ORGINAL ARTICLE Received 17 September. 2017 Accepted 1 November. 2019

ISSN: 2375-9887

Vol. 7, Issue 1, 14-19, 2020

Journal of Exploratory Studies in Law and Management

ISSN: 2375-9887

jeslm.worldofresearches.com

Critical Thinking Disposition of Fifth Grade Students: The Effect of Exploratory Teaching Method in the Science Class

Korosh Nozari*, Fatemeh Saffari

PhD student, Curriculum Planning, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran

A B S T R A C T

The purpose of this study was to examine the impact of exploratory teaching method on the Critical Thinking Disposition. By using a quasi-experimental design, data are gathered from pre-test and posttest. Population of the study consisted of 329 (153: girls and176: boys) students. For selecting the samples, elementary schools identified from different areas of Isfahan city. Then, based on controlled demographic variables, schools were selected and finally 56 students were allocated to experimental group and 56 students were allocated to control group. The data gathering tool included California Critical Thinking Disposition Inventory (CCTDI) with 34 items (three areas of critical thinking skills including Analysis, Structuring data and Self – confidence). The content validity of questionnaire was determined using the specialist`s views and the reliability of the questionnaire was estimated 0.93 using Coronbach`s Alpha method. Data analysis was performed using SPSS23 software. Data analyzed at two levels of descriptive statistics and inferential statistics. Results showed that there was significant difference in the grades of critical thinking skills for both groups which were taught based on traditional and exploratory teaching methods (P≥0.05). Exploratory methods resulted in significant differences between control and experiment groups. Therefore, it was concluded that the exploratory teaching method influenced the analysis skills of the students. Adjusted mean scores of analysis component suggested that control group has lower analysis skills in comparison to exploratory group.

Keywords: Teaching Method, Exploratory, Critical Thinking.

INTRODUCTION

Knowledge and wisdom have been sought constantly by different nations and countries in the course of the history. But today, in the first decade of the Third Millennium, knowledge is considered as a strategic factor for the success of the individuals, organizations and society, and it is the only source the worth of which is in its application. Hence, the construction, production and consumption of knowledge have been the center of human development, sustainable development and knowledge-oriented society(Armour, 2019; Thompson* & Ku, 2005).

Critical thinking skills can be developed like other intellectual skills. School is the center of education and the textbooks are the most important means of education through which education

* . Corresponding Author: Nozari, K.

To cite this article: Nozari, K., Saffari, F. (2020). Critical Thinking Disposition of Fifth Grade Students: The Effect of Exploratory Teaching Method in the Science Class. *Journal of Exploratory Studies in Law and Management,* 7 (1), 14-19.

goals can be achieved. If textbooks are properly developed, they can play an influential role in teaching critical thinking. Teaching critical thinking is the only teaching that facilitates the transition from simple and easy acceptance of problems to free will and discernment and increases human ability in appreciating the problems(Vong & Kaewurai, 2017). Elementary and junior high school are among sensitive educational years since the students face puberty and adolescence and undergo fundamental changes in their identity and the way of thinking and achieve abstract thinking; therefore, they develop necessary background to achieve critical skills during these years. As a result, the teaching curriculum should be prepared in a way that appropriately develops research atmosphere, creativity and criticism in analyzing social issues and problems(Hashemi, 2011; Terenzini, Springer, Pascarella, & Nora, 1995).

The importance of attention to exploratory methods is in the mastery of learners over concepts, scientific principles and rules, their application in solving scientific problems and increasing thinking skills. Application of directed exploratory method for developing critical thinking skills is supported(Allen, Barker, & Ramsden, 1986; Fakayode, 2014). Traditional teaching methods have changed into debilitative factor in the course of learning. A comprehensive reform in teaching seems necessary in order to concentrate on exploration as a main element of curriculum to develop students' understanding of scientific concepts along with reasoning and thinking(Dogan, Pringle, & Mesa, 2016; Van Driel, Beijaard, & Verloop, 2001). Therefore, this study tries to investigate the influence of the application of directed exploratory teaching method in the development of critical thinking skills of the elementary students. The present study investigates the influence of traditional and explanatory teaching methods in natural science lesson on the analysis skills of critical thinking of the elementary students of grade five district of Isfahan city.

