachers were making the same use of problem solving technique ( $M = 14.31, SD = .47$ ) as well as arts teachers ( $M = 12.21, SD = .91$ ). Applications of problem-solving technique arouse students' capabilities to solve problems in this regard. The effects of problem solving award students to know about real world challenges, peer work, use of cognitive abilities towards positive directions, acknowledging previous and current experiences, adjust and assimilate diverse scenarios, estimation and representation of solution and its reflection (Chiriatic, 2008; Mykytyn et al., 2008; Hassan, 2020; Servan et al., 2009).

Cooperative is an important technique that strongly supports with the teachers' teaching methods. It is used to obtain well-known exposure since decades for the sake of students' peer and group learning toward their better educational gains (Ashman & Gillies, 2003; Hassan, 2020). It is teachers' pedagogical practice that facilitates the learner in acquiring and creating academic and social relations towards goal accomplishment (Gillies & Boyle, 2010). Results of present study report that 49.90% teachers' cooperative teaching has an influence on students' educational gains that align with the results of other studies (Gemechu & Abebe, 2017; Hassan, 2020; Molla & Muche, 2018; Nnorom, 2015; Swab, 2015). Results of current study declared that teachers' cooperative teaching significantly affects science and arts learners' educational gains,  $t(798) = 37.38, p < .01$ ; science teachers make the same use of cooperative method ( $M = 14.28, SD = .50$ ) as well as arts teachers ( $M = 12.22, SD = .98$ ) that support with the findings of the study conducted by Gull and Shehzad (2015) on ample of 63 male and female students having 16-19 years of age administering self-developed instrument based on 30 items. Content validity was ensured from experts and reliability of the instrument was confirmed by calculating Kuder-Richardson formula; .84. Results show a significant difference between cooperative teaching method and learners' educational gains,  $t(60) = 13.98, p < .01$ .

## Conclusions

Process of teaching learning carried out dynamic personalities; teachers are interconnected with it. Teachers impart instructions applying innovative teaching methods for effective teaching. Teachers' maximum usage of teaching methods had a significant impact on students' educational gains as compared to innovative teaching methods. Purposeful teaching is reflected in terms of learners' educational gains. Exams and continuous assessments are the common sources to measure students' educational gains. Students' educational gains are sole measurement of teachers' effectiveness. Educational score may be institutional level and content specific. Teachers make continuous use of brainstorming, inquiry, problem solving and cooperative method to obtain students better

academic educational gains. Present study concludes that Pakistani secondary school teachers are making 57.60% innovative teaching methods in their classrooms for effective teaching. They impart instructions applying 42.60% brainstorming technique for the sake of students' educational gains. Using brainstorming in classroom, teachers make groups, throw task among students, share ideas and acquire solutions of debatable problem focusing students' cognitive abilities for better educational gains. Inquiry technique is the use to help learners' understanding and to enable students' developmental ability. Teachers apply this technique to enable their students find solution of burning dilemmas. Present study concludes that teachers make 56.50% use of inquiry method among secondary school students for their better educational gains. Problem solving technique is used to make students critical thinkers and problem solvers. It is logical rather that dogmatic approach. Teachers apply technique in teaching learning process to take full considerations focusing learners' internal as well as internal cognitive abilities. Pakistani secondary school teachers make 53.70% use of problem-solving technique among their students for their better educational gains. Near to fifty percent teachers put problem, share ideas and sort answers of that issue during classroom teaching. Applications of cooperative enhance students' wealthy and extensive information. Teachers arouse students' abilities in peers and use to maximize teaching learning process. Socrates claims that in cooperative learning teachers make small groups under his / her and supervision for successful learning. Present study concludes that 49.9% secondary schools' teachers make maximum use of cooperative learning for the sake of better educational gains. Teachers enable students to help each other, share notes, make assignments and give further educational help. Resultantly, strategy remains helpful for students learning in educational, social adjustment in prolonging states cultural, social, economic and educational aspects in this regard. Overall study concludes that teachers were making more use of brainstorming, inquiry, problem solving and cooperative on science students as compared to arts students for their better educational gains.

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**Mehboob UI Hassan**  
(Corresponding author)

PhD, Institute of Education and Research, University of the Punjab, Lahore, Pakistan.  
E-mail: hassanbhattig@hotmail.com

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**Razaqat Ali Akbar**

Post Doc, Director, Institute of Education and Research, University of the Punjab, Lahore, Pakistan.  
E-mail: rafaqat.ier@pu.edu.pk

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