The results of the investigations by Kitot, Ahmad, and Seman (2010), who studied the influence of the teaching of the research and exploration on the learners' activities and interrogatory moral showed that teaching research methods and enticing students to work and asking targeted questions increase the level of the critical thinking of the students.

Lin and Lai (2011), investigated the problem-based learning and ICT for learning natural science to develop key skills (technology, meta-cognition, creativity) of the third grade students. In this study, the control group received training on the traditional model of ICT and the experimental group received ICT-based and problem-based learning model. The results showed that the creativity ability of both groups increased; technology skills of the experimental group was better than the control group and only self-test aspects of meta-cognition in the experimental group significantly increased.

Negretti (2012), studied the influence of exploratory- analytical approach on the educational progress of students in the field of writing. This approach used the structures of the meta-cognitive theories of learning and self-regulatory learning to show how these approaches increase the students' ability in speech, writing, communication and composition. In general, the results showed that there was a relationship between situational meta-cognitive awareness of the students and learning activities and tasks and this relationship shows that how the students can use meta-cognitive approaches to apply writing strategies. Meta-cognitive awareness, also relates to self-tuning and development of individual writing approaches.

METHODOLOGY

The methodology of the present study is quasi experimental by considering control and experimental groups and performing pretest and posttest. In this study, exploratory teaching methods are considered as independent variables and analysis skills which belong to critical thinking skills are among dependent variables. With respect to the general purpose of the study

which was determining the influence of exploratory teaching method in natural science lesson on the analysis skill of the students, control and experimental groups and pretest and posttest were used. The population consisted of all the fifth grade students including primary school boys and girls in Isfahan city (including 329 students among whom 153 are male and 176 are boys). They enrolled in the fifth grade of primary school in the academic year 2014-15. Since the selected sample must represent the real population, primary schools which sign up students with certain conditions were removed from the statistical population.

To measure critical thinking, California Critical Thinking Disposition Inventory (CCTDI) questionnaire was used. The questionnaire which examines cognitive skills of critical thinking contains 75 questions in Likert scale ranging from strongly agree to strongly disagree with points (from one to six). They covered seven areas of critical thinking skills, including truth-seeking, open mindedness, the analysis power, information organization power, self-confidence, maturity, and exploratory abilities. However, in this study, because of the essential importance of the components of the analysis in the science curriculum of the students as basic and fundamental skill, this component (analysis) has been investigated.

The reliability of the questionnaire was calculated by using Cronbach's alpha test (0.90). The validity of the translated version of this test was examined by the content validity which showed high degree of agreement about it.

Group exploratory-based science lesson was conducted by means of raising a problem, collection and classification of data, making hypothesis, experimenting, group discussion on the results, presenting the results in the form of an organized expression or a formula and the analysis of the performed process in order to improve it. In order to ensure the proper implementation by the teachers, clinical supervision was applied. This method of teaching covered 30% of the content. The number of teaching sessions on average was twelve sessions for each class. Before and after the implementation of the research projects, pretest and posttest of critical thinking disposition were performed. Before executing this project, groups were taught by common methods of teaching or the traditional method.

RESULTS

Table 1. Results of Kolmogorov-Smirnov test for the normality assumption of the analysis skills

Component	Statistics k-s-z	Significance level	Shapiro Statistics	Significance level
Analysis	0.265	0.33	0.792	0.4

According to the results of the table, it is clear that presumption of the normal distribution of analysis scores is confirmed. ($0.05 \leq P$). Levine's test was used for the study of the assumption of the equality of the variance, the results are presented in table (2). As the results of the table (2) show, the results of Levin's test proved the equality of the variance of the component of analysis power. If P is higher than 0.05 in Levine, typically the assumption of equal variances is confirmed. As it can be seen from the table, P value is less than 0.05. So, the assumption of homogeneity of variances is confirmed. As it can be seen from table 2, the F value obtained from Levine's test is not significant; therefore, it can be concluded that the variances are homogeneous and covariance analysis test is possible.

Table 2. Results of Levine's test for homogeneity of variances

	F	Inter- group df	Df	p
Analysis power	21.04	1	110	0.39

Table 3. Mean and Standard Deviation of tastes' scores in critical thinking analysis component at pre-test and post-test stages of both control and experimental groups

group	Pre test		Post test	
	mean	Std. deviation	mean	Std. deviation
control	15.45	3.395	17.29	3.108
exploratory	14.37	2.097	44.79	4.314

Table 3 shows Mean and Standard Deviation of tastes' scores in critical thinking analysis component at pre-test and post-test stages of both control and experimental groups. Based on this information, the mean score of both traditional and exploratory groups increased after teaching by exploratory and traditional teaching methods, but this increase was noteworthy in exploratory method.

Table 4. A summary of the results of covariance analysis relating to the influence of both control and exploratory groups on the students' analysis skills

Component	Sources	Sum of squares	Df	Mean square	F	p	Eta
Analysis power	pretest	0.62	1	0.62	0.004	0.001	0.958
	group	20438.06	1	20438.06	1432.824	0.001	0.665
	error	1554.795	109	14.264	-	-	-

As it can be seen from table 4, by considering pretest scores as covariate, exploratory teaching method results in significant difference between both control and experimental groups.(P ≥٠/٠٥) The amount of the influence of exploratory teaching method was 0.665. That is, 0.665 percent of the variance of posttest (increase in analysis power) relates to teaching through exploratory teaching methods. Therefore, it is concluded from the results of the above table that exploratory teaching method influences the students' analysis skills. In fact, the results of the table show that there is significant difference between pretest scores of analysis component and posttest scores of analysis component in both groups.

Table 5. Output relating to the comparison of the scores of analysis skills relating to the influence of both control and exploratory groups.

Group	Mean	Std. Deviation	95% Confidence Interval	
			Upper Bound	Lower Bound
control	17.281	0.509	18.291	16.272
exploratory	44.79	0.509	45.8	43.781

As it is shown in Table 5, after adjusting for pretest scores, there is significant difference between tastes F = 1432.824, 0.05 P < 0 and ETA: 0.665. Adjusted mean score of analysis component suggests that control group has lower analysis skill in comparison to the exploratory group.

CONCLUSION

With respect to testing the research hypothesis, that is, "exploratory teaching method in natural science lesson has significant influence on the analysis skill of grade five elementary students of Isfahan". The mean scores of both control and exploratory groups increased after teaching based on exploratory teaching methods and there is significant increase. By considering pretest scores as covariate, exploratory methods result in significant differences between control and experimental groups. Therefore, it is concluded from the above table that the exploratory teaching method influences analysis skills of the students. Adjusted mean scores of analysis component suggest that control group has lower analysis skills in comparison to exploratory group.

The results of this study are consistent with the findings of Mahmoud (2012), Siew and Mapeala (2016), Cheng and Wan (2017). In fact, the preceding studies emphasize generally or specifically on the significant impact of exploratory teaching method on the growth of critical thinking skills of the students with reference to exploratory components.

In his research, Negretti (2012), studied the relationship between teacher's behaviors toward the students with the formation of attitudes in them and concluded that the way teachers interact with the students influence on the creation and growth of their attitudes. The above mentioned researchers emphasize that when teachers behave fairly toward the students and show attention and concern to their problems and ideas, the students do not get involved in indifferent and pessimistic feelings. The kind of lesson planning, teachers' teaching methods (implementation and enforcement aspects), learning styles, study strategies and learners' achievement motivation are among the factors that influence the effectiveness and coordination of curriculum and applying them correctly (according to the situation) brings about the effectiveness of the curriculum and result in the less distance between designed curriculum and its implementation and application and prepares the ground for more effectiveness and influence of the curriculum. Meanwhile, their improper application can destroy coordination between designed curriculum and their application and increases the distance between them.

From the general findings of this study, it can be concluded that if the teachers use more student centered activities while providing learning experiences in the course of planning teaching activities and use analytical, various, cooperative and flexible teaching methods, we can witness more development of social moral in learners. Although it has been mentioned repeatedly in the research that teachers are main basis of the teaching, exploratory method put utmost importance on the centrality of the students' thinking, analysis, power of the mind and reasoning. It provides challenging plans and meaningful learning opportunities in order to improve the analysis power of the students. In contrast, traditional approaches pay special attention to teachers and teaching atmosphere lacks flexibility and suitable challenge and learners do not have an important role in the course of teaching and planning teaching materials. Therefore, in the course of exploratory teaching, teachers should pay attention to indexes such as scientific teaching, encouragement and the growth of cognitive capabilities, balanced free will, suitable discipline, attention to values and social criteria in teaching, strengthening the foundations of human development and social adaptation. In this case, teaching can influence analysis skills of the students and develop them.

REFERENCES

Allen, JB, Barker, LN, & Ramsden, JH. (1986). Guided inquiry laboratory. *Journal of Chemical Education, 63*(6), 533.

Armour, Mary-Helen. (2019). Toward a Different Model of Online Learning-Developing a Self-Paced Online Experience. *AGUFM, 2019*, ED13D-0901.

Cheng, May Hung May, & Wan, Zhi Hong. (2017). Exploring the effects of classroom learning environment on critical thinking skills and disposition: A study of Hong Kong 12th graders in Liberal Studies. *Thinking Skills and Creativity, 24*, 152-163.

Dogan, Selcuk, Pringle, Rose, & Mesa, Jennifer. (2016). The impacts of professional learning communities on science teachers' knowledge, practice and student learning: A review. *Professional development in education, 42*(4), 569-588.

Fakayode, Sayo O. (2014). Guided-inquiry laboratory experiments in the analytical chemistry laboratory curriculum. *Analytical and Bioanalytical Chemistry, 406*(5), 1267-1271.

Hashemi, Seyed Ahmad. (2011). The use of critical thinking in social science textbooks of high school: A field study of fars province in Iran. *International Journal of Instruction, 4*(1).

Kitot, Awg Kasmurie Awg, Ahmad, Abdul Razak, & Seman, Ahmad Ali. (2010). The effectiveness of inquiry teaching in enhancing students' critical thinking. *Procedia-Social and Behavioral Sciences, 7*, 264-273.

Lin, Chia-Hui, & Lai, Ah-Fur. (2011). *Apply ICT-based PBL on the nature science learning to enhance the third grade students' key competences.* Paper presented at the 2011 International Conference on Electrical and Control Engineering.

Mahmoud, Hala Gabr. (2012). Critical thinking dispositions and learning styles of baccalaureate nursing students and its relation to their achievement. *International Journal of Learning and Development, 2*(1), 398-415.

Negretti, Raffaella. (2012). Metacognition in student academic writing: A longitudinal study of metacognitive awareness and its relation to task perception, self-regulation, and evaluation of performance. *Written Communication, 29*(2), 142-179.

Siew, Nyet Moi, & Mapeala, Ruslan. (2016). The effects of problem-based learning with thinking maps on fifth graders' science critical thinking. *Journal of Baltic Science Education, 15*(5), 602.

Terenzini, Patrick T, Springer, Leonard, Pascarella, Ernest T, & Nora, Amaury. (1995). Influences affecting the development of students' critical thinking skills. *Research in higher education, 36*(1), 23-39.

Thompson*, Ling, & Ku, Heng-Yu. (2005). Chinese graduate students' experiences and attitudes toward online learning. *Educational media international, 42*(1), 33-47.

Van Driel, Jan H, Beijaard, Douwe, & Verloop, Nico. (2001). Professional development and reform in science education: The role of teachers' practical knowledge. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching, 38*(2), 137-158.

Vong, Sam Aun, & Kaewurai, Wareerat. (2017). Instructional model development to enhance critical thinking and critical thinking teaching ability of trainee students at regional teaching training center in Takeo province, Cambodia. *Kasetsart Journal of Social Sciences, 38*(1), 88-95